Contents

Nanotechnologies and natural sciences

Computer modelling and information technologies

Informācijas sistēmu menedžmenta augstskola

ISMA ANNO 1994

ISMA University

Information Technologies, Management and Society

The 16th International Scientific Conference
Information Technologies and Management
2018 April 26 - 27

ISMA University,
Riga, Latvia

Poltava National Technical Yurii Kondratyuk University,
Poltava, Ukraine

SATBAYEV UNIVERSITY
Almaty, Republic of Kazakhstan

Riga, 2018

IT&M 2018 Scientific Organizing Committee

IT&M 2018 Scientific Programme Committee

Supporting Organizations	ISMA Computer Technology Institute, Latvia ISMA Business Institute, Latvia
ISSN 1691-2489	***Information Technologies, Management and Society*** The 16th International Scientific Conference ***Information Technologies and Management 2018*** April 26 - 27, 2018. Theses. Editors Yu.N. Shunin and V.I. Gopeyenko **ISMA University, Riga, 2018**
Copyright©isma2018	1 Lomonosova Str., Bld.6, LV-1019, Riga, Latvia e-mail: isma@isma.lv

Novel materials for molecular electronics

Alytis Gruodis[1*], Artiom Magomedov[2], Vytautas Getautis[2]

[1]*Institute of Chemical Physics, Vilnius University, Saulėtekio al. 9, LT-10223 Vilnius, Lithuania*
[2]*Dept. of Organic Chemistry, Kaunas University of Technology, Radvilėnų pl. 19, Kaunas 50254, Lithuania*

**Corresponding author's email: Alytis.Gruodis@ff.vu.lt*

Abstract

New branched hole transporting materials containing two, three, and four linked diphenylamine-substituted carbazole fragments were synthesized and tested. Maximal value of charge drift mobility $\mu_0 = 4*10^{-4}\ cm^2V^{-1}s^{-1}$ allows estimating the carbazole derivatives as prominent material for solar cell manufacturing.

Keywords: carbazole-containing derivatives, diphenylamine-substitutes, perovskite solar cells, quantum chemical simulations

1 Introduction

Nowadays, solar energy market expands very rapidly. Traditional crystalline silicon equipment plays significant role in solar energetics. Otherwise, usage of molecular devices increases step by step due to economical purposes because they are relatively inexpensive for manufacturing and exploitation. Due to high absorption coefficient of polar π-conjugated molecules, thin-layered material can adsorb the big amount of light, especially in UV-VIS region. Such advantages promote the design and production of molecular devices. In comparison to traditional silicon devices, several disadvantages are well known: low molecular and thermal stability, low photovoltaic stability, low strength stability.

Carbazole and fluorene compounds play a very important role in molecular electronics [1] due to such circumstances: they are mechanically flexible, chemically stable at room temperature and electronically well π-conjugated. Carbazole as a tricyclic structure consists of nitrogen-containing pentagon and two six-membered hexagon rings and belongs to the basic materials for the dye industry.

This work is aimed for systematic estimation of novel molecular materials where polar π-conjugated system of core (phenyl bridge) is related with the several carbazole substitutes [2]. Existing of stable amorphous phase in films without transition to crystalline state was estimated as the important condition for cell manufacturing. Thermal analysis of the synthesized materials revealed that their thermal stability is high enough for the practical application in photovoltaic devices. Electronic absorption spectra contain several bands in the near UV region and that is beneficial for the application in the photovoltaic solar cells. Maximal value of charge drift mobility is equal to $\mu_0 = 4*10^{-4}\ cm^2V^{-1}s^{-1}$.

Double-, triple- and quadro-substituted molecular structures were synthesized and analysed by physical non-invasive methods. Most stabile derivatives – V957 and V1039 - are presented in one-conformational form (see Figure 1 and 2). Big number of conformational motions allows existing many conformational forms. While, additional branches introduced in V1039 and V957 or substitution of methoxy groups to methyl ones did not lead to the higher efficiency. Overall, it is evident that this type of molecules holds great promise for practical wide-scale application in commercial perovskite solar cells.

2 Quantum chemical simulations

Quantum chemical calculations of the carbazole-containing derivatives were performed by means of *Gaussian09* [3] software using density functional (DFT) method B3LYP. Optimization of the ground-state geometry was done using 6-31G(d) basis set supplemented with polarization functions. Singlet transition energies, corresponding oscillator strengths, and spatial distributions of electron density for the HOMO and nextHOMO as well as the LUMO and nextLUMO were obtained by means of the semi empirical TD method.

Fig. 1 represents the conformer V957 containing two carbazole fragments bridged by phenyl in 1,2 positions and next two – in 5,6 positions, respectively. Carbazole fragments are oriented parallel to each other and perpendicular to phenyl fragment. Due to high symmetry in several compounds, the initial assumption about the possible dimerization and following crystallization must be analysed.

Fig. 2 represent spatial atomic distribution of three conformers after ground state geometry optimization, when three carbazole fragments are bridged by phenyl in 1,3,5 positions. Three carbazole fragments are rotated through [–CH_2–] junction in the phenyl plane. Due to interfragmental interactions of biphenyl-amino groups belonging to the different carbazole fragments, the orientation of carbazole fragments is chaotic. Two carbazole fragments are directed down from the phenyl plane, and one – to opposite direction. Interfragmental orientation could be estimated in range [20..30] deg.

For all presented structures, HOMO and nextHOMO states represent the charge redistribution in carbazole fragment with both biphenyl-amino fragments. For all presented structures, LUMO and nextLUMO states represent the charge redistribution in carbazole fragment only. Due to high symmetry in several compounds, especially V957a, the population of lowest excited electronic state is not allowed (oscillator strength for transition $S_0 \rightarrow S_1$ is very small). It could be concluded that charge localization in excited state is limited by carbazole without biphenyl-amino substitutes.

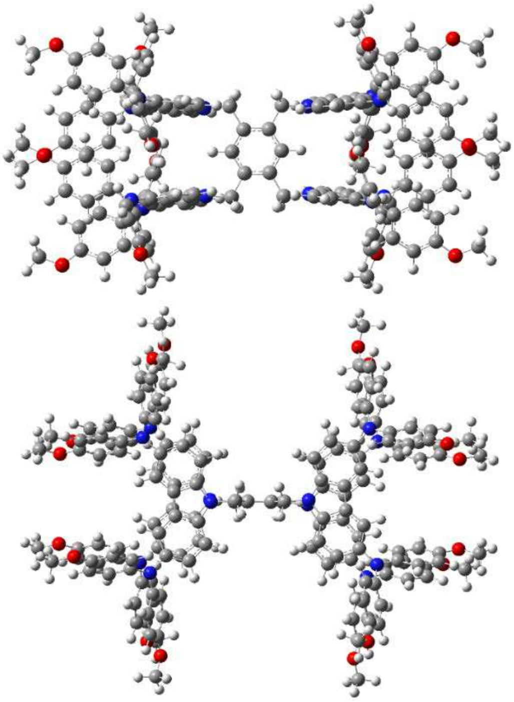


FIGURE 1 V957

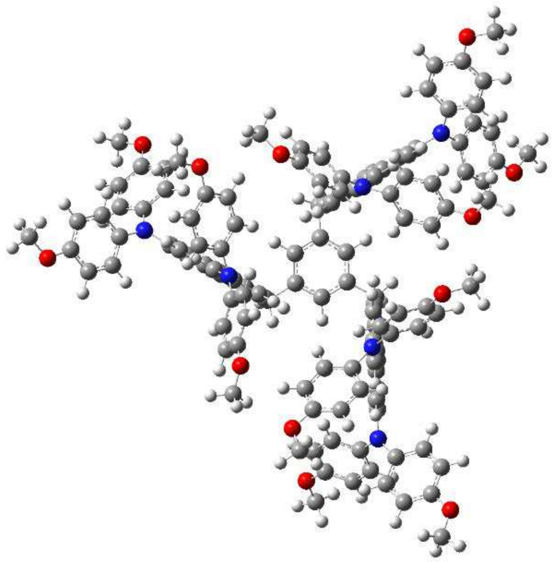


FIGURE 2 V1039

Acknowledgements

Computations were performed on resources at the High Performance Computing Center "HPC Sauletekis" in Vilnius University, Faculty of Physics.

References

[1] Shunin Y, Bellucci S, Gruodis A, Lobanova-Shunina T 2018 *Nonregular Nano-systems: Theory and Applications (Lecture Notes in Nanoscale Science and Technology)* Chapter 6. Classification and Operating Principles of Nanodevices Springer 409 p.

[2] Magomedov A, Paek S, Gratia P, Kasparavicius E, Daskeviciene M, Kamarauskas E, Gruodis A, Jankauskas V, Kantminiene K, Taek Cho K, Rakstys K, Malinauskas T, Getautis V, Khaja Nazeeruddin M 2018. Diphenylamine-Substituted Carbazole-Based Hole Transporting Materials for Perovskite Solar Cells: Influence of Isomeric Derivatives *Adv. Funct. Mater.* 1704351 - DOI: 10.1002/adfm.201704351.

[3] Frisch M J et al. 2013 Gaussian 09, Revision D.01, Gaussian, Inc., Wallingford CT

Ab initio simulations of the Y, Ti and O solute interactions in *fcc*-Fe lattice in presence of V_{Fe} vacancies

Aleksejs Gopejenko[1]* , Yuri F Zhukovskii[1], Yuri A Mastrikov[1], Eugene A Kotomin[1], Pavel V Vladimirov[2]

[1]*Institute of Solid State Physics, University of Latvia*
[2]*Karlsruhe Institut für Technologie, Institut für Angewandte Materialen, Karlsruhe, Germany*

**Corresponding author's e-mail: agopejen@inbox.lv*


Abstract

Inclusion of Ti atoms, which is present as a natural impurity in steels, during the manufacturing of the oxide dispersed strengthened (ODS) steels before the mechanical alloying results in the formation of various particles containing Y, Ti, and O such as $YTiO_3$, Y_2TiO_5 and $Y_2Ti_2O_7$. This also results in the reduction of the average size of the ODS particles to about 5 nm compared to the average size of 10-20 nm of pure Y_2O_3 particles, which improves the mechanical properties and radiation resistance of the ODS steels and leads to the interest in study of the Y, Ti, and O interactions in *fcc* Fe lattice. On the whole, ferritic alloys containing a high density of nanoscale clusters of Y–Ti–O exhibit superior creep strength and potential for high resistance to radiation damage.

Keywords: oxide dispersed strengthened steels, *ab initio* calculations, density functional theory

1 Introduction

Implementation of the reduced activation ferritic-martensitic steels strengthened by yttrium oxide Y_2O_3 (yttria) as well as by $YTiO_3$, Y_2TiO_5, and $Y_2Ti_2O_7$ allows increasing the operating temperatures of the future fusion reactors by 100°C, thus improving reactor efficiency. During mechanical alloying of yttria, small amounts of Ti are added as they refine the dispersion of reinforcing oxide during hot isostatic pressing (HIPping). As the size of Ti atom is very close to the size of Fe atom, the former can much easier than yttrium substitute regular iron atoms in the Fe lattice (unlike oxygen atoms). These results are in the focus of interests in order to study the interaction between the two Ti atoms, Ti and vacancy as well as between Y and Ti in *fcc* Fe lattice.

ODS steels are produced during the mechanical alloying followed by the HIP process at temperatures of around 1000-1200°C under the pressure of 100 MPa. Experimental evidence proved that a noticeable part of Y, Ti, and O atoms are present in the solid solution already after the milling. Both size and spatial distribution of the ODS particles noticeably affect the mechanical properties and the radiation resistance of the ODS steels. Unfortunately, to date the formation principles of the ODS steels are not fully understood.

2 Computational details

VASP 5.2 computer code based on the Density Functional Theory (DFT) approach with a plane-wave (PW) basis set combined with the Perdew-Wang-91 GGA (Generalized Gradient Approximation) non-local exchange-correlation functional has been used to perform *ab initio* calculations [1]. The core electrons are described using the Projector-Augmented Wave method (PAW). Its computational procedure includes an iterative solution of Kohn-Sham equations, which is based on residuum-minimization and optimized charge-density mixing routines, and employs a plane-wave (PW) basis set combined with the PAW scalar relativistic pseudopotentials [2]. The latter include Fe core electrons of ($4s^1 3d^7$ outer shell), O ($2s^2 2p^4$), Y ($4s^2 4p^6 5s^1 4d^2$), and Ti ($3p^6 4s^2 3d^4$) atoms with 8, 6, 11, and 12 external electrons, respectively.

Numerous preliminary test calculations have been performed to define the calculation parameters necessary to obtain plausible results. The results of these calculations for some basic lattice parameters such as lattice constant, bulk modulus, cohesive energy, and vacancy formation energy have been found to be in a good qualitative agreement with the ones reported in the experiments and other theoretical studies.

The cut-off kinetic energies should be set to at least 800 eV, the k-point sets in the Brillouin zone should be at least 7×7×7 k-mesh for supercells (SCs). Our model supercells are cubic, with the dimensions of 4a0×4a0×4a0 and 5a0×5a0×5a0, extensions (containing 64 and 125 atoms, respectively), the calculated optimized lattice constants of which have been found to be 3.448 Å [3-6].

3 Conclusions

The binding energies between different defects in *fcc* Fe lattice have been calculated. The smallest binding energies in the calculated configurations have been found for the configurations when oxygen atoms occupy the substitutional positions, while two yttrium atoms, two titanium atoms as well as both Y and Ti atoms have been positioned as the first nearest neighbours (1NN): 1.12 eV, 0.88 eV, and 1.34 eV respectively. With the increase of the distance between two Y atoms, Y and Ti atoms as in Y-O_{Fe}-

Y as well as Y-O_{Fe}-Ti configurations the binding energies between the defects very moderately increase (2.00 eV and 2.04 eV when two Y as well as Y and Ti atoms are 2NNs, respectively. The binding energies 2.20 eV and 2.24 eV have been obtained when two yttrium as well as Y and Ti atoms are 3NN neighbours, respectively, while the largest binding energy in a Ti-O_{Fe}-Ti precipitate (1.58 eV) has been obtained when two Ti atoms are the 2NNs. The same as for mechanism of yttria nanocluster growth, presence of iron vacancies is necessary to attain stability in (Y, Ti, O) precipitates, simultaneously it can still increase considerably the binding energy. Future work has to determine the effective formation and stability of (Y, Ti, O) nanoclusters at reactor operating temperatures and under irradiation or thermal conditions.

References

[1] Kresse G, Furthmüller J 2012 *VASP the Guide (Release 5.2.12)* University of Vienna
[2] Kresse G, Joubert D 1999 *Phys Rev B* **59** 1758-75
[3] Gopejenko A, Zhukovskii Yu F, Vladimirov P V, Kotomin E A, Möslang A 2010 *J Nucl Mater* **406** 345-50
[4] Gopejenko A, Zhukovskii Yu F, Vladimirov P V, Kotomin E A, Möslang A 2011 *J Nucl Mater* **416** 40-4
[5] Gopejenko A, Zhukovskii Yu F, Vladimirov P V, Kotomin E A, Möslang A 2012 *Proc. NATO ARW „Nanodevices and Nanomaterials for Ecological Security" (Eds. Shunin Yu N and Kiv A E, Springer: Dordrecht, 2012)* 149-60
[6] Gopejenko A, Zhukovskii Yu F, Kotomin E A, Mastrikov Yu A, Vladimirov P V, Borodin VA, Möslang A 2016 *Phys Status Solidi B* **253** 2136-43

Suitability of WS_2 nanotubes with different morphology for photocatalytic water splitting: First principles simulations

Yuri F Zhukovskii[1]*, Sergei Piskunov[1], Oleg Lisovski[1, 2], Eckhard Spohr[2]

[1]*Institute of Solid State Physics, University of Latvia, 8 Kengaraga Str., LV 1063, Riga, Latvia*
[2]*Theoretical Chemistry Dept, University of Duisburg-Essen, Universitätstr. 2, 45141 Essen, Germany*

**Corresponding author's e-mail: quantzh@latnet.lv*

Abstract

Tungsten disulphide 1D single-walled nanotubes (WS_2 SW NTs), either achiral (possessing armchair (n, n) or zigzag-type (n, 0) chiralities) or chiral (2n, n) with diameters $d_{NT} > 2.0$ nm have been found to be suitable for photocatalytic applications since their band gaps correspond to the range of visible light between the red and violet edges (1.5 eV < $\Delta\varepsilon_{gap}$ < 2.6 eV). We have simulated the electronic structure of gradually growing armchair *(ac)*, zigzag (*zz*), and chiral WS_2 single-walled nanotubes, diameters of which reach up to 12.0 nm (all of them are determined as diameters of internal W-containing shells of nanotubes). For all the WS_2 nanotubes, the top of valence band and the bottom of conduction band edges (ε_{VB} and ε_{CB}) must be properly aligned relatively to the oxidation (ε_{O_2/H_2O}) and reduction (ε_{H^+/H_2}) potentials separated by 1.23 eV, respectively, *i.e.*: $\varepsilon_{VB} < \varepsilon_{O_2/H_2O} < \varepsilon_{H^+/H_2} < \varepsilon_{CB}$. For thin nanotubes (0.5 < d_{NT} < 1.8 nm), the latter condition is not fulfilled. It has been found that band edge positions of SW WS_2 NTs (ε_{VB} and ε_{CB}) depend only on diameter and not chirality. At the same time separation between pairs of energies (ε_{VB}, ε_{O_2/H_2O}) and (ε_{H^+/H_2}, ε_{CB}) is small enough to satisfy requirements of photocatalytic suitability for SW WS_2 NTs of arbitrary diameters ($d_{NT} > 1.0$ nm) without any presence of point defects (*e.g.*, dopants). Large scale *ab initio* calculations on SW WS_2 nanotubes have been performed by us within the formalism of hybrid Density Functional Theory and Hartree-Fock method (using HSE0 Hamiltonian) properly adopted for tungsten disulphide bulk.

Keywords: tungsten disulphide 1D single-walled nanotubes,first principles calculations, density functional theory

1 Introduction

While the sphere of renewable energy has undergone essential development in the last decades, there are many issues to be addressed. One of the possibilities to substitute fossil fuel consumption with a renewable alternative is to develop efficient catalysts for solar hydrogen generation from water. Such catalysts have been known for 45 years since the pioneering work of Honda&Fujishima [1], but have not yet reached sufficient level to make the technology economically competitive, *i.e.* ≥10% conversion efficiency [2]. During the last years, the nanostructures of transition metal chalcogenides (TMCG) attract growing attention, in particular, tungsten disulphide (WS_2) nanotubes (NTs) of different chiralities and diameters [3].

It is important that parameters of the band structure of these nanotubes possessing defectless morphology almost ideally fit to the visible light range of electromagnetic spectrum. When diameters of single-walled (SW) WS_2 NT (d_{NT}) grow from 1.8 nm up to 12 nm, the energy gap $\Delta\varepsilon_{gap}$ increases within the range 1.5 eV < $\Delta\varepsilon_{gap}$ < 2.6 eV, which corresponds to change of colour from red to violet. Also, the obligatory condition for suitability of nanotube for photocatalytic applications is that the top of valence band and the bottom of conduction band edges (ε_{VB} and ε_{CB}) must be properly aligned relatively to the oxidation (ε_{O_2/H_2O}) and reduction (ε_{H^+/H_2}) potentials separated by 1.23 eV, respectively, *i.e.*, $\varepsilon_{VB} < \varepsilon_{O_2/H_2O} < \varepsilon_{H^+/H_2} < \varepsilon_{CB}$. In the case of thin SW WS_2 NTs (0.5 < d_{NT} < 2.0 nm) the latter condition is not fulfilled, *i.e.*, efficiency of their application in photocatalysis will be substantially lower than in the case of those which diameter is larger.

To clarify dependence of photocatalytic suitability on the morphology of WS_2 SW NTs, either achiral (possessing armchair (n, n) or zigzag-type (n, 0) chiralities) or chiral (2n, n) with diameters $d_{NT} > 1.0$ nm, we have performed large-scale *ab initio* calculations of their electronic structure, consequently varying n index.

2 Computational details and models

The equilibrium geometry and electron band structure of achiral and chiral WS_2 single-wall nanotubes (Fig. 1) were simulated within a full symmetry approach implemented in *CRYSTAL14* code [4]. Self-consistent electronic-structure calculations were performed using both Gaussian atomic orbitals for expansion of the Bloch functions (LCAO approach) and the hybrid exchange-correlation functional HSE06 [5]. The choice of the latter can be justified by the fact that it adequately provides the value of $\Delta\varepsilon_{gap}$ for bulk (1.35 eV) and its edges found to be qualitatively close to the experimental data [6].

The **k**-point mesh in the reciprocal space, at which the Hamiltonian matrix is diagonalized, was generated according to Monkhorst Pack scheme [7]. The reciprocal-space Brillouin zone (BZ) sampling was performed with 18×18×10 and 18 k-points for 3D WS_2 bulk and SW NTs, accordingly [8]. One-electron equations have been solved iteratively to self-consistency in energy within threshold of $3 \cdot 10^{-9}$ eV. Total optimization of the lattice constants and atomic sites in 3D and 1D WS_2 hexagonal structures were performed whilst the forces on atoms have been reduced to < 0.003 eV $\cdot$ Å^{-1}.

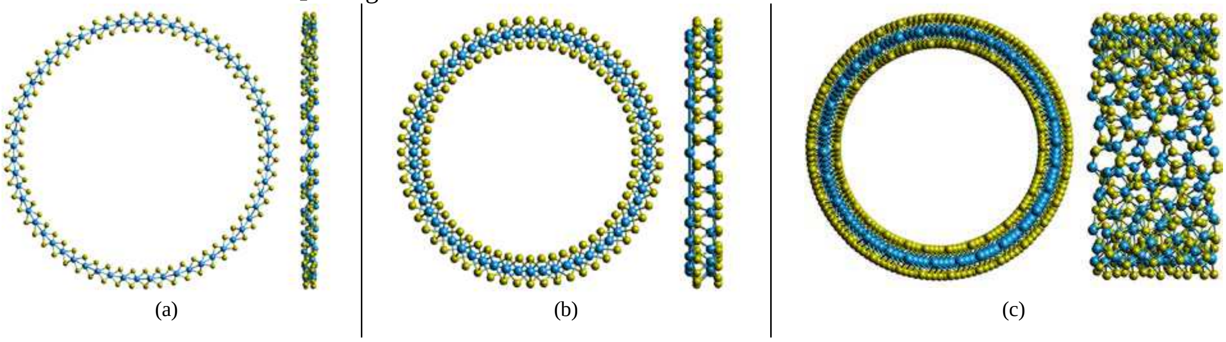


FIGURE 1 Three types of WS_2 SW NT chiralities modeled in this study: (a) armchair (n, n), (b) zigzag (n, 0) and (c) chiral ($2n$, n). Left side of each subfigure corresponds to the NT cross-section while right side images unit cell of the nanotube

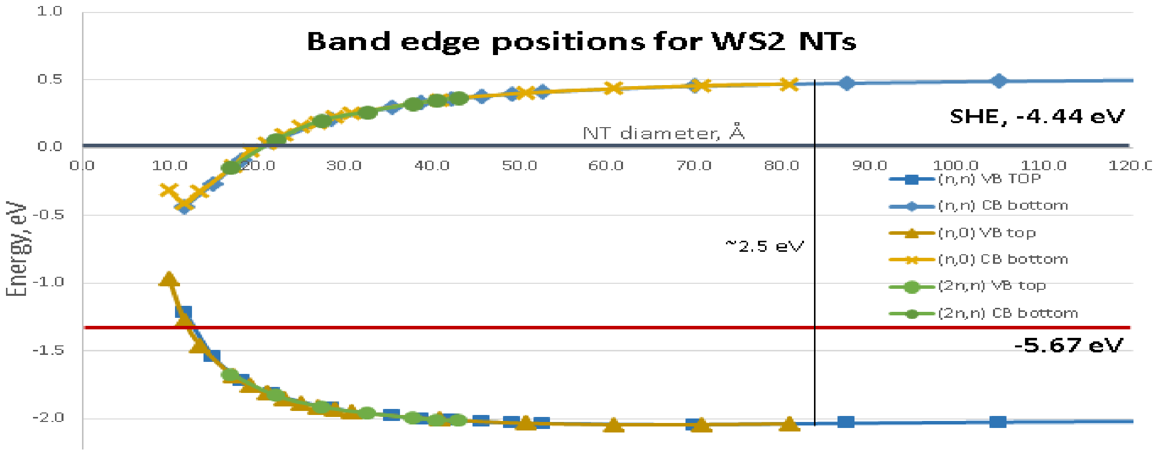


FIGURE 2 Dependence of edge positions on d_{NT} and chirality of nanotubes (SHE, standard hydrogen electrode, corresponds to $\varepsilon_{H^+/H_2} = 0$)

3 Conclusions

We have simulated the electronic structure of gradually growing WS_2 SW NTs of three different types of chiralities (Fig. 1), diameters of which increase from 1.0 nm up to 12 nm (Fig. 2). The band edge positions were found to be depended only on diameter d_{NT} (permanently growing with its increase) and not on chirality. Beginning with $d_{NT} > 2.0$ nm, this energy diagram corresponds to the requirement of nanotubes' photocatalytic ability: $\varepsilon_{VB} < \varepsilon_{O_2/H_2O} < \varepsilon_{H^+/H_2} < \varepsilon_{CB}$. Tuning of the band gap in this case possesses exclusively high resolution which makes WS_2 SW NTs suitable for photocatalytic applications in the corresponding range of visible spectrum. Additional analysis of nanotubes' stability against photocorrosion has to be performed.

References

[1] Fujishima A, Honda K 1972 *Nature* **238** 37–8
[2] Thimsen E, Biswas S, Lo C S, Biswas P 2009 *J Phys Chem C* **113** 2014–21
[3] Yadgarov L, *et al*. 2012 *Angew Chemie Int. Ed* **51** 1148–51
[4] Dovesi R, Saunders V R, Roetti C, Orlando R, Zicovich-Wilson C M, Pascale F, Civalleri B, Doll K, Harrison N M, Bush I J, D'Arco Ph, Llunell M, Causà M, Noël Y 2014 *CRYSTAL14, User's Manual*; University of Torino, Turin (Italy)
[5] Heyd J, Scuseria G E, Ernzerhof M 2003 *J Chem Phys* **118** 8207-15
[6] Kam K K, Parkinson B A 1982 *J Phys Chem* **86** 463-7
[7] Monkhorst H J, Pack J D 1976 *Phys Rev B* **13** 5188-92
[8] Evarestov R A, Bandura A V, Porsev V V, Kovalenko A V 2017 *J Comput Chem* **38** 2581-93

Accuracy of simulation of fractional Brownian motion

Anatolii Pashko*

Taras Shevchenko National University of Kyiv, Ukraine

**Corresponding author's e-mail: aap2011@ukr.net*

Abstract

We construct the model of a fractional Brownian motion with parameter $\alpha \in (0,1)$, which approximates such process with given reliability $1-p,\, 0<p<1$ and accuracy $\delta > 0$ in space $L_2([0,T])$. To build statistical models we use spectral representation of random processes - namely in the form of as integrals. Example of simulation is given.

Keywords: fractional Brownian motion, Hurst index, accuracy of the model, reliability of the model, Gaussian random process

1 Introduction

The use of statistical simulation methods, in particular, the methods for simulation of fractional Brownian motion, is becoming increasingly popular in recent day. Thus, in addition to the tasks of simulation and estimation of traffic in the theory of telecommunication networks, the models of fractional Brownian motion are used in financial mathematics, while solving stochastic boundary value problems and problems of computational mathematics, in queuing systems [1-4].

Let (Ω, Σ, P) be a standard probability space and *T* be a parametric space (*T = [0; T]* or *T = [0;1]*).

Definition 1. A fractional Brownian motion (generalized Wiener process) with Hurst index $\alpha \in (0,1)$ we call Gaussian random process $W_\alpha(t),\, t \in [0,T]$ with correlation function $R_\alpha(t,s) = \frac{1}{2}\left(|t|^{2\alpha} + |s|^{2\alpha} - |t-s|^{2\alpha}\right)$, such that $W_\alpha(0) = 0$ and $EW_\alpha(t) = 0$.

If $\alpha = \frac{1}{2}$ we have a standard Wiener process.

A generalized fractional Brownian motion with parameter $\alpha \in (0,1)$ can be represented in the form of the following stochastic integral [5]:

$$W_\alpha(t) = \frac{A}{\sqrt{\pi}}\left(\int_0^\infty \frac{\cos(\lambda t)-1}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_1(\lambda) - \int_0^\infty \frac{\sin(\lambda t)}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_2(\lambda)\right),$$

where $\zeta_1(\lambda)$, $\zeta_2(\lambda)$ are independent real valued standard Wiener processes with $E\zeta_1(\lambda) = E\zeta_2(\lambda) = 0$, $E(d\zeta_1(\lambda))^2 = E(d\zeta_2(\lambda))^2 = d\lambda$, $A^2 = \left(\frac{2}{\pi}\int_0^\infty \frac{1-\cos(\lambda)}{\lambda^{2\alpha+1}}\, d\lambda\right)^{-1}$.

Let us take an interval $[\varepsilon, \Lambda],\, 0<\varepsilon<\Lambda$, and represent the process $W_\alpha(t),\, t\in[0,T]$ in the form

$$W_\alpha(t) = \frac{A}{\sqrt{\pi}}\left(\int_0^\varepsilon \frac{\cos(\lambda t)-1}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_1(\lambda) - \int_0^\varepsilon \frac{\sin(\lambda t)}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_2(\lambda)\right) +$$

$$+\frac{A}{\sqrt{\pi}}\left(\int_\varepsilon^\Lambda \frac{\cos(\lambda t)-1}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_1(\lambda) - \int_\varepsilon^\Lambda \frac{\sin(\lambda t)}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_2(\lambda)\right) +$$

$$+\frac{A}{\sqrt{\pi}}\left(\int_\Lambda^\infty \frac{\cos(\lambda t)-1}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_1(\lambda) - \int_\Lambda^\infty \frac{\sin(\lambda t)}{\lambda^{\frac{2\alpha+1}{2}}}\, d\zeta_2(\lambda)\right).$$

Let $0<\lambda_1<\ldots<\lambda_n=\Lambda$ be a partition of the interval $[0,\Lambda]$, such that $\lambda_1 = \varepsilon$. We shall consider a model of the process $W_\alpha(t)$ represented by the following sums

$$S_n(t,\Lambda) = \frac{A}{\sqrt{\pi}}\left(\sum_{i=1}^{n-1} \frac{\cos(\lambda_i t)-1}{\lambda_i^{\frac{2\alpha+1}{2}}} X_i - \sum_{i=1}^{n-1} \frac{\sin(\lambda_i t)}{\lambda_i^{\frac{2\alpha+1}{2}}} Y_i\right),$$

where $\{X_i = \zeta_1(\lambda_{i+1}) - \zeta_1(\lambda_i),\, Y_i = \zeta_2(\lambda_{i+1}) - \zeta_2(\lambda_i)\}_{i=1}^{n-1}$ are independent Gaussian random variables with

$$EX_i = EY_i = 0,\; E(X_i)^2 = E(Y_i)^2 = \lambda_{i+1} - \lambda_i.$$

Next theorem contains conditions, under which the model approximates a process of fractional Brownian motion with given reliability and accuracy in a space $L_2([0,T])$. The results are based on work [6].

Theorem 1. The model $S_n(t,\Lambda)$ approximates the process $W_\alpha(t)$ with a given reliability $1-p,\, 0<p<1$ and accuracy $\delta > 0$ in $L_2([0,T])$ if

$$\int_0^T (B(t,[0,\Lambda]))dt < \delta^2 \min\left\{\frac{1}{2}, \left(-2\ln\left(\frac{\delta}{2}\right)\right)^{-1}\right\},$$

where $B(t,[0,\Lambda]) =$

$$= \frac{A^2}{\pi}\left(\frac{t^2\lambda_1^{2-2\alpha}}{2-2\alpha} + \frac{1}{\alpha\Lambda^{2\alpha}} + \frac{2t^2}{3}\sum_{i=1}^{n-1}\frac{(\lambda_{i+1}-\lambda_i)^3}{\lambda_i^{2\alpha+1}}\right),$$

$0 < \lambda_1 < ... < \lambda_n = \Lambda$ is a partition of the interval $[0,\Lambda]$.

Corollary 1. The model $S_n(t,\Lambda)$ approximates the process $W_\alpha(t)$ with a given reliability $1-p,\ 0<p<1$ and accuracy $\delta > 0$ in $L_2([0,T])$ if

$$D([0,\Lambda]) < \delta^2 \min\left\{\frac{1}{2}, \left(-2\ln\left(\frac{\delta}{2}\right)\right)^{-1}\right\},$$

where $D([0,\Lambda]) =$

$$= \frac{A^2}{\pi}\left(\left(\frac{\lambda_1^{2-2\alpha}}{2-2\alpha} + \frac{2}{3}\sum_{i=1}^{n-1}\frac{(\lambda_{i+1}-\lambda_i)^3}{\lambda_i^{2\alpha+1}}\right)\frac{T^3}{3} + \frac{T}{\alpha\Lambda^{2\alpha}}\right),$$

$0 < \lambda_1 < ... < \lambda_n = \Lambda$ is a partition of the interval $[0,\Lambda]$.

Let $0 < \lambda_1 < ... < \lambda_n = \Lambda$ - uniform partition of the interval $[0,\Lambda]$.

Corollary 2. The model $S_n(t,\Lambda)$ approximates the process $W_\alpha(t)$ with a given reliability $1-p,\ 0<p<1$ and accuracy $\delta > 0$ in $L_2([0,1])$ if

$$G([0,\Lambda]) < \delta^2 \min\left\{\frac{1}{2}, \left(-2\ln\left(\frac{\delta}{2}\right)\right)^{-1}\right\},$$

where $G([0,\Lambda]) =$

$$= \frac{A^2}{\pi}\left(\frac{1}{3}\left(\frac{\Lambda}{n}\right)^{2-2\alpha}\left(\frac{1}{2-2\alpha} + \frac{1+2\alpha}{3\alpha}\right) + \frac{1}{\alpha\Lambda^{2\alpha}}\right).$$

Corollary 3. The model $S_n(t,\Lambda)$ approximates the standard Wiener process $W(t)$ with a given reliability $1-p,\ 0<p<1$ and accuracy $\delta > 0$ in $L_2([0,1])$ if

$$GW([0,\Lambda]) < \delta^2 \min\left\{\frac{1}{2}, \left(-2\ln\left(\frac{\delta}{2}\right)\right)^{-1}\right\},$$

where $GW([0,\Lambda]) = \frac{A^2}{\pi}\left(\frac{7}{9}\left(\frac{\Lambda}{n}\right) + \frac{2}{\Lambda}\right)$.

2 Simulation

We represent realization of fractional Brownian motion (figure 1-3).

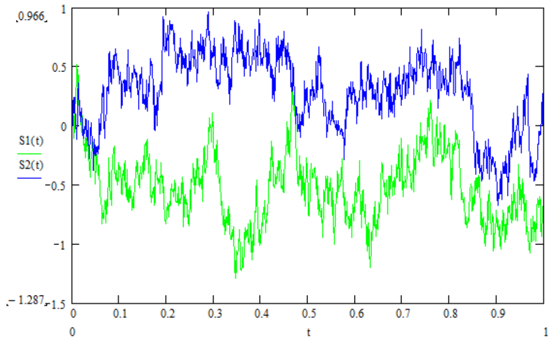


FIGURE 1 Realization of fractional Brownian motion with $\alpha = 0.3$

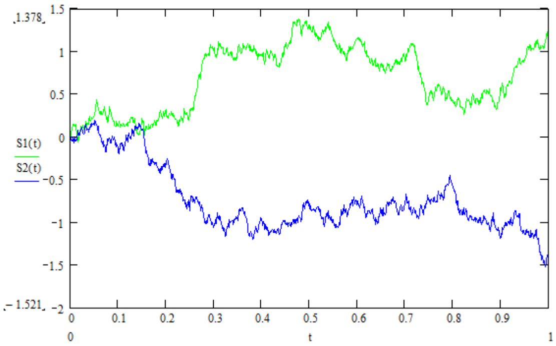


FIGURE 2 Realization of fractional Brownian motion with $\alpha = 0.5$

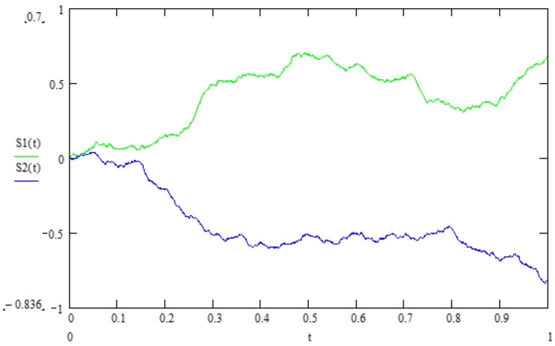


FIGURE 3 Realization of fractional Brownian motion with $\alpha = 0.8$

3 Conclusions

Statistical simulation Methods of fractional Brownian motion were developed. The methods are based on the spectral representation of random processes as integrals is used.

References

[1] Mishura Yu 2008 Stochastic calculus for fractional Brownian motion and related processes
[2] Norros I 1994 A storage model with self-similar input *Queueing Systems* **16**
[3] Sabelfeld K 1989 Monte Carlo Methods in Boundary Problems
[4] Kozachenko Yu, Yamnenko R, Vasylyk O 2008 *φ-sub-Gaussian random process*
[5] Prigarin S, Hahn K, Winkler G 2008 Comparative analysis of two numerical methods to measure Hausdorff dimension of the fractional Brownian motion *Siberian J. Num. Math.* **11**(2)
[6] Kozachenko Yu, Kamenshchikova O 2009 Approximation of SSub(φ) stochastic processes in the space Lp(T), *Theor. Probability and Math. Statist.* **79**

Design and optimization of spatial motion lambda mechanism for the flaps

Konstantin Nechval, Dorjpalam Tserentogtokh*

Transport and Telecommunication Institute, University of Latvia, Lomonosova Str. 1, LV-1019 Riga, Latvia

**Corresponding author's e-mail: tsttseegii@gmail.com*

Abstract

A wing produces lift as a result of unequal pressures on its top and bottom surfaces. This creates a shear force and a bending moment, both of which are at their highest values at the point where the wing meets the fuselage. The structure at this point needs to be very strong, to resist the loads and moments, but also quite stiff, to reduce wing bending. The wing will be quite thick at this point, to give the maximum stiffness with minimum weight. An advantage of wing-mounted engines is that their weight is close to the area in which the lift is produced. This reduces the total fuselage weight, reducing the shear force and bending moment at the wing root. A correct position of the fuel-load also results in a smaller moment at the wing root. Fuel load close to the tips reduces this moment. Therefore the order in which the tanks are emptied is from the root to the tip. The tail plane, rudder and ailerons also create lift, causing a torsion in the fuselage. Since the fuselage is cylindrical, it can withstand torsion very effectively. Also the landing gear can generate side loads causing torsion of the fuselage. But the main force caused by the landing gear is an upward shock during landing. For this, shock absorbers are present, absorbing the landing energy and thus reducing the force done on the structure. The extra work generated during a hard landing results in a very large increase in the force on the structure. This is why the absorbers are designed with a safety margin by taking into account a vertical speed 1.25 times higher than the maximum vertical speed during landing.

Flaps are fitted at the trailing edges. Light aircraft usually have simple flaps, or none at all. Larger aircraft have the more complex split flap or Fowler flap. Most large transport aircraft have double-slotted Fowler flaps. Leading-edge flaps, called slats, may be added to increase lift even further. Flaps and slats increase both lift and drag, both being advantageous for landings. Spoilers are fitted to the top surface of the wing. When operated, which is usually at touchdown, spoilers increase drag and reduce lift.

The main idea of the paper is to improve linkage mechanism of flaps control system for simple stable process.

Keywords: spatial motion lambda mechanism, flaps control system, design, optimization.

Improvement of the winglets shape in the wing

Konstantin Nechval, Davaajav Nyambayar*

Transport and Telecommunication Institute, University of Latvia, Lomonosova Str. 1, LV-1019 Riga, Latvia

**Corresponding author's e-mail: nymkacheb@gmail.com*

Abstract

The high pressure on the lower surface of the wing creates lateral airflow outwards or away from the fuselage towards the wingtip where, on account of relatively lower air pressure above the wing, tends to spill over and swirl around the wingtip to form a vortex creating additional drag described as "induced drag" thereby reducing aerodynamic efficiency of the wing. Recall, induced drag is the form of drag on an aircraft that is related to lift. Specifically, induced drag arises from the three-dimensional effects of a wing caused by downwash velocity near the wing tip. The circulatory motion of the air at the trailing edge of the wing (called a vortex) tends to drag the surrounding air down with it, causing a downward velocity component at the wing (see Figure 1). This downward component is called the downwash velocity and is often visually apparent when an airplane emerges out of a cloud bank.

Winglets are small aerodynamic surfaces mounted almost vertically at the wingtips. Inspiration for the design came from birds observed to curl their wingtip feathers upward when in need of high lift. A well designed winglet rises vertically and is swept back such that it significantly reduces the size of the wingtip vortex thus reducing induced drag. Already had a lot of solutions found for modern winglets since were first developed. But even now, engineers do not stop looking for new forms in the design of new wings and winglets. The paper sets out one of the attempts to do something better in this direction.

Keywords: wing, winglets shape, improvement

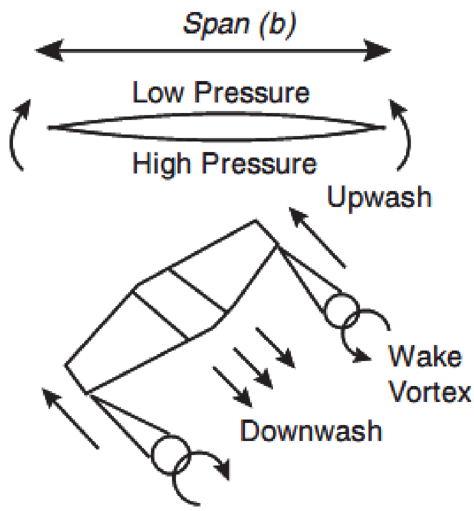


FIGURE 1

Solution problem of the determination of fail fasteners and structural joints

Konstantin Nechval, Erdenebaatar Batjargal*

Transport and Telecommunication Institute, University of Latvia, Lomonosova Str. 1, LV-1019 Riga, Latvia

**Corresponding author's e-mail: bbatja99@gmail.com*

Abstract

A complete airplane structure is manufactured from many parts. These parts are made from sheets, extruded sections, forgings, castings, tubes, or machined shapes, which must be joined together to form subassemblies. The subassemblies must then be joined together to form larger assemblies and then finally assembled into a completed airplane. Many parts of the completed airplane must be arranged so that they can be disassembled for shipping, inspection, repair or replacement and arc usually joined by bolts or rivets. In order to facilitate the assembly and disassembly of the airplane, its desirable for such bolted or riveted connections to contains as few fasteners as possible. For example, a semimonocoque metal wing usually resists bending stresses in numerous stringers and sheet elements distributed around the periphery of the wing cross sections. The wing cannot be made as one continuous riveted assembly.

Keywords: fail fasteners, structural joints, determination problem

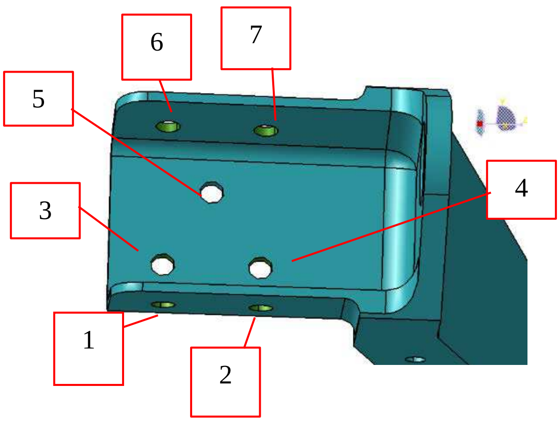
1 Introduction

Evaluation of design safe life of the elementThe main concept of the paper is to create inspection bolt for the purpose of disassemblies prevention.

Compare of two different old and new technology Hi-Lock fastener and inspection bolt.

As an example we have analysis of connection of the bracket with neighboring elements that have minimum fatigue life margin. The Rib 8 of Aileron Flange connection fatigue analysis have conclusion that connection with minimum service life is located at the bolt №6

2 How to identify most significant element in the structure



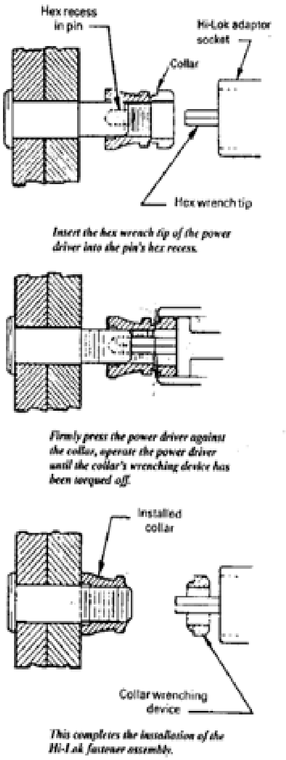
Value of σR0 (MPa) for underloaded element connections made of Al-alloys (7050-T7451) for single-row fastening is 177MPa.

Evaluation of design safe life of the element is 40 000 FH.

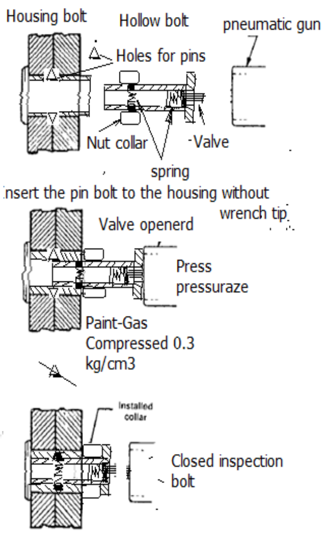
In advance we consider that bolt 6 would be inspection bolt.

3 Comparisons of two fasteners

In order to prevent subassemblies of the joint we have inspection bolt that can identify fracture effect overlapping with paint.



Installation of the Hi-Lok fastener.



Installation of inspection fastener

Theoretical modelling of nanodevices in the frameworks of embedded molecular cluster model

E K Shidlovskaya

Institute of Aeronautics, Riga Technical University, Kalku iela 1, Riga LV-1658, Latvia
Department of Natural Sciences and Computer Technologies, ISMA University, Lomonosova iela 1, k-6, Riga LV-1019, Latvia

**Corresponding author's e-mail: shidlovska@inbox.lv*

Abstract

Applicability of cluster embedding method with non-orthogonal wave functions for theoretical study of processes in nanodevices is studied. We demonstrate that our cluster embedding method is compatible with quantum transport theory based on time-dependent DFT. We conclude that quantum transport theory methods may be applied if we use one-electron approaches both with orthogonal and non-orthogonal wave functions. Possibilities to generalise quantum transport theory methods on the case of temperature-dependent electron transitions and theoretical modelling of temperature-dependent processes in nanodevices are discussed.

Keywords: embedded molecular cluster model, non-orthogonal wave functions, quantum transport theory, current in nanodevices

1 Introduction

When we theoretically describe nanodevice we have to treat the whole quantum system as two subsystems: small finite fragment of the system containing nanodevice (cluster) and the rest of the system containing electrodes. Problem "cluster in the field of the rest of system" is successfully solved in the frameworks of embedded molecular cluster (EMC) model with *orthogonal* wave functions. We have modified EMC model treating cluster embedding problem in the frameworks of one-electron approximation with *non-orthogonal* wave functions. We have proposed new cluster embedding scheme based on this approach [1].

Our present aim is application of our cluster embedding method for quantum-chemical modelling of processes in nanosystems and calculation of electrical properties of nanodevices.

2 Cluster embedding equations

Our cluster embedding scheme [1] is based on Hartree-Fock (HF) method. In the last years HF one-electron equations are rarely used. Calculations usually are carried out in the frameworks of density functional theory (DFT) with one-electron Kohn-Sham equations. Besides that, for theoretical modeling of nanodevices we want to apply quantum transport theory based on DFT. Therefore, we should find cluster embedding equations our variation procedure gives when we use DFT Kohn-Sham approach.

Total energy of many-electron system described by non-orthogonal one-electron wave functions on the both HF and DFT Kohn-Sham levels may be written in the same way. Varying expression for the total energy and analyzing our variation procedure we demonstrate [2] that our cluster embedding method based on HF calculation scheme is compatible with DFT Kohn-Sham calculation scheme. Cluster embedding equations remain the same if instead of Fock operator we use Kohn-Sham Hamiltonian. Therefore, there exists possibility to combine our cluster model (with non-orthogonal one-electron wave functions) and quantum transport theory based on time-dependent DFT (TDDFT). Our embedding scheme may be combined with TDDFT if electron transitions are described correctly: occupied and vacant cluster states are localized in the cluster region in the same manner. Our initial embedding equations [1] are established to give localized in the cluster region occupied states and delocalized vacant ones [3]. To get occupied and vacant states of the same localization degree, we have modified [3] our initial cluster embedding equations.

3 Quantum transport theory and cluster model

One of the approaches for calculation of electrical properties of nanodevices is quantum transport theory methods developed by Gross with co-workers [4]. We study possibility to combine our cluster approach with approach of Gross et al. Method of Gross implies that wave functions of nanodevice central part are orthogonal to the wave functions of the electrodes. We show [2] that approach for electric current calculation developed for orthogonal wave functions may be applied for non-orthogonal wave functions if we transform initial equations assuming that overlaps between wave functions are small ($S^2 << S$). Using this assumption we may combine our cluster embedding method with approach of Gross et al. and calculate electric parameters of nanodevices.

We conclude that our cluster embedding method is compatible with electric current calculation method based on TDDFT [4]. We propose calculation scheme for electric parameters of nanodevices using our cluster embedding method and based on TDDFT current calculation methods.

4 Conclusions

We demonstrate that our cluster embedding method is compatible with DFT Kohn-Sham method. We conclude that our embedding scheme may be combined with TDDFT and electric current calculation method based on TDDFT. We use TDDFT based quantum transport theory method of Gross et al [4] and propose approach for calculation of electric parameters of nanodevices.

Quantum transport theory methods for electric current calculation may be applied if we deal with one-electron approaches. In this case we can easily construct one-electron density and get continuity equation for electric current.

To treat processes in nanodevices, we should consider temperature-dependent electron transitions. In the frameworks of one-electron approach we can define temperature-dependent occupation numbers for vacant and occupied one-electron states. One-electron density may be constructed and continuity equation for electric current may be obtained using these occupation numbers.

Situation is more complicated if we want to overcome limitations of one-electron approximation using approaches like configuration interaction (CI) or perturbation theory (PT) methods. Our cluster embedding scheme is compatible with PT or CI methods because occupied and vacant cluster states are localized in the cluster region in the same manner. One-electron density may be constructed for these methods, too. But possibility to get continuity equation and expression for electric current in general form requires further study.

References

[1] Shidlovskaya E K 2002 Improved embedded molecular cluster model *Int J Quantum Chem* **89** 349-70

[2] Shidlovskaya E K 2012 in ed Y N Shunin and A E Kiv *Nanodevices and Nanomaterials for Ecological Security* NATO Science for Peace and Security Series B: Physics and Biophysics Springer pp. 191-202

[3] Shidlovskaya E K 2006 Problem of cluster embedding in crystalline lattice *Computer Modelling and New Technologies* **10**(4) 17-28

[4] Kurth S, Stefanucci G, Almbladh C-O, Rubio A, Gross E K U 2005 Time-dependent quantum transport: A practical scheme using density functional theory *Phys Rev B* doi: 10.1103/PhysRevB.72.035308

Modeling of the future climate in Central Asia within the framework of the CORDEX international project (Coordinated Regional climate Downscaling Experiment)

Nadiya Yunicheva[1], Ildan Kaipov[2], Kairat Bostanbekov[3]

[1]Institute of Information and Computational Technologies, 125 Pushkin Street, 050010, Almaty, Kazakhstan
[2]National Center of Space Research and Technology, Almaty, Kazakhstan
[3]Kazakh National Research Technical University, Almaty, Kazakhstan

Authors e-mail: [1]naduni@mail.ru, [2]ildan.kaipov@gmail.com, [1]k.bostanbekov@norlist.kz

Abstract

Projections of future climate are the main source of evidence-based information to address issues relating to the policy of Kazakhstan in the field of climate change, adaptation, strategies for planning of mitigation actions, risk management, planning for the development of such sectors of economy as agriculture, energy, industry, water resources, biodiversity. The research will be carried out on the basis of calculations of the ensemble of AOGCMs of the new generation participating in an international project for comparing the climate models CMIP5. New generation models have higher spatial resolution and improved model description of the Earth climate system components. This work is an attempt to find the best way of doing it.

Keywords: Climate, climate change, modeling, assessment, greenhouse gases, sensitivity, projection, experiment.

1 Introduction

Most of the regional information on climate change is based on the use of the coupled atmosphere-ocean general circulation models (AOGCMs) used in the last 30 years in the framework of the World Climate Research Program (WCRP). However, the horizontal resolution of most of the modern AOGCMs is still of the order of several hundred kilometers [1]. It does not allow them to capture the effects of local factors (characteristics of complex topography and land use that are changing the climate signal at small scales). To resolve this problem various "regionalization" or "downscaling" (zoom in) methods are developed to clarify the spatial climate information derived from AOGCM [2].

Methods of the regional climate downscaling (RCD) are increasingly used in the consideration of various climate change problems [3]. One of the reasons for low RCD-based products using is the lack of a coordinated framework for the assessment of the methods based on the RCD, and obtaining a high-quality ensemble projections to characterize the uncertainty underlying the regional projections of climate change. Most of RCD studies isolated and tied to specific interests, so there is currently no comprehensive picture of regional assessments of climate change, based on experiments using RDC. In this regard, within the framework of WCRP the Task Force on Regional Climate Downscaling has been recently established. The first result of the activities of this group was a create of a structure which is called as "Coordinated Regional Climate Downscaling Experiment (CORDEX)" [4,5]. Essentially CORDEX has a dual purpose: (1) to evaluate and compare the working model performance (the structure of the model evaluation) and (2) to set a number of experiments for obtaining climate projections to be used in impact and adaptation studies (database of prospective climate evaluations). The CORDEX purpose is to provide a framework that is available for a broad scientific community, making maximum using of the results. Therefore, the CORDEX areas cover most of the earth's surface of the globe, including the Central Asian region.

The authors of the upcoming project have the experience in the modeling of future regional climate acquired during the project for the preparation of III-VI National Communication of the Republic of Kazakhstan on Climate Change. They implemented a number of numerical experiments to assess the performance of such future climate characteristics as surface temperature and precipitation.

2 Conclusion

In the course of work, the following results were obtained:

- Optimal parameters for regional climate hydrodynamics models.
- Model sensitivity to greenhouse gas concentration increase.

The results of the work can be used when planning socio-economic regional development, development of adaptation events to climate change while assessing possible damage from the effects of the negative consequences of climate change on natural and economic systems.

References

[1] Alapaty K, Mathur R, Pleim J, Hogrefe Ch, Rao S T, Ramaswamy V, Galmarini S, Schaap M, Vautard R, Makar P, Baklanov A, Kallos G, Vogel B, Sokhi R 2011 New directions: understanding interactions of air quality and climate change at regional scales *Atmospheric Environment* **49** 419–21

[2] Baklanov A 2010 Chemical Weather Forecasting: A New Concept of Integrated Modelling *Advances in Science and Research* **4** 23-7

[3] Baklanov A, Grisogono B (Eds.) 2007 *Atmospheric Boundary Layers: Nature, Theory and Application to Environmental Modelling and Security* Springer, 248 p., ISBN: 978-0-387-74318-9

[4] Baklanov A, Korsholm U, Mahura A, Petersen C, Gross A 2008 ENVIRO-HIRLAM: on-line coupled modelling of urban meteorology and air pollution *Advances in Science and Research* **2** 41-6

[5] Baklanov A, Sørensen J H, Mahura A 2007 Methodology for Probabilistic Atmospheric Studies using Long-Term Dispersion Modelling *Environ. Model. Assess.* DOI 10.1007/s10666-007-9124-4

Information system project development for firm "Universal Pilot Group"

Valdis Grīviņš*, Alexander Mrochko

ISMA University, Riga, Latvia

**Corresponding authors e-mail: valdis.grivins@gmail.com*

Abstract

Wireless networks are finding more and more use in our current everyday life, including workplaces. With the big development of laptops, smartphones, smartwatches, tablet pcs and all kinds of wireless devices people are starting to try and find ways to remove the physical connection for connecting to internet. Also with development of smart house management it is becoming more and more plausible to optimize working conditions in many offices, by optimizing environment in an office. This work is an attempt to find the best way of doing it.

Keywords: wireless networking, smart office, efficiency

1 Introduction

Over the past decade, a lot of offices have evolved to become more informal, more airy and open, and more focused on collaboration and shared spaces. Many offices have also focused on creative comforts like comfortable furniture and company-provided snacks, as a way to help professionals relax so that they can be more creative and productive The challenge is that while companies have invested in these types of office upgrades, the technology in offices has remained pretty stagnant and so many of the old office frustrations like trying to connect to a conference call or present a PowerPoint from your laptop are still as annoying as ever.

That's where the new trend toward the "smart office" is kicking in. It's about using tech to amp up workspaces so that they are more efficient and employee-friendly.

Microsoft examined productivity (work per unit output), innovation (a combination of creativity and collaboration) and empowerment (feeling valued, making a difference and able to make strategic contributions) in businesses classified as having 'weak', 'average' and 'strong' digital cultures. Here are the results in the Figure 1 [1].

What's noticeable is that, across all three metrics, the stronger the digital culture the lower the percentage of employees who feel unproductive, lacking innovativeness and short on empowerment. A strong digital culture is clearly a positive thing, but there's room for improvement: the percentages of employees in strong-digital-culture businesses who rate themselves highly on empowerment (47%), innovativeness (39%) and in particular productivity (22%) might be expected to be higher, for example.

2 Overview

This work discusses the advantages, disadvantages and makes some conclusions on the following issues:

- Smart office advantages over regular office
- Becoming relatively wire free
- Ways to implement smart office

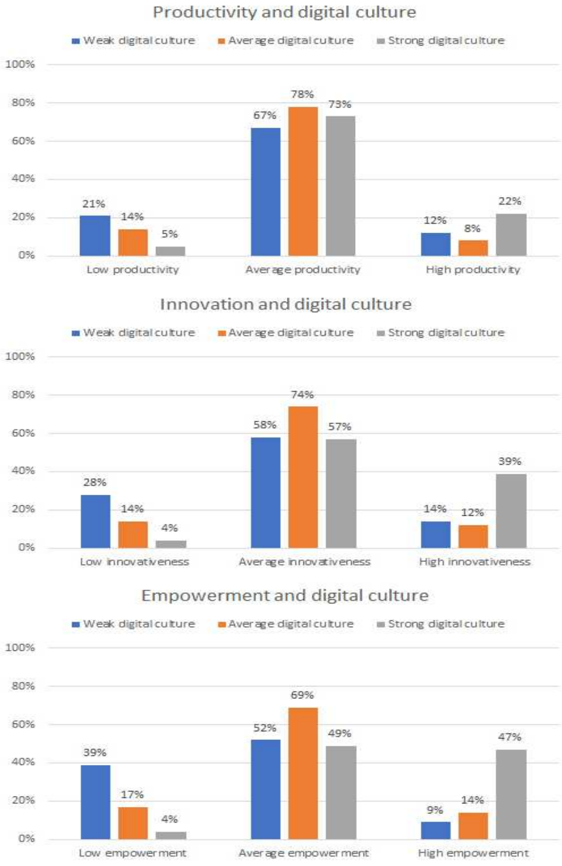


FIGURE 1 Productivity and digital culture

3 Decision

By making use of currently available solutions to make a plan on how to upgrade a regular office to a smart office, thereby improving the working conditions of company employees and raising their productivity. Some examples – smart desks, which are transformable for sitting and standing, that give feedback on sitting/standing patterns to improve general well-being of an office worker. Cordless office – making use of wireless technologies make that office has no fixed workplaces, everyone can freely move around the office and work from any available space.

4 Conclusion

This is a new trend in office making, thereby there are no real set rules on how to make this work, and therefore people can choose the best way on how to make it work for them. General consensus makes it so that people in these new kinds of offices are more productive, happier.

References

[1] https://ncmedia.azureedge.net/ncmedia/2018/02/EEE-Insights-Report.pdf Microsoft - Digital culture: Your competitive advantage

The effective diffusion coefficient in two-dimensional systems

J R Kalnin[1], E A Kotomin[2]

[1]*Venstspils University of Applied Sciencies, 101a Inženieru Street, LV-3601, Ventspils, Latvia*

[2]*Institute for Solid State Physics, University of Latvia, Kengaraga 8, Riga LV-1063, Latvia*

Abstract

The applicability of the effective diffusion coefficient D_{eff} of extended effective medium theory in two-dimensional case was tested for the model of periodically distributed impenetrable inclusions in the limit when the inclusion volume fraction f is very high (f tends to 1). Theory is compared with computer simulations in the continuous case. The range of applicability of the commonly used relation $D_{eff}=D_h/(1+f)$ (D_h – diffusion coefficient in the host matrix) depends on the ratio of bandwidths d between inclusions to the mean free path length l (or hopping length in a discrete model). In the limit $f \rightarrow 1$ and $l/d > 1$ $D_{eff} \rightarrow D_h$.

Keywords: effective diffusion coefficient, matrix with inclusions, mean free path, computer simulations, two-dimensional systems

1 General

Let us consider a simple case of matrix with two-dimensional periodic distribution of impenetrable inclusions shown in Figure 1.

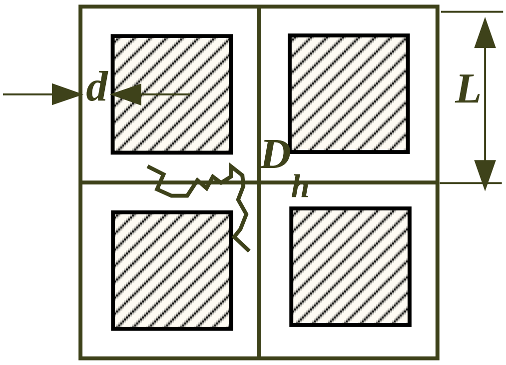


FIGURE 1 Periodically placed impenetrable inclusions

The extended effective medium theory [1, 2] predicts that the effective diffusion coefficient D_{eff} in the case of impenetrable inclusions with volume fraction f is

$$D_{eff} = \frac{D_h}{1+f}, \quad (1)$$

where D_h is the host diffusion two-dimensional (2d) diffusion coefficient

$$D_h = \frac{l^2}{4\tau}, \quad (2)$$

l is a mean free path, and τ hopping time.

Eq. (1) was confirmed by the Monte-Carlo simulations. In particular, for f=1 Eq. (1) gives $D_{eff}=1/2D_h$. However, if one considers the limiting case f=1 as diffusion along the contours around the inclusions, this yields $D_{eff}=D_h$ (it follows from simple considerations: diffusion along the contour segments L is 1d and total 2d diffusion may be described by Eq. (2) where l is replaced by L, and τ by $T=(L/l)^2\tau$).

We show that this contradiction arises due to the approximations used in the derivation of Eq. (1): 2d diffusion and the limiting case of small l. In FIG. 2 we present the results of computer simulation for l comparable with the width d of channels between the inclusions. As one can see, D_{eff} increases twice as l grows.

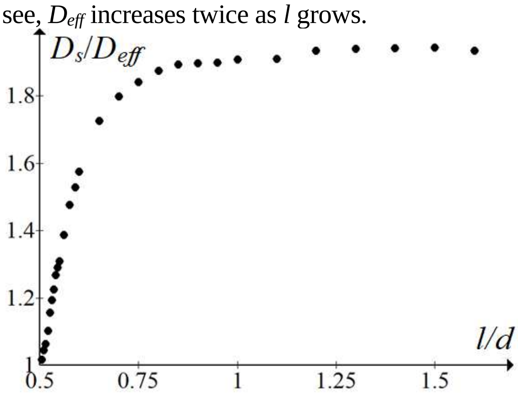


FIGURE 2 Ratio of D_s (effective diffusion coefficient from computer simulations) to D_{eff}, Eq.(1), as the function of l/d. L=10, d=0.2

2 Conclusions

Restrictions of extended medium theory in the case of volume fraction f close to 1 are demonstrated: Eq. (1) does not describe properly transition from 2d to 1d diffusion along the contours. From FIG. 2 it follows that it serves as good approximation only if for small mean free paths, $l/d<0.5$ or $f<(1-(l/L)/2)^2$.

References

[2] Kalnin Yu R, Kotomin E A 1998 *J.Phys.Math.Gen* **31** 7227

[3] Kalnin J R, Kotomin E A, Maier J 2002 *J.Phys.Chem.Sol.* **63** 449

Web based project management: software evaluation

Violeta Jadzgevičienė

Vilnius Gediminas Technical University, Saulėtekio al. 11, LT-10223 Vilnius
Vilnius Business Collage, Kalvarijų g. 125, LT-08221, Vilnius.

Corresponding author's e-mail: violeta.jadzg@gmail.com

Abstract

It is known that effective project management comprises good planning as well as information processing. This information has to be received on time, immediately analysed and valued. It allows foreseeing probable issues or obstacles also evaluating the effect on other project management processes. There are many project management tools and software being developed every day to help managers to automate the administration of individual projects or groups of projects during their life-cycle. Project Management software helps to plan and realize your project while enabling you to control your internal processes, from project generation through workflow and approves a successful conclusion. This work presents a short comparison of popular web based project management tools.

The growing supply of project management software raises challenges with choosing one for the particular project. The choice is dependent on the methodology and operated processes, which outline the requirements for the software. Kerzner (2003) discerns five essential functions of project management software.

1. **Planning and control** – each task receives a set start and finish times, the recourses for successful completion are calculated.
2. **Report production** – the ability to create new reports or modify and/or edit existing ones. These reports can be fully compatible with Gant diagrams and/or any other essential graphs, for example, anticipating work recourses; planning of expenses and money traffic, etc.
3. **Calendar** – this function allows the organization of separate project steps or stages as well as these steps into work weeks with exclusion of holidays. This function allows calculating needed recourses for every stage of the project and forms the daily schedule of every participant.
4. **"What if" analysis** – This function permits the creation of a project copy where it is possible to submit chosen data. After this the system presents a comparative analysis of the two projects in a desired form which display possible results if, say, the number of participants lowers, the budget shrinks, etc.
5. **Project portfolio analysis** – It gives the opportunity to control two or more projects at the same time. While managing a couple projects it permits the use of same constant files or data.

K. Schwalbe (2007) while talking about the importance of software in project management highlights the importance of a software that is compatible with a specific corporation as a factor in successful project completion. While choosing a software Wei, Liang ir Wang (2007) suggests the use of seven steps methodology while picking a software that is accomodating the specific needs of the organization for project management.

References

[1] Schwalbe K 2007 *Information technology project managemen* United States: Academic Internet Publishers
[2] Wei Chun, Liang Gin, Wang Mao 2007 A comprehensive supply chain management project selection framework under fuzzy environment *International Journal Of Project Management* **25**(6) 627-36
[3] Kerzner H 2003 *Project management - a systems approach to planning, scheduling and controlling* New York: Wiley

Difference between modern artificial neural networks and new approach for information processing in human brain

Dina Panyukova

Institute of Information and Telecommunication Technologies, Kazakh National Research Technical University named after K.I. Satpayev, Satpayev Str.22, 050013, Almaty, Kazakhstan

Corresponding author's e-mail: haleth@mail.ru

Abstract

Artificial neural networks become important mechanism for data processing and many other intellectual tasks. All of them are based on artificial neuron model. But the artificial neuron concept was formed with understanding of human brain functioning from nearly middle of XX century. Until now the processes in biological brain are researched even more and new principles are revealed. The article is devoted to discussion about modern artificial neural networks as an actual brain model while neurobiology has developed from the time of the artificial neuron creation. Also, while such intellectual systems as neural networks can be used with reasonable efficiency, their "understanding" of data processing is still an arguable issue.

Keywords: Neural network, data processing, artificial intelligence, learning process, Chinese room

1 Introduction

Artificial neural networks (ANNs) are wildly used in modern information technologies. Their application fields include approximation, classification, data processing and control. So, are used almost anywhere where task hardly can be solved by conventional programming. They have high level of flexibility and adaptation but with certain error in results. They become basic technique for most of intellectual systems nowadays.

ANNs are based on concept of artificial neuron which model was firstly presented in 1943 and developed in 1960. Then in the late 1980s ANNs started to be researched and implemented more and more. But since then ANN's data processing principle hasn't had any significant change. While neuroscience is still researching how human brain is working and revealing new factors and principles of data processing.

"Artificial neuron concept" part of the thesis devoted to artificial neuron concept as it is used in modern ANNs and the biological process on which ANN is based.

"New approaches in biological data processing" part is devoted to short review of understanding of thinking process in biological brain. Especially to new principles that are revealed from the time when artificial neuron is modelled.

In "Actuality of ANN" part of the thesis ANN and new biological data processing concept are compared.

Then in "Understanding" of intellectual systems" ANN "understanding" of data processing is discussed. Does it "know" what it is doing or just recreate something by a pattern?

At the conclusion the perspectives of ANN development are suggested.

2 Artificial neuron concept

Artificial neuron concept is based on idea that information is passing through nervous system by an electrical signal passing from one neuron to another. And such signal can be stimulating or retarding.

If describe artificial neuron in more details, firstly incoming signals from connected neighbouring neurons are multiplied by relevant weighting coefficient. Such coefficients can be positive for stimulating signals or negative for retarding signals. If weight is zero the connection is logically absent. Then sum of the weighted signals are going through activation function. So, the output signal is the result of chosen activation function.

Of course, in some specific ANN the structure of artificial neuron can be different. For example in RBF network there is no exact weights or in output neurons sometimes there is no activation function. But anyway concept of ANN is based on work of biological neuron system as it was said that only by electrical signals human brain is processing information.

3 New approaches in biological data processing

As described in previous part ANN is based on the information processing in biological neurons. But such biological neurons are only a part of biological nervous system.

Recent evidence helped neuroscientist to discover that "thinking" process is provided not only by electrical signal but with chemical reaction too. And such chemical signals provide communication not only of neurons but also for glial cells as described in [1]. Glial cells can fully identify activation of neuron and affect the information transmission.

Also glial cells are executing even more functions in the brain. Such are nutrition of neurons, protection, myelination and even stimulation for new connections as written in [2].

4 Actuality of ANN

ANNs become very popular and useful instrument for almost any task which cannot be solved by conventional techniques. But they still have some disadvantages human brain doesn't have. Some of these disadvantages rest on still limited computing possibilities of electronics. But some concerns partial flexibility of ANN structure and functionality.

Presumably new model of human brain that unlike ANN will simulate "thinking" action in more details will have more capabilities.

5 "Understanding" of intellectual systems

If to discuss ANN not only as programming instrument but as intellectual software that can "understand" what it is doing, researches have to obtain consensus about possibility of not only analysis but also of synthesis by ANN. It is not straight equal to "consciousness" phenomenon, because that question concerns only the education technique of ANN, not its self-awareness.

To argue against "understanding" of ANN it is enough to refer to thought experiment known as the Chinese room which is properly described in [3]. So, even if suppose that state-of-art ANN has "consciousness", in its educational process given data is not enough for "understanding" as for humans it is not enough to know incoming and resulting factors for comprehensive formulation of theorem.

6 Conclusions

Nowadays ANN became one of the most distinguished instruments for any computing. But it still cannot compare with biological nervous system especially with human brain.

As discussed in the article there are two main ways to expand ANN functionality. First is to formulate extended model of nervous system functionality that includes chemical signals in data processing as described in third and fourth part. Second is to develop of education process for ANN as discussed in fifth part.

References

[1] Fields R D 2012 *Encyclopedia of Human Behavior (Second Edition) Glial Cells* 255–60

[2] Mihailoff G A, Haines D E *2018 Fundamental Neuroscience for Basic and Clinical Applications (Fifth Edition), Chapter 2 – The Cell Biology of Neurons and Glia* 15–33.e1

[3] Rakover S S 1999 The computer that simulated John Searle in the Chinese Room *New Ideas in Psychology* **17** 55-66

Development of an automated system for controlling the thermal regime of an oil pipeline based on a neural network estimation

R G Rakhmatullayev* , O V Zhirnova, A T Nagimova, A Zh Onlasynova

Kazakh National Research Technical University named after K.I. Satpayev, Institute of Information and Telecommunication Technologies, specialty 5B070200-"Automation and Control", Kazakhstan, Almaty

**Corresponding author's e-mail: rakhmatullayev@bk.ru*

Abstract

In this work there was conducted a research of the dynamic model for the control of thermal regime of an oil pipeline and is carried out its neural network estimation. There were revealed the advantages and disadvantages of intelligent networks. An important scientific and technical task is to predict the level of electric power consumption of an industrial enterprise. Considered an identification algorithm that allows to select random rows from the block of transformed initial data for a dynamic object, to transit to the parameter space and to use a priori information about the parameters existence area in order to improve accuracy. This allows to create a model of a dynamic object, which gives a smaller forecast error. The algorithm is used to construct a mathematical model based on the results of experimental researches of heat removal. Proposed an impulse energy method based on the energy representation of the process of regulating the parametric state of an object.

Keywords: Thermal regime, model, structure, neural networks, neural network analysis

1 Introduction

People always aim to create a thinking machine, an apparatus that would be better and faster than a person to make decisions. A kind of super brain that solves all problems. And decisions on the extraction and transportation of oil are relevant for the development of the oil industry. The problem statement can be formulated as follows: neural network estimation is necessary to reduce the influence of the environment (temperature drops) on the oil pipeline and to save money, time and human resources. With the help of an intelligent system the accuracy of the model is increased and entropy is reduced. The postational transfer system is characterized by the fact that oil or oil products enter the reservoirs of intermediate pumping stations, fill them, and then are pumped to the next station. If several reservoirs are located at the station then the product is pumped continuously: in one tank the products come in, and from the other they are pumped out into the oil pipeline. Transit pumping system can be carried out through the reservoir and from the pump to the pump. During the pumping through the reservoir the products from the previous pumping station are sent to the next pumping station through a reservoir designated for the separation of gas or water from oil. Transferring from the pump to the pump is focused on the fact that the product from the previous pump station is sent directly to the next pump station, bypassing the intermediate reservoir, which is connected in parallel to the oil pipeline. This pumping scheme is the most perfect and economical, since it ensures maximum sealing of the system, and losses from evaporation in the intermediate reservoir are eliminated. The last ones in this system can be created in a minimum amount and only to free the pipeline at starting or repairing. As a model for the implementation of this regime there were chosen neural networks. Being a new direction in modeling neural networks are most suitable for modeling. Reduction the energy costs of the equipment is the main aim in the calculations of technological modes of oil pumping. Solving this problem will lead to a reduction of oil transportation costs. These requirements are met by neural network information analysis technologies as the most effective method for processing operational data in multiparameter, hard-to-formalized oil and gas production environments. In this regard, the current task, to which the article is devoted, is the development of new methods and tools for operational diagnostics of the pipeline condition in the oil and gas industry based on the technology of artificial neural networks.

2 Overview

The control object is a linear section of the oil pipeline. By the principle of products pumping there are used two systems in practice: postational, transit. The system includes: Neural systems on the crane nodes; Neural systems on training cells with algorithms for parametric identification of backward propagation. In the training cells there are measured the wall temperature and temperature of the liquid using thermal resistance converters, according to the values of which the training is carried out in accordance with the described algorithms. The received training coefficients from the "training cells" enter the block of distribution of training coefficients W, along the length of the pipeline. The distribution of the coefficients is carried out by the formula:

$$\frac{Wij1 + Wij2}{2}\beta_k,$$

where i, j – numbers of training coefficients, k – number of the crane platform, β k - weight distribution coefficient.

3 Decision

For ACS TP of the oil transportation the availability of qualitative mathematical support plays a fundamental role. Obtaining a real effect from its implementation is directly related to the use of a sufficiently adequate mathematical model of the control object and of the algorithm for its implementation. The developed models allow the ACS TP adequately to simulate typical non-stationary and non-isothermal operation modes of main oil pipelines. For the development of training algorithm it is firstly necessary to select the data obtained experimentally. For this purpose it is necessary to approximate the liquid and external wall temperature graphs in order to obtain the numerical values of the liquid and external wall temperatures.

4 Conclusion

The efficiency of models and control algorithms has been tested for the main tasks of modeling the dynamics of long-distance oil transportation. The proposed control algorithm ensures the required control quality, as well as the maintenance of process parameters strictly within the acceptable limits. The developed techniques can be used in training simulator complexes imitating the control of long-distance oil transportation, for the preparation of dispatch personnel.

References

[1] Haseli Y, van Oijen J A, de Goey L P H 2013 Reduced model for combustion of a smali biomass particie at high operating temerature, *Bioresource Technology* **131** 397-04

[2] Kvyetnyy R N, et al. 2015 Modification of fractal coding algorithm by a combination of modern technologies and parallel computations *Proc. SPIE 9816, Optical Fibers and Their Applications 2015* 98161R, doi: 10.1117/12.2229009

[3] Ławicki T, Zhirnova O 2015 Application of curvelet transform for denoising of CT images *Proc. SPIE 9662, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2015, 966226 (11 September 2015)* doi: 10.1117/12.2205483

[4] Moskvina S M, et al. 2015 Evaluation of the impact of uncontrolled parametric perturbations on stability of automatic systems with logical control units *Proc. SPIE 9816, Optical Fibers and Their Applications 2015, 98161X* doi: 10.1117/12.2229136

[5] Wójcik W, Zhirnova O V, Kulakova E A, Imanbekov B T 2015 Development of an automated system diagnostics and management of biogas combustion process *Proceedings of the Second International scientific-practical conference "Information and telecommunication technologies: education, science and practice", Volume II, Almaty, Kazakstan, December 3–4, 2015*

[6] Zhirnova O V, Kozhamberdieva M I, Imanbek B T 2015 Gasification process for vapor flow, temperature, and raw materials *Proc. of the IV International Conference "Global Science and Innovation", 12–13 March, USA, Chicago, 2015*

[7] Zhirnova O V, Suleimenov B A, Toigozhinova A Zh, Wojcik W T 2015 Construction of mathematical model the combustion of biogas to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **N1**(421) 177-85

[8] Nussupbekov B R, Karabekova D Z, Khassenov A K, Zhirnova O, Zyska T 2016 Heat flow meter for the diagnostics of pipelines *Proceedings of SPIE The International Society for Optical Engineering 10031, 100312C*

[9] Zhirnova O V, Toigozhinova A Z, Imanbek B, Kulakova E A, Suleimenov B A 2016 Diagnosis of combustion process biogas and gas power plants to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **6**(420) 123-35

[10] Guzhva A G, Dolenko S A, Isaev I V, Oborev E A, Persiantsev I G, Shimelevich M I 2012 *Investigation of the influence of the amount of simultaneously determined parameters on the error of the neural network solution of the inverse problem of electrical prospecting*

[11] Komyagin A F 2012 *Automation of production processes and ACS TP for gas and oil pipelines* Moscow: Energoizdat

[12] Minsker I N 1983 *Operational control of chemical and technological complexes* Moscow: Chemistry

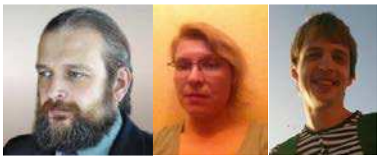
[13] Shishkin A F 2010 *Automated control systems for enterprises of the oil and gas industry* Moscow: Energoizdat

The search for additional features for the improving of a joint ("two-dimensional") classifier of genre types and stylistic colouring of poetic texts

V Barakhnin[1, 2*], O Kozhemyakina[1], I Pastushkov[1]

[1]*Institute of Computational Technologies of SB RAS, Lavrentiev av., 6, 630090, Novosibirsk, Russia*
[2]*Novosibirsk State University, Pirogov str. 1, 630090, Novosibirsk, Russia*

**Corresponding author's e-mail: bar@ict.nsc.ru*



Abstract

In this paper we propose the usage of additional features for the improving of a joint ("two-dimensional") classifier of genre types and stylistic colouring of poetic texts in Russian. We expand a range of the features to increase the precision of classifier. On the basis of these approaches the principles of formation of the training samples for the algorithms for the definition of styles and genre types were analysed. The computational experiments with a corpus of texts of the lyrics of A.S.Pushkin from 1818 to 1825 and of the whole lyrics of K.N.Batyushkov were implemented, which showed good results in determining the stylistic colouring of poetic texts and sufficient results in determining the genres. The proposed algorithms can be used for automation of the complex analysis of Russian poetic texts, significantly facilitating the work of the expert in determining their styles and genres by providing appropriate recommendations.

Keywords: automated analysis, computational experiments, "two-dimensional" classifier, genre, style

1 Introduction

In the tasks of automated text analysis in natural language, the problem of determination of their genre and stylistic characteristics is determined. The researcher can get this problem in a wide range of situations: from the problems of automation of the complex analysis of poetic texts, for which the type of genre and stylistic characteristics are the important attributes used in determining of the impact of lower levels on higher levels of the verse (see for example [1]), to the tracking of messages in social networks to identify the terrorist threats, the determination of marketing preferences of buyers, etc.

The researches in the field of automated determination of the genre type of texts were started recently – in early 2010-ies. So, in work [2] the algorithms of determination of genre types of odes, songs, epistles, elegies and epitaphs are based on the works of English poets-sentimentalists of the XVIII century. The time period in this study was not chosen by chance: in the poetry of the XVIII century the classicism with its strict genre rules dominated, and this greatly facilitated the development of algorithms.

The paper [3] describes the method of text classification (for certain genres and authors) based on the analysis of statistical regularities of letter distributions, i.e. the probabilities of occurrence of letters and letter combinations, along with this a solution is found without the "invasion in the sphere of literature, i.e., without the analysis of syntax, literary techniques and patterns of character interactions". However, in [4], the authors build an original counterexample to the statistical method of identification that shows the necessity of using, at least, the methods of morphological analysis.

As for the automation of determination of stylistic characteristics of the texts, we don't know the researches in this area, at least for the texts in Russian. Thus, our researches on computer joint definition of the type of genre and stylistic colouring of Russian texts are of a pioneer nature.

In the present work we suggest and use the additional features for the improving of a joint ("two-dimensional") classifier of genre types and stylistic colouring of poetic texts. Our purpose is not the creation of new theories of genre and stylistic relationships within literary works but the development of the analyser that allows to correlate correctly the stylistic colouring of the text with its genre identity what has relevance for researches in the field of Informatics, because we are talking about the tools used not in the strictly linguistic space.

2 The choice of training data

While we built the joint ("two-dimensional") classifier of genre types and stylistic colouring of texts, we took into account that the classifier itself is a multidimensional structure, based on the totality of parameters, which define the object of study. When we construct the multidimensional classifiers associated with such difficult (for unequivocal definition) categories like genre and style, the phased development of each analysis parameter is required in order to exclude possible errors and the variability of results. Such classifier is created for the first time (at least for texts in Russian). For the analysis we take the lyrics of A.S.Pushkin from 1818 to 1825 and the whole lyrics of K.N.Batyushkov. We confirm the results received on the material of the lyrics of A.S.Pushkin of Lyceum period (that we took as training sample on the first stage of the researches), and we make the experiments with classifier using new features.

Genre types formed the basis of the classifier: along one axis we have placed the genre types in order of ascending “the sublimity” and along another axis - the traditional styles (see Table 1, Table 2).

TABLE 1 The statistics on the genre and stylistic compliance, Pushkin (1818-1825)

	High	**Neutral**	**Low**
Ode	4	-	-
Epistle	17	66	9
Madrigal	-	1	-
Satire	-	-	2
Idyll	1	1	-
Tale	-	-	3
Song	-	2	-
Elegy	28	49	1
Anacreontic	1	1	-
Epigram	-	21	24
Ballad	2	2	-
Anecdote	-	1	1

TABLE 2 The statistics on the genre and stylistic compliance, Batyushkov

	High	**Neutral**	**Low**
Ode	4	-	-
Epistle	9	15	1
Madrigal	-	1	-
Idyll	1		-
Elegy	22	20	-
Satire	1	1	3
Epitaph	3	-	-
Epigram	-	-	18
Anecdote	-	-	1

3 Description of the numerical experiment

For the new experiment we used the above-described massive of Pushkin's lyrics (1818-1825), comprising 247 poems, and of Batyushkov’s lyrics, comprising 105 poems, marked by an expert on genres and styles.

All the corpus of texts was devided into three parts: the lyrics of A.S.Pushkin of Lyceum period, the lyrics of A.S.Pushkin from 1818 to 1825 and the whole lyrics of K.N.Batyushkov. For each poem we extract some features among the features of TF-IDF matrix, the usage of the words from a poem from the dictionary of Russian language of XVIII century, the metro-rhytmic features like a rhyme type, size, stanza, number of male and female endings and the year when a poem was written. The usage of old Slavonic and old church Slavonic was determined by the difference between the dictionary mentioned above and Russian Wikipedia corpus and was decoded as vector with quantity of usage for each of these words. There also the SMOTE algorithm and the random oversampling for solving problem of class minority were used. After the extraction of the features the logistic regression was learned and the features that more important than others for taking decision were used for the learning model of multilayer perceptron [5]. The achieved average f1-measure is about 95% by cross-validation of the 3 partitions for each author, but it’s worth noting that some classes behave worse because of being represented by too few examples.

The experimental results are following (see Table 3): we calculated the average, the minimum, and the maximum of the f1-measure of correct predictions of the method with cross-validation (algorithm was implemented in the language Python using the library scikit-learn).

TABLE 3 Experiment with the definition of the genre on multilayer perceptron with features best for logistic regression

	Average f1-measure	**Max**	**Min**
Pushkin	0.93	0.95	0.92
Batyushkov	0.91	0.92	0.89

4 Conclusions

The search for additional features for the improving of a joint (“two-dimensional”) classifier of genre types and stylistic colouring of poetic texts helps to obtain the best results. We implement the computational experiments to the corpus of texts of the lyrics of A.S.Pushkin from 1818 to 1825 and the whole lyrics of K.N.Batyushkov, and these experiments showed good results in determining the stylistic colouring of poetic texts and sufficient results in determining the genres. The using of large number of heterogeneous features requires a certain approach to the architecture of the classifier, but it gives the greater accuracy of predictions.

References

[1] Barakhnin V, Kozhemyakina O 2012 About the automation of the complex analysis of Russian poetic text *CEUR Workshop Proceedings* **934** 167-71 (*in Russian*)

[2] Lestsova M 2014 The determination of the core and the periphery of the genres of odes, songs, epistles, elegies and epitaphs on the works of English poets-sentimentalists of the XIX century *Bulletin of the Chelyabinsk State Pedagogical University* No 4 196-205 (*in Russian*)

[3] Orlov Yu, Osminin K 2010 The definition of the genre and the author of a literary work by statistical methods *Applied Informatics* **26**(2) 95-198 (*in Russian*)

[4] Orlov Yu, Osminin K 2012 *Methods of statistical analysis of literary texts* Editorial URSS: Moscow (*in Russian*)

[5] Haykin S 1998 Neural Networks: A Comprehensive Foundation 2nd Prentice Hall PTR Upper Saddle River, NJ, USA

The 16th INTERNATIONAL SCIENTIFIC CONFERENCE
INFORMATION TECHNOLOGIES AND MANAGEMENT 2018
April 26-27, 2018, ISMA University, Riga, Latvia

Deep neural networks in classification of lithological layers and determining uranium deposits

A M Kairbekov* , R I Mukhamediev, Y N Yergaliyev

Institute of information and telecommunication technologies, Satbayev University, Satpayev str. 22a, Almaty, Republic of Kazakhstan

**Corresponding author's e-mail: abylay.kairbekov@gmail.com*

Abstract

Using an artificial neural networks and other machine learning algorithms for classification lithological layers with electric logging give not such good result as real expert decisions. Often the reasons of poor result are data representation or a lack of data. As well as computational power for data analysis in short time using more complex algorithms. Deep learning methods have to show better result with correct chosen data and features. Besides using of data from one well it is also necessary to use the data of several nearby wells. Comparison of different number of layers and neurons in each layer as well as several activation functions in deep neural network for revealing higher accuracy. This will all help to easily and cheaply determine uranium deposits.

Keywords: deep learning, neural network, electric logging, deep neural network, machine learning, lithological layers classification, uranium deposits, artificial intelligence

1 Introduction

The analysis of well logging data in uranium deposits is an important step in the various stages of prospecting, exploration and development of deposits. The efficiency of the mining process depends from the correct interpretation of logging data [1]. This work based on logging data that has already been used in other researches, but with different approaches. Here the main concept represents capabilities of deep neural network using open source google tensorflow libraries. This library provides different mathematical and machine learning build in functions such as neural network.

Deep learning is approach in artificial intelligence (AI). Specifically it is one of the type of machine learning algorithms, that allows the computer to be improved with experience and data accumulate. Machine learning is the only viable approach to building AI systems that can function in difficult environments. Deep training is a particular case of machine learning, allowing for greater efficiency and flexibility through the representation of the world in the form of a hierarchy of nested concepts in which each concept is defined in terms of simpler concepts, while more abstract representations are computed in terms of less abstract ones [2].

TABLE 1 Codes of lithological types

Lithological code	Name of lithological type
1	Gravel, pebbles
3	Mediumgrained sands
4	From smallgrained sands to super fine-grained sands
6	Siltstone (aleurolite)
7	Clay
47	Short grained clayey sands
57	Clayey sandstone
59	The carbonate cement sandstone

Electric logging data gives only two features apparent resistance and natural polarization, which are not enough for efficiently training the network. There are several types of lithological layers need to classify (Table 1) [3].

2 Deep neural network

Deep neural networks it is a neural network with more than one hidden layer (figure 1).

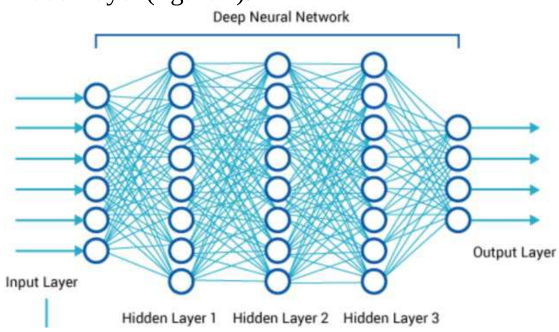


FIGURE 1 Deep neural network

Neural network for lithological classifying will consist of input layer, 2 or more hidden layer and output layer. Each lithological layer lies like a pancake and occupies a large area. So the data from one well may be related to another well. Therefore better to take a window of data from some nearby wells and few meters above and below. Each of these parameters need to take as an input to neural network. Hidden layers will contain between 100 and 1000 neurons each. Every inner layers will have own activation function and optimizer. Usually it softmax activation function and Adam optimizer. Finally output layer with 8 neurons for each class. Output layer will be represent each class as binary format. Neuron with greatest probability will be one, others as a zero also known as HotOne function.

3 Conclusion

All manipulations with neural network using python and tensorflow libraries currently in progress. There are large number of different configurations of network only the parameters change such as number of layers, number of neurons, activation functions, number of epochs and batches. For each configure it consume a lot of time using only CPU, but with parallelization and GPU efforts time will be reduced. After all running and comparisons better results will be revealed. This approach should be more efficient than methods in [4].

References

[1] Muhamedyev R, Kuchin Y, Muhamedyeva E *Data Analysis GIS using neural networks methods* IITU, Almaty, Kazakhstan

[2] Goodfellow I, Bengio Y, Courville A *Deep learning* The MIT Press Cambridge, Massachusetts London, England

[3] Bektemyssova G, Kuandykov A, Cho Young Im, Muhamediyev R, Iskakov S, Khamitov A 2014 Construction of Recognition System at the Uranium Production Process *14th International Conference on Control, Automation and Systems (ICCAS 2014) Oct. 22-25, 2014 in KINTEX, Gyeonggi-do, Korea*

[4] Muhamedyev R, Yakunin K, Sainova S, Kuchin Y 2015 *Comparative analysis of classification algorithms* Application of information and communication technologies - AICT 2015, Russia, Rostov-na-Don, p. 96-101

Development of an automated diagnostics system for biogas combustion processes

Sh N Abduzov, Sh K Khairushev, O V Zhirnova, D T Ziyavdunova*

Kazakh National Research Technical University named after K.I. Satpayev, Institute of Information and Telecommunication Technologies, specialty 5B070200-"Automation and Control", Kazakhstan, Almaty

**Corresponding author's e-mail: oxana_fedoseyeva@mail.ru, abduzov_sharafuddin@mail.ru*

Abstract

This article shows the ecological and economic efficiency of biogas using. An analysis of the prospects for the development of world energy shows a noticeable shift of the priority problems towards a comprehensive assessment of the possible consequences of the key energy sectors influence on the environment, life and health of the population. Activities on energy conservation and environmental safety are aimed on increasing the use of renewable energy sources.

Keywords: Biogas combustion, process diagnostics, mathematical model, control algorithms

1 Introduction

Increasing of the efficiency of heat sources is one of the main priorities in the development of new and in the modernization of existing heat-generating devices. The deteriorating ecology, as well as the global crisis, leads to the search for new methods of heat supply control, which could ensure the ecology and economy of heat supply. For the development of new, environmentally friendly technologies for the production and processing of biomass it is necessary firstly to develop the basis for these processes. The theme of the article "Development of intelligent control algorithms for diagnostics of the biogas combustion process" is related to the fact that this system allows to solve a complex of problems related to the use of renewable resources for the production of heat and energy. The problem of reducing energy costs has always been very important. In addition, energy saving is the most important mean of protecting the environment, ensuring the reduction of harmful emissions in proportion to the amount of saved gas. Therefore, optimization of the biogas combustion process on the basis of creating new methods and means for combustion quality control is an actual scientific and technical task.

2 Overview

The article suggests a new type of high-efficiency environmentally friendly low-power energy installations that use as a fuel a combination of such renewable energy sources as biogas and natural gas. This approach is based on an efficient method of biogas combustion using "fast reactor" technology, as well as a new technology for environmentally friendly burning of low-calorie fuels in volumetric matrix burners. The automation of the biogas combustion installation guarantees the safe operation of the entire system. The main task of the plant automation is to ensure reliable operation of the burner with the help of fault-tolerant sensors, blockers and actuators.

3 Decision

Conduction of experimental combustion determines the existing dependencies of the combustion process from the quality of the fuel and the physicochemical regularities of the biogas combustion processes. As a result, numerical modeling is important for the development and improvement of biogas combustion technologies. Mathematical modeling of furnace devices is today one of the most important ways of obtaining the most representative information about aerodynamics, local and general heat exchange. Despite the great success, achieved in the development of numerical experiment, the great diversity, the completely unexplored structure of biogas and the complex chemical processes that arise at the biogas combustion do not allow the creation of universal models.

The mathematical model allows to determine the specific volume of biogas per ton of waste and the total amount generated at a certain time.

$$G_e = 1{,}868C \cdot (0{,}014T + 0{,}28)\text{, м}^3\text{/т}$$

where

- G_e - specific biogas emission (м^3/ ton of wastes);
- 1,868 – amount of biogas formed from 1 kg of organic carbon, м^3/kg;
- C - total organic carbon (kg/ton of wastes) (varies depending on the morphological composition, time and method of wastes storing in a wide range, for organized polygons is within the range of 150-220 kg/ton);
- T - wastes temperature, °C

It is established that the speed of destruction of organic substances is described by the equation:

$$R = (1 - 10^{-kt})\text{, 1/year,}$$

where k - solid wastes decomposition constant, characterizing the percentage of organic mass of solid wastes, completely decomposed during the year (according to the available experimental data, the values of the coefficient are in the range from 0.035 to 0.045); t - time since burial, years.

Consequently, the specific biogas emission, allocated by one ton of landfill mass to a certain time (year) from the moment of burial:

$$Q_e = 1{,}868 \cdot C \cdot (0{,}014T + 0{,}28) \cdot (1 - 10^{-kt}),$$

м^3/(tons·year)

Therefore, the amount of biogas is determined by multiplying the value of specific emissions on the volume of buried wastes in tons. This model is widely used in European countries for preliminary estimation of biogas emissions from landfills of solid wastes, characterized by a uniform composition of garbage.

Mathematical model (Advanced model of ASC), recommended for determination of methane emissions.

For the active polygon, the methane production speed (nm3 / year) is determined using the dependence:

$$V = (1 - W) \cdot L_0 \cdot M \cdot \frac{k_1 \cdot k_2 \cdot \tau}{k_2 - k_1} \cdot (e^{-k_1 \cdot \tau} - e^{-k_2 \cdot \tau}).,$$

Accordingly, the volume of formed methane is:

$$Q = (1 - W) \cdot L_0 \cdot M \cdot (1 + \frac{k_1}{k_2 - k_1} \cdot e^{-k_1 \cdot \tau} - \frac{k_2}{k_2 - k_1} e^{-k_2 \cdot \tau}),$$

where

- W – humidity of wastes entering the polygon;
- L_0 – the methane generation potential (nm^3/tons of dry wastes), taking into account only organic degradable fractions;
- M – mass of wastes for the current year of polygon operation;
- k_1 – constant of waste decomposition in the phase of acetone formation;
- k_2 – constant of waste decomposition in the phase of methanogenesis;
- τ – time of solid wastes decomposition.

The application of this model requires a large amount of sufficiently accurate experimental data, in particular, according to the morphological composition of each fraction of domestic wastes, which makes it extremely difficult to apply it in practice.

4 Conclusion

Experimental results of the coal waste conversion in the superheated steam flow presented. The method of the experimental data processing developed with the help there are identified kinetics kinetic regularities of the steam conversion. There obtained estimates of the convective heat transfer coefficient of the granular material layer with the steam.

The simulation results of the automatic control unit operation confirmed the efficiency of the developed model. The resulting model of extreme regulation of the combustion process in the furnace can improve the energy performance of the work by maintaining optimum efficiency values. Proved developed a simulation of extreme performance regulation model when changing the reference signal, ie, the maintenance of the boiler efficiency at the same level with a given accuracy.

Modern technology for municipal wastewater treatment is associated with the consumption of significant amounts of electricity and heat. Under conditions of acute energy crisis, the problem of reducing these energy costs with alternative energy sources available on the treatment facilities themselves and constantly renewing is acutely relevant.

This article has viewed as an object of control installation for co-incineration of biogas and natural gas. Mathematic proposed model and method that allows the combustion process of the fuel its composition and ensure optimal parameters of the combustion process. The mathematical model of the process of adsorption of biogas and natural gas.

References

[1] Bolshakov N Y 2005 *Process optimization in the aeration tank – septic tank to minimize the discharge of organic and nutrient* Ph.D. Thesis, Sant Peterburg

[2] Eaton A M, Smoot L D, Hill S C, Eatough C N 1999 Components, formulations, solutions, evaluation, and application of comprehensive combustion models *Progress in Energy and Combustion Science* **25** 387-436

[3] Haseli Y, van Oijen J A, de Goey L P H 2013 Reduced model for combustion of a smali biomass particie at high operating temeratures *Bioresource Technology* **131** 397-04

[4] Haseli Y, van Oijen J A, de Goey L P H 2011 A detailed one-dimensional model of combustion of a woody biomass particie *Bioresource Technology* **102** 9772-82

[5] Kvyetnyy R N, et al. 2015 Modification of fractal coding algorithm by a combination of modern technologies and parallel computations *Proc. SPIE 9816, Optical Fibers and Their Applications 98161R* doi: 10.1117/12.2229009

[6] Ławicki T, Zhirnova O 2015 Application of curvelet transform for denoising of CT images *Proc. SPIE 9662, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments* 966226 (11 September 2015) doi: 10.1117/12.2205483

[7] Lu H, Robert W, Peirce G, Ripa B, Baxter L L 2008 Comprehensive study of biomass particie combustion *Energy & Fuels* **22** 2826-39

[8] Melgar A, Perez J, Laget H, Horillo A 2007 Thermochemical eąuilibrium modelling of a gasifying process *Energy Conversion and Management* **48** 59-67

[9] Moskvina S M, et al. 2015 Evaluation of the impact of uncontrolled parametric perturbations on stability of automatic systems with logical control units. Proc. SPIE 9816 *Optical Fibers and Their Applications* 98161X, doi: 10.1117/12.2229136

[10] Nikolaev A N, Bolshakov N Y, Fetyulina I A 2002 Investigation of the effect of age on the efficacy of activated sludge biological defosfotatsii in the aeration tank – secondary settling tank *Water and Environment: Challenges and results* 2/2002, p.12

[11] Porteiro E, et al. 2006 Mathematical modelling of the combustion of a single wood particie *Fuel Processing Technology* **87** 169-75

[12] Thunman H, et at. 2002 Combustion of wood particles - a particie model for Eulerian calculations *Combustion and Flame* **129** 30-46

[13] Walters D, Cokljat D 2008 A three-equation eddy-viscosity model for reynolds-averaged navier-stokes simulations of transitional flows *Journal of Fluids Engineering* **130** 121401 1-14

[14] Williams A, et al. 2012 Pollutants from the combustion of solid biomass fuels *Progress in Energy and Combustion Science* **38** 113-37

[15] Wornat M, et al. 1996 Single-particle combustion of two biomass chars

26 th Symposium (Int.) on Combustion 3075-83

[16] Wójcik W, Zhirnova O V, Kulakova E A, Imanbekov B T 2015 Development of an automated system diagnostics and management of biogas combustion process *Proceedings of the Second International scientific-practical conference "Information and telecommunication technologies: education, science and practice" **2** Almaty, Kazakstan, December 3–4, 2015*

[17] Zhirnova O V, Kozhamberdieva M I, Imanbek B T 2015 Gasification process for vapor flow, temperature, and raw materials *Proc. of the IV International Conference "Global Science and Innovation" 12–13 March, USA, Chicago*

[18] Yang Y B, et al. 2008 Combustion of a single particie of biomass *Energy & Fuels* **22** 306-16

[19] Svalova M V 2008 The mathematical model of the process of biogas obtaining from wastes of poultry production products *Bulletin of Izhevsk State Technical University* **3** 145

[20] Eder B, Schultz H 2008 *Biogas installations. Practical guide.* The site of the "Zorg" company

[21] Zhirnova O V, Suleimenov B A, Toigozhinova A Zh, Wojcik W T 2016 Construction of mathematical model the combustion of biogas to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **N1**(421) 177-85

[22] Nussupbekov B R, Karabekova D Z, Khassenov A K, Zhirnova O, Zyska T 2016 Heat flow meter for the diagnostics of pipelines *Proceedings of SPIE - The International Society for Optical Engineering* **10031** 100312C

[23] Zhirnova O V, Toigozhinova A Z, Imanbek B, Kulakova E A, Suleimenov B A 2016 Diagnosis of combustion process biogas and gas power plants to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **6**(420) 123-35

Methods for similarity assessment of children and parents by usage of face images

A Dautkulova* , R Yunussov

Satbayev University, Satbayev Str. 22, 050013 Almaty, Kazakhstan

**Corresponding author's e-mail: aigerim.dautkulova@gmail.com*

Abstract

At present machine learning begins to be widely used in all spheres of human life. In this paper, we describe a method for defining blood relations on photographs using machine learning technology. The aim of the article is to study the applicability of computer vision algorithms to gabitoscopy problems. For determining blood relations, it is first necessary to find the face in the photo and to identify his facial landmarks. Further with the found landmarks it is possible to make comparisons and to determine blood relations.

Keywords: Machine learning, computer vision, features extraction, face detection, facial landmarks

1 Introduction

This paper shows the results of the development of system for determining blood relations written in the Python programming language using computer vision.

The practical need for machine learning arose due to the fact that today a great variety of input data and possible solutions becomes too large for traditional preprogrammed systems. Passengers registration systems in airports, based on face recognition algorithms. Multiple penetration of such systems in different areas of human activity shows the huge potential of researches and development in this knowledge area. And growing problems in the area of security systems, that the governments and corporate sectors face, necessitated further development of more effective method of problem solutions [1].

The development of this system can be divided into several main parts:

1. face detection;
2. defining facial landmarks;
3. comparison of found faces;
4. defining blood relations.

2 Face detection

Algorithm for finding 68 specific points on any face is described in the article One Millisecond Face Alignment with an Ensemble of Regression Trees. In this paper they present a new algorithm that performs face alignment in milliseconds and achieves accuracy superior or comparable to state-of-the-art methods on standard datasets [2]. Face alignment can be solved with a cascade of regression functions.

Histogram oriented gradients (HOG), proposed by Dalal and Triggs in their article «Histograms of Oriented Gradients for Human Detection» [3], HOG image descriptor and Linear Support Vector Machine (SVM) can be used to train very accurate object classifiers or in a specific case for finding faces.

The detector limits the area of the face in the image with a square border. During the training, a face detector was selected to detect faces based on the histograms of oriented gradients [4]. An example of this algorithm is shown in Figure 1.

FIGURE 1 Histogram of Oriented Gradients

At each step of the regressor training, the form from the training sample is first centered, and then aligned with the middle shape using the Procrustean transformation. The training of each regressor in the cascade is carried out using the Gradient Tree Boosting algorithm [5].

3 Detecting facial landmarks

Real-world images can be cluttered, faces can be partially occluded, and they can exhibit large variations in appearance, shape, expression, and head pose [6].

A pre-trained facial landmarks detector in the Dlib library is used to estimate the possible location of the 68 (x, y) - coordinates that are mapped to facial landmarks on the face.

The indices of the 68 coordinates can be visualized as shown in Figure 2.

As indicated in the article [7], after studying this image, one can come to the conclusion that the facial areas can be accessed through a simple indexing in Python.

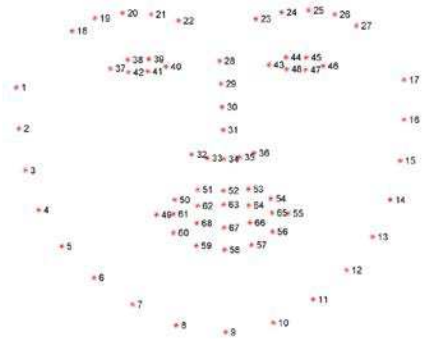


FIGURE 2 68 key points

The result of the finding of faces and parts of the face in the photograph is shown in Figure 3.

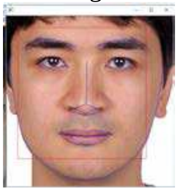


FIGURE 3 The face and facial landmarks of the father

4 Comparing faces

Similarity measure in a data mining context is a distance with dimensions representing features of the objects. If this distance is small, it will be the high degree of similarity where large distance will be the low degree of similarity [8].

Euclidean distance is the most common use of distance. When data is dense or continuous, this is the best proximity measure [8].

4.1 NEURAL NETWORKS. FACE DESCRIPTOR

Deep neural networks can be used to carry out biometric identification of a person in the face. There are suggestions that the use of convolutional neural networks should give the best results when working with images, since their structure corresponds to studies of the visual cortex of the brain [9]. In these studies, was found that there are simple cells that respond to lines located at different angles and complex cells that react in connection with the activation of a specific set of simple cells [10].

The convolutional networks themselves suggested using Y. LeCun in their work [11]. And it was suggested to use them as an analogue of the visual cortex of the brain for image recognition.

A classical convolutional neural network consists of pairs of layers - sub-sample layers and convolution layers, each of which in turn consists of feature cards (figure 4). Each feature card filters the image, finding a certain attribute for itself. For example, the first map of signs looks for vertical lines, the second - horizontal lines, and so on [12].

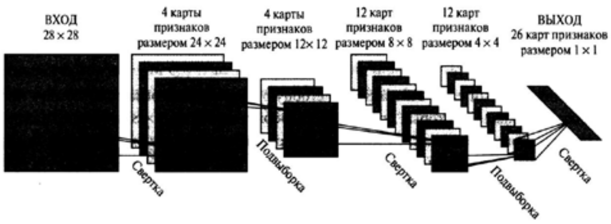


FIGURE 4 Example of a convolutional neural network

To evaluate the proximity of the found descriptors in dlib, the Euclidean distance is used. If two vectors of the descriptors of two persons have Euclidean distance less than 0.6, then they belong to one person.

For this, we calculate the Euclidean distance between the descriptor belonging to the father and the child (figure 5).

FIGURE 5 Photos of father and child

Then the distance between the descriptors of the images of the mother and the child (figure 6).

Thus, we get two values of the Euclidean distance. Comparing the results, we find out to which of the parents the child is more like. Since the smaller the distance between descriptors, the more similar people are from photos.

FIGURE 6 Photos of mother and child

As a result, we got the results shown in Figure 7. As shown in the figure, the child in general looks more like a father.

```
Image of the Dad
Image of the Mom
Image of the child
Baby looks like Dad
```

FIGURE 7 The result of the general comparison

5 Comparison of certain facial features

Using the indices of certain facial features described earlier, we can distinguish separate features.

For each of the three people, the coordinates of the parts of the face are calculated and written into separate variables. For example, consider the definition of the similarity of the eyes of parents and children. After finding the corresponding eye coordinates, the system calculates the Euclidean distance between these coordinates.

As a result of this calculation, we get two arrays of Euclidean distances between the corresponding coordinates of the eyes of the father and child, mother and child. In order to compare whose coordinates are located closer, we find the arithmetic mean of all the distances found in each array. In the end, we get two values. Accordingly, the distance that is less determines the eyes, which are more similar to the eyes of the child.

As a result, the system will provide information on which of the parents is more like a child in general, which parent is more like eyes, mouth, nose and jaw (figure 8).

```
Image of the Dad
Image of the Mom
Image of the child
Baby looks like Dad
Mouth from Dad
Nose from Dad
Eyes from Dad
Jaw from Dad
>>>
```

FIGURE 8 The result of the comparison

7 Conclusions

The result of this work is a system that takes three photographs: parents and a child, and gives information about which parent is more like a child in general terms. Then the similarity between the individual features of the parent and child is calculated. And the same result is given about which part of the face to which of the parents is more like. That is, to which of the parents the eyes of the child, mouth, nose and jaw are more similar.

References

[1] Amirgaliyev Y, Yunussov R 2015 Pattern recognition systems in the problems of automatic person identification using the passport data *Computer modelling & new tecnhologies* **19**(2B) 27-30
[2] Kazemi V, Sullivan J *One Millisecond Face Alignment with an Ensemble of Regression* Trees Electronic version on the site https://pdfs.semanticscholar.org/d78b/6a5b0dcaa81b1faea5fb0000045a62513567.pdf
[3] Dalal N, Triggs B 2005 Histograms of Oriented Gradients for Human Detection *IEEE Computer Society Conference on Computer Vision and Pattern Recognition San Diego, CA, USA*
[4] King D E 2015 *Max-margin object detection* arXiv preprint arXiv:1502.00046
[5] Friedman J, et al. 2001 *The elements of statistical learning* Springer, Berlin: Springer series in statistics T. 1
[6] Smith B 2014 Nonparametric context modeling of local appearance for pose-and expression-robust facial landmark localization *IEEE* 1741-8
[7] Rosebrock A *Detect eyes, nose, lips, and jaw with dlib, OpenCV, and Python* Electronic version on the site https://www.pyimagesearch.com/2017/04/10/detect-eyes-nose-lips-jaw-dlib-opencv-python/
[8] Polamuri S *Five most popular similarity measures implementation in Python* Electronic version on the site https://dataaspirant.com/2015/04/11/five-most-popular-similarity-measures-implementation-in-python/
[9] Matsugu M, Mori K, Mitari Y, Kaneda Y 2003 Subject independent facial expression recognition with robust face detection using a convolutional neural network *Neural Networks* **16** 555-9
[10] Дорогой Я Ю *Архитектура обобщенных сверточных нейронных сетей* **54** 229-34 *(in Russian)*
[11] LeCun Y, Botton L, Bengio Y, Haffner P 1998 Gradient-Based Learning Applied to Document Recognition *Proc. of the IEEE* **11**
[12] Simon Haykin 2006 *Neural networks McMaster* University Hamilton, Orlando, Canada

Convolutional neural networks for object detection. Implementation and comparative analysis

Maksat Kanatov[1*], Lyazzat Atymtayeva[2]

[1]Satpayev University, Satpayev str. 22a, Almaty, Kazakhstan
[2]Suleyman Demirel University, Abylai Khan str. 1/1, Kaskelen, Almaty, Kazakhstan

**Corresponding author's e-mail: maksatkanat@gmail.com*

Abstract

Currently, computer vision is an actively developing part of computer technology and image recognition is one of the most important parts of artificial intelligence. We can find a wide range of areas that apply these technologies. For example, in medicine they can be used for diagnosing a Magnetic Resonance Imaging or X-ray image; in security systems - for detecting intruders, etc. However, often object recognition cannot work without object detection by the reason of finding the necessary information only in the small particular part of images. In order to find the required object quickly and with good quality, we have to apply search and detection algorithms. There are various methods and technologies for object detection. This work presents the description of the best option with a high probability of object detection accuracy that can be realized by using the convolutional neural networks.

Keywords: object detection, object recognition, convolutional neural networks

1 Introduction

To date, computer vision is actively developing. The field of application is growing every day. The recognition of objects has become an integral part of artificial intelligence. Today, recognition is applied almost everywhere: from medicine to engineering. To quickly recognize an object, you must first find it in the picture. There are several such objects on one frame of the image. To work with each of them you need to find their boundaries in the pictures. To do this, you must use the object detection method. In this article, we will consider the implementation of a method based on a neural network and compare it with classical methods using the ready-made Haar cascades.

2 Object detection methods

There are several options for object detection. The most popular of them without the use of neural networks are the Haar Cascades and HOG cascades. The very first of these was the method of Viola and Jones of Cascade Haar. This method was proposed by Paul Viola and Michael Jones in 2001, as a fast method of searching for objects. Previous methods of searching for objects that were based on working with the intensity of the image had a large computational complexity, especially for RGB images. The Viola and Jones method works with rectangular tags that calculate the sum of the pixels of several adjacent rectangular areas. This method was originally intended for search and detection of persons, but allows you to find other objects. Development has become very popular for a short time, because the speed of work was very high. FIGURE 1 shows how method of Viola and Jones works, using Haar features for face detection.

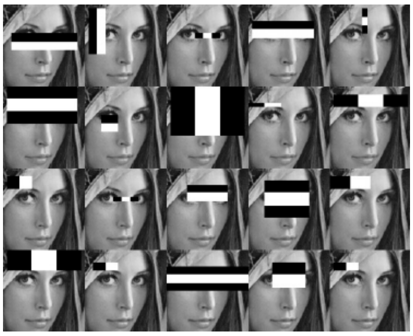


FIGURE 1 Haar features in face detection algorithm

In 2005, a new idea was proposed for searching and detecting objects. The idea was based on the use of the Histogram directed gradients. The idea was realized by INRIA researchers Dalal and Triggs. In their work, they used an algorithm to find pedestrians. The main idea of the algorithm is the assumption that the appearance and shape of the object in the image area can be described by the distribution of intensity gradients or the direction of the edges. The implementation of these descriptors can be done by dividing the image into small connected areas, called cells, and calculating for each cell histogram of the gradient directions or edge directions for the pixels inside the cell. The combination of these histograms is a descriptor. To increase the accuracy, local histograms undergo normalization in contrast. For this purpose, the intensity measure is calculated on a larger image fragment, called a block, and the value obtained is used for normalization. Normalized descriptors have better invariance in relation to illumination. The HOG descriptor has several advantages over other descriptors. Since HOG works locally, the method supports the invariance of geometric and photometric transformations, except for the orientation of the object.

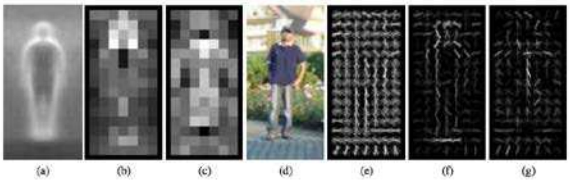


FIGURE 2 Features of Histogram oriented gradients

Similar changes will appear only in large fragments of the image. Moreover, as Dalal and Triggs have discovered, rough division of space, accurate calculation of directions and strong local photometric normalization make it possible to ignore pedestrian movements if they support the vertical position of the body. The HOG descriptor is a good way of finding people in images.

Today, with the development of artificial intelligence including machine learning, detection and recognition of objects comes to a new level. The accuracy of such methods is extremely high, false positives are not practical. One of the best methods is the use of convolutional neural networks.

3 Convolutional neural networks

The concept of artificial neural networks appeared more than half a century ago. However, a great interest in artificial neural networks began in the late 80's. The active use of neural networks for image recognition began at the beginning of the 21st century. At this point in time, neural networks occupy a large share in the field of image recognition.

Convolutional neural networks are a special kind of artificial neural networks, the author of which is Yann Lecun. This type of neural network is part of deep learning. The main task of convolutional neural networks is effective image recognition.

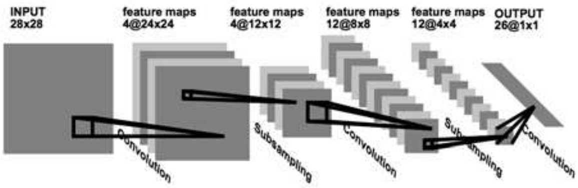


FIGURE 3 Architecture of convolutional neural networks

Figure 3 shows the standard architecture of convolutional neural networks. In conventional neural networks, each neuron is connected to all the neurons of the previous layer, with each link having its own personal weighting factor. In a convolutional neural network, only a limited matrix of small scales is used in the convolution operation, which is "moved" along the entire processed layer (right at the beginning - directly on the input image), forming after each shift an activation signal for the neuron of the next layer with the same position. That is, for the different output layer neurons, the same matrix of weights is used, which is also called the core of the convolution. It is interpreted as the graphic coding of a feature, for example, the presence of an inclined line at a certain angle. Then the next layer, obtained as a result of the convolution operation by such a matrix of weights, shows the presence of this feature in the processed layer and its coordinates, forming the so-called feature map. Naturally, in a convolutional neural network a set of weights is not one, but a whole gamut that encodes image elements (for example, lines and arcs from different angles). At the same time, such convolution kernels are not laid by the researcher in advance, but are formed independently by training the network using the classical method of back propagation of the error. Passage by each set of weights forms its own instance of the feature card, making the neural network multichannel (many independent feature cards on one layer). It should also be noted that when the layer is sorted by a matrix of weights, it is usually not moved to the full step (the size of this matrix), but to a short distance. So, for example, with the dimension of a 5 × 5 matrix of weights, it is shifted by one or two neurons (pixel) instead of five, so as not to "step over" the sought-for feature.

In practice, this means the ability to recognize complex feature hierarchies. Usually, after passing through several layers, the map of features degenerates into a vector or even a scalar, but such cards of signs become hundreds. At the output of the convolutional layers of the network, several layers of a fully connected neural network (perceptron) are additionally installed, on the input of which terminal tags cards are supplied.

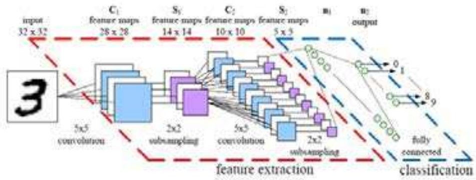


FIGURE 4 A convolutional neural network model for image recognition

In our experiment, we used real-time images from the IP Camera using the RTSP stream. The frame resolution is 1280x720. This means that our model of a convolutional neural network is much deeper than the above model.

For learning the neural network model, we used the "Pascal Visual Object Classes" dataset. Using this data, we trained a model of a convolutional neural network for finding a person. Dataset of 2012 contains 17 125 images totally. Of these, 4087 marked images with 8566 objects were used for training. The dataset was divided into 50% - train data, 25% - cross validation data, 25% - test data.

The training was conducted on two NVIDIA Quadro 2000 video cards using NVIDIA CUDA Deep Neural Network librady(cuDNN). Using the GPU significantly speeds up the computational process. However, to get the best model, we still had to wait more than 4 days. As a result, we were able to get a good model of a neural network. Running the recognition process in the GPU also speeds up the computational process. However, we still did not manage to simultaneously use two video cards for real-time recognition. But even on one video card we managed to achieve a speed of 12 frames per second in 720p resolution.

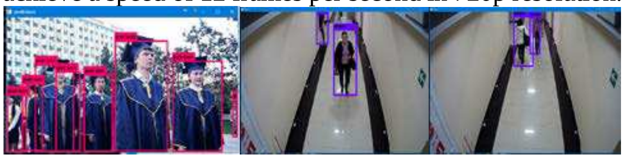


FIGURE 5 Person detection based on convolutional neural networks (Main educational building of Satbayev University)

Using this model, we were able to get a system for detecting people with an accuracy of 99.4%. Comparing with classical methods using cascades, it has very high accuracy. Also, for this model full size or special side of an object is not required. The model is less demanding of the conditions for the provision of information for recognition. However, even in such conditions, the system has a very high level of accuracy. All thanks to the correct selection and preparing of training data and the good learning process of the convolutional neural networks model.

4 Conclusion

As a result, we got a system for searching and detecting people in a frame using convolutional neural networks. This model takes a lot of time in the moment of data preparation and in the process of training the neural networks. Also, the system is not as fast as the Viola-Jones method and HOG descriptors. However, the convolutional neural network allows us to achieve incredible accuracy. Even with the full size of the input data and with poor image quality, this model continues to recognize objects with high accuracy.

Nowadays, computational insufficiency decreases every year, and soon. We believe that soon anyone can use this method with high recognition speed for large scale images.

References

[1] Viola P, Jones M 2001 *Rapid Object Detection using a Boosted Cascade of Simple Features*

[2] Dalal N, Triggs B 2005 *Histograms of Oriented Gradients for Human Detection*

[3] Viola P, Jones M 2005 *Detecting Pedestrians Using Patterns of Motion and Appearance*

[4] Lipetski Y, Sidla O 2017 *A combined HOG and deep convolution network cascade for pedestrian detection*

[5] Viola P, Jones M 2003 *Fast Multi-view Face Detection*

[6] Everingham M, Van Gool L, Williams C K I, Winn J, Zisserman A 2009 *The PASCAL Visual Object Classes (VOC) Challenge*

[7] Simonyan K, Zisserman A 2015 Very deep convolutional networks for large-scale image recognition

[8] Ward J, Andreev S, Heredia F, Lazar B, Manevska Z 2011 *Efficient mapping of the training of Convolutional Neural Networks a CUDA-based cluster*

[9] Redmon J, Angelova A 2015 *Real-Time Grasp Detection Using Convolutional Neural Networks*

Intelligent subsystem for determining the optimum pulsation frequency of a jigging machine

B A Suleimenov, Y A Kulakova*

Kazakh National Research Technical University after K I Satpayev, Satpayev 22, Almaty, Kazakhstan

Corresponding author's e-mail: elena_winters@mail.ru

Abstract

Intelligent control systems are actively developing and can significantly reduce financial costs and improve the environmental performance of ore-dressing processes. Usage of intelligent control systems for jigging machines allows to minimize costs and negative influence of chrome ore tails on the environment, exclude losses of chromium and energy resources in the ore-dressing process. Paper considers models for determining the frequency of pulsation jigging machine based on fuzzy logic, neural and hybrid networks. Models are built on the basis of data obtained from experts and they allow researchers to simulate the various modes of operation of the jigging machine.

Keywords: pulsation frequency, jigging machine, fuzzy model, neural model, neural fuzzy model

1 Introduction

Kazakhstan ranks first in the world in explored reserves of chromium and provides 15% of the world's production [1, 2]. Consequently, there is a need for a thorough processing of chrome ore, especially small and fine classes, which previously fell into the waste of production. In the field of gravitational enrichment, in particular, the jigging process, to date, sufficiently effective technologies have been created that allow controlling the process, reducing energy costs for production, and facilitating the work of the operator. The main equipment for enriching small classes of chrome ore is a jigging machine. The jigging process involves a large number of input variables and accordingly, all the developed systems impose the functions of making many decisions on the operator. In connection with human factors, such as qualifications, fatigue, inattention, etc., it is not possible to achieve the highest possible technological enrichment indicators. The application of an intelligent control system will solve existing problems.

The complexity of the jigging and control process is associated with two features, firstly, there is no single idea of the mechanism of stratification of material in the jigging machine [3, 4]; secondly, the qualitative course of the jigging process depends on numerous factors, both internal and related to physical properties of the raw material being enriched, and with external ones, for example, technological variables such as the level of ore, pulsation frequency, consumption of water, etc. [5, 6]. Therefore, it is very problematic to develop a quality control system based on only theoretical data, so the data is relative or approximate.

2 Overview

This work discusses the following issues:

- Usage of an intelligent system to control jigging machine
- Development of intelligent control models
- Analysis of obtained intelligent control models
- Simulating various modes of operation of the jigging machine.

3 Decision

Taking into account the complexity of control the jigging process it was decided to develop a system that is based on the practical experience of technologists working directly on the jigging machine. To improve the technological indexes (the maximum chromium content in the concentrate and the minimum in the reject material), enrichment of chrome ore in the jigging machine, it is suggested that the pulsation frequency be determined by means of an intelligent subsystem. Its task is to determine the optimal values of the pulsation frequency (Y), depending on the initial ore concentration (X1) and chromium concentration in the reject material (X2).

The main task in the synthesis of intelligent models is to compile a planning matrix for the full factorial experiment (FPE). As a result of the questioning of experienced operators, which were working with jigging machine for a long time the base rules (bases of knowledge) will be obtained. Using this matrix, an object or process control model is created [7]. Synthesis of the models for determining the optimum value of the pulsation frequency will be performed using the graphical tools of the Matlab system and planning matrix.

4 Conclusion

The intelligent control system of the jigging machine will reduce the influence of the human factor on the ore-dressing control process, which will ensure high technological performance.

The introduction of automated controls system of chrome ore-dressing process, on the one hand, is associated with the costs of their acquisition. On the other hand, it allows to exclude losses of commodity concentrate and its getting into production waste. This certainly has an ecological and economic effect.

Using the data obtained from experts and the Matlab package, three types of models to determine the optimal value of the pulsation frequency were synthesized: fuzzy by means different kinds of terms (trapezoid and triangular), neural and neural fuzzy models. These models allowed the researcher to simulate various modes of operation of the jigging machine. A fuzzy model with triangular terms is the best solution for determining the optimum value of the pulsation frequency of the jigging machine.

References

[1] Forbes Kazakhstan 2015 How many trillion dollars does the interior of the Kazakhstan earth keep? https:// forbes.kz/stats/ostatochnyie_yavleniya

[2] *Kazakhstan Business magazine* **2** 2006 http://www.investkz.com/journals /47/150.html

[3] Verhoturov M 2006 *Gravitational Enrichment Methods* MAX PRESS: Moscow pp 375 *(in Russian)*

[4] Shohin V M 1993 *Gravitational Enrichment Methods* Nedra: Moscow pp 400 *(in Russian)*

[5] Kozin V Z, Tikhonov V N 2010 *Testing, control and automation of beneficiation processes* Nedra: Moscow pp 343 *(in Russian)*

[6] Tikhonov O N 2008 *Regularities of the effective separation of minerals in the processes of beneficiation* Nedra: Moscow pp 208 *(in Russian)*

[7] Suleimenov B A, Sugurova L A, Suleimenov A B 2016 *Intelligent systems of optimal control and operational diagnostics (methods of synthesis and application)* Shikula: Almaty pp 235 *(in Russian)*

[8] Swingler K 1996 *Applying Neural Networks, a Practical Guide Academic* Press: London pp 355

Synthesis modal and fuzzy regulators to maintain the frequency of pulsation of jigging machine

B A Suleimenov, Y A Kulakova*

Kazakh National Research Technical University after K I Satpayev, Satpayev 22, Almaty, Kazakhstan

**Corresponding author's e-mail: elena_winters@mail.ru*

Abstract

The pulsation frequency of the jigging machine is one of the key factors that ensure high technological indicators of chromium ore dressing in jigging machines. Maintaining this variable at a given level is one of the main tasks of the automated control system for jigging. The paper is devoted to the synthesis of several types of controller to maintain the pulsation of the jigging machine. A mathematical model of a jigging machine based on the pulsation frequency has been developed. The study of several controllers allows researcher to find the best solution for the fulfillment of assigned tasks.

Keywords: pulsation frequency, jigging machine, modal regulator, fuzzy PI regulator

1 Introduction

Currently, the process of jigging in world practice is used to enrich iron, chrome and other ores. Processing equipment that implement the jigging process are jigging machines that have a wide range of designs and have a number of controlled variables on which the quality of ore-dressing depends. In the separating jigging machine alljig-G/F, the pulsation frequency of the jigging machine is a key controlled variable and is supported by rotary-piston valves, which are driven by an electric motor. It is controlled by a frequency converter, which provides a smooth start of the motor and applies a voltage of a certain frequency to it, as a result of which it is possible to change the rotational speed of the motor shaft, and consequently, the rotary piston valves. The rotational speed of the rotary piston valves is the pulsation frequency of the jigging machine. To ensure high enrichment characteristics, it is necessary to maintain the frequency of rotation of the motor shaft at a specified frequency.

The structural diagram of the control object in general form is shown in Figure 1.

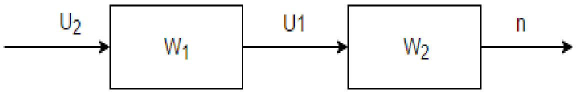


FIGURE 1 The structural diagram of the control object

where W_1 is the transfer function of the variable speed controller, W_2 is the transfer function of electric motor; U_1 is the the supply voltage of the electric motor with a certain frequency (manipulated Variable); U_2 is the analog signal to the variable speed controller e.g. current 4 ... 20 mm, voltage 0-10 V; n is the rotational speed of the motor shaft (controlled variable).

2 Overview

The following issues are discussed in this paper:

- Development of mathematical model of jigging machine
- Synthesis of a regulator to maintain the set frequency of pulsation using the modal control method
- Synthesis of fuzzy PI controller
- Analysis of direct quality assessment of regulation (according to the graphs of the transition characteristics)
- Selection of a regulator for an automated jigging machine based on the obtained data

3 Decision

The mathematical model of the jigging machine is necessary for the synthesis of the controller and the simulation of the system.

To maintain an adjusted frequency for the control object, it is necessary to synthesize the regulator. This is proposed to be done using the modal control method. The two most common characteristic polynomials are chosen: the binomial Newton polynomial, the Butterworth polynomial for the system [1]. Two regulators will be synthesized and a comparison will be performed.

Model of control object with a regulator will be built in Simulink Matlab. It will be constructed taking into account the structural diagram of the control object, the structural diagram of the regulator, and the obtained coefficients.

To find the best version of the regulator, a fuzzy PI-controller was synthesized. Unit step responses of the system will be obtained using modal regulators and a fuzzy PI controller.

4 Conclusion

The maintaining the set frequency of pulsation jigging machine is one of the main functions of the automated system. This ensures high technological indicators of chromium ore dressing.

The synthesis of three types of controllers for the automated system has been made. The modal regulator designed using the binomial Newtonian polynomial has the best direct indicators of the quality of regulation.

References

[1] Kochetkov V P 2012 *Fundamentals of Control Theory* Fenix: Moscow 55 pp *(in Russian)*
[2] Miroshnik I V 2005 *Theory of automatic control. Linear systems* Piter: St. Petersburg 336 pp *(in Russian)*
[3] Rajani K Mudi, Nikhil R Pal 2000 A self-tuning fuzzy PI controller *Fuzzy Sets and Systems* **115**(2) 327-38

Analysis of the current state of control problems of the flotation enrichment process using artificial intelligence approaches

Sh Koshimbayev, Z Lukmanova*

Kazakh National Research Technical University named after K.I.Satpayev, Institute of Information and Telecommunication Technologies, specialty "Automation and Control", Kazakhstan, Almaty

**Correspondingauthor'se-mail: zhanar.lukmanova@gmail.com*

Abstract

Nowadays, the actual problem is the flotation enrichment process control based on the methods of artificial intelligence (AI). At the creation of control systems of the flotation process the developed multi-level dynamic model is an algorithm of neural network modeling that allows to choose the method and laws of regulation, nomenclature and parameters of the accuracy of monitoring tools. In fact, it looks like an inclusionof a feedback to the model that regulates one or more input parameters according to the measured values of one or more output parameters. For the neural network flotation control system the conformity of the model to a real flotation unit plays a decisive role. Existing mathematical models can not sufficiently accurately and fully describe the flotation process. A suitable solution for simulating of a complex nonlinear process with many parameters is neural networks.

Keywords: flotation, artificialintelligence, algorithm, neuralnetworkmodeling, sulphideores

1 Introduction

This work describes the problems of the flotation enrichment process control and modeling the process. The most widely used in this area is artificial intelligence, in particular, neural networks, followed by fuzzy logic, genetic algorithms, support vector machines and training decision trees [1]. The problem of flotation enrichment can be successfully solved with the help of intelligent systems. Therefore, the analysis of the current state and the use of methods of artificial intelligence make it possible to find effective algorithms for complex objects control with various types of parameters uncertainty [2].

2 Research problem statement

The problem statement is formulated as follows: the flotation process is investigated as a control object of artificial intelligence. Incomplete study of the flotation enrichment process of sulphide ores makes it difficult to create efficient automation systems.

3 Analysis of the current state of control problems of the flotation enrichmentprocess

The leading professional software systems of the neural network make it possible to obtain an effective solution of production tasks for control of the flotation enrichment process of sulphide ores. The technology of the artificial neural network has been successfully used by thousands of experts in order to solve complex tasks of data mining, image recognition and predictive modeling, for the construction of classifiers and neural network simulators and forecasting solutions. Here are some of the most well-known simulator programs for neural networks on the software market: Alyuda Neuro Intelligence - Neural network software and an Excel extension for forecasting and data analysis. Supports several algorithms. A trial version is available. Amygdala - Open source software for neural networks modeling, written on C ++. Neural Network Modelsin Excel - Software that implements neural networks for solving forecasting and classification problems in Excel. The reverse distribution is used. Can handle missing values and categorical data. Neural Network Toolbox for MATLAB is an environment for neural networks researches, for their design and modeling in MATLAB [3].

The developed analysis of the flotation enrichment process control is based on the artificial intelligence approach, which is used to create a multilayered network of direct distribution with the support of both fully connected and networks with structural connections. Neural network software can be divided into two stages:

Stage 1. Preliminary processing of data containing information on the behavior of a complex control object (for example, the values from various sensors, such as: temperature, pressure, flow, liquid level, object speed, etc.). Obtaining qualitative data on the basis of which an optimal neural network model is constructed that affects the final result, i.e. the quality of image recognition using artificial intelligence approaches.

Stage 2. Neural network modeling, in which as a mathematical model of a control object is used time series compiled of informative features describing the behavior of a real complex control object [4-5].

There is considered the neural network technology for complex objects control based on artificial intelligence.

4 Algorithm

1. A very important element of neural networks is an adaptive adder. The *adaptive adder* calculates the scalar multiplication of the input signal vector *x* by the parameter vector. In other words, it calculates a linear homogeneous function (x,), has n adjustable parameters. On the diagrams, we will designate it as shown on Fig. 1. We call it adaptive because of the presence of a vector of adjustable parameters .

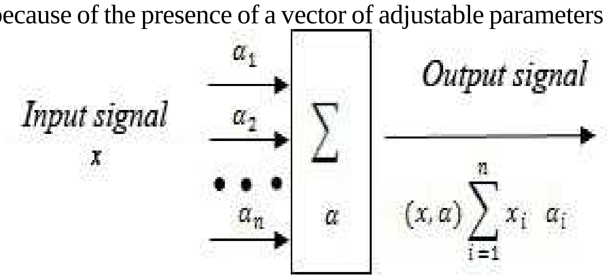


FIGURE 1 Adaptive adder

2. In order to carry out our task it is useful to have a non-homogeneous linear function of the output signals. Its calculation can also be represented by an adaptive adder having an n+1 input and receiving a constant single signal at the 0 input. The use of 1 is more often convenient, although not necessary. The adder with such an additional input is called a non-homogeneous adaptive adder (Figure 2) [6].

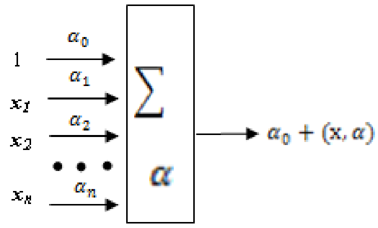


FIGURE 2 Non-homogeneous adaptive adder

The aim of network training is to adjust its weights when the applying a set of input values leads to the required set of output values [7].

In this case, the input receives the results of parameters measuring that affect the flotation process; the output results - laboratory measurements of the sulphide ores content. An important feature of neural networks of a direct transmission is the possibility of prior training, which will allow to continuously adjust the model for maximum correspondence to the real process [8-9].

5 Conclusion

There was composed an analysis of the current state of control problems of the flotation process using artificial intelligence approaches, where a neural network technology for complex objects control based on artificial intelligence. Therefore, the development of intelligent flotation control systems remains a promising direction in improving the efficiency of sulphide ore enrichment.

References

[1] Jovanovic I, Miljanovic I, Jovanovi T 2015 Soft computing-based modeling of flotation processes *A review, Minerals Engineering* **84** 34-63

[2] Jovanovic I, Miljanovic I 2015 Modelling of flotation processes by classical mathematical methods *Arch. Min. Sci.* **60**(4) 905–19

[3] *Artificial intelligence - reality and prospects* http://ai-es.blogspot.com/p/blog-page.html/1st of March, 2018

[4] Samigulina G A 2012 *Development of the decision support systems on the basis of the intellectual technology of the artificial immune systems* Automatic and remould control Springer. **74**(2) 397-403

[5] Zhukov L A, Reshetnikova N V 2007 *A manual on the discipline "Applications of neural networks"* Krasnoyarsk 20-2

[6] Bumazhenko T M *Application of neural networks for the flotation process regulation* BSUIR, Minsk, Republic of Belarus

[7] Gorban A N 1990 *Training of neural networks* Moscow: SP ParaGraph

[8] Suleimenov B A, Sugurova L A, Suleimenov A B 2016 *Intelligent systems of optimal control and operational diagnostics (methods of synthesis and application)* Almaty "Shikula" 78-80

[9] Koshimbayev Sh K, Suleimenov B A 2016 *Automation of standard technological processes: Textbook* Almaty 226 p

Synthesis and analysis of intellectual models for diagnostics the technical state of a turbine unit

A Suleimenov[1]* , L Boleeva[2], B Suleimenov[1]

[1]*Satpayev University, Satpayev Str.22, 050013, Almaty, Kazakhstan*

[2]*Taraz State University named after M.Kh. Dulati, Tole bi str., 60, Taraz, RK*

**Corresponding author's e-mail: batr_sul@mail.ru*

Abstract

Research results: there are synthesized and investigated intellectual models of diagnostics of turbine units; developed software that implements diagnostic models in industrial controllers; tested algorithms (models) for diagnostics the state of turbine units under industrial conditions of an operating power station; the expected economic effect is the extension of the between-repair period of turbine-units by 15-20%.

Keywords: technological object, technological state, turbine unit, fuzzy algorithms, neural network algorithms, neuro fuzzy algorithms, diagnostic algorithms, operative diagnostics system

1 Introduction

At the first stage of the development of industrial production the maintenance of operational reliability or serviceability of technological equipment (hereinafter - TE) was carried out "to failure." In the second half of the last century there was appeared and successfully applied until present another direction - scheduled preventive maintenance. However, in market conditions it becomes obvious - it is necessary to move on to a more progressive strategy of ensuring the operational reliability of the TE - "according to its actual state". The transition to this strategy needs the creation of a system for the operational diagnostics of the technical state of the TE. The application of the TE systems according its actual state makes it possible to increase production efficiency by reducing the time of equipment downtime in repair, reducing the cost of production by reducing the cost of repairs and the emergency repair of the equipment.

The cost on the creation of an automated system of operational diagnostics will be significantly reduced if it will be included in the structure of the current automated control system of technological process (ACSTP) as its subsystem. In this case, there will be used the information support of the operating ACSTP, which significantly reduces the costs of its development and implementation. At the same time, the effect from the implementation of an extended ACSTP will increase significantly, because in addition to effects from operational and optimal process control there will also be achieved the effect from operational diagnostics of the TE. In addition, it is possible to expect the appearance of a so-called *synergistic* effect - when the effects from the ACSTP and the operational diagnostics subsystem are much higher than their simple sum. This occurs as a result of the interaction of process control and the diagnostics of the TE: on the one hand, the operative and optimal management of the process favorably affects the TE, and on the other hand, operational diagnostics allows to maintain the TE state at the proper level, thereby improving its manageability. Diagnostic functions allow the subsystem at an early stage to fix the beginning of destructive processes in the TE and to localize them in time.

2 Research methods

As a result of the conducted researches, we synthesized four models for diagnostics the technical state of a turbine unit using the following methods: fuzzy algorithms, neural network algorithms, neural networks, and the method of experiment plugging. Comparative table 1 of these models showed that the best result was shown by neuro fuzzy networks 0.8% of error, that is a very good result compared to traditional methods (the method of experiment planning showed 6.75% of error).

TABLE 1 Comparative table

Modeling method	The value of absolute error % *Y*
1. fuzzy algorithms	1,15101 %
2. neural network algorithms	1,146136 %
3. neuro fuzzy networks	0,88102 %
4. experiment planning	6,75%

Therefore, further researches on model sensitivity, uniqueness and stability were carried out only for the neuro fuzzy model.

The results of modeling the assessment of the technical state of one of the elements of the turbine unit - high-pressure cylinder (HPC) - showed that they are justified from the point of view of the technological process physics of the turbine unit and fully reflects the experts' estimates.

3 Conclusion

As a result of the conducted researches, we adopted the following recommendations for the elimination of emergency situations at the HPC:

a. if the value Y lies in the range from 0 to 0.25 - the HPC is in the normal state;
b. if the value Y lies in the range from 0.26 to 0.5 - an emergency situation is possible, the more careful control and the necessary preventive actions of the operational personnel given above are required;
c. if the value Y lies in the range from 0.51 to 0.79 - a pre-emergency situation;
d. if the value Y lies in the range from 0.8 to 1.0 - an emergency situation has arisen.

Depending on the assessment of the HPC technical condition the operational diagnostic subsystem can take one of the following solutions:

- in case (a) – to do nothing;
- in case (b) – to analyze the possible causes of the HPC technical condition deterioration: to check the temperature of the bearings at a place and the temperature of cooling water; to check lubricant circulation and oil pump operation; to check the pressure in the discharge chamber of the HPC and in front of it; to check the operation of the heating lines for flanges and studs; to check the position of the shaft of the turbine by special marks;
- in case (c) - depending on the results of the analysis to perform one of the following actions: to identify the cause of the bearings temperature rise, and to eliminate it according to the instructions and the above mentioned measures; if necessary, to reduce the steam flow to the top of the turbine in order to normalize the pressure in the discharge chamber of the HPC; if necessary, to adjust the work of heating lines for flanges and studs;
- in case (d) – to act according to the order of the workshop technician, the shift supervisor or the deputy chief of the operation department or the person replacing him.

Similarly, it is possible to generate a planning matrix of the FFE and for assessing the technical state of other elements of the turbine unit: LPC, PS, generator. The problems of this class are fixed by the corresponding sensors, and the reaction on them is specified in the technological instructions and can be duplicated on the monitor screen with the help of the operational diagnostics subsystem.

Therefore, the proposed method for assessing the technical state of the turbine unit allows early to predict the occurrence of emergency situations.

The developed algorithms for diagnostics the technical state of the turbine unit were tested at Almaty CHP-2. The expected economic effect is the extension of the between-repair period of turbine units by 15-20%.

Research of specific phonemes of the Kazakh language on the basis of LPC coefficients

Liazzat B Ilipbayeva*, Dana Zh Utebayeva

Satpayev University, 22a, Satpayev str., Almaty, RK

**Corresponding author's e-mail: donika.joldybay@gmail.com*

Abstract

In this article we will consider the specific phonemes of the Kazakh language on the basis of the linear predictive coding coefficients. LPC coefficients' values were determined in order to investigate the basic characteristics of a speech signal of Kazakh specific phonemes. This is actual, for the recognition of speech and efficient coding of speech information, which requires the improvement of voice encryption algorithms.

Key words: speech-processing, phonemes, linear predictive coding of speech, linear predictive coefficients.

1 Introduction

Linear-code predictive coefficients are the most in demand tool with the development of digital technologies. In addition, linear predictive speech coding is the kind of approximation to a real acoustic system.

Among the current studies, the LPC coefficients that needed to recognize phonemes of the Kazakh language have not been fully determined yet. As well as the most probable frequency of recognition of the sounds of the Kazakh language have not fully studied. Therefore, researching these coefficients allows us to recognize sounds and protect them in the transmission media.

2 Estimation of Linear Prediction Coefficients.

In the Kazakh language there are 37 phonemes, 12 of them are vowels and 25 are consonants. And among them 5 are vowel specific phonemes - «ә», «і», «ө», «ү», «ұ», «ң», and 3 are consonants - «ғ», «қ», «һ». During the study were considered the time and spectral characteristics, discrete and Linear Predictive Coefficients' values of these specific phonemes. Each phoneme has waveform and a discrete value in the form of matrices. Time components and discrete values of phonemes have been obtained using the program Matlab.

Obtained analysis allowed distinguishing the main differences and similarities in the acoustic characteristics of phonemes and it was noticed that there are special phonemes in Kazakh and English, which are very similar in pronunciation.

There are groups of phonemes that are perceived by the native speaker of English, Russian and Kazakh as one sound. Therefore, specific phonemes were taken for the study. Also, there are phonemes and a number of specific phonemes like English and Kazakh sounds:

The English phoneme [a, æ, ʌ] - both Russian and Kazakh [a].

English phoneme [ә] - as the specific Kazakh phoneme [ә].

English phoneme [ɔ:] - as the specific Kazakh phoneme [ұ].

English phoneme [ng] - as the specific Kazakh phoneme [ң].

In common, in the speech production model, a time-varying excitation signal is filtered by the vocal tract filter with time-varying characteristics. The speech signal at the filter output is the result of convolution of the excitation signal with the filter impulse response. Because of the time-varying nature of the speech signal, the predictor coefficients are to be estimated from short segments of the speech signal. The basic approach is to find a set of predictor coefficients that will minimize the mean squared error between samples of short segments of the original speech signal with the corresponding predicted speech samples. So, these predictor coefficients are taken as a[k] and the process estimating a[k] from the speech signal is called *linear prediction analysis* [1]. The main task of the method is to determine the coefficients a[k] of the digital filter from observations of the sequence of samples of any speech signal s[n]. The main assumption of the linear prediction method is that the speech sample at the output of the voice path s [n] can be predicted from a linear combination of its previous values and the value of the signal [2]. These values of the coefficients, which are called linear predictive coding (LPC) coefficients, can be used in determining the pitch frequency, in speech coding, in speech recognition and synthesis problems.

In this study, first was considered acoustic characteristics of phonemes. After analyzing phonemes with their acoustic characteristics, it was obtained linear predictive coding (LPC) coefficients of specific phonemes of the Kazakh language by the program Matlab. During the study, it was noted that vowel and consonant phonemes were obtained with two different ways. Because, voiced sounds are produced by forcing air through the glottis with the vibration of vocal tract and unvoiced sounds are produced by forming a constriction in the vocal tract and forcing air through this constriction at a high velocity to produce turbulence [1]. So, only for voiced sounds like «a, i, u» the periodic impulse train is valid, if we try to recognize them. For unvoiced sounds, the excitation signal needs to be changed to «white noise» with a flat spectral envelope.

3 Conclusions

Thanks to the advancement of modern telecommunication and multimedia technologies, a huge amount of confidential voice data is moved through open and shared networks.

These applications are critical to protecting the integrity of voice data and protecting the privacy of authorized users. And, for the protection of voice data, linear code values of phonemes were studied. Study has been started from the time and spectral characteristics of phonemes. In the result of the study, comparative analysis of phonemic values is carried out and linear - code values of specific phonemes of the Kazakh language are received. So, these considering Linear Predictive Coding coefficients of phonemes help to recognize sounds and to protect the transmitting speech.

References

[10] Jayan A R 2016 Speech and Audio Signal Processing *Delhi-110092* **68**

[11] Shaila Dr, Apte D 2017 Speech and Audio Processing *Delhi* **9**

Development of a virtual model for geometric information coding specifying the motion kinematics of the mobile robot of the additive control system in engineering

G R Utegenova, B Zh Tilesheva, A S Turakbayeva, O V Zhirnova, R M Uteshev*

Kazakh National Research Technical University named after K.I. Satpayev, Institute of Information and Telecommunication Technologies, specialty "Automation and Control", Kazakhstan, Almaty

**Corresponding authors e-mail: btilesheva@mail.ru*

Abstract

During the research there was developed a mobile robot motion control system. Within the framework of this dissertation work there were reviewed the existing control systems for mobile robots; designed and tested the kinematic and dynamic model of the mobile robot taking into account the dynamics of the drive; studied the existing algorithms for trajectory planning and chosen the most frequently used algorithm in mobile robotics; considered the issue of technical implementation of this system on the example of a specific mobile robot. The considered practical task in the project gives a clear idea about the significance of the presented development. This system is able to solve very actual problems in the mobile robots management in different spheres of life, since mobile two-wheeled robots are widely used both in everyday life (robotic vacuum cleaners) and in more specific industries (robots-conveyors).

Keywords: Mobile robot, coding, additive system, fuzzy logic, fuzzy logic output.

1 Introduction

Nowadays, more and more popular become service mobile robots. In order to perform their functions these robots must be able to move in certain trajectories in automatic mode. Usually in modern robots for this purpose there is used a navigation system that determines the robot's own coordinates, plans the trajectory at the current time and controls its movement. Since the actual environment, in which the robot is located, usually contains mobile obstacles (people, other mobile robots) movement in it along a predetermined trajectory is almost impossible [1-4]. The relevance of the research is that the proposed architecture of the control system will allow to increase the efficiency of the performed work and will expand the scope of application of mobile robots by ensuring their autonomous operation in partially undetermined conditions. It also simplifies the task of the human operator, who, having been freed from robot control at the action level, gets the opportunity to focus more on high-level tasks. In addition, the requirements for the operator qualification are reduced, since there is no need to teach him how to control the elementary movements of the robot [5-10].

The aim of the work is to analyze and to synthesize information processing algorithms by the mobile robot motion control system that extend its autonomous movement capabilities, to develop the architecture, algorithmic and software support of intelligent control systems for mobile robots based on the fuzzy logic method and the tracking vision system for autonomous solution of tasks.

2 Overview

In this work we consider the solution of the problem of a mobile robot movement control in the presence of mobile (dynamic) obstacles. The problem is formulated as follows. There is a piecewise linear trajectory from the initial point to the target one. It can be corrected in real time using algorithm A* (A-star). The mobile robot navigation system tracks its position and calculates the coordinates of the current reference point to which the robot should move, avoiding collisions with obstacles (static and dynamic).

3 Decision

The general prerequisite for the application of fuzzy control systems is, on the one hand, the presence of uncertainty associated with both the lack of information and the complexity of the system and the impossibility or inexpediency of its description by traditional methods and, on the other hand, the existence of an object, necessary control actions, disturbances, as well as the availability of information of a qualitative nature. A typical wheeled robot P3-DX is shown on Figure 1.

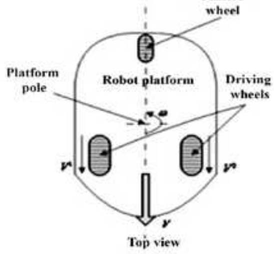


FIGURE 1 Mobile robot P3-DX, top view

The mobile robot is a three-wheeled platform, equipped with independent electric motors of the right and left wheels. The platform is equipped with a video camera and ultrasound [11-14]. The kinematic model, is shown on Figure 2, of the wheeled robot P3-DX is following:

$$y_1 = cos\alpha V_2,\ y_2 = sin\alpha V_2,\ \alpha = \omega \tag{1}$$

$$V_2 = \frac{K}{2}(V^1 + V^2),\ \omega = -\frac{K}{2}(V^1 - V^2) \tag{2}$$

where y=(y_1,y_2) – coordinates of the wheeled robot in plane, *a* – angle of robot rotation in plane, *Vz* – robot speed, ω – angular speed, V^1 V^2 – longitudinal wheel speed, *K* – drive transmission coefficient.

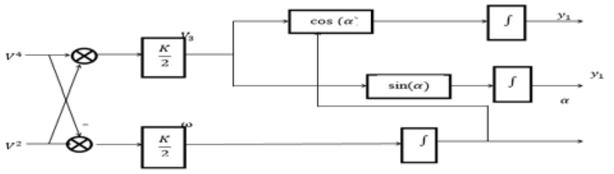


FIGURE 2 The kinematic model of the wheeled robot P3-DX

The mobile controlled object in the developed debugging complex is a wheeled robot. In general case, the problem of its localization (determination of its Cartesian coordinates U1, U2 and angular orientation *a* at time *t*) can be solved by direct detection and recognition, which is shown on Fig. 3 and Fig. 4.

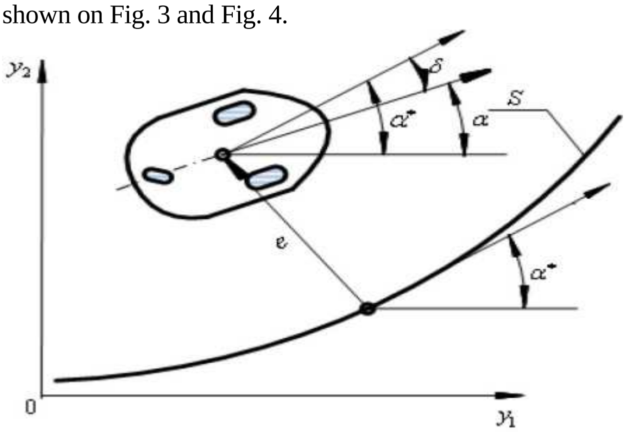


FIGURE 3 Wheel robot and curve segment s - e - normal deviation from the curve S, α - angular orientation error

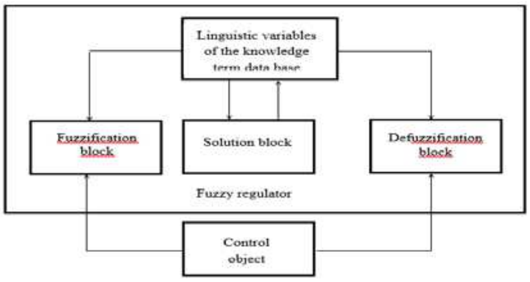


FIGURE 4 Functional diagram of a system with fuzzy logic

4 Conclusion

Nowadays, there were proposed several algorithms for fuzzy inference. Some of them have received the greatest application in systems of fuzzy inference, including the Mamdani algorithm, the Tsukamoto algorithm, the Larsen algorithm, the Sugeno algorithm, and etc. We choose the Mamdani algorithm, is shown on Figure5.

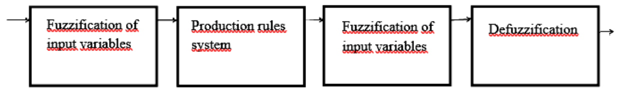


FIGURE 5 Mamdani fuzzy inference system

All systems with fuzzy logic function according to the same principle: the measurements of the devices are fazzificated, processed and defazzificated [15-18]. The Mamdani algorithm is one of the first, which found application in systems of fuzzy inference. Formally, the Mamdani algorithm can be defined in the following form on Figure 5. Formally, the Madani algorithm can be defined as follows:

1. Formation of the rule base of fuzzy inference systems.
2. Fazzification of input variables
3. Aggregation of subconditions in fuzzy production rules.
4. Activation of subconclusions in fuzzy production rules.
5. Accumulation of conclusions in fuzzy production rules.
6. Defuzzification of output variables

Test automation using open source products is the most pronounced trend that is gaining popularity in both small companies and corporations. This is determined by resource conservation and high quality of existing solutions.

The market gets further away from the bulky commercial solutions towards open source products, and towards the automated testing as part of the tested application.

References

[1] Besekersky V A, Popov E P 2003 *The theory of automatic control systems* St. Petersburg

[2] Broynl T 2012 *Embedded Robotic Systems: Design and Application of Mobile Robots with Embedded Control Systems*

[3] Diveev A I, Ibadulla S I 2014 *Synthesis of the motion control system of a mobile robot along spatial trajectories by the method of variational programming*

[4] Pritikin F N, Osadchy A Yu 2005 *Coding of geometric information specifying the kinematic chain model of the android robot actuator* Sant Peterburg

[5] Haseli Y, van Oijen J A, de Goey L P H 2011 A detailed one-dimensional model of combustion of a woody biomass particie *Bioresource Technology* **102** 9772-82

[6] Kvyetnyy R N, et al. 2015 Modification of fractal coding algorithm by a combination of modern technologies and parallel computations *Proc. SPIE 9816, Optical Fibers and Their Applications 2015 98161R*, doi: 10.1117/12.2229009

[7] Ławicki T, Zhirnova O 2015 Application of curvelet transform for denoising of CT images *Proc. SPIE 9662, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2015, 966226 (11 September 2015)* doi: 10.1117/12.2205483

[8] Moskvina S M, et al. 2015 Evaluation of the impact of uncontrolled parametric perturbations on stability of automatic systems with logical control units *Proc. SPIE 9816, Optical Fibers and Their Applications 2015, 98161X* doi: 10.1117/12.2229136

[9] Porteiro E, et al. 2006 Mathematical modelling of the combustion of a single wood particie *Fuel Processing Technology* **87** 169-75

[10] Thunman H, et at. 2002 Combustion of wood particles - a particle model for Eulerian calculations *Combustion and Flame* **129** 30-46

[11] Walters D, Cokljat D 2008 A three-equation eddy-viscosity model for reynolds-averaged navier-stokes simulations of transitional flows *Journal of Fluids Engineering* **130** 121401: 1-14

[12] Williams A, et al. 2012 Pollutants from the combustion of solid biomass fuels*Progress in Energy and Combustion Science* **38** 113-37

[13] Wornat M, et al. 1996 Single-particle combustion of two biomass chars *26th Symposium (Int.) on Combustion* 3075-83

[14] Wójcik W, Zhirnova O V, Kulakova E A, Imanbekov B T 2015 Development of an automated system diagnostics and management of biogas combustion process *Proceedings of the Second International scientific-practical conference "Information and telecommunication technologies: education, science and practice", Volume II, Almaty, Kazakstan, December 3–4, 2015*

[15] Zhirnova O V, Kozhamberdieva M I, Imanbek B T 2015 Gasification process for vapor flow, temperature, and raw materials *Proc. of the IV International Conference "Global Science and Innovation", 12–13 March, USA, Chicago*

[16] Yang Y B, et al. 2008 Combustion of a single particie of biomass *Energy & Fuels* **22** 306-16

[17] Svalova M V 2008 The mathematical model of the process of biogas obtaining from wastes of poultry production products *Bulletin of Izhevsk State Technical University* **3** 145

[18] Eder B, Schultz H 2008 *Biogas installations. Practical guide* The site of the "Zorg" company

[19] Zhirnova O V, Suleimenov B A, Toigozhinova A Zh, Wojcik W T 2016 Construction of mathematical model the combustion of biogas to reduce greenhouse gas emissions // *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **1**(421) 177-85

[20] Nussupbekov B R, Karabekova D Z, Khassenov A K, Zhirnova O, Zyska T 2016 Heat flow meter for the diagnostics of pipelines *Proceedings of SPIE - The International Society for Optical Engineering* 10031, 100312C

[21] Zhirnova O V, Toigozhinova A Z, Imanbek B, Kulakova E A, Suleimenov B A 2016 Diagnosis of combustion process biogas and gas power plants to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **6**(420) 123-35

Intellectualization of the process of operational diagnostics of thermal processes at a thermal power plant

M M Zhardem, R R Islamova, D G Zhaksybaev, O V Zhirnova, A Zhumabergenov

Kazakh National Research Technical University named after K.I. Satpayev

**Corresponding author's e-mail: muratbek.1996@mail.ru*

Abstract

In this work there is considered the expediency of the **intellectualization** of the process of operative diagnostics of thermal plants on the basis of intelligent technologies. It is shown that in the conditions of the modern developing market it is necessary to talk about the unsatisfactory state of the technological potential of the electric power industry. In order to solve existing problems it is necessary to make a transition of thermal energy systems to a new quality of management by forming a new technological platform of the intellectual and energy system.

Keywords: Analysis, operational diagnostics, intellectualization, intellectual and energy system.

1 Introduction

In the last decade Smart Grid technology ("intelligent network") has been developing in the advanced countries of the world. There are already dozens of pilot projects, where the use of "smart meters", "smart elevators", "smart houses", the use of solar and wind energy in combination with "smart houses" gives a significant gain to the consumer in paying for energy organizations services. By analogy with the concept of Smart Grid, the transition of thermal energy systems to an intellectual level provides the creation of a new technological platform of the intellectual and energy system.

Intellectualization of information-measuring processes means using not only a new generation of tools, but also a new generation of mathematical, algorithmic and software support.

The intellectual and energy system is a client-oriented network of a new generation, which should ensure the availability of the resource use. Reliable, high-quality and efficient service of electric power consumers due to flexible interaction of all its subjects (all types of generation, electric networks and consumers) on the basis of modern technological means and a single intellectual hierarchical control system.

In the intelligent power supply system the final consumer of electricity is considered as a partner of the electric power industry entities in terms of ensuring reliable operation of the power system and acquires the "active" status.

The concept of IES is aimed at implementing an active consumer strategy, under which there is understood providing the possibility of independent change by consumers the volume and functional properties of the received electricity on the basis of the balance of their needs and the capabilities of the energy system. In other words, it stimulates the consumers to participate in load regulation.

Control levels in the intellectual and energy system are presented on Figure 1.

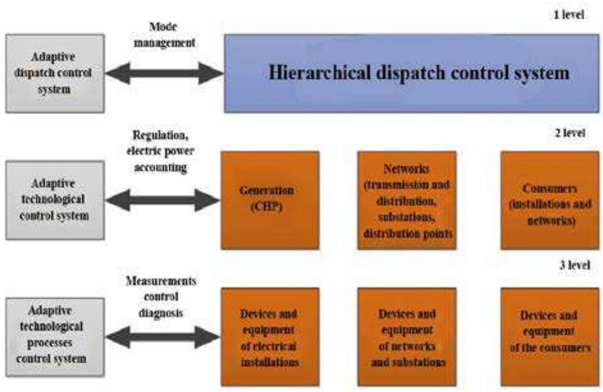


FIGURE 1 Control levels in the intellectual and energy system

An intelligent solution is the use of hybrid approaches and models, when combining various intellectual and traditional models allows to obtain the most effective solutions, especially the guaranteed accuracy of the forecast.

2 Overview

New properties of the power system within the IES framework:

1. Interaction of the network with any types of generation, including small and alternative energy sources;
2. Interaction of the network with consumers on the basis of efficient use of electricity due to situational load regulation with maximum consideration of consumer requirements;
3. Creation a new network electric power topology with a hierarchical and technological segmentation and flexible active-adaptive intersegment bonds providing exchanges and regulation of basic, half-peak and peak powers by the corresponding automatic control system;

4. Implementation of adaptive response of the power system and electric network to the current situation based on a combination of local and centralized control in normal and emergency conditions;
5. Development of new information resources and technologies for the assessment of situations, development and adoption of operational and durable solutions – in order to implement effective control.

3 Decision

Analysis of the reliability of the system with the use of an intelligent system, the Kohonen network and with the use of conventional emergency automatics led to the fact that the subsystem could maintain the stability only through the coordination of reactive power sources. There was not required a load cutoff.

4 Conclusion

Based on the conducted analysis the following conclusions can be made: the transition of thermal energy systems to an intellectual level provides the creation of an intellectual and energy system. The basis of which is the application of the theory of fuzzy sets and the use of the Kohonen network at the detection of pre-emergency states. Created on the basis of the intellectual and energy system make it possible to use the most effective methods of diagnosis. There were synthesized and investigated the methods for the creation of the intellectual-energy system that will be based on more flexible efficient use of electricity.

References

[1] Suleimenov B A, Mutanov G M, Suleimenov A B 2012 *Intelligent control systems: theory, methods, means* Almaty: KazNU named after Al-Farabi 223 p

[2] Volkova I O, Bushuyev V V, Veselov F V 2012 *The concept of an intelligent electric power system in Russia with an actively adaptive network* Moscow

[3] Haseli Y, van Oijen J A, de Goey L P H 2011 A detailed one-dimensional model of combustion of a woody biomass particie *Bioresource Technology* **102** 9772-82

[4] Kvyetnyy R N, et al. 2015 Modification of fractal coding algorithm by a combination of modern technologies and parallel computations *Proc. SPIE 9816, Optical Fibers and Their Applications, 98161R* doi: 10.1117/12.2229009

[5] Ławicki T, Zhirnova O 2015 Application of curvelet transform for denoising of CT images *Proc. SPIE 9662, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2015, 966226 (11 September 2015)* doi: 10.1117/12.2205483

[6] Moskvina S M, et al. 2015 Evaluation of the impact of uncontrolled parametric perturbations on stability of automatic systems with logical control units *Proc. SPIE 9816, Optical Fibers and Their Applications 98161X* doi: 10.1117/12.2229136

[7] Wójcik W, Zhirnova O V, Kulakova E A, Imanbekov B T 2015 Development of an automated system diagnostics and management of biogas combustion process *Proceedings of the Second International scientific-practical conference "Information and telecommunication technologies: education, science and practice", Volume II, Almaty, Kazakstan, December 3–4, 2015*

[8] Zhirnova O V, Kozhamberdieva M I, Imanbek B T 2015 Gasification process for vapor flow, temperature, and raw materials *Proc. of the IV International Conference "Global Science and Innovation", 12–13 March, USA, Chicago*

[9] Zhirnova O V, Suleimenov B A, Toigozhinova A Zh, Wojcik W T 2016 Construction of mathematical model the combustion of biogas to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **1**(421) 177-85

[10] Nussupbekov B R, Karabekova D Z, Khassenov A K, Zhirnova O, Zyska T 2016 Heat flow meter for the diagnostics of pipelines *Proceedings of SPIE - The International Society for Optical Engineering* 10031, 100312C

[11] Zhirnova O V, Toigozhinova A Z, Imanbek B, Kulakova E A, Suleimenov B A 2016 Diagnosis of combustion process biogas and gas power plants to reduce greenhouse gas emissions *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences* **6**(420) 123-35

Research of a thermo-stressed state of a core of variable section in the presence of a heat flux, thermal insulations and heat exchange

M Arshidinova[1, 2]* , K Begaliyeva[1, 2], A Kudaykulov[1], A Tashev[1]

[1]*Institute of Information and Computing Technologies CS MES RK, Kazakhstan*
[2]*Al-Farabi Kazakh National University, Kazakhstan*

**Corresponding author's e-mail: mukaddas_arshidi@mail.ru*

Abstract

The horizontal core of restricted length and variable transverse section is considered. Radius of section changes on coordinate linearly, and a sectional area non-linearly. On the area of the left-hand end of a core the heat flux is brought, the lateral area of a core is heat-insulated, and through the area of the right end there is a heat exchange to an environment. On the basis of the law of conservation of energy the field of distribution of temperature and three components is defined: deformations, tension and movements. Also the size of thermal lengthening and the arising axial effort, in case of jamming of two ends of a core is defined.

Keywords: Core of variable section, axial effort, deformation, tension, lengthening.

1 Introduction

The horizontal core of restricted length of l (cm) and variable transverse section is considered. At the same time the section of a core is a circle. Radius on coordinate changes linearly, and a sectional area non-linearly. The sectional area of the left-hand end of F_0[cm^2] is more than the right end of Fl [cm^2]. The lateral area of the studied core is completely heat-insulated. On a sectional area of the left-hand end of a core the heat flux of constant intensity is brought q[$\frac{\text{watt}}{\text{cm}^2}$].

Through a sectional area of the right end there is a heat exchange to a surrounding medium. At the same time coefficient of heat exchange of h [$\frac{\text{watt}}{\text{cm}^2\,{}^0\text{C}}$], and environment temperature of T_{oc} [K]. Physicomechanical properties of material of the studied core it is characterized by a thermal expansion coefficient α [$\frac{1}{K}$], and heat conductivity of K_{xx}[$\frac{watt}{cm\ K}$] ,and also E[$\frac{КГ}{cm^2}$]. The calculated scheme of a task is provided in the figure 1.

Cores of variable section from refractory materials are widely used as the bearing elements of power stations, jets and processing industry. In these designs they work at influence of heterogeneous types of sources of heat. In a corollary of what in them arise the composite non-linear thermo - an intense strained state. Therefore development of the express methods, computing algorithms and programs allowing to investigate thermo - an intense strained state of rod stock of variable section is a current problem. As reliable work of power complexes of engines depends on thermo-strength characteristics of the bearing elements in the form of rod stock of variable section.

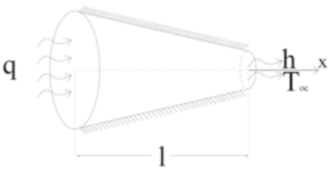


FIGURE 1 Calculated scheme of a task

2 Overview

On the basis of fundamental laws of conservation of energy the numerical solution of the established problems of a thermomechanical condition of rod stock of restricted length and a constant transverse section at simultaneous influence of heterogeneous types of sources of heat is provided in works [1-3]. In these tasks sizes of lengthening of the studied core because of influence of sources of heat were defined. In case of jamming of two ends of a core the size of the arising axial compressive force and also distribution laws of temperature, components of deformation, tension and movement is calculated.

3 Decision

At the solution of an objective it was applied:

1. For definition of the field of temperature, deformation, tension and movement the method of minimization of the total thermal energy on nodal values of temperature is used. Later the size of lengthening of a core of variable section from heating and also the size of the arising squeezing axial effort in case of jamming of both ends of a core is calculated
2. For definition of the field of movement the method of

minimization of a potential energy of elastic deformations (taking into account existence of the field of temperature) on nodal values of movement is used
3. Programs in the Phyton programming language are developed and realized on computers

4 Conclusion

The analysis of the received results showed that application of fundamental laws of conservation of energy at the solution of the established tasks thermo - an intense strained state of rod stock of variable section in the presence of heterogeneous types of sources of heat leads to obtaining results of a high precision. These results naturally satisfy the corresponding laws of conservation of energy for the considered tasks. The Phyton programming language allows to perform necessary difficult analytical operations without errors.

References

[1] Kudaykulov A, Zhumadillayeva A 2016: Numerical simulation of temperature distribution field in beam bulk in the simultaneous presens of heat insulation, heat flux and heat exchange *Acta physica polonica* **A** 335-6
[2] Akhmetov S, Kudaykulov A 2017 On the Method of Construction of the Dependence of the Heat Extension Coefficient on Temperature in Heat-resistant Alloys *International Jounal* 20-9
[3] Akhmetov S, Kudaykulov A 2017: Methodology of Accouting for the Local Surface Heat Exchange for Investigation of Non-stationary Thermomechanical Processes in the Structure Elements of the Construction *International Jounal* 94-8

Energy-saving electric drive for capacity regulation of the blowing fans of the kiln

N Sarsenbayev*

Institute of Information and Telecommunication Technologies, Kazakh National Research Technical University named after K.I. Satpayev, Satpayev Str.22, 050013, Almaty, Kazakhstan

**Corresponding author's e-mail: nurlan_ss@mail.ru*

Abstract

In this work there is considered the simultaneous control of the rotation frequency of two asynchronous motors with a phase rotor for regulation the capacity of fan blowers in a kiln, in order to increase the economic efficiency of its operation. One of the engines is connected according to the scheme of the valve cascade, and the second one is connected by a dual-supply circuit.

There is created the model of the proposed system, and also conducted the researches of the dynamic characteristics on the basis of the model.

Keywords: energy-saving electric drive, asynchronous-valve cascade, dual-supply machine, blowing mechanisms, simulation modeling

1 Introduction

The aim of this research is the development and investigation of an energy-saving automated electric drive with improved energy characteristics for regulation the capacity of fan blowers in a kiln.

In order to achieve this goal it is necessary to solve the following tasks:

- to investigate the capacity regulation technology of fan blowers in a kiln.
- to develop an energy-saving electric drive for regulation the capacity of fan blowers in a kiln;
- to develop a mathematical model of the electric drive, allowing to investigate the dynamic properties of the system.
- to explore the electromechanical and power characteristics of the drive in all modes of operation.

The production of sulfuric acid is one of the most important and large-scale productions in the chemical industry. This is determined by the role played by sulfuric acid in many branches of the national economy - in the production of virtually all types of mineral fertilizers, which is one of the largest consumers of sulfuric acid (40%), in the organic synthesis industry (30%), as an electrolyte in all processes of electrolysis of non-ferrous metals, in the oil, textile and other industries.

In Kazakhstan the technology of sulfur production from waste gases of non-ferrous metallurgy was implemented on the enterprises of Kazakhmys Corporation LLP and Kazzinc LLP.

The most important task of the sulfuric acid industry is the continuous improvement of production through the use of the latest achievements of science and technology, the distribution of practices in the introduction of new methods of work.

In the general scheme of sulfuric acid production the first two stages are of great importance - the preparation of raw materials and its burning or roasting.

The first stage of sulfuric acid production is raw materials roasting for the production of sulfur dioxide.

In order to burn sulfur-containing raw materials oxygen is needed. In order to do this air is supplied to the kiln. For combustion processes control in the furnace it is necessary to supply the required amount of air, depending on the amount of incoming fuel.

The main purpose of blowing mechanisms is to maintain the optimum combustion regime in the furnace chamber. Under the concept of optimal mode it means maintaining the optimal "fuel-air" ratio and the creation of the most favorable conditions for complete combustion of fuel. To fulfill this condition, it is necessary to supply the required amount of air to the furnace.

Since the fuel supply control process and blowing is carried out with the help of electric drives, the problem of optimal combustion of fuel is focused on the formation of conditions for the functioning of a twin-motor electric drive.

2 Research results

Nowadays, frequency-regulated electric drives are used to regulate the speed of such mechanisms. A functional diagram of such a system is given in work [1], where the regulation is performed with a change in the supply network frequency of the drive motors of these mechanisms by means of expensive frequency converters.

Frequency regulation of the network is a complex task, because all the energy supplied to the motor is used for the conversion process regardless of the control range. In connection with this, the main disadvantage of this scheme is the large control power, as well as the high cost of the electric drive, because the frequency converters capacity is commensurate with the engine power.

The most expedient and effective way to solve the problem of the optimal mode of the fuel combustion process is to use a cascade electric drive (in accordance with the cascade and dual-supply systems), which have more opportunities and higher energy parameters [2, 3].

3 Conclusion

The article presents a functional diagram of the blowing mechanisms control with cascade connections of two asynchronous motors.

The implementation of the energy-saving electric drive of the blowing mechanisms according to the valve cascade allows to achieve the following advantages in comparison with traditional methods:

- a reduction of energy consumption by an average of 30-40%;
- maintains the set air or temperature consumption of the cooled object;
- elimination of starting currents and motor overloads;
- in the entire range of operating speeds and loads, the power coefficient of the drive is close to 1 [2].

In order to analyze the processes occurring, in this system there is performed a simulation modeling. In order to obtain the dynamic characteristics of the control objects there was used the MatLab modeling software package.

There is considered the dynamics of the asynchronous motor operation at the control of the phase shift (θ) angle neglecting electromagnetic transient processes and taking into account only electromechanical ones.

References

[1] Suvorov M V 2004 Energy-saving control complex of the blowing mechanisms of the boiler house *Energy saving* **3**
[2] Onischenko G B, Lokteva I L 1979 *Asynchronous valve cascades and dual-supply motors* Moscow: Energia
[3] Isembergenov N T, Sarsenbayev N S 2004 *Two-motor electric drive of coordinated rotation* The patent of the Republic of Kazakhstan № 41408, Bul №9, 15.09.2004
[4] Ualiev D, Sarsenbayev N S, Chabaev A 2014 Energy-saving system for automated control of the blowing mechanisms of boiler plants *Proceedings of the International Satpaev Readings "ROLE AND PLACE OF YOUNG SCIENTISTS IN THE REALIZATION OF THE STRATEGY" KAZAKHSTAN-2050", dedicated to the 80th anniversary of KazNTU named after KI. Satpayev*

Modeling the temperature in the wind box of sintering process

N R Toktassynova* , B A Suleimenov

Kazakh National Research Technical University after K I Satpayev, Kazakhstan

**Corresponding author's e-mail: tamaki1992@gmail.com*

Abstract

At the present time software automation testing is actively developing field of software development industry. Since automation testing is relatively young field, there are no best practices and standards formulated till the end yet. Currently there are many approaches and tools in the market used by different companies. Some of them are useful and actually can save companies money on software development process. However some of the approaches and tools are just a waste of resources. In variety of tools and approaches it is hard to find the proper way of setting up automation testing solution. This work is an attempt to find the best way of doing it.

Keywords: sintering process, modeling, heat transfer, porous media

1 Introduction

The agglomeration is a process of sintering a phosphorite charge made up of different materials (phosphorite and coke particles), with a diameter of no more than 10-2 m, to obtain pie of the finished product called sinter. A common type of agglomeration is the process of sintering iron ores, to which a great deal of papers have been devoted. The problems arising in this process are similar to different ores: phosphorite, lead, zinc and other chemical elements.

Key problems in the phosphoric agglomeration: a large amount of return (about 40-50%), change in the composition of the initial charge (change in gas permeability) and control of operational (speed of sintering machine, wind box vacuuming) and initial parameters (coke content in the initial charge) after the completion of the process (based on the quality of the obtained sinter).

All solutions to the presented problems of the agglomeration process control can be divided into 2 categories: control of operational parameters - speed of sintering machine or vacuum in the wind box and control of the initial composition of the charge - change in the content of coke and moisture. In this case, as observable parameters are considered: burn-through point [1, 2, 3], flame-front position [4], heat front propagation [5], temperature in different layers (gas and solid phase) of charge [6, 7], carbon efficiency [8], the content of a certain substance in the sinter [9], quality and quantity of sinter.

As can be seen from the literature analysis, most parameters relate to the problem of temperature regulation: inside the charge during the sintering process, temperatures under the horn, at the end of the process and others. The aim of this work is to simulate the temperature in the wind boxes. Sintering gases are sucked through 26 wind boxes located under the sintering machine. Temperature simulation is necessary to determine the wind boxes in which it is necessary to install thermocouples and based on the data from the sensors to synthesize an algorithm to control the sintering machine.

2 Equations of the sintering process

2.1 TEMPERATURE CHANGE DURING SINTERING PROCESS

The initial phosphorite charge, as well as the final sinter, is a porous material in which the solid and gas phase are considered. The temperatures of the solid and gas phase in the porous material are equal and are determined by the following equation:

$$\begin{aligned}&\left(\theta_p \rho_p c_{\rho.p} + (1-\theta_p)\rho C_p\right)\frac{\partial T}{\partial t} + \rho C_p u \nabla T + \\ &+ \nabla\left(\left(-\theta_p k_p - k(1-\theta_p)\right)\nabla T\right) = Q\end{aligned}, \qquad (1)$$

where $k [W/(m\cdot K)]$ – thermal conductivity of gas, ρ $[kg/m^3]$ – density of gas, C_p $[J/(kg\cdot K)]$ – heat capacity at constant pressure of gas, γ – ratio of specific heats of gas, θ_p – volume fraction of solid (*1- porosity*), k_p $[W/(m\cdot K)]$ – thermal conductivity of porous matrix ρ_p $[kg/m^3]$ – density of porous matrix, $c_{\rho.p}$ $[J/(kg\cdot K)]$ – specific heat capacity of porous matrix, Q $[W/m^3]$ – heat source from chemical reactions and heat from outside.

2.2 GAS VELOCITY IN A POROUS MEDIA

The velocity of the gas in the sintering process is described by the Ergun equation, which is used in hydrodynamics of a single-phase liquid flow in fixed layers with a certain porosity and packing density of particles. In all cases of fixed layers application, pressure drop is one of the main factors. The pressure drop in the layer $\Delta p/L$ is depends on the fluid velocity, its density and viscosity, the size and shape of the particles, the porosity of the layer, the surface roughness and, possibly, the presence of walls:

$$\frac{\Delta p}{L} = \frac{150\mu u(1-\varepsilon)^2}{d^2\varepsilon^3} + \frac{1.75\rho u^2(1-\varepsilon)}{d\varepsilon^3}, \quad (2)$$

where μ *[Pa·s]* – dynamic viscosity of gas, ε – porosity of porous matrix, *d [m]* – equivalent particle size.

The flow in a saturated porous medium can be modelled using the Darcy law or the Darcy-Brinkman model, depending on the specific pore size. If, for a given pore size, the influence of viscosity on fluid flow can be ignored, the Darcy law can be applied, and the flow is described solely by a variable pressure. If the pore size is large enough that the fluid can transmit the moment changes by shearing, then Brinkman's equation should be applied. It allows to find the same variables as the Navier-Stokes equations, but it includes terms that take into account the porosity of the medium through which the liquid flows [10]. Then the equations of motion in a porous material can be determined by following equation:

$$\rho\frac{\partial u}{\partial t} = \nabla\left[-pI + \frac{\mu}{\varepsilon}\left(\nabla u + (\nabla u)^T\right)\right] - \\ -\left(\frac{\mu}{k} + \beta_f\,|u| + \frac{\rho\nabla u}{\varepsilon^2}\right)u, \quad (3)$$

where k [m^2] – permeability of porous matrix, Then, taking into account the Ergun Equation (2) [11]:

$$k = \left[\frac{150\mu u(1-\varepsilon)^2}{d^2\varepsilon^3}\right]^{-1} \cdot \frac{1}{f_p f_{pbase}}, \quad (4)$$

$$\beta_f = \frac{1.75\rho u^2(1-\varepsilon)}{d\varepsilon^3} \cdot \frac{1}{f_p f_{pbase}}, \quad (5)$$

where f_p – factor for the change of porosity up on sintering shrinkage, f_{pbase} – global calibration constant in Ergun's equation = 3.5.

2.3 HEAT OF COKE COMBUSTION

The agglomeration process is accompanied by the release of heat due to coke combustion. In the combustion of coke, the following chemical reactions are usually considered:

$$\begin{aligned} &C + O_2 = CO_2 \\ &C + 0.5O_2 = CO \\ &0.5C + 0.5CO_2 = CO \\ &C + H_2O = CO + H_2 \end{aligned}, \quad (6)$$

The reaction rate is determined depending on the concentration of the substances:

$$R_j = k^f \prod c_i^j, \quad (7)$$

where k^f – constant of reaction rate determined by Arrhenius equation:

$$k^f = A^f \exp\left(\frac{-E^f}{R_g T}\right), \quad (8)$$

where A^f - forward frequency factor, E^f *[J/mol]* – forward activation energy, R_g - universal gas constant.

Then the heat released by the reaction is determined by the equation:

$$Q_j = -R_j H_j, \quad (9)$$

where H_j – enthalpy of *j*-reaction

2.4 CONCENTRATION CHANGE

The change in the concentration of gases in the Equation (6,7) is determined by

$$c_i = \frac{\rho\omega_i}{M_i}, \quad (10)$$

where ω_i – mass fraction of gas *i*:

$$\varepsilon\rho\frac{\partial\omega_i}{\partial t} + \nabla j_i + \rho(u\cdot\nabla)\omega_i = R_i \quad (11)$$

where j_i - a variable that includes the diffusion model of the process.

3 Thermophysical properties

Determination of thermophysical properties (TPS) of ore materials require numerous experiments, since the mineral and chemical composition of samples are different, and certain elements are changed due to temperature variation. The solution of the problem consists in obtaining the dependences of the thermal conductivity and heat capacity of substances on the structural features, chemical and mineral composition on the basis of the TPS models of the composite structure, taking into account the temperature changes.

The composition of the initial charge includes carbonate phosphorites (fraction of P_2O_5 = 18-25%) and coke. Data on heat capacity, heat conductivity, density can be determined from various reference books [12, 13]. Then the thermophysical properties of the charge can be determined as follows (for example, heat conductivity):

$$c_p = \sum \varpi_i c_i, \quad (12)$$

4 Overview

This work discusses the main differential equation for modeling temperature in the wind boxes under the sinter machine:

- Heat transfer in porous media
- Gas velocity in porous media
- Heat source from chemical reaction
- Transport of concentrated species in porous media for gases
- Thermophysical properties of initial charge and sinter

5 Conclusion

The sintering process is one of the important processes to obtain elements from ores, accompanied by a huge amount of return as a result of non-operative control and non-stationary nature of the initial charge. Therefore, controlling the operation of the sinter machine is an urgent and necessary task. In this paper, an analytical method was chosen to model the agglomeration process, which takes into account all the physico-chemical processes taking place during the sintering. For each process, the basic differential equations and properties necessary to obtain an adequate model were determined.

6 Further research

The implementation of this model should also provide for the boundary conditions for each equation. Later on, based on these equations, a two-dimensional model will be constructed that considers one pallet with the initial charge and also the heat supplied from the outside under the horn. PDE method will be used to solve the differential equations. Main result of the simulation is to determine wind boxes, where thermocouples should be installed and develop an algorithm for controlling the agglomeration process.

References

[1] Kwon W H, Kim Y H, Lee S J, Paek K 1999 Event-based modeling and control for the burnthrough point in sintering *process IEEE Transactions on control systems technology* **7**(1) 31-41

[2] Du S, Wu M, Chen X, Lai X, Cao W 2016 *Intelligent Coordinating Control Between BTP and MBL* **21**(1) 139-47

[3] Huang X, Fan X, Chen X, Yang G, Gan M 2016 Bed Permeability state prediction model of sintering process based on data mining technology *ISIJ International* **56**(12) 2113-7

[4] Zhou H, Liu Zihao, Cheng M, Liu Ruipeng, Cen K 2015 *Applied Thermal Engineering* **75** 307-14

[5] Mitterlehner J, Loeffler G, Winter F, Hofbauer H, Schmid H, Zwittag E, Buergler T H, Pammer O, Stiasny H 2004 Modeling and simulation of heat front propagation in the iron ore sintering process *ISIJ International* **44**(2) 11-20

[6] Martinsen F, Foss B A, Johansen T A *A control relevant dynamic model of grate sintering* http://folk.ntnu.no/bjarnean/pubs/conference/conf-50.pdf

[7] Chandra S, Nundy S, Mukhopadhyay 2012 State space modeling and estimation of coupled PDE system: a case study in sintering process *India Conference (INDICON), Annual IEEE*

[8] Chen X, Chen X, Wu M, She J 2016 *Control Engineering Practice* **54** 117-28

[9] Song Q, Wang A 2009 *Journal of Iron and Steel Research* **16**(5) 1-6

[10] Analyze Geophysical Phenomena Involving Fluid Flow with the Subsurface Flow Module https://www.comsol.ru/subsurface-flow-module (*in Russian*)

[11] Kaymak Y, T. Hauck T, Hillers M 2017 *Iron Ore Sintering Process Model to Study Local Permeability Control* Excerpt from the Proceedings of the COMSOL: Rotterdam

[12] Bogatyrev A F, Panchenko S V, Skuratova N A *Generalization of the dependencies of thermophysical properties of solid materials with reacting components* http://www.rusnauka.com/NIO/Phisica/bogatyrev%20a.f..doc .htm (*in Russian*)

[13] Bobkov V I 2017 Models for determination of the properties of phosphate raw material *The successes of modern science and education* **4**(14) 73-7 (*in Russian*)

Developing of the project of a random access memory on FPGA with use of a CAD of QUARTUS II and the Verilog language

A Zaurbek, A Zh Zhaibergenova* , D Z Dzhuruntaev

Satpayev University, Satpayev Str. 22, Almaty, Kazakhstan

**Corresponding author's e-mail: zhanshuak@gmail.com*

Abstract

In operation an example of creation of the project of a random access memory on the basis of the programmable logic integrated circuit (FPGA) in the environment of an automated design engineering system (CAD) of QUATUS II (Altera), which supports all design stages of digital devices on the basis of programmed and reconfigurable logic is reviewed. For the description of behavior of the designed device language of the description of the Verilog equipment which is widely applied during creation of projects on a basis of FPGA is used. With the help of a CAD of QUATUS II compilation of the project is executed, the RTL diagram of a random access memory is synthesized and received executed its functional simulation.

Keywords: Programmable logic integrated circuit, compilation of the project, simulation, programming FPGA, language of the description of equipment, compilation of the project

1 Introduction

Automated design engineering system (CAD) of Quartus II developed by Altera, it is intended for design of digital devices with a high level integration at a basis of the programmable logic integrated circuit (FPGA). The CAD of Quartus II supports all design stages of digital devices on the basis of programmed and reconfigurable logic: creation of the project, compilation of the project, logical project implementation in RTL (register transfer language), simulation and programming of FPGA [1-3]. FPGA is represented by digital integrated microcircuits which consist of a set of programmable logical valves and programmable connections between these valves. Now on a basis of FPGA which contain millions of logical valves any complexity can create digital devices practically.

In Quartus II CAD input of the diagram or description of the designed device can be carried out text or circuit by methods [2, 3]. In case of a circuit method by means of the graphics editor CAD Quartus II it is necessary to draw a project logic in the form of the diagram. In case of a text method input of the description of the diagram is carried out with use of languages: VHDL (Verilog Hardware Design Language), AHDL (Altera Hardware Design Language), Verilog and System Verilog [3]. In this operation for the description of behavior of the designed device we use language of the description of the Verilog equipment which is widely applied during creation of projects on a basis FPGA. Use of the Verilog language, on comparing with a circuit method of the project description, leads to essential abbreviation of a design cycle digital devices, to reduction of time expenditure and cost of development as throughout all development cycle FPGA is used same.

2 The objective

Mastering of the main methods of creation of the project on FPGA in the environment of QUARTUS II CAD with use of language of the description of the Verilog equipment, obtaining practical skills of synthetizing and simulation of a random access memory and check of results of a firmware of a chip FPGA on DE0–CV board.

3 Solution

For creation of the project of a random access memory we launch the Quartus II Altera system. In a dialog box of NPW we specify a way where will settle down the project, a name of the project and a name of the module – the principal file of the project. We select necessary parameters of a chip from a window of a choice of family and the FPGA type of the Cyclone V family, FBGA casing type, quantity of outputs of a chip (484), a class of speed (7), we specify on DE0-CV board chip type FPGA 5CEBA4F23C7. We create the text file in language of the description of the Verilog equipment and we save it with extension of *.v (ram.v) in folder/ram.

We execute compilation of the project and we realize it at the level of RTL. The compiler Quartus II analyzes the project regarding errors, synthesizes the logic diagram, sets up the project under the Altera device and generates output files for simulation, time analysis, creation of the software and programming of the device. The compiler creates files for programming and configuring Altera FPGA. For compilation of the project we select Processing from the menu choose Processing > Start Compilation or click an icon at a toolbar. In case of errors we will correct the HDL description and we repeat compilation. In case of successful compilation we click in the menu Tools > Netlist Viewers > RTL Viewer and we receive the diagram of the projected random access memory at the level of RTL. We save this diagram in the ram folder in a format *. pdf (ram.pdf).

We execute the functional simulation of the project and we check correctness of operation of a random access memory in terms of logic and circuit designers. We set parameter values: finite interval of time of simulation, value of a clock signal clk and other input signals necessary for simulation. We realize start of process of simulation of a random access memory by means of the command Simulation> Run Functional simulation or toolbar buttons . After the end of simulation we receive results of the functional simulation.

Further in operation the primitive (character) of a random access memory is created. For implementation of development in a specific chip FPGA are specified to what outputs of a chip it is necessary to connect the input and output signals which are available in the project. Configuring of a chip, a project firmware is executed. The firmware of the project includes: setup of the device by means of which programming, and programming of a chip will be carried out. Results of a firmware FPGA are checked on DEO–CV board.

4 Conclusions

For project implementation of a random access memory the chip FPGA 5CEBA4F23C7 of the Cyclone V family is selected and DE0-CV board is used. On the basis of this chip, its operation is developed at the level of the RTL diagram of a random access memory and simulated. The clock pulse of clk is created by means of the Push-button button, and remaining input signals are created by means of slider switches of a board DE0-CV connected to inputs FPGA. For check of operation of a random access memory its outputs are connected to the LED’s located on a demonstration board of DE0-CV.

In the course of execution of the job:

1. the text description of the ram module in language of the description of the Verilog equipment is developed;
2. the diagram of a random access memory at the level of RTL is synthesized;
3. the primitive (character) of a random access memory is created;
4. the functional simulation of the synthesis circuit of a random access memory is executed and time diagrams are constructed;
5. configuring of a chip FPGA is executed and its operation on a board is checked, violation of insulation of processes (virtual machines), basic principle of virtualization;

Results of the real operation can be used in case of a penetration of other digital devices on FPGA in the environment of Quartus II CAD with apFPGAation of language of the description of the Verilog equipment

References

[1] Efremov N V 2011 Vvedenie v sistemu avtomatizirovannogo proektirovaniya Quartus II *MSL* p 147

[2] Tarasov I E, Potekhin I E 2007 Razrabotka system tsifrovoi obrabotki signalov na baze PLIS *Telecom* p 248

[3] Beklemishev D N, Orlov A N, Popov M G, Kudrov A A 2014 Modelirovanie mikroprotsessornyh system na baze programmiruemyh logicheskih integralnyh shem s ispolzovaniem Verilog HDL i SAPR Quartus II *MIET* p 100

Collective method in solving the Big Data clustering problems

B Bissarinov[1,a], R Mussabayev[2,b], A Bissarinova[3,c]

[1]Al-Farabi Kazakh National University, Almaty, Kazakhstan
[2]Institute of Information and Computing Techniologies of the Ministry of education and Science, Almaty, Kazakhstan
[3]Satbayev University, Almaty, Kazakhstan

Author's e-mails: [a]bbaituma@gmail.com, [b]rmusab@gmail.com, [c]aigulbis@mail.ru

Abstract

This paper considers application of a collective method to solve the problem of Big Data clustering. The paper summarizes various clustering methods and thoroughly studies the method of collective clustering. This research is carried out within the framework of program-targeted financing (PTF) of the "Development of information technologies and systems for promoting sustainable development of the individual as one of the foundations for the development of digital Kazakhstan".

Keywords: automation testing, quality control, test automation tools

1 Introduction

Informational technologies and their derivations, such like computers, mobile phones and Internet are essential in modern world, especially in huge companies. In cases, involving a big number of counteragents, applicants etc.it is necessary to process huge amounts of data. Nowadays, managing the functioning of corporations, banks or governmental organizations is impossible without using the Big Data technology. The paper summarizes collective research methods. The separate attention is drawn to the family of clustering methods. *Methods of research.*Methods of research are divided into quantitative and qualitative. The method to be chosen will depend on research questions, the basic research philosophy, as well as on preferences and skills. Qualitative research is first and foremost an exploratory study. It is used to understand the main causes, opinions and motives. They give an idea about a problem, help develop ideas or hypotheses for potential quantitative research. Qualitative research is also used to identify trends in thinking, opinions and to deepen the problem. Qualitative methods of data collection vary with the use of unstructured or semi-structured methods. Some common methods include focus groups (group discussions), interviews and lab studies. The sample sizes are usually small, and respondents are selected to fulfill this quota. Quantitative research is used to quantify a problem by creating numeric data or data that can be converted into useful statistics. They are used to quantify relationships, opinions, behavior, other variables and to summarize results from larger samples of population. Quantitative research uses measurable data to formulate facts and identify research models. Quantitative methods of data collection are much more structured than qualitative data collection methods. Quantitative methods of data collection include various forms of surveys: online surveys, document reviews, mobile surveys and kiosk reviews, in person interviews, telephone interviews, longitudinal studies, site interceptors, online surveys and systematic observations [1].

2 Overview

Currently, an approach based on the collective method of decision-making is widely used in cluster analysis. The collective method is a research method in which a cluster analysis of the data is performed by a team of scientists who are investigating the same problem, taking the results of the study as the result of a collective solution in the investigated data area. Since the algorithms for cluster analysis are not universal, each algorithm is applied to strictly defined area, that is, some algorithms are designed for tasks in which objects of each cluster are described by "spherical" areas of multidimensional space; other algorithms better cope with the search for "tape" clusters, etc. To allocate clusters for the heterogeneity of the data under study, it is desirable to apply a set of different algorithms, instead of using one specific algorithm. The collective approach reduces the influence of the algorithms' parameter choice on grouping results [2].

*Clustering.*Business problems can be mapped to various data mining tasks, such as clustering, classification and regression [3]. Clustering will be considered as a method of quantitative data analysis in this article. A cluster is a subset of data, which is similar. Clustering (also called learning without a teacher) is a process of dividing a data set into groups in such a way that the elements of each group are as close to each other as possible, while the different groups are as different (remote) from each other as possible. Clustering can detect previously undetected links in a dataset. There are many applications of cluster analysis. For example, in business, cluster analysis can be used to identify and characterize customer segments for marketing purposes. In biology, it can be used to classify plants and animals according to their characteristics. Two main groups of clustering algorithms are [4]:

- Hierarchical: agglomeration; separating;
- Divisive: K-medians; self-organizing map.

3 Decision

Requirements for good clustering methods are:

- Possibility to display some or all hidden clusters.
- In-cluster and interclusteral disimilarity.
- Possibility to work with various attribute types.
- Possibility to work with noise and emissions.
- Possibility to process high dimensionality.
- Scalability, interpretability and use.

4 Conclusion

Finding similarity between two objects is an important problem of clustering, therefore clusters can be shaped from objects with high similarity in clusters and low similarity in clusters. Normally, to measure similarity or dissimilarity between objects, a distance measures such as Euclid, Manhattan and Minkowski are used. The distance function returns a lower value for object pairs that are more similar to each other.

References

[1] McHugh J 2000 Testing intrusion detection systems: a critique of the 1998 and 1999 DARPA intrusion detection system evaluations as performed by lincoln laboratory *ACM Trans. on Information and System Security* **3** 262– 94
[2] Berikov V B 2013 A team of algorithms with weights in a cluster analysis of heterogeneous data *Bulletin of Tomsk State University* **2**(23) Tomsk 22-31
[3] Lichodzijewski P, Zincir-Heywood A, Heywood M 2002 *Dynamic intrusion detection using self organizing maps*
[4] Sayad S 2017 Real Time Data Mining *Clustring*
[5] http://www.saedsayad.com/clustering.htm

Energy maximization approach for solving clustering problem

Alexander Krassovitskiy* , Rustam Mussabayev

Institute of Information and Computational Technologies, Pushkin str. 125, Almaty, Kazakhstan

**Corresponding author's e-mail: akrassovitskiy@gmail.com*

Abstract

Clustering problem is treated by introducing a parametric function that represents energy of data points. First, a clustering algorithm based on the energy maximization approach is constructed. Second, the parameter identification problem is considered. Preliminary results on clustering and identification of parameters are obtained on several public datasets.

Keywords: clustering, classification, parameter identification, data analysis

1 Introduction

Clustering algorithms are widely used to classify samples of data by certain criteria. The data elements are considered as *n*-dimensional real-value vector points. A distance function is defined on these data points as a criterion of closeness or data likelihood. A number of clustering algorithms have been implemented recently [1] directed to the broad scope of application; some of them gained popularity due to their elegance and efficiency, e.g., DBScan [2].

Our work is inspired by the idea of handling energy values assigned to data points, so that their grouping energy growths faster for higher density points. Based on this approach we construct a clustering algorithm that yields a maximum of energy function (in general, may yield local maximum) for every good sample grouping.

There is a certain drawback for our approach related to the fact that we use a number of heuristic parameters provided to the algorithm. In order to overcome this drawback, the parameter identification problem is considered. The identification problem is solved by encapsulating the clustering algorithm into a "black box", so its parameters are used as input, while we get the precision as its output. Preliminary results on clustering and identification are obtained on several public datasets e.g. Iris, WPBC from [4].

2 Implementation

Our clustering algorithm has the following two parts: finding centroids, and cluster propagation. For the first part we realize an algorithm that for a given dataset of real-value vector points finds such subset that contains center points of data highest density. In order to do so we introduce an empirically-based energy function p.

$$p(dist(s_i, s_j)) : [0,1] \to [0,1],$$

where s_i, s_j are normalized data points from the given dataset, and *dist* is our function of normalized distance. Function p satisfies the following conditions: $p(0) = 1$, $p(1) = 0$, and p is strictly monotonic. Moreover, we require that p to be a parametric function so that we have a control on how far data points may affect one another. A point s_j from the dataset is selected as a centroid point if $D_i\, p(dist(s_i, s_j))/R_2$ is a maximum for all *i*, where $D_i = \sum p(dist(s_i, s_k))/R_1$, and R_1, R_2 are parameters of the algorithm. We mark all these centroid points as clusters, each having exactly one element.

Next, we realize the idea of cluster propagation by including data points into one of the clusters in such a way that it "fits best" to the energy of that cluster. In particularly, we sort out the points and the clusters, after that we find the pair that gives maximum energy gain and merge the point to this cluster. In our algorithm the data points may jump from one cluster to another if corresponding energy increases. This procedure is repeated until no data points can be merged or jump.

We treat the parameter identification problem by iterative search of the best input parameters, i.e., as an optimization problem regarding precision of the clustering. The precision is calculated by comparing the clusters we compute with known values from the corresponding dataset.

3 Discussion

Note, that we introduce the energy (gain) function as a measure of data density or, in other words, representation of the data grouping into a dense cluster. Our algorithm represents a physically inspired approach that lies between density-based and expectation maximization clustering approaches.

One positive side of this method is that the introduced energy function simplifies the proof of the algorithm convergence.

Preliminary results on clustering and parameter identification are obtained on several public datasets. We consider the advantages as well as disadvantages of our solution comparing to several known algorithms [3] applied on Iris and WPBC [4].

TABLE 1 Parameter identification results

Dataset	Precision	Algorithm simulation
Iris	0.9574	more than 1500 runs, step value in parameter identification is 1/50
WPBC	0.9140	more than 1000 runs, step value in parameter identification is 1/200

4 Conclusion

The central idea of this work is energy-based clustering approach. Here, clustering problem is considered as an optimization problem with respect to energy function.

It is essential that our algorithm has a natural “stopping” property, i.e., the algorithms necessary completes each execution run in a finite number of steps. Moreover, it results to a fixed number of clusters corresponding to the input parameters of energy function, centroids, and cluster propagation. This, in turn, simplifies the noise identification problem (as those data points that avoid any cluster).

Our computational experiments also show basic limits of the above technique, e.g. we conclude empirically a highly discreet nature of this optimization problem.

We realize a computationally stable algorithm for identifying parameters that give a proper clustering. Our intention is to use this computational model in problem oriented clustering, yet its use in concrete applications requires further investigation. What is essential about our approach is the possibility to adapt it to a range of clustering datasets and achieve the suitable precision.

Acknowledgments

This research is conducted within the framework of the grant num. BR05236839 "Development of information technologies and systems for stimulating a sustainable development of the individual as one of the foundations for the development of digital Kazakhstan".

References

[1] Karlsson Ch 2010 *Handbook of Research on Cluster Theory* Edward Elgar Publishing
[2] Ester M, Kriegel H P, Sander J, Xu X 1996 *A density-based algorithm for discovering clusters in large spatial databases with noise* AAAI Press 226-31
[3] Bagirov A M 2008 Modified global k-means algorithm for minimum sum-of-squares clustering problems *Pattern Recognition* **41**(10) 3192-99
[4] *Clustering datasets* https://archive.ics.uci.edu/ml/datasets.html

Development of social trust information system in the education field using the "Big Data" technologies

Rustam Mussabayev*

Institute of Information and Computational Technologies, Pushkin str. 125, Almaty, Kazakhstan

**Corresponding author's e-mail:rustam@ipic.kz*

Abstract

The prerequisites for the implementation of the given information system are the tasks of forming methodological and technological bases for the development and application of the information system of social trust for the citizens of the Republic of Kazakhstan in the field of education with a view to stimulating the sustainable development of the individual with the use of the "Big Data" technologies.

Keywords: social trust system, big data, sustainable development

1 Introduction

The social trust system – is an information system based on the "Big Data" technologies that successfully trace the trajectory of a person's movement from birth to the period of entering adulthood. Such type systems are successfully functioning in the world [1, 2].

Similar information systems of other countries contain a wide range of criteria (in the areas of education, health, social protection, etc.) that are characteristic only for these countries. For example, in China, with the help of digital technologies and "Big Data", a system is being developed since 2014 that analyses the data about each citizen, assigning it an individual rating [3].

2 Overview

In the world practice, the pedagogical community is a key provider of educational strategies and social changes. At present, there are great prospects for using the "Big Data" technologies in the field of education, since this approach allows to raise the educational process and the possibilities of conducting analytics to a new level, and also to help in optimizing the performance indicators of educational institutions [4]. Analysis of "Big Data" allows to speed up the solution of scientific, research and pedagogical problems. The implementation of the information system of social trust, based on such an analysis using modern digital technologies, will lead to the creation of social instruments to stimulate sustainable development of the individual.

3 Decision

In Kazakhstan, information systems that reflect the interests of an individual government body are developing in a disjointed and non-systematic manner. There are no single tools for analyzing and predicting the trajectory of the development of a citizen in relation to society and the state (patriotism, citizenship, social behavior, values). Profession of teacher is not in demand among successful students. There is a high workload of teachers. The minimum set of incentive measures for the professional growth of the teacher. At the same time, education is a branch of human activity, in which a large amount of data has always been produced.

Analytics can be applied at any level of the educational process, starting with pre-school institutions, students of lower grades and graduating from higher education institutions. Indicators identified in the process of analytics can allow to optimize the costs of the training system, to minimize risks.

The object of the information system being developed is children and young people who have effectively used the opportunities provided to them by the state (state youth policy, social support, the program of development and support of youth, etc.) for the benefit of personal growth.

Scientific novelty consists in the creation of methodological bases and information system that allow to assess and stimulate citizens of the Republic of Kazakhstan to personal growth and civil responsibility, as well as timely prevent negative social phenomena.

Importance of the information system:

- ensuring social control, transparency in the economy, society and politics;
- simplification of economic instruments and procedures for citizens with high social capital;
- development of tools for motivation and incentives to increase civil liability;
- development of tools for the formation and career development of civil servants with a high index of social trust;
- building fair and transparent access to various social and economic benefits for citizens with a high index of social trust;

Intelligent control and decision-making systems (including in real time) allow system monitoring and evaluation based on reliable and verified data using Big-data technologies. Significance at the national level is due to the forecasting of tensions in the country's regions among young people, the prevention of social upheavals in society, the stimulation of civic awareness and patriotism, the building of transparency and equity in access to resources.

Internationally, geopolitical stability in the region, implementation of the UN Sustainable Development Goals, accessibility of data for the country's participation in various international ratings. The creation of the system is dictated by a new stage in the country's development - building a socially responsible civil society. The current fragmentation of the existing information systems of state bodies has generated a lot of questions in the society from the standpoint of duplicating information, the burden of excessive work, weak interdepartmental interaction on data exchange and their provision. All this is the result of a weak methodological study of the functioning of information systems.

4 Conclusion

In the conditions of the country's transition to the third industrial revolution, digitalization of all spheres of human activity, i.e. queuing up children in kindergartens, the educational trajectory of students throughout life, per capita financing, the introduction of compulsory social health insurance, etc.

In this regard, for a single coordinated digitization of all spheres, the State Program "Digital Kazakhstan" [5] was adopted. Main objectives:

- accounting of resources and infrastructure of educational organizations;
- human resource management;
- forecasting the movement of students;
- resource planning and control;
- keeping history of students;
- data exchange in electronic form.

Taking into account the above, the tasks of the proposed program are topical, their implementation will allow to develop digital technologies in Kazakhstan in a coherent way.

Acknowledgments

This research is conducted within the framework of the grant num. BR05236839 "Development of information technologies and systems for stimulating a sustainable development of the individual as one of the foundations for the development of digital Kazakhstan".

References

[1] 2014 *Technologies of "Big data" in the most important industries* CITO Research with the support of QlikView **E-resource:** www.rbcgr.com 11p

[2] 2015 *Analytical review of the Big Data market* **E-resource:** https://habrahabr.ru/company/moex/blog/256747/

[3] 2017 *The Big Brother 2.0. How China builds a digital dictatorship* **E-resource:** http://carnegie.ru/commentary/71546

[4] Bulavin D, Chikunov A, Budushkaeva 2015 *Analytical review of the large data market* M.: Bord 51 p

[5] *Message of the President of the Republic of Kazakhstan N.Nazarbayev to the people of Kazakhstan January 31, 2017 "Third modernization of Kazakhstan: global competitiveness"*

Generalization rate evaluation in open publication materials in Russian language

I Ualiyeva* , A Krassovitsky, R Mussabayev

Institute of Information and Computational Technologies, Pushkin str. 125 (Kurmangazy str.), Almaty, Kazakhstan

**Corresponding author's e-mail: i.ualiyeva@gmail.com*

Abstract

We are surrounded by information; thousands of articles are published daily. Publications in which journalists make general statements that are not confirmed by complete systematic facts in order to influence the readers' opinion, use the generalization strategy. The presented algorithm of processing of the text information allows to determine the degree of generalization in a publication, to obtain its numerical estimation. The authors have identified key words and phrases of generalization, have formed a basic dictionary, have calculated the degree of generalization of several publications, developed a software application for automatic search for the generalized expressions. The obtained degree of generalization may become one of the informative properties for calculating the rating of journalists and publications and the degree of our confidence in them.

Keywords: generalization, text analysis

1 Introduction

The problem of relations and media coverage of the work of power structures and the life of society in Kazakhstan has a special significance, since it is the media that form the public opinion of the citizens of Kazakhstan. Kormilitsyna M A in her article writes: "In the eyes of people living in Russia, a politician is what the media represents him" [1]. This remark also applies to the media of the Republic of Kazakhstan. The media are intermediaries between the authorities and citizens, in practice there are cases when a media source form a negative representation of a case using a certain type of strategy such as the generalization strategy.

We have a particular interest in such generalization where a statement involves an analysis of a discussion of open publication that lacks complete and systematic confirmation by facts. The aim of the study is to develop an algorithm for determining the degree of generalization of the analyzed publication and obtaining its numerical estimate. In this regard, we solve the following tasks: (1) identify key words and phrases of generalization, compilation of a basic dictionary of words expressing generalization; (2) automatic search for words and phrases of generalization in open publications.

2 Overview

For this study, the authors used several open on-line sources of official and semi-official media of the RK [1-5]. Publications have been investigated for the presence of generalization in them. In order to automatically find and extract generalization expressions, a C# program has been implemented with the linguistic rules encoded by regular expressions.

The classification from [6] has been used to search for generalization elements, in which this question is considered using language semantics. In this article, lexical levels and stylistic devices are distinguished:

1. Lexical units with the value of regularity / irregularity, as, for example, usually, rarely, infrequently, spontaneously, never.
2. Quantitative indicators, as, for example, every tenth, massive, grew, grows, many, quantity.
3. Lexical units with semantics of universality. Examples: it is known, indicative, it is considered, it happens, it turns out.
4. Stylistic units containing metaphors with a generalizing meaning. For example, bad genetics, broke records, brain wash, so-called quality of life.

Based on this classification, we have identified the most common keywords and phrases that meet these generalization criteria.

The question arises whether the key words and phrases can actually reveal the text or not. The articles [1-5] have been manually analyzed for the presence of generalization. The percentage of the occurrence of the key words and phrases in publications has been calculated. In particular, the article that we attributed to the generalized [1] showed 2.27%, and the article with the lack of generalization [2] has 0% generalization

TABLE 1 Frequency of occurrence of key words and phrases in publications used for generalization

Article number	[1]	[2]	[3]	[4]	[5]
Percentage of keywords and phrases, %	2,27	0	0,88	1,98	1,09

The interface of our program allows one to highlight the key elements, according to the rules of generalization, both from the original text, as well as the text, formulated from the basic morphological word forms (when all punctuation marks are excluded).

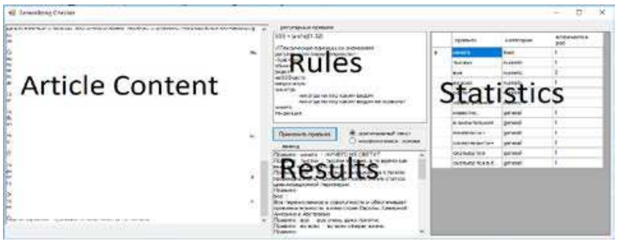


FIGURE 1 The program interface for calculating the generalization degree

For a practical convenience of identifying these phraseological structures, we have introduced lexical and grammatical rules based on extended regular expressions suitable for automatic search.

Each rule has its own weight. Initially, for the keywords (e.g., usually, rarely, not often, spontaneously, etc.), the initial weight is set at 0.5 and for phrases more suited to the concepts of generalization (for example, "so-called quality of life"), the weight is set at 1.0.

We also suggest using quantitative estimates for the main linguistic elements that affect the generalization degree. Consider this idea by the following example "The general level of unprofessionalism is growing". In this example, the degree of generalization is incremented by the word "generic" to the keyword "grows" and is reduced due to the words of specifics "level", "unprofessionalism".

3 Conclusion

For systematization, we propose to introduce the concept of the generalization degree, as a qualitative evaluation of the text. We also suggest using quantitative estimates for the main linguistic elements that affect the degree of generalization.

To identify the stylistic methods of generalization, we propose a method based on the following heuristic observation: for generalization, terms from domains are used that are not directly related to the content of the article. To identify these lexical structures, we suggest adding the dictionary database to thematic dictionaries. Further, we can detect phrases aimed at generalization, identifying words with obvious isolation from the context of the article.

Acknowledgments

This research is conducted within the framework of the grant num. BR05236839 "Development of information technologies and systems for stimulating sustainable development the individual as one of the foundations for the development of digital Kazakhstan".

References

[1] Duvanov S 2017 *How to stop the "brain drain" from Kazakhstan* http://www.ca-portal.ru/article:39057 *(in Russian)*

[2] Bompieva J. 2018 *Kazakhstan needs serious results in the field of professional education* https://tengrinews.kz/conference/240/ *(in Russian)*

[3] Duvanov S 2018 *Do not go to the Eurasian Economic Community* http://www.fergananews.com/articles/8366 *(in Russian)*

[4] Satpayev D 2018 *Linguistic decolonization* https://forbes.kz/life/opinion/dosyim_satpaev_lingvisticheskaya_dekolonizatsiya/ *(in Russian)*

[5] Tukpiev J 2018 *There is nothing to breathe! In which cities of Kazakhstan is the most dangerous air?* http://www.kazpravda.kz/news/obshchestvo/nechem-dishat-v-kakih-gorodah-kazahstana-samii-opasnii-vozduh (in Russian)

[6] Dankova N 2016 The strategy of generalization as means of representation of the judiciary (on the material of Russian and English print media) *Political Linguistics* **1** 73-81 *(in Russian)*

Gas transportation by motor driven gas compression unit

Nurlan Batayev[1*], Talgat Shuvatov[2], Ayan Onbayev[1]

[1]*Control Engineer in "Zeinet & SSE" LLP. PhD student in Kazakh National Research Technical University after K.I.Satpayev, Almaty, Kazakhstan*
[2]*"Zeinet & SSE" LLP, PhD, Almaty, Kazakhstan*

**Corresponding author's e-mail: n.bataev@zeinetsse.com*

Abstract

In the gas transportation system many gas compression units operated for over 20 years with running over 100 thousand hours. Their technical and economic performance (efficiency, power, vibration characteristics, reliability) is not satisfy to modern requirements. As known, gas transportation is a very complex process. The difficulty is that the gas is a combustible material and there is always the likelihood of an explosion in case of improperly operated condition, especially if the gas is at high pressure. This article describes the basics of the technological process and control system for natural gas transportation using motor driven gas pumping unit. The control system is Allen Bradley Programmable Logic Controller, supervisory control and data acquisition system based on WEB HTML.

Keywords: Gas Compression Unit, Programmable Logic Controller, OPC, SCADA

1 Introduction

Continuous rising cost of energy resources and the prime cost of transported gas, it's non-renewable in nature do most important direction of the development of energy-efficient units for pipe systems. One of the solution to this major problem of the industry is the implementation of motor driven gas pumping units [1].

In comparison with other types of drives the main advantages of electrical motor-driven gas pumping units (EGPU) are follows:

- High reliability;
- Minimum costs for major repairs;
- The big motor potential of EGPU parts and components;
- Simplicity of automation and control;
- Ecological cleanliness;
- Changing speed of the motor;
- Fire Safety.

In order to proper gas transportation it is used a huge number of sensors that can detect various gas parameters, such as temperature, pressure, and other important parameters. All of the equipment and the sensors must be displayed correctly on special diagrams – P&ID (Piping and Instrumentation Diagram). A piping and instrumentation diagram is a detailed diagram in the process industry which shows the piping and vessels in the process flow, together with the instrumentation and control devices [2].

After mapping all signals in the scheme of automation there is a process of creating a SCADA system. SCADA system is necessary for continuous process monitoring, control process, this system displays all values of sensors, valves, dampers, etc. To momentarily transmission data SCADA system use the OPC protocol for connect with PLC [6]. This system allows taking trends, generating emergency reports, etc. Through SCADA system operator can control the process.

2 Main functions of the system

Below are given main advantages of the control system:

- Automatic and remote control of gas piping valves, drive motor and other electrical equipment of the Gas Compression Unit (GCU), according to mode of the GCU.
- Starting readiness inspection, blocking actions that are not permitted in the current mode of the GCU.
- Forming warning and alarm system, emergency protection system.
- Emergency stop of GCU by the operator in case of failure of the controller.
- Control functionality of the modules and system units.
- Representation at local control panel of all current parameters in digital form.
- Calculating the values of the technical and economic performance of the GCU.

3 Decision for Control system architecture

Software system is designed for the automatic management, control and protection, and to stabilize the process variables in all modes. The software of GCU is a set of subsystems, supporting their individual functional load. It has a modular structure and is built on the principles of open systems concept.

The software system includes the next main components:

- The system of monitoring and information collection (SCADA system) [3, 4];
- The application software for programmable logic controllers (PLC) [5];
- Communication media between controllers and SCADA system via OPC.

4 Conclusion

The result of this work is control and process monitoring system for natural gas transportation through Motor driven Gas Pumping Unit. This system takes into account almost all sensors and equipment which are available at the compression station. One of the benefits of this system that it is an automated control system, it means that man's role in the process control is very small.

References

[1] https://en.wikipedia.org/wiki/Compressor_station
[2] https://en.wikipedia.org/wiki/Piping_and_instrumentation_diagram
[3] SCADA - https://inductiveautomation.com/what-is-scada
[4] SCADA - https://en.wikipedia.org/wiki/SCADA
[5] PLC - https://unitronicsplc.com/what-is-plc-programmable-logic-controller/
[6] https://en.wikipedia.org/wiki/Open_Platform_Communications

Machine learning approach for gas turbine parameters forecasting

Nurlan Batayev[1*], Dauren F Akhmetov[2], Batrbek Suleimenov[3]

[1]*Control Engineer in “Zeinet & SSE” LLP. PhD student in Kazakh National Research Technical University after K.I.Satpayev, Almaty, Kazakhstan*
[2]*Sapporo Rakuno Gakuen University, Japan*
[3]*Kazakh National Research Technical University after K.I.Satpayev, Almaty, Kazakhstan*

**Corresponding author’s e-mail: n.bataev@zeinetsse.com*

Abstract

Natural gas is one of the most common sources of energy in the modern world. Transportation of gas from production sites to consumers is carried out by the gas compression stations, which allow increasing the gas pressure for subsequent transportation through the gas pipeline. An integral part of any compressor station is a centrifugal compressor and a gas turbine. In this work described gas turbine parameters forecasting approach based on various machine learning regression methods. Data for the model were collected from one of the compressor stations located in the territory of the Republic of Kazakhstan. A step-by-step methodology and implementation of parameter prediction is described. A comparative analysis of different models is carried out.

Keywords: Gas turbine, Machine Learning, Python, Validation set, Test set

1 Introduction

Main parts of any gas compressor station are centrifugal compressor and gas turbine. Depending on the model, the centrifugal compressor is capable of increasing the gas pressure by a factor of 1.2-1.5 times. The gas turbine is the centrifugal compressor’s drive and delivers the necessary speed to the shaft to achieve the required pressure at the compressor discharge. As with any equipment, gas turbine parts wear with the running hours. It is very important to prevent breakages in time. And it is best to make a forecast for future malfunctions in time to eliminate them. There are various diagnostic methods, such as vibration diagnostics, parametric diagnostics, etc. In this article, we will consider the prediction of the parameters of a gas turbine based on various methods of machine learning and perform a comparative analysis between them.

As a data set several weeks operation parameters of the Gas Compression Unit are used. This dataset contains 68 columns (features) and 42000 rows. The axial compressor discharge pressure is chosen as the target parameter, i.e. we will make a forecast for it based on the remaining parameters. As a tool for implementing the described task, a high-level general-purpose programming language Python 3.6 was chosen, which includes all the necessary libraries for this kind of tasks. Python supports several programming paradigms, namely functional, structural, imperative, object-oriented, aspect-oriented. The code in Python is organized into functions and classes that can be combined into modules [2].

Within this article, regression analysis methods will be used for parameters prediction. Regression analysis is a statistical method of studying the effect of one or more independent variables $X_1, X_2 \dots X_n$ on the target parameter (dependent variable) Y. Independent variables are otherwise called regressors or predictors, and dependent variables are criterial. The terminology of dependent and independent variables reflects only the mathematical dependence of variables, rather than cause-effect relationships [3].

Linear model is the basis of statistics for the last 30 years and remains one of the most important tools. Considering inputs vector $X^T = X_1, X_2, \dots, X_n$, we forecast the target parameter Y by the model

$$\hat{Y} = \hat{\beta}_0 + \sum_{j=1}^{n} X_j \hat{\beta}_0, \tag{1}$$

where $\hat{\beta}_0$ displacement.

To compare a linear model with a set of data for learning, there are different methods, but certainly the most popular is the method of least squares, for which is used minimization of displacement β

$$RSS(\beta) = \sum_{j=1}^{n} (y_i - x_i^T \beta)^2. \tag{2}$$

2 Overview

In Python, there are various libraries for implementing regression algorithms. The most used ones are LinearRegression, Lasso, Ridge, LassoCV, RidgeCV methods which can be imported from the sklearn library.

To solve the prediction task, the following steps were performed:

- Data preprocessing
- Model training on different methods

- Forecasting based on a trained model
- Scoring of the models
- Select the best method

3 Conclusion

In this work we have selected the best method for gas turbine parameters forecasting. For the above methods, a small comparative analysis was made using three criteria: MSE, training time and the number of non-compliance for a given corridor. For all methods, the same corridor was specified and the total number of points that are outside this corridor between current and forecast values were counted.

For various data sets, different machine learning methods can produce better or worse results compared to each other, so it is required to test a number of methods, choose required settings and select the best one, which gives best scoring results for the test dataset.

References

[1] Hastie T, Tibshirani R, Friedman J *The Elements of Statistical Learning* Second Edition
[2] *Python* https://ru.wikipedia.org/wiki/Python
[3] *Regression* https://en.wikipedia.org/wiki/Regression_analysis
[4] *Xgboost library* https://xgboost-clone.readthedocs.io/en/latest/python/python_intro.html
[5] *Analyzing time series in Python* https://habrahabr.ru/post/207160/

Machine Learning in predicting new bacterial pathogens

Maxat Kabdullin* , Azat Kabdullin

Institute of Information Technologies and Telecommunications, department of Information Technologies, Satbayev University, Kazakhstan

**Corresponding author's e-mail: maksat.kab@gmail.com*

Abstract

This thesis contains a method for predicting bacterial pathogens, using the machine learning feature space model, the method of prediction is considered, and the supposed attributes for using the prediction and possible results are considered.

Keywords: ML, predicting, new bacterial pathogens

1 Introduction

This work contains a method for predicting bacterial pathogens, using the machine learning feature space model, the method of prediction is considered, the supposed attributes for using the prediction and possible results are considered [1].

Predicting the spread of new bacterial pathogens is a fundamental factor in the modern existence of mankind. Without the ability to predict new bacterial pathogens, there is a great risk in losing not only financial resources, but also large losses of the human population [2].

2 Overview

Predicting is possible in many ways, but one of the most effective is prediction by machine learning. Machine learning is a set of algorithms and methods that allow a computer to make predictions based on previous experiences, such as statistical data and ranking of results. At the same time, the result of training is not just a program capable of sorting results, but a formula that the person understands. That is, with the help of machine learning from the "raw" data you can get new useful information. In such cases, instead of the name "machine learning", usually another is used - "data mining". Data extraction is actively used by analysts to optimize processes in their areas. Already this technology is used in the study of associative rules and can help to find out which products are most often bought together, and place them in the store accordingly.

It also follows the definition that ML: machine learning is a scientific discipline dedicated to creating algorithms that allow a computer to improve its performance based on empirical data. At the same time, performance refers to the percentage of correctly processed samples, for example, correctly guessed branches of program execution [4].

Representation of data, although there are quite a few models of representing objects in machine learning, the so-called model of feature space has become most widespread. In it, each object is represented as a set of pairs [attribute, value], which are called attributes.

This model is suitable for predicting new bacterial pathogens according to a number of criteria: according to the research data, each bacterium has its own set of attributes, this is in what conditions the bacterium can exist, the metabolic rate, rapid adaptation to the changed conditions of existence, the ability to change in a short time with the transfer of heredity etc. This information can then be used to automatically screen out bacteria that do not pose a high risk to humans or animals. In the example above, the metabolic rate is a numerical attribute. The ability to change in a short time - Boolean. In addition to these two types, categorical or nominal attributes are often encountered, roughly speaking - enumerations. For example, for bacterial pathogens this can be the structure of microorganisms, i.e. in different species of bacteria the structure is not the same, but there is a certain minimum set, present in each bacterium. Very rarely, string attributes are also introduced, where arbitrary values can be arbitrary strings. Typically, in the data set, one special attribute is also introduced, the so-called class attribute. On the training data (if the method with training is used, of course) its value is known, and for the processed data it needs to be calculated [3].

3 Decision

In the prediction of bacterial pathogens, the training sample may include a sign of whether a particular bacterium is considered to be a high infection rate, either at a low level or with a possibly high infection rate. It is this attribute that will be the attribute of the class, and it will be required to calculate it for new predictions. A common table form is used to store such data sets. This can be, for example, a database, a CSV file, or an MS Excel spreadsheet. In this case, the names of the columns denote the names of the attributes, and the rows of the table itself are the individual objects to be processed. (Inside the program, as in mathematical reasoning, objects are represented as vectors in a multidimensional space, while the axes of coordinates correspond to separate attributes, that is, to individual elements of the vector) [5].

4 Conclusion

The idea of machine learning is that computers not only execute commands, but also learn to find answers to problems that do not have a ready solution.

References

[1] Kuhn M, Johnson K 2013 *Applied Predictive Modeling*
[2] Barber D 2015 *Bayesian Reasoning and Machine Learning*
[3] Mirkin B *Core Concepts in Data Analysis: Summarization, Correlation and Visualization*
[4] Hal Daumé III *Course in Machine Learning*
[5] Jiawei Han, et. al *Data Mining: Concepts and Techniques*

Development of diagnostic systems for thermal facilities based on data processing

Zh Omirbekova[1*], A Suleimenov[1], L Boleeva[2]

[1]Satpayev University
[2]Taraz Government University, Kazakhstan

**Corresponding author's e-mail: zhanomir@gmail.com*

Abstract

The complexity of modern industrial enterprises has led to the automation of equipment management, which includes sensors for monitoring the behavior of equipment and valves with remote control to act on undesirable events. Production automation physically protects the integrity of the plant. However, it reacts to abnormal conditions. The settings are set for the equipment in the operating range, and whenever the behavior of the equipment, such as steam pressure, is outside the specified range, an alarm is triggered and control equipment such as a valve is triggered to reset the equipment to a predetermined operating state.

Keywords: data processing, diagnostics, transfer function, identification

1 Introduction

Steam generating heat engines are the technological basis of many industrial facilities. This role assumes close attention on the part of both technologists and industrial automation specialists, because modern technological progress requires ensuring the optimal operation of the equipment, reducing energy consumption, increasing reliability, economy, and environmental friendliness with an increase in efficiency. A steam boiler as an object is a complex dynamic system with a large number of input and output interrelated quantities, therefore, when investigating it, in most cases, decompose on a separate monitor

2 Overview

The main task is to help operators to diagnose equipment, to forecast undesirable events, such as stopping the plant, to offer adequate values of set points and differences in the characteristics of malfunctions in the operation of process plants. The model consists of two main components:

- Individual data analysis: analysis of sensor data for future patterns, leading to undesired events for specific equipment.
- Analysis of group sensor data: analysis of the correlation of sensor data to determine the dependent factors between them and their errors in the data [1, 2].

3 Data processing

Statistical data is obtained at CHPP-2 using the Metran-910-4-8 sensors the following two most important monitoring channels:

- Boiler feedwater flow rate;
- Superheated steam flow rate

Data on the flow of feedwater (registered with the help of Metran-910-4-8, which has the serial number 2320) is shown figure 1.

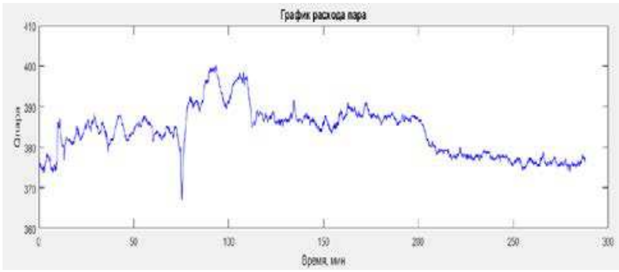


FIGURE 1 Steam flow rate

The developed mathematical models constructed based on differential equations of material and thermal balances are not entirely convenient for the purposes of operational diagnostics. The fact that the overhaul period of the boiler is long enough, therefore, monitoring the state of the boiler for a long time with the help of differentiated equations is not very convenient because of the need to use the computing resources of the computer to solve these equations.

A more convenient and economical form of mathematical description of the physics and chemical laws of the processes occurring in the boiler are algebraic equations. Therefore, we proposed a technique for obtaining transfer functions through various control channels that allow us to evaluate the state of the boiler by means of simple algebraic equations. Such a technique does not require a continuous solution of differential equations throughout the entire overhaul period [3, 4].

This approaches is based on the processing of statistical data obtained from a real object through various control channels and recovery, both the structure of transfer functions, and the values of the coefficients of these algebraic relations.

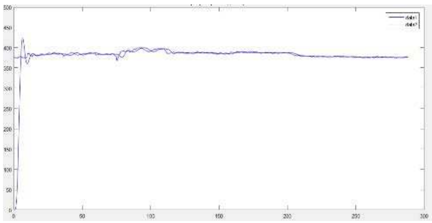


FIGURE 2 The graph "data 1" characterizes the signal after filtering and the graph "data 2" signal before filtering

As a result of identifying the object by input and output parameters, a characteristic curve of the object was constructed (Figure 2), which describes its operability. This characterizing curve depends on the transfer function W(s) indicated on formula

The input-output ratio is a classical transfer function whose coefficients are identified with statistical processing of data from sensors [5].

$$\frac{1.281}{1.7s+0.0006861}, \quad (1)$$

The transfer functions obtained with the help of the MATLAB tool for the most important and representative control channel: "Water flow rate - Steam flow" for different time intervals are presented in the table 1

TABLE 1 Transfer functions from 05/25/2017-07/01/2017

Dates	Channels	Transfer functions
05.25. 2017	Water flow rate - Superheated steam flow rate	$\frac{0.02767}{0.45s + 0.000944}$
06.26.2017	Water flow rate - Superheated steam flow rate	$\frac{0.03991}{0.1s + 0.004355}$
07.01. 2017	Water flow rate - Superheated steam flow rate	$\frac{0.01482}{0.4s + 0.01037}$
20.07.2017	Water flow rate - Superheated steam flow rate	$\frac{4.99}{0.4s + 0.01037}$

Modeling the channel "Water Flow and Superheated Steam Flow" with first-order transfer functions with different coefficients that were obtained by identification showed the dynamics of the change, which is a non-stationary operating mode that can cause undesired events at the site.
Therefore, that due to the uneven loading of the boilers that make up the station, and their natural, uneven wear, the graphs should be periodically reviewed with the introduction of the necessary adjustment. It is most convenient to review the schedules after planned and unplanned regime-adjusting tests of boiler equipment.

4 Conclusion

Maintaining a given water level in the steam manifold is one of the main tasks that ensure reliable operation of the boiler. With a high water level in the boiler, boiler water can be thrown into the superheater and, as a result, the destruction of its structures from hydraulic shocks. The harmful phenomenon of entrainment into the superheater of wet steam together with the salts contained in it is also intensified. Salt deposits, in turn, cause:

- in superheaters - burnt pipes due to unacceptably high temperature conditions;
- in steam pipelines and track fittings - their failure, and also are the centers of intergranular corrosion;
- in the flowing part of the turbines - a decrease in efficiency, a decrease in the cross-section of the interblade channels.

These phenomena lead to the appearance of significant axial forces acting on the turbine rotor, which can cause the thrust bearing of the turbine to melt and lead to an accident.

References

[1] Garcia A C B, Bentes C, de Melo R H C, Zadrozny B, Penna T J P 2011 Sensor data analysis for equipment monitoring *Knowledge and Information Systems* **28**(2) 333–64 http://doi.org/10.1007/s10115-010-0365-1

[2] Liu J M, Chen R, Yao Q 2010 Nonparametric transfer function models *In Journal of Econometrics* **157** 151–64

[3] Petyt M 1969 Theory of matrix structural analysis *J. Sound Vib.* **10**(2) 358–9

[4] Vogels T P, Rajan K, Abbott L F 2005 Neural network dynamics *Annu. Rev. Neurosci.* **28** 357–76

[5] Haidacher M, Patel D, Bruckner S, Kanitsar A, Gröller M E 2010 Volume visualization based on statistical transfer-function spaces. *In IEEE Pacific Visualization Symposium 2010, PacificVis 2010 - Proceedings (pp. 17–24)*

Introduction to BigData technology for diagnosis of diabetes

Nurbek Saparkhojayev* , Assel Mukasheva

Satbayev University, Satpayev Str. 22, Almaty, Kazakhstan

**Corresponding author's e-mail: mukasheva.a.82@gmail.com*

Abstract

This paper gives a short description of BigData technology in terms of using in medicine, especially for diagnosing of diabetes. The idea of extracting data for collecting, organizing and analyzing huge amounts of data is shortly described.

Keywords: Diabetes mellitus, BigData, EMRs, treatment

1 Introduction

Diabetes mellitus is described as a clinical syndrome characterized by hyperglycemia, due to deficiency or diminished effectiveness of insulin [1].

Diabetes mellitus has become a global threat. The WHO has estimated that the number of people having diabetics illness in the world by 2025 may reach up to 60 million and India's contribution to it would be 30 million. Hence this is a main question and an awareness regarding this disease is crucial [2].

Effects of diabetes have been reported to have a more fatal and worsening impact on women than on men because of their lower survival rate and poorer quality of life. WHO reports state that almost one – third of the women who suffer from diabetes have no knowledge about it. The effect of diabetes is unique in case of mothers because the disease is transmitted to their unborn children. Strokes, miscarriages, blindness, kidney failure and amputations are just some of the complications that arise from this disease. For the purposes of this paper, the analyses of diabetes cases have been restricted to pregnant women [3].

A huge amount of data gets accumulated in the hospitals, most of them just get stored in some form of files which are never touched back, if these data are analysed properly they help in deriving some interesting facts. A small touch of data mining will help in generating interesting facts which remained unrevealed otherwise, hence taking into consideration the diabetes mellitus a detailed analysis of diabetic data set is performed using data mining technique [2].

2 Related work

The authors recognise that our healthcare environment is navigating today in a rapid speed. Though there are many challenges, there are few bright spots on the horizon by the development of technology. Reducing health care costs while improving patient care is an ongoing issue for the healthcare environment. In recent days, healthcare industry faces vast challenges to save the data generated and to process them to drive knowledge out of them. Big data analytics is the process of examining the large sets of data. Through Big data analytics, valuable insights can be gained, novel patterns can be detected, and powerful real world decisions can be made. BigData Analytics permits data scientists and various other users to assess large volumes of transaction data [4].

We are working with medical database, these medical data is huge i.e. big data so first we should understand what big data is, and what is importance of big data in health care. Big data is a term for data sets that are so large or complex that traditional data processing applications are inadequate. Challenges include analysis, capture, data acuration, search, sharing, storage, transfer, visualization, querying, updating and information privacy. The term BigData is simply used for predictive analytics and many other advance techniques to extract data from different huge multiple datasets. Due to different advanced technique we can easily or confidently extract data which may lead in decision making and better decision may lead to good result or greater efficient [5].

3 Data extraction

Big data analytics is the process of collecting, organizing and analyzing large amount of data (called big data) to determine patterns and other valuable information. It can be classified into four types. They are:

a. Prescriptive analytics is important, but mostly not used.
b. Predictive analytics use big data to identify past patterns to predict the future.
c. Diagnostic analytics is used to discovery or to determine why something happened
d. Descriptive analytics or data mining are at the bottom of the big data value chain, but they can be valuable for uncovering patterns that offer insight [4].

Real world clinical data unstructured and heterogeneous in nature, severely skewed, and contains hundreds of relevant yet sometimes correlated attributes. This data resides in multiple databases such as individual EMRs, lab and imaging systems, physician notes, medical correspondences, claims, CRM systems, and hospital finance department servers. The collection, integration, and analysis of such big, complex, and noisy data in healthcare are a challenging task. For this reason, healthcare information systems can be considered as a form of big data not only for its sheer volume, but also for its complexity and diversity which makes traditional data warehousing solutions prohibitively cumbersome and illsuited for large scale data exploration and modeling [6].

Rapidly growing volumes of medical data, and we begin to understand that speed and quality of their analysis depend on our health and quality of life [7].

4 Conclusion

Due to large amounts of information will be nice to get a system with the ability to monitor and in the future improve the health of the nation, a high-quality level of medical care in general and a reduction in the mistakes that occur with the appointment of treatment. Also relevant is the recommendation of the possible use of "BigData" in the field of medical institutions.

References

[1] http://www.patient.co.uk/doctor/diabetes-mellitus

[2] Sadhana Savitha Shetty 2014 Analysis of Diabetic data Set using Hive and R *International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, ISO 9001:2008 Certified Journal)* **4**(7)

[3] AiswaryaIyer S Jeyalatha, Ronak Sumbaly 2015 Diagnosis of diabetes using classification mining techniques *International Journal of Data Mining & Knowledge Management Process (IJDKP)* **5**(1) DOI: 10.5121/ijdkp.2015.5101

[4] Shyni S, R Shantha Mary Joshitta, Dr L Arockiam 2016 Applications of Big Data Analytics for Diagnosing Diabetic Mellitus: Issues and Challenges *International Journal of Recent Trends in Engineering & Research (IJRTER)* **02**(06) ISSN: 2455-1457

[5] Nida Afreen Rizvi, Anjana Pandey, Ratish Agrawal, Mahesh Pawar 2017 Prediction model of Diabetes Drug Using Hive and R *International Journal of Control Theory and Applications? ISSN: 0974-5572* **10**(14)

[6] Kiyana Zolfaghar, Naren Meadem, Ankur Teredesai, Senjuti Basu Roy, Brian Muckian 2013 Big Data Solutions for Predicting Risk-of-Readmission for Congestive Heart Failure Patients *2013 IEEE International Conference on Big Data. ISSN 978-1-4799-1293-3/13/ p. 64-71*

[7] https://22century.ru/popular-science-publications/artificial-intelligence-in-medicine

Introduction to virtualization system in Big Data

Nurbek Saparkhojayev*, Ilya Mirkhiyazova

Satbayev University, Satpayev Str. 22, Almaty, Kazakhstan

**Corresponding author's e-mail: mirkhiyazova@gmail.com*

Abstract

Modern approaches to the classification of virtualization technologies and descriptive functions will be determined by analyzing various tools for creating a virtual environment, for the subsequent development of tools for working with large data. We consider four virtualization systems that are widely used today and the discuss about the Proxmox VE visualization system.

Keywords: Virtualization, virtual machine, VMWare ESXi, MS Hyper-V, Citrix XenServer, Proxmox VE

1 Introduction

Virtualization - the logical combination of computing resources or hardware components, ie, logical isolation from each other's computational processes that are carried out on a common physical resource. An example of virtualization can be the launch of several operating systems on a single computer. At that time, each operating system works with a set of logical resources such as processor, RAM, storage devices. Others have access to device-level access and all of them are managed by the host operating system - the hypervisor [1].

Virtual Machine - virtualization as virtualization as a hardware operating system for virtualization. However, this is a software environment that is copied from the host system software [1].

Virtualization can be used to test new solutions or to train employees. For example, pre-testing for new applications.

2 Overview

Advantages of Virtualization:

- As the console has remote control, infrastructure management is simplified.
- The ease of clustering of the virtual machine.
- Money saving. By means of consolidation, this technology will reduce the number of servers. You can perform operations performed on multiple physical machines by running the necessary operating systems on a single virtual server on a single server. Additionally, the number of devices and support for its operation will be reduced.
- The volume of electricity consumption will be reduced.
- As the number of devices decreases, the number of service providers can be reduced.
- Because of the smaller number of physical servers, they also reduce the number of storage space [2].

Virtualization Disadvantages: you will need to purchase new devices for virtualization. Because virtual machines require a lot of processors, such as additional memory volumes, fast storage systems, to work.

3 Decision

Today, many large companies and corporations are transitioning to virtual technology. Because virtual servers can be used to streamline and manage resources efficiently and reduce budget costs. There are a lot of devices that can be used to virtualize. For example: Proxmox VE, VMware ESX, Citrix XenServer, Microsoft Virtual PC, VMware Workstation, QEMU, Parallels, VirtualBox, Microsoft Virtual Server, Sun Logical Domains, Xen, Citrix XenServer, Microsoft Hyper-V, VMware ESXi, OpenNode and so on.

German scientists have tested the most popular virtualization devices. As a virtual machine they used Debian 7.7.

Considered virtualization systems:

- VMWare ESXi
- MS Hyper-V
- Citrix XenServer
- Proxmox VE

During testing, an Intel i5-2500 processor with 8 GB of RAM and 1 TB hard disk was used. During testing, one virtual machine works and receives 100% of available resources.

The data is based on Debian 7, when Debian 7 is directly installed on this equipment. Its performance is 100%. Promox VE and MS Hyper-V provide 87% power during maximum load. That is, 13% of power goes to virtualization. Then VMware 63% and Citrix XenServer were behind with 39% [3].

4 Conclusion

Advantages of Promox VE virtualization system:

- convenient management with web-service;
- Powerful and easy software for virtualization;
- quick cloning of auxiliary systems from the template;
- Ability to look at statistical data and data graphs for individual virtual server download on the RAM, CPU,
- HDD, line (last hour, day, week, month, year) [4];
- automatic backup copy of the virtual machine will be made;
- Ability to copy finished templates from the

manufacturer's site;

- Availability of the state of the virtual machine state, creation of the state chain and return to any part;
- The ability to detect and prevent the problems I have encountered [5];

By tracing the test results, you may want to test and test your system before setting up any virtualization system.

References

[1] *Virtual Linux - Overview of virtualization methods, architectures and implementations* IBM developerWorks Russia 26.04.2014

[2] *Virtualization for an IT Specialist Virtualization* **E-resource:** https://compix.kz/services/once/virtualization/

[3] *Benchmark Comparison Virtualization VMware Citrix XenServer Proxmox MS MS Hyper-V* Computer Tips Jan 4, 2015

[4] Waseem Ahmed Proxmox 2016 *Complete guide* 2nd ed. Packt Publishing 2016

[5] Konovalov D 2016 *Proxmox VE - installation and configuration* Informatization 20.08.2016

Research of data interception methods

A A Ziro* , A A Zhamankulova

Kazakh National Research Technical University, Satpayev Str. 22, Almaty, Kazakhstan

**Corresponding author's e-mail: ziro.aasso@gmail.com*


Abstract

Article considered virtualization technologies, their types, advantages and disadvantages. Attention to specific risks and information security threats in case of virtualization platforms is paid. The main risks of virtualization platforms are defined. Potential internal vulnerabilities of virtualization platforms can be revealed only by testing for penetration which user-friendly and available instrument for implementation is specialized by Kali Linux OS. The attacks to the virtual machines with use of the Kali Linux tools were organized. As a result of experiments is Kali Linux allows revealing and analyzing vulnerabilities at the channel, network and transport levels. For detection of problems at the level of applications that is urgent for virtualization of platforms, it is necessary to use commercial products of ethic hacking in addition.

*Keywords: i*nformation security, virtualization, operating system, network infrastructure, attack

1 Introduction

At present, in the digital age, when the introduction of advanced technologies is widespread, which in turn exerts a significant influence and affects all spheres of human activity, special attention is paid to the direction of information security.

To date, there is a clear tendency of a sharp shortage of qualified specialists in the field of information security, and often in organizations the functional responsibilities of this direction are assigned to specialists who are not always competent in security matters.

To exclude a number of negative factors and raise the level of information security, this article will provide an interesting solution that will not only expand the range of knowledge of young professionals, but also provide an opportunity to check the degree of protection of their data.

2 Practical research

The practical part of the study is based on the use of special virtualization software VMware Workstation, which provides the ability to install one or more virtual machines on a single physical computer and run in parallel with it [1].

By means of VMware Workstation we will prepare two virtual machines, one of which will perform the role of the researched one, and the other functions of the attacker. Embedded operating systems are Windows 7 and Kali Linux 2017.

It should be noted that Kali Linux is not a regular user operating system, but a special distribution designed for experts in the field of information security, the main purpose of which is testing for penetration and security auditing [2].

In Kali Linux, a lot of tools that can implement a wide range of tasks in the field of information security, while for the convenience of the user they are grouped into sections that are represented in Figure 1 [3].

FIGURE 1 Sections in Kali Linux

The next step in the practical part is to work with the Ettcercap tool, which you need to run on a virtual machine that acts as an attacker. As a network interface, you need to select eth0, this will allow you to purposefully obtain data about the machine under investigation for further manipulation. The process of working with Ettcercap is presented in Figure 2.

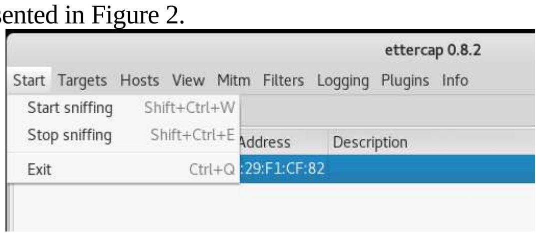


FIGURE 2 The process of working with Ettcercap

The final step in Ettcercap is to configure the remote connection, after which the scan process starts directly

3 Auxiliary tool of data interception

As an auxiliary tool, WireShark is considered, on which it is necessary to activate the traffic analysis of the examined machine, with the network interface corresponding to Ettcercap. As a result, as soon as the user of the examined machine uses a vulnerable resource, the attacking machine will intercept the data. The process of working with WireShark is presented in Figure 3. An example of work on the machine under study is shown in Figure 4.

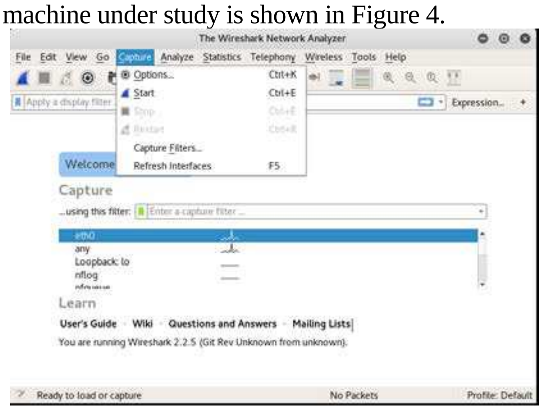


FIGURE 3 The process of working with WireShark

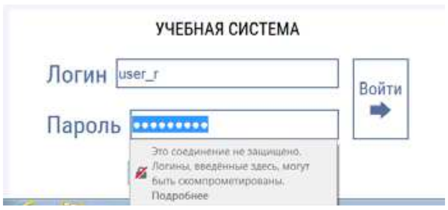


FIGURE 4 Work on the machine under study

As a result of the analysis of the intercepted data, a login and password were discovered that were publicly available and in the event that an attacker worked, they could be used for mercenary purposes. The result of the data analysis is shown in Figure 5.

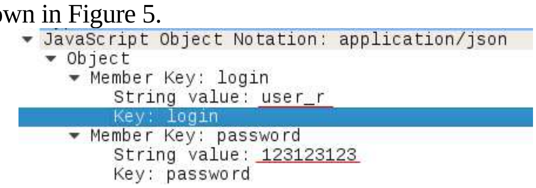


FIGURE 5 Result of data analysis

4 Decision

As a solution to this problem, it is recommended to ignore questionable resources and use only protected ones that support modern security technologies.

5 Conclusion

In conclusion, I would like to note that the most interesting for criminals is this kind of data, which provides an opportunity not only to gain access to personal data, but also to implement more ambitious plans, which can lead to serious consequences and cause irreparable damage.

References

[1] *Virtual machine VMware Workstation* https://vellisa.ru/vmware-workstation

[2] *Review: Kali Linux* https://losst.ru/obzor-kali-linux /

[3] *Explore the applications in Kali* https://www.lynda.com/Linux-tutorials/Explore-applications-Kali/455715/482576-4.html

Analysis of devices structures for modular reduction

S Adilbekkyzy[1]* , E Aitkhozhayeva[1], S Tynymbayev[2]

[1]Satbayev University, Satbayev Str. 22, Almaty, Kazakhstan
[2]Institute of Information and Computational Technologies, Pushkin Str.125, Almaty, Kazakhstan

**Corresponding author's e-mail: sairan.02.95@mail.ru*

Abstract

In spite of the high security of asymmetric cryptosystems, their application is limited in connection the low performance compared to symmetric cryptosystems. Hardware implementation of asymmetric cryptosystems allows to increase their speed. Modular reduction is the most critical basic operation that slows down the speed of asymmetric crypto algorithms. Three types of device structures for modular reduction are analyzed in terms of hardware and time costs. To increase the speed for implementation of modular reduction in RSA cryptographic processors it is proposed to use matrix and pipelined structures which are characterized by a higher speed.

Keywords: hardware encryption, asymmetric cryptoalgorithms, modular reduction

1 Introduction

Wide application of asymmetric cryptosystems with potential security in comparison with symmetric cryptosystems is constrained by their low speed, since encryption and decryption procedures use complex and cumbersome mathematical calculations on very large numbers.

Hardware encryption has a number of significant advantages over software encryption, one of which is high-speed performance [1]. The hardware implementation of cryptoalgorithm guarantees its integrity, encryption and storage of keys is performed in the encoder board itself rather than in the computer's RAM. Thus, the security of the implementation of the algorithm is ensured, which is also an important advantage.

In practical asymmetric cryptography, the world standard is the RSA algorithm, which is based on the decomposition of large numbers into prime factors, which is an irreversible transformation. The complexity of the factorization of large integers determines its good cryptostrength. However, the fastest RSA cryptoprocessor performs encryption and decryption operations approximately 1000 times slower than the DES crypto processor (symmetric cryptoalgorithm).

2 Devices structures for modular reduction

In RSAalgorithm, modular exponentiation of numbers modulo P (a^xmodp) is used, which is realized through multiplication, squaring and modular reduction. Acceleration of these operations will allow the development of a high-speed RSA crypto processor. Acceleration of these operations will allow to design a high-speed RSA cryptoprocessor. The most time-critical base operation when implementing the RSA algorithm is modular reduction (obtaining the remainder from dividing the number by the module P), which is repeated many times. In this paper, three methods for formation of the remaindersby an arbitrary module P were investigated.

In the first method multiple modules P*i (i=1,3…k) are formed in different blocks, then they are subtracted from the reduced number A by using K adders simultaneously (in parallel) [2]. The least positive remainder C_i=A-P*i is the result. This method of forming remainders is characterized by large hardware costs - for large ratios of the reducible number A and the module P, the complexity of the circuit increases sharply. This method is acceptable for hardware costs only for small values of A and P, while in the RSA algorithm very large numbers are used. The second method is based on the sequential formation of the remainders (r_i) of the bit weights of the binary number (2^i) from division by the module P with further adding modulo P of those remainders for which the coefficients Ai of the corresponding weights are equal to one. It is implemented by the formula: $A\ modP = (\sum_0^{k-1}(2^i modP)A_i)\ modP$.

In [3], the former circuit of the remainder by an arbitrary module is presented, which consists of K-1 partial remainders formers (PRF), K-1 modulo adders (MAdd), K-1 logic circuits AND, as well as registers of numbers A and P. The time for modular reduction of the number A in this circuit is mainly determined by the delay time of the signals on the K-1 adder modulo P.

The third method for modular reduction of number uses the principle of a machine algorithm for binary division with a shift of remainders to left. The module P is consistently subtracted, starting with the most significant bits of the number A. To calculate the next partial remainder, the previous remainder is shifted to the left by one bit and the next bit of the number A is appended to the less significant bit of the partial remainder. From the received number the module is subtracted. Partial remainder is formed in the partial remainders formers PRF. The aggregate of all the formers of partial remainders forms a matrix circuit for modular reduction of the number A modulo P [4].

Matrix devices have a very important performance potential - the possibility of pipelining. Matrix devices have a very important potential for increasing performance- the possibility of pipelining. When pipelining, the whole process is divided into a sequence of completed steps. Each of the stages of the division procedure is performed at its stage pipeline, with all stages running in parallel. On the basis of the matrix circuit of modular reduction, it is possible to construct a pipelined device for formation of the remaindersby arbitrary module P of the number A. The pipeline consists of stages, each of which contains the partial remainder former PRFand the buffer register BR.

The results calculated at the i-th stage on the partial remainder former PRF_i are transferred for further processing to the (i + 1) stage of the pipeline through the buffer register BR_i.

Synchronization of the pipeline work is provided by clock pulses (CP), the period of which is determined by the time of formation of the partial remainder in the PRF and the delay in the triggers of the buffer register. In the pipeline device of modular reduction with K stages, the input data can be fed to the input with a frequency in K times larger than in the case of a conventional dividing device. With the same frequency, the result appears at the output of the device.

3 Conclusion

The investigated circuits have optimal hardware costs, but the speed of these devices is not high enough to perform the operations of asymmetric algorithms.Acceleration of the formation of the remainder by an arbitrary modulus can be achieved by modifying the circuit of the third method of forming the remainders, using the remainders shift not one but two bits to the left.At the same time, the structure of the PRF will be complex, but the process of remainder formation is accelerated twice.

References

[1] Aitkhozhayeva E Z, Tynymbayev S T 2014 Aspects of hardware reduction modulo in asymmetric cryptography *Bulletin of National Academy of Sciences of the Republic of Kazakhstan* **5**(2014) 88-6 *(in Russian)*

[2] Petrenko V I, Kuz'minov J V 2007 Modulus multiplexer RU Patent No.2299461 *(in Russian)*

[3] Kopytov V V, Petrenko V I, Sidorchuk A V 2011 Device for generating remainder from arbitrary modulus of number RU Patent No.2445730 *(in Russian)*

[4] Tynymbayev S T, Shaikulova A A, Imanbaev A Z, Ziro A A 2017 Matrix schemes for reducing the number modulo *Vestnik KazNRTU Special Edition* 534-6 *(in Russian)*

Organization of reliable and secure database with encryption

A Agabek* , E Aitkhozhayeva

Satbayev University Satbayev Str. 22, Almaty, Kazakhstan

**Corresponding author's e-mail: abzagabekov@gmail.com*


Abstract

This work is dedicated to the organization of a reliable and secure database in MS SQL Server 2012. The design of an integral database is considered using the ER method in the All Fusion ERwin Data Modeler CASE-tool, also considered its implementation in MS SQL Server 2012 and the protection by transparent data encryption TDE. The logical and physical model of the database with referential integrity for a computer studio for assembling and configuring laptops and workstations was designed. While using TDE a hierarchical system of key management is set. HP 3PAR 7200 store server with RAID configuration functions is selected as a reliable storage system.

Keywords: secure database, ER-method of designing, transparent data encryption, RAID arrays

1 Introduction

According to the legislation of the Republic of Kazakhstan, computer databases are given the same legal protection as property and personal non-property rights. Thus, the right to protect undisclosed information from an illegal user is provided by the articles 1017-1019 of the Civil Code of the Republic of Kazakhstan. Criminal liability for such offences comes according to Article 184 of the Criminal Code of the Republic of Kazakhstan. High state level of legal information security, legal database protection methods determine the relevance of developing modern technologies for storing and using information.

Almost all important data for any organization are stored in databases, so the designing and development of the correct database with reliable and secure storage are still actual concerns. Complex data security should be provided. At the same time, it is necessary to choose the relevant storage system, as well as to solve the issues of cryptographic protection of information, which is an indispensable means of protecting confidential data in the event of the theft of storage media, or unauthorized access to data on the storage media.

There are three levels of data encryption: file system level, database level and application level. There is a capability of encrypt the entire database as a whole or only encrypt specific tables or cells at the database level. Each of these levels has its advantages and disadvantages.

2 Database design

ER-method was used to design the database, which allows you to design a database of any complexity using CASE-tools. An analysis of the subject area was carried out. Computer studio for the assembly and configuration of laptops and workstations is very popular among users who professionally and carefully approach to the choice of technical characteristics of their devices.

The entities, attributes and relationships were defined between them. Logical and physical level ER-diagrams were built in the All Fusion ERwin Data Modeler CASE-tool and communications between entities were installed through primary and foreign keys that support the referential integrity of the data. The tables are normalized in accordance with the requirements of the standard for the design of relational databases [1].

The developed ER-model includes the following entities: Orders, Assemblies, Disks, Processors, Graphic adapter (GPU), Memory, PSUs, Motherboards, Sellers.

The designed database is physically implemented in Microsoft SQL Server 2012. The database konfig_comp was created, where the encryption functions are disabled by default.

3 Database encryption and storage system

Transparent Data Encryption (TDE) was used for cryptographic protection of data in the event of the theft of storage media and unauthorized access to storage media. TDE allows SQL Server to perform real-time encryption. All data is encrypted while writing a database to disk leaving the data protected during storage period of time. All data is decrypted again while reading process in progress. The advantage is that transparent encryption does not require user application changes and does not increase the size of encrypted data. Enabling TDE entails nullifying a pre-existing log and creating a new virtual transaction log, which provides a better degree of database protection [2].

TDE uses a hierarchical key structure, which increases the cryptographic strength of this system. Based on the master key of the service (created during the installation of SQL Server) the main key of the database was created. And with the use of the main key, a certificate was created. Then, a database encryption key was created, encrypted with this certificate, and TDE was enabled. It is suggested to check

TDE availability and parameters using system tables of the system database master: sys.databases, sys.certificates, sys.dm_database_encryption_keys because encryption is transparent for users.

SQL Server encrypts the keys of each level with a superior key or certificate. If you get the key of the highest level (the main key of the SQL Server SMK service), you will get all the data in an unencrypted form. SMK is protected by the operating system using the Windows Data Protection API (DPAPI). The location of the DPAPI keys can be found in the system catalog which exposure can follow the hack of the encryption system.

Extended key management was implemented using the sp_configure stored procedure for a more reliable and secure approach to key management.

As a storage system (storage), the choice was made in favor of HP 3PAR 7200 due to some advantages. HP StoreServ 7200 model is the most affordable in the line and represents a convenient, effective and reliable solution in the middle price segment. HP 3PAR 7200 has the functions of configuring RAID arrays. The key features of the device is a pair of controllers, each of which is equipped with a special processor ASIC Gen4, which provides a unique high-speed system. Despite of this model is the youngest in the line of HP 3PAR StoreServ systems, it supports almost all the functionality implemented in older devices. The HP 3PAR StoreServ 7000 is the best solution, reducing 90% of the time required for control and 50% of the capacity requirements.

The key difference of HP StoreServ 7200 from more expensive solutions, for example 7400, 10400, 10800 is the limitation of the scalability of controllers and disks

4 Conclusion

There are different approaches to database encryption. It is necessary to consider all the advantages and disadvantages of a particular technology before implementing database encryption and depending on the requirements for the protecting data in the database, choose the solution that will optimize resources and provide reliable storage. Comprehensive approach to building protection plays an important role in implementing encryption, i.e. it is necessary to consider other means of protection: access control, hiding data transfer channels, key management etc.

References

[1] Bondar’ A G 2013 *MS SQL Server 2012 Sozdanie baz dannyh i razrabotka program* BHV Peterburg: SPb p.608 *(in Russian)*

[2] Abdullhassan F K 2014 Prozrachnoe shifrovanie dannyh (TDE) *Molodoy uchenyy* **8**(2014) 122-4 https://moluch.ru/archive/67/11488/ 1 Feb 2017 *(in Russian)*

Modeling optimal policy on base of the large-scale DSGE model

A Ashimov* , Yu Borovskiy, M Onalbekov

Satpayev University, Satpayev Street, 22a, Almaty, Kazakhstan

**Corresponding author's e-mail: ashimov37@mail.ru*

Abstract

The paper presents the nine-country nonlinear dynamic stochastic general equilibrium model describing the optimal functioning of the agents: patient and impatient households; oil, traded non-oil and non-traded goods producers; second-tier banks; as well as the behavior of central banks and governments, which mainly act according to the rules, taking into account the conditions of the possibility of debt crises. The parameters of the proposed model (including shocks characteristics) were estimated by Bayesian method based on its log-linearized version using quarterly statistics for 2000-2016 of the Eurasian Economic Union five countries (Kazakhstan, Russia, Belarus, Armenia, Kyrgyzstan) as well as the Unites States, China, the European Union and the rest of the world. The proposed model was tested with methods of parametric control theory (in particular, by assessing the stability indicators of mappings defined by the model) for the possibility of its practical application i.e. on the conditions of transferring the results of computational experiments to the studied subject area. Using the parametric control theory methods scenario analysis and evaluation of the optimal measures of economic policy were performed at the individual country levels, and the Eurasian Economic Union and the global economy

Keywords: dynamic stochastic general equilibrium model, multi-country economic modeling, testing of the model, parametric control

1 Introduction

The topical problems are the shocks impact analysis and measures effectiveness evaluation in the field of economic policy of interacting emerging and advanced economies, taking into account the financial market frictions impact, with possible situations of debt crisis [1], the dollarization of economy [2], as well as the impact of the integration conditions for a number of countries in the regional economic union.

In recent years, multi-country dynamic stochastic general equilibrium models (DSGE model) occupy an important place in the modern macroeconomic analysis and evaluation of economic policy measures. Since, in the multi-country DSGE model [3] with financial frictions were studied the macroeconomic impacts of banking regulation changes on Canada economy. In the multi-country DSGE model [4] was carried out a qualitative policy analysis of the macroeconomic interdependence among regions belonging to the euro area, as well as between regions of the euro area and the global economy. In the multi-country DSGE model [5] is studied the harmonization impact of labor tax rates. In the multi-country DSGE model [6] is studied the shocks transferring within international relations and incomplete Exchange-rate pass-through.

In this paper we consider the above described problems of shocks impact analysis, scenario analysis and effective measures evaluation in the field of economic policy for both emerging and advanced economies on the basis of the developed multi-country model.

2 Intensional description of the global economy within the model

The developed model describes the global economy in accordance with the following main proposals:

1) The economy of each region (country) represented by the following agents. Continuums of patient and impatient households; oil, traded non-oil and non-traded goods producers; second-tier banks, state represented by the central bank, government and continuum of government agents who are carrying investment and consumption functions.
2) The composition of functions of the respective agents is the same in all regions.
3) Households, non-oil traded and non-traded goods producers in the labor markets and in their products markets are correspondingly agents of monopolistic competition.
4) Wages and some products prices are inflexible.
5) All agents are absolute rationality agents.
6) All markets are in equilibrium.

Each patient and impatient household in each time interval performs optimal actions, consistently solving a number of nonlinear programming problems with their mathematical formulation in the form of appropriate objective functions and constraints. Preliminary each household in each time interval determines the optimum values of: its consumption expenditures and investments in non-financial assets; their wages for industries of its region (taking into account rigidity by Calvo). Patient and impatient households also determine the optimal values of deposit funds and necessary borrowed funds. Then each household based on values of consumption expenditures and investments in non-financial assets, sequentially determines the optimal values of consumed products of regions, industries, and individual producers by solving the respective nonlinear programming problems. Each patient household based on the optimal value deposits funds by solving nonlinear programming problem, determines the optimal values of the deposit in each second-tier banks. Each impatient household on the basis of their credit demand, by solving the optimization problem, determines the credit demand splitting for second-tier banks of its region.

Each oil, traded non-oil or non-tradable goods producer in each time interval performs optimal actions consistently solving a number of nonlinear programming problems with their mathematical formulation in the form of appropriate objective functions and constraints. Preliminary each producer in each time interval determines the optimal values of required borrowed funds, investment spending, labour services, rented land and purchased intermediate products. Non-oil traded and non-traded goods producer also determine (based on the rigidity by Calvo) its price values for output. Then producer based on purchasing costs of investment and intermediate goods consistently defines, by solving corresponding optimization problems, the optimal values of consumed production quantities separated by industries, regions, and individual producers. Producer on the basis of obtained optimal labor expenditures, by solving optimization problems, optimally splits it for patient and impatient households and determines labor of each individual household. Producer also optimally details the values of rented land from households and government, as well as makes optimal decisions on borrowing from second-tier banks of its region.

Each second-tier bank in each time interval performs optimal actions consistently solving a number of optimization problems with their mathematical formulation in the form of appropriate objective functions and constraints. Preliminary, each second-tier bank in each time interval determines the optimal values of deposit interest rate for patient households, loan interest rates for lending to producers and impatient households, borrowing value from the Central bank of its region and other second – tier banks of all regions, taking into account the constraints of conditions of debt crisis rising in the country. The second-tier bank based on its optimal demand for second-tier banks borrowings, by solving optimization problems, determines the credit demand from each separate second-tier bank of each region. Second-tier bank of emerging economies countries (regions) can take into account in its optimal solution the conditions of the occurrence of economy dollarization. In addition, each second-tier bank holds government bonds of all regions.

In this model, the government, the central bank and the continuum of government agents carrying investment and consumption functions represent the state of each region. The regional government in each period carries out the state budget execution (acquisition of income and expenditure under approved budget items) and management of public debt. The region central bank within the framework of the monetary policy determines the refinancing interest rate for inflation targeting and economic growth by Taylor rules, as well as implementing a trust management of the sovereign fund of the region (if there is a sovereign fund in the region). Every government agent carries out its consumption and investment functions through solving a number of optimization problems within the allocated budget.

The appropriate first-order conditions of optimization problems to be solved in each time interval (quarter) t by agents in all regions are provided in the agent's intensional descriptions. An intensional description of the global economy in terms of the model is closed by auxiliary equations and balance equations on various markets.

3 Mathematical model, parameter estimation and testing

Nonlinear model consists of equations consistent with the aggregated first-order conditions of the optimization problems of households, producers, second-tier banks, government agents, as well as of auxiliary and balance equations. The model also includes equations which describe the rules of economic and financial activities of government, the central bank and shocks assignment rules. Nonlinear model in vector form is as follows:

$$\mathrm{E}_t F^{\theta}\left(X_{t-1}, X_t, X_{t+1}, H_t^{\Sigma_H}\right) = 0. \tag{1}$$

Here $\mathrm{E_t}$ is the sign of conditional mathematical expectation on information available at time interval t, F^{θ} is a known vector function; θ is a set of parameters consisting of the model structural parameters and autoregressive parameters of shocks; X_t is a vector of endogenous variables and shocks given by the first-order autoregressions (X_0 is given); $H_t^{\Sigma_H}$ is a vector which consists of Gaussian white noises, Σ_H is a set of noises standard deviations.

An approximate linear model was obtained by using the log-linearization around the steady-state value of the model equations (1) and applying Sims algorithm [7] it was used for nonlinear model's parameters estimation. The reduced linear model is written as:

$$\hat{X}_t = Q^{\theta}\hat{X}_{t-1} + F^{\theta}H_t^{\Sigma_H}, t = 1,2,3, \ldots \tag{2}$$

Here Q^{θ}, F^{θ} are matrixes of appropriate dimensions; $\hat{X}_t$ is a vector of variables of linear model corresponding to the vector X_t.

The linear model (2) is supplemented with initial conditions $\hat{X}_0$ and measurement equation (for model's parameters estimation) written as $\hat{S}_t = M\hat{X}_t$, where M is a matrix, where each row contains one 1, and the rest elements equals 0, in addition in each column of the matrix M there is not more than one 1.

Parameters estimation of linear model has been carried out using the Bayesian approach using Dynare software [8]; then the determined parameters values were moved to a non-linear model.

The estimated non-linear model was successfully tested using three approaches: 1) comparison of the respective calculated values of linear and nonlinear models variables with the given shocks; 2) retrospective forecasting and 3) stability indicators assessment [9].

The comparison results of the respective values of the endogenous variables of linear and nonlinear models demonstrate acceptable error values of linearization (not more than 2% for all considered time intervals). Within the framework of model retrospective forecasting for Q1-Q4 of 2016, the mean square deviation of the obtained predicted values of economic indicators from the relevant observable values are about 3 percentage points. All estimates of stability indicators based on the model, obtained with parametric control theory methods don't exceed 4.0%. These facts confirm the possibility of practical application of nonlinear model under study.

4 Analysis and parametric control based on the Model

4.1. IMPACT ASSESSMENT OF SHOCKS ON ECONOMIC PERFORMANCE

Macroeconomic analysis of the impact of internal and external shocks on macroeconomic indicators - GDP and inflation for the period from the Q1 of 2016 to the Q4 of 2022 was conducted. The following can be summarized as the examples of the obtained results of the analysis: the internal shocks in productivity, oil production, risk premium and oil price shocks most seriously affected the actual deviation of the GDP of the Republic of Kazakhstan in the Q1 of 2008 (4.36% of its trend); margins on products, oil production, margins on wages and oil price shocks most seriously affected the actual deviation of inflation in the Republic of Kazakhstan in the Q1 of 2008 (-0.62% of its trend).

4.2. STATEMENT AND SOLVING THE PARAMETRIC CONTROL PROBLEM OF ECONOMIC GROWTH AND SUPPRESSION VOLATILITY OF MACROECONOMIC INDICATORS

The formalized statement of the parametric control problem based of the developed model is formulated as follows.

For a given quarter of the beginning of regulation t, for a given subset of Regions $S \in \{S_{1,kz}, S_{1,ru}, S_{1,by}, S_{1,ar}, S_{1,kr}, S_{1,ch}, S_{1,us}, S_{1,eu}, S_{1,rw}, S_2, S_3\}$ (where $S_{1,j}$ - separate j-th Region of the model, corresponding to the Republic of Kazakhstan at $j = kz$, to the Russian Federation at $j = ru$, to the Republic of Belarus at $j = by$, to the Republic of Armenia at $j = ar$, to the Republic of Kyrgyzstan at $j = kr$, to the People's Republic of China at $j = ch$, to the European Union at $j = eu$, to the USA at $j = us$, to the Rest of the world at $j = rw$; S_2 – is the set of 5 EAEU countries; S_3 – all countries), for all $r \in S$ to find the values of the government policy instruments $\eta^r_{R,t+1}, \dots, \eta^r_{R,t+n}$, $\eta^r_{ge,t+1}, \dots, \eta^r_{ge,t+n}$, accordingly at the interest rate on government bonds and government consumption, providing the maximum criterion

$$K_{r,t} = \mathrm{E}_t \sum_{r \in S} \sum_{i=1}^{n} \beta^i \left(Y^r_{t+i} - \alpha_1 \left(\frac{Y^r_{t+i} - \bar{Y}^r_{t+i}}{\bar{Y}^r_{t+i}} \right)^2 - \alpha_2 \left(\frac{\pi^r_{t+i} - \bar{\pi}^r_{t+i}}{\bar{\pi}^r_{t+i}} \right)^2 \right) \quad (3)$$

based on the model, presented in the form (1) and under constraints ($i = 1, \dots, 40$):

$$\mathrm{E}_t \pi^r_{t+i} \le \bar{\pi}^r_{t+i} + 0{,}025, \quad (5)$$

$$\bar{R}^r_{t+i} - 0{,}025 \le \mathrm{E}_t R^r_{t+i} \le \bar{R}^r_{t+i} + 0{,}025, \quad (6)$$

$$\mathrm{E}_t GE^r_{t+i} \le 1{,}05\, \overline{GE}^r_{t+i}, \quad (7)$$

and also with the following restrictions on the indicators of the EAEU countries $r' \in S$, given by the conditions of integration in the EAEU:

$$\mathrm{E}_t \pi^{r'}_{t+i} \le E_t \pi^{r''}_{t+i} + 0{,}05, \quad (8)$$

$$\mathrm{E}_t \frac{Def^{r'}_{t+i}}{Y^{r'}_{t+i}} \le 0{,}03, \quad (9)$$

$$\mathrm{E}_t \frac{B^{r'}_{g,t+i}}{Y^{r'}_{t+i}} \le 0{,}5. \quad (10)$$

Here Y^r_t, π^r_t, Def^r_t, $B^r_{g,t}$ are respectively the GDP, consumer price inflation, budget deficit, public debt of country r; the sign « ¯ » corresponds to the trend values of these variables (or for the inflation - its target level); $\alpha_1 = \bar{Y}^r_t$, $\alpha_2 = 5\bar{Y}^r_t$ are the weight numbers of the state's objective function; β – is a discount factor, n = 40 is the vision of the state policy, given parameter, r' and r'' ($r' \neq r''$) – are countries of the EAEU.

The parametric control problem of economic growth and suppression the volatility of the economic indicators of the Republic of Kazakhstan based on the model was solved at 3 levels –level of the Republic of Kazakhstan (1), level of the EAEU (2) and level of the world economy (3). The Table 1 presents the results of solving these variants of the parametric control problem for the expected values of the indicators of the Republic of Kazakhstan in the forecast period (Q1 2016 - Q4, 2022): real GDP growth, a decrease in the volatility of real GDP and volatility in consumer price inflation.

TABLE 1 Changes in the indicators of the Republic of Kazakhstan in % deviation from the baseline scenario

Indicator	**Problem level**		
	1	*2*	*3*
Real GDP	0,35	0,53	0,68
Volatility of real GDP	-14,13	-15,74	-17,62
Volatility of consumer price inflation	-8,30	-12,59	-13,45

7 Conclusions

In the paper during the process of macroeconomic analysis, estimates of the shocks contribution in the values of macroeconomic indicators were obtained for historic period, as well as each shock contribution in the variance of the medium-term forecasts of model macroeconomic indicators estimates were obtained.

Within the evaluation of optimal measures in the field of economic policy on the basis of model a number of parametric control problems [9] of economic growth and minimizing the volatility of macroeconomic indicators (GDP and inflation) were formulated and solved at the level of a particular region; all the countries of the Eurasian Economic Union and all model regions level.

The results of studies on the parametric regulation shows a better efficiency (for each country) of the optimal coordinated measures in the field of economic policy at the global level in comparison with the relevant measures at the level of the regional union, which, in its turn, demonstrate a better efficiency in comparison with the parametric control results at the level of particular country.

References

[1] Rossi S P S, Malavasi R 2016 *Financial Crisis, Bank Behaviour and Credit Crunch* Springer

[2] Tovar C E 2009 DSGE Models and Central Banks *Economics* **3**(16) 1–33

[3] Resende C, Dib A, Perevalov N 2010 *The Macroeconomic*

Implications of Changes in Bank Capital and Liquidity Requirements in Canada: Insights from the BoC-GEM-FIN Bank of Canada Discussion Paper, No. 2010-16

[4] Gomes S, Jacquinot P, Pisani M 2012 The EAGLE. A Model for Policy Analysis of Macroeconomic Interdependence in the Euro Area *Economic Modelling* **29**(5) 1686-714

[5] Matus S, Milan V 2015 Labor Tax Harmonization in a Multi-Country Model *Czech Journal of Economics and Finance* **65**(3) 192-210

[6] Razafindrabe T M 2016 A Multi-Country DSGE Model with Incomplete Exchange Rate Pass-through: Application for the Euro Area *Economic Modelling* **52** 78–100

[7] Sims A 2002 Solving Linear Rational Expectations Models *Computational Economics* **20**(1) 1–21

[8] Adjemian S, Bastani H, Juillard M, Mihoubi F, Perendia G, Ratto M, Villemot S 2011 Dynare: Reference Manual, Version 4; *Dynare Working Papers Series* **1**

[9] Ashimov A A, Sultanov B T, Adilov Zh M, Borovskiy Yu V, Novikov D A, Alshanov R A, Ashimov As A 2013 *Macroeconomic Analysis and Parametrical Control of a National Economy* Springer, New York, NY

Ways of using Internet of Things (IoT) for health monitoring

Yergaliyev Y N*, Mukhamediyev R I, Kairbekov A M

Institute of information and telecommunication technologies, Satbayev University, Satpayev str. 22a, Almaty, Republic of Kazakhstan

**Corresponding author's e-mail: erlanergaliev@gmail.com*

Abstract

Internet of Things (IoT) is a new and fast growing technology in which everything (smart objects and smart devices) are connected to the internet for effective communication between these connected things. Internet of things serves as a catalyst for the healthcare and plays very important role in wide range of healthcare monitoring applications. Networked sensors devices, either worn on the body or embedded in living environments, make possible the gathering of rich information to evaluate physical and mental health condition of the patient by collecting body temperature, blood pressure, sugar level etc. Communicating this collected information to the doctor, making accurate decision on the data collected and notifying the patient is the challenging task in the Internet of things. In this paper author focus on analyzing of smart devices indicators to health monitoring, thereby using it to health monitoring.

Keywords: Internet of Things, smart healthcare, smart devices, health indicators

1 Introduction

"Internet of Things (IoT) is the network of physical objects or "things" embedded with electronic devices, software technologies, sensors, and network connectivity, which facilitates these objects to collect and exchange data for availing various services." It is a concept demonstrating a connected set of anything, any one, any time, any place, any service and any network connection [2]. Simply we can say that IoT is a concept of basically connecting any device with an on and off switch to the Internet. This includes everything from smart phones, smart coffee and tea makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of (nano to macro devices).

A recent healthcare system should provide better healthcare services to people at any time anywhere in an affordable and patient friendly manner. Currently, the healthcare system is going to change from a traditional approach to a modernized patient centered approach. In the traditional way the doctors play the major role. For necessary diagnosis and advising they need to visit the patients. There are two basic problems related to this approach. Firstly, the healthcare professionals must be at place of the patient all the time and second, the patient remains admitted in the hospital, wired to bedside biomedical instruments, for a long period of time. In order to solve these two problems the patient oriented approach has been received. In this theme, the patients are aware with knowledge and information to play a more active role in disease diagnosis, and prevention. The important element of this second approach is a reliable and readily available patient monitoring system (PMS). Health is one of the global challenges for humanity [3-5].

According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual. Healthy persons can secure their lifetime income and hence to increase in gross domestic product and in tax revenues. Healthy persons can also reduce pressure on the already overwhelmed hospitals, clinics, and medical professionals and reduce workload on the public safety charities, networks, and governmental or non-governmental centers. To keep people effective and healthy, a readily accessible modern healthcare system is a prerequisite [3-5].

2 Using IoT in healtcare

There are people all over the world whose health may suffer because they don't have ready access to effective health monitoring. But small, powerful wireless solutions connected through the IoT are now making it possible for monitoring to come to these patients. These solutions can be used to securely capture patient health data from a variety of sensors, apply complex algorithms to analyze the data and then share it through wireless connectivity with medical professionals who can make appropriate health recommendations.

As a result, patients with chronic diseases may be less likely to develop complications, and acute complications may be diagnosed earlier than they would be otherwise. For example, patients suffering from cardiovascular diseases who are being treated with digitalis could be monitored around the clock to prevent drug intoxication. Arrhythmias that are randomly seen on an EKG could be easily detected, and EKG data indicating heart hypoxemia could lead to faster detection of cardiac issues. The data collected may also enable a more preventive approach to healthcare by providing information for people to make healthier choices.

Healthy, active people can also benefit from IoT-driven monitoring of their daily activities and well-being. A senior living alone, for example, may want to have a monitoring device that can detect a fall or other interruption in everyday activity and report it to emergency responders or family members. For that matter, an active athlete such as a hiker or biker could benefit from such a solution at any age, particularly if it's available as a piece of wearable technology.

TABLE 1 Interrelation of indicators and symptoms of disease

Indicators	Symptoms	Diseases	Data acquisition	Device sample
Calorie Counter	binge eating	overweight	manually	Fitbit Flex
HeartRate Monitor	heart arrhythmias	bradycardia tachycardia aritmia	auto	Polar H10
Blood Pressure Monitor	high blood pressure	aneurysm	both	OMRON M7 Intelli IT
Body Temperature	high temperature	fever	both	Wireless Body Thermometer
Physical activity *(pedometer)*	immune deficiencies metabolic syndrome	overweight	auto	Fitbit Flex
Water volume	fatigue unbalanced ph	eczema rheumatism gastritis	manually	LifeFuels Smart Nutrition Bottle
Glucose level	sweating anxious dizziness	hyperglycemia hypoglycemia diabetes	manually	Glucose meter
Skin condition	raised bumps ulcers discolored patches	skin disorders	both	Haptic finger
Vision condition	dim vision low vision	glaucoma cataracts	manually	
Fall Detector	faint	Parkinson disease	auto	Medical Guardian
Weight monitoring	binge eating	overweight	both	Samsung's Welt
Blood oxygen saturation *(Pulse oximeters)*	hemoglobin level	emergency medicine respiratory or cardiac problems chronic obstructive pulmonary disease (copd) sleep disorder apnea	auto	Oxxiom from True Wearables Ember from Cercacor Profusa's Lumee
Sleep time	fatigue	sleep disorders	auto	Sleep Number it bed iFit with Early Sense integration
Neurological function monitoring	gait limb paralysis cerebral palsy	detection of Parkinson, Alzheimer disease	auto	BIS™ Complete 4-Channel Monitor
Asthma sensor *(tracks environmental conditions)*	shortness of breath cough wheezing	asthma	auto	Graphene Sensor
Detect concussions	headache confusion amnesia slurred speech	concussion	auto	Force Impact Technologies' FITGuard

3 Conclusion

The IoT is revamping healthcare services, as people have started using IoT to manage their health requirements. For example, people can use IoT devices to remind them about = appointments, changes in blood pressure, calories burnt and much more. One of the best parts of the IoTs in the healthcare industry is the remote health monitoring system, where patients can be monitored and advised from anywhere. Real-time location services are another major approach IoT offers. By using the service, doctors can easily track device locations, which directly reduces excess time spent. Smartphone usage is increasing rapidly, and people have started using mobile apps for almost everything. When it comes to the healthcare industry, mobile apps can improve communications between patients and doctors over a secured connection.

The primary duty of Digital Health Advisors and the clinicians will be to work collaboratively when the organization is shifting towards IoT-enabled infrastructure. Proper training and feedback are mandatory for better deployment. The traditional method of recording a patient's details, i.e., a pad of paper hanging on the patient's bed, is not going to work anymore, since such records are only accessible to a limited few, and can be lost or scrambled. This is an application where on-field mobile/tablet technology might work, since they offer hassle-free record management on the applications in the device. Health data information will be available in just a tap when information is recorded electronically, once security and privacy issues are met.

References

[1] Singh P 2018 Internet of things based health monitoring system: opportunities and challenges *International Journal of Advanced Research in Computer Science* **9**(1) January-February

[2] Sreekanth K U, Nitha K P 2016 A Study on Health Care in Internet of Things *International Journal on Recent and Innovation Trends in Computing and Communication* **4**(2) February 2016

[3] Sneha N Malokar, Samadhan D Mali 2017 An IOT Based Health Care Monitoring System - A Review *International Journal of Innovative Research in Computer and Communication Engineering* **5**(6)

[4] West D M 2013 *Improving Health Care through Mobile Medical Devices and Sensors* Center for Technology Innovation at Brookings

[5] Dimitrov D V 2016 Medical Internet of Things and Big Data in Healthcare *Healthc Inform Res.* **22**(3) 156–63

Wireless sensor networks research

Dmitriy Kim*

Satbaev University, Almaty, Kazakhstan

**Corresponding author's e-mail: expendebles125@gmail.com*

Abstract

In recent years, hardware development technology has made effective changes in the process and performance. Due to such changes, the technologies have become smaller, more productive, cheaper. Programming such microcircuits is now one of the most important successful works. However, despite the growing popularity, the programming of microprocessors remains a science with little research. In this paper I describe the essence of microprocessor programming. Currently, the widely distributed so-called wireless sensor networks, which can broadcast information from any network to the Wi-Fi connection. The main elements of this network are gateways, sensors and nodes. It is noteworthy that this kind of programming is confined to the hardware part, and therefore, is unique. An important notion in such networks is a platform - a combination of hardware and software objects of a wireless network. System selection, component selection. The software component includes analysis and selection of the system, as well as special software for working with data from gateways and nodes.

Keywords. Sensor, wireless networks, hardware programming, fpga systems, microprocessors, controllers

1 Introduction

Wireless sensor networks are a network of autonomous nodes with sensors to monitor various external factors, such as temperature, humidity, pressure and others. Modern networks are bidirectional, which also allows you to control the activity of sensors.

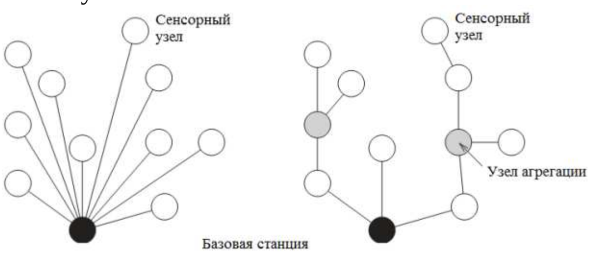


FIGURE 1 Modes of transferring information directly and through aggregation nodes

Sensor networks, as shown in Figure 1, have different methods of transferring information. The first method is obsolete, but it still finds application in different networks. Nodes, in turn, include 3 subsystems:

1. Processor
2. Communication
3. Sensory

We will analyze the hardware market using the following criteria:

1. Availability
2. Price
3. The interface

The conducted studies showed that the ESP8266 module is suitable for all parameters. This module can also be used as a bridge between WiFi and another device or you can use it as a standalone device for working on the network.

The selection of a suitable OS in this case is an important link in the construction of the entire system. Suitable OS for working with microprocessors is not so much. However, in the market you can find OS 4 families:

1. TinyOS
2. Contiki OS
3. RIOT
4. Linux

For analysis, we also use several parameters, namely:

1. The minimum value of memory
2. Support for C ++
3. Multithreading
4. Modularity
5. Real time mode

The best results were shown by the OS of the Linux family, however this system is too demanding for memory, so we choose another one. The OS Tiny has very little functionality, which also does not suit us. The Riot OS does not support microcontrollers of a certain category, which is also bad. And there is only Contiki OS, which has the following parameters: 30 KB on ROM, 2 KB on RAM with average multithreading and modularity.

The development of special software for sensor networks is carried out by:

1. Apache
2. Microsoft IIS
3. Nginx

Microsoft releases an operating system inconvenient for the PHP language. So choose between the 2 remaining. Figure 2 shows a graph showing that the minimum memory is required for NGINX.

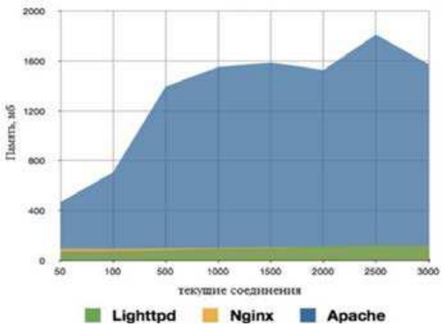


FIGURE 2 Graph of OS memory usage

2 Microarchitecture

Microarchitecture describes how exactly the processor is located and connected to each other registers, ALUs, finite state machines, memory blocks and other blocks needed to implement the architecture. Each architecture, including MIPS, can be many different microarchitecture, providing a different ratio performance, price and complexity. All of them can perform the same programs, but their internal device can be very strong differ.

References

[1] Harris D M, Harris S L 2013 *Digital circuitry and computer architecture. The second edition* Publisher Morgan Kaufman

[2] Ugryumov E P *Digital circuitry* 2010

[3] Pong P Chu 2008 *FPGA prototyping by Verilog examples* A John Wiley & sons

Bibliometric indicators for prospectivity estimation of research domains

R I Muhamediyev[1]*, Y V Shevchenko[2], A Idrissov[3]

[1]Kazakh National Research Technical University, Almaty, Kazakhstan
[2]Department of Strategic Planning and Analytics, Science Fund JSC, Almaty, Kazakhstan
[3]Almaty University of Power Engineering and Telecommunications, Almaty, Kazakhstan

**Corresponding author's e-mail: ravil.muhamedyev@gmail.com*

Abstract

The area of research, described with a general term of Information and communication technologies (ICTs), features extraordinary dynamism, fast emergence of new terms and change of conventional areas of research. To estimation of research domain and publication activity bibliometric indicators are widely used. Unfortunately the existing indicators have significant limitations. This paper describes new indicators based on differential equation that allow us to evaluate dynamic of research domain. We show some results obtained using the indicators named as D1 and D2.

Keywords: bibliometric indicators, scientometrics, ICT domains, differential indicators

1 Introduction

The idea of unified publications assessment in the flield of science by applying the citation index (SCI) was proposed by Eugene Garfield [1]. Indicators , such as number of publications, the citation index, the number of co-authors, etc., are widely used for the evaluation of research domains and organizations in selected countries and regions [2-4], the policy making in the field of scientific research [5], impact assessment of publications databases, in particular, the use of public archives increases citation of publications [6]. Bibliometric data is used to build prediction models [7] sometimes in combination with patent analysis [8, 9].

At the same time, bibliometric methods have significant limitations. Numerical indexes are non-linearly dependent from size of the country and organization [10]. The larger the research group, the higher the Crown indicator and h-index are [11]. H-index is very sensitive to research domains characteristics (productivity, citation habits, and citation dynamics). The use of indicators without a clear understanding of subject area leads to the effects of "quick and dirty" [12].

Various authors introduce new or modify former indicators. In [13], the change in the Hirsch index with time is estimated. The special index (j-index) was introduced in [14]. Authors of [15] suppose the new index better describes the field of scientific publications of the author.

To assess the dynamics of the development of scientific areas, it is necessary to assess the velocity of change. This need is realized by analyzing the temporary graphs of indicators. In spite of the fact the h-velocity index was introduced in [16] for estimating the rate of change of Hirsch index, the numerical estimation of changes in bibliometric indicators is not widely implemented. In our opinion, the use of dynamic indicators allow us to more accurately assess the potentials of research areas.

2 D1 and D2 indicators

We determined the following differential indicators of a prospective scientific area, defined by the given key search term [17].

$$D1_i = f_1(n_i, \frac{dn_i}{dt}, \frac{dc_i}{dt}),$$

$$D2_i = f_2(n_i, \frac{d^2 n_i}{dt^2}, \frac{d^2 c_i}{dt^2}).$$

Put it differently, prospectivity indicator $D1_i$ is a function depending on publication count n_i, speed of change of publication count $\frac{dn_i}{dt}$ (time derivative) and of citation count $\frac{dc_i}{dt}$ in the given area of research.

Indicator $D2_i$ is a function depending on publication count n_i, acceleration of change of publication count $\frac{d^2 n_i}{dt}$ and of citation count $\frac{d^2 c_i}{dt}$ in the given area of research.

Functions f_1 and f_2 aggregate contribution of citations and publications by some means or other. In a particular case, aggregation can be accomplished using weighted summation. Then, for an individual scientometric database j, scientific research prospectivity indicators in a field i at the moment of time t_k, can be determined with the equations

$$D1_i^j(t_k) = \alpha \times n_i^j(t_k) + \beta \times \frac{dn_i^j(t_k)}{dt} + \gamma \times \frac{dc_i^j(t_k)}{dt}, \quad (2)$$

$$D2_i^j(t_k) = \alpha' \times n_i^j(t_k) + \beta' \times \frac{d^2 n_i^j(t_k)}{dt} + \gamma' \times \frac{d^2 c_i^j(t_k)}{dt}, \quad (3)$$

where $\alpha, \beta, \gamma, \alpha', \beta', \gamma'$ are some empirical factors to be regulating contribution share of publication count, speed and acceleration of change of publication count n_i and speed and acceleration of change of citation count c_i, respectively. Note that as the second derivative function can be calculated using the first derivative $\frac{d^2 f}{dx^2} = \frac{d(df/dx)}{dx}$, the Eq.(3) can be expressed as

$$D2_i^j(t_k) = \alpha' \times n_i^j(t_k) + \beta' \times \frac{d(dn_i^j(t_k)/dt)}{dt} + \gamma' \times \frac{d(dc_i^j(t_k)/dt)}{dt}. \quad (4)$$

For more evident estimation of change dynamics in publishing activity, especially in the domains with large amount of publications, indicators α и α' can be made equal to 0. In this case

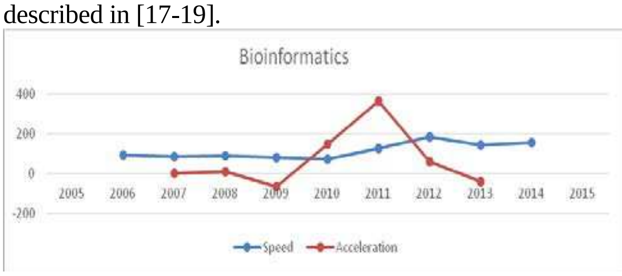
$$D1_i^j(t_k) = \beta \times \frac{dn_i^j(t_k)}{dt} + \gamma \times \frac{dc_i^j(t_k)}{dt}, \quad (5)$$

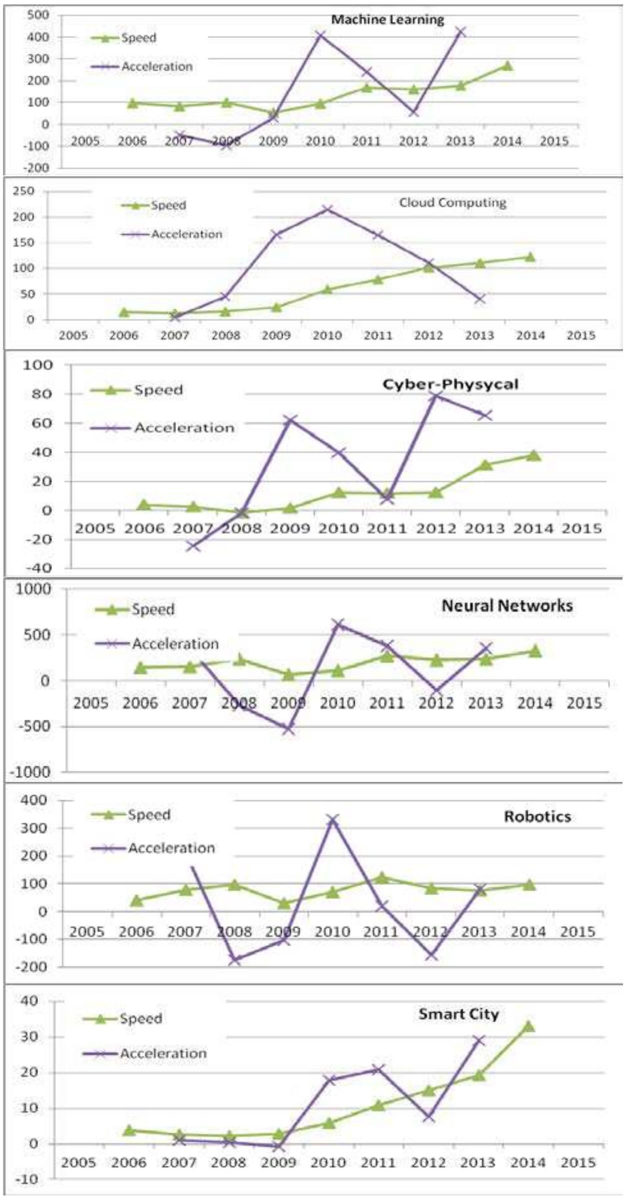
$$D2_i^j(t_k) = \beta' \times \frac{d(dn_i^j(t_k)/dt)}{dt} + \gamma' \times \frac{d(dc_i^j(t_k)/dt)}{dt}. \quad (6)$$

Equations 5 and 6 were used for further calculations.

3 Applying D1 and D2 to estimate dynamics of publication activity in ICT domain

The curves in Figure 3 illustrate change dynamics of D1 and D2 in ICT domains. As D1 effectively means speed of change, but D2 – acceleration of publication and citation count growth, they are indicated in the curves as Speed and Acceleration, respectively. Our calculation based on data described in [17-19].





4 Conclusion

The use of indicators D1 and D2 give us possibility more clearly reveal the dynamics of changes in the publication activity in the research domains of ICT.

In a number of cases, we can state the transition from research to the practical application of technology. Of course, the application of the introduced indicators requires taking into account a number of subjective factors and expert assessments. Estimation of the limitations of these indicators is the task of further research.

References

[1] Garfield E Citation indexes for science: a new dimension in documentation through association of ideas *Science* **122**(1955) 108–11

[2] Gauthier Élaine 1998 *Bibliometric analysis of scientific and technological research: a user's guide to the methodology* Canada: Science and Technology Redesign Project, Statistics Canada

[3] Van Raan, Anthony F J 2003 The use of bibliometric analysis in research performance assessment and monitoring of interdisciplinary scientific developments *Technology Assessment-Theory and Practice* **1**(12) 20-9

[4] Abramo Giovanni, Ciriaco Andrea D'Angelo, Fabio Pugini 2008 The measurement of Italian universities' research productivity by a non parametric-bibliometric methodology *Scientometrics* **76**(2) 225

[5] Mokhnacheva J V, Mitroshin I A 2014 Nanoscience and nanotechnologies at the Moscow domain: a bibliometric analysis based

on «Web of Science» (Thomson Reuters) *Information resources of Russia* **6**(2014) 17-23

[6] Debackere Koenraad, Wolfgang Glänzel 2004 Using a bibliometric approach to support research policy making: The case of the Flemish BOF-key *Scientometrics* **59**(2) 253-76

[7] Moed H F 2007 The effect of "open access" on citation impact: An analysis of ArXiv's condensed matter section *Journal of the Association for Information Science and Technology* **58**(13) 2047-54

[8] Daim T U, Rueda G R, Martin H T 2005 Technology forecasting using bibliometric analysis and system dynamics *In Technology management: a unifying discipline for melting the boundaries. IEEE* 112-22

[9] Daim T U, et al. 2006 Forecasting emerging technologies: Use of bibliometrics and patent analysis *Technological Forecasting and Social Change* **73**(8) 981-1012

[10] Inaba Takashi, Mariagrazia Squicciarini 2017 ICT: A new taxonomy based on the international patent classification OECD/OCDE **49**

[11] Katz J Sylvan 2000 Scale-independent indicators and research evaluation *Science and Public Policy* **27**(1) 23-36

[12] Durieux Valérie, Pierre Alain Gevenois 2010 Bibliometric indicators: quality measurements of scientific publication *Radiology* **255**(2) 342-51

[13] Van Raan, Anthony F J 2005 Fatal attraction: Conceptual and methodological problems in the ranking of universities by bibliometric methods *Scientometrics* **62**(1) 133-43

[14] Egghe, Leo. 2007 Dynamic h‐index: The Hirsch index in function of time *Journal of the Association for Information Science and Technology* **58**(3) 452-4

[15] Levene Mark, Trevor Fenner, Judit Bar-Ilan 2013 *A bibliometric index based on the complete list of cited publications arXiv preprint arXiv* 1304.6945

[16] Rousseau Ronald, Fred Y Ye 2008 A proposal for a dynamic h-type index *Journal of the Association for Information Science and Technology* **59**(11) 1853-5

[17] Абдильманова А, Алыгулиев Р, Мухамедиев Р 2016 Дифференциальные метрики оценки библиометрических показателей доменов ИКТ *Cloud of Science* **3**(3) 366-79

[18] Mukhamediev R I, Aligulyev R M, Muhamedijeva J 2017 Estimation of Relationship Between Domains of ICT Semantic Network *International Conference on Digital Transformation and Global Society* Springer, Cham P. 130-5

[19] Muhamedyev R I, Kalimoldaev M N, Uskenbayeva R K 2014 Semantic network of ICT domains and applications *Proceedings of the 2014 Conference on Electronic Governance and Open Society: Challenges in Eurasia – ACM p. 178-86*

Experimental validation of Sholkor robot

K A Abzhaparov[1], G E Kuandikova[1], K S Sholanov[2]*

[1]*Satbaev University*
[2]*Karaganda Technical University*

**Corresponding author's e-mail: koli-87@mail.ru*

Abstract

In this paper we have reported results of successful experiences using robot Sholkor. The paper describes a new 6 DOF parallel manipulator named as SHOLKOR with whole moves platform as end-effecter. Main properties of new design are presented in terms of analytical solution for direct kinematics and efficient force control of platform actions. Due to those properties, the proposed design can be used as an active support in protecting machines, buildings and other structures from undue impacts. The model was validated by comparing simulation and experimental results. The results show a reasonable correlation and show the interest for this application of robot Sholkor.

Keywords: parallel manipulators, hydraulic actuator, experimental tests

1 Introduction

A plenty of platform type robots are currently used in various fields. Such robots have the structure topology similar to one of the Gough-Stewart platform [1-2]. Advantages of these robots are generally known. However, in the majority of platform type robots with more than 3 degrees of freedom, variable coordinates of the movable platform are interrelated with each other so that a movement of any drive requires simultaneous coordinated movement in the other drives connecting the platforms. There is not apparent solution of the direct kinematic problem for manipulators of such platform type robots [2-4]. Therefore, certain issues are encountered when creating control systems, as well as during their operation, since failure in one drive results in inoperability of the entire robot.

To improve functionality of the parallel manipulators of a platform type robot was offered a new structure topology of the parallel manipulator [5]. Such robot consists of two platforms connected with six connecting links (CL), which allow linear movements.

A sudden mechanical impact shall be viewed as a force or kinematic impact, which results in unwanted effects. To sudden mechanical impacts we can include large-scale earth pulsations in different planes during earthquakes, fluctuations of water surface affecting floating crafts, strokes during landing of the aircrafts, etc. The necessity to protect from sudden mechanical impacts, including vibrations, appears to be especially urgent for vehicle drives and passengers. The above review of the previous scientific researches proves that the idea to use parallel manipulators as active supports is substantially new.

2 Example of the active support application as a seismic isolation device

Using the experimental device, it was confirmed that the robot can be used as a seismic isolation device. Technical essence of the robot application as a seismic isolation device is that at any time by controlling the pressure in the hydraulic cylinder cavity it is possible to ensure equilibrium of forces acting on the upper platform and reaction forces of connecting links, i.e. relative stillness of the upper platform. The bottom platform can make non-standard motion (spatial variations of the earth's surface crust).

Some parallel manipulators depends on the construction area. Calculations for the first option of the combined system, as per bearing capacity, by average values in the hydraulic system of 35 bars and piston diameter of 250 mm show that one parallel manipulators installed for every 220 sq.m. of the building area. The practice shows that approximate weight of 1 sq.m. of the building is ten kN. There are a lot of areas in which the use of active supports is of vital necessity.

3 Control system of hydraulic actuators

Dissipation mechanism of sudden mechanical impacts based on the fact, that at any given time, by controlling the pressure in the upper enclosure of six hydro cylinders can be achieved the equilibration forces, acting on the upper platform, i.e. stationary upper platform, while when the lower platform can perform unwanted movements, together with the source of mechanical impacts. In this connection the control system of each hydraulic drive should automatically provide the necessary pressure in the cylinder above the piston enclosure of hydraulic actuator.

To automate the robot's operation as an active support, has been designed the control system (CS). Its functional block scheme is shown in Figure 1. The following symbols is used in Figure 1: IC- industrial controller; MS – movement sensor; SS – strain-gage sensor; PS – pressure sensor; NO – normally opened delivery valve, NC – normally closed bleeder valve. The control system CS acts as follows: signal from the movement sensor and from strain-gage sensor is received by the industrial controller on a real time basis. CS acts as follows: the signal from the SS and from PS in real time goes on IC. On an existing algorithm IC determines the necessary pressure PN in the cavities of the cylinders to balance of the working power. IC compares that pressure with the actual pressure of above the piston cavity of the hydraulic cylinder PA, according to data from the detector PS and as a result generates a control signal which is fed to one of the valves. Thus, if PA > PN, then is opened the bleeder valve NC, and the delivery is closed; if on the contrary, to open the delivery valve and the bleeder is closed. In the case where the pressure is equal to PA=RN, then the condition of the valves does not change. In the case when the rod is in its extreme uppermost position or the lowermost position, the valve position can be changed only in a certain way or don't change. In IC there is a program to prevent the possible collision of the piston with the case when reaching the end position. The source for this program are the signals from the movement sensors MS.

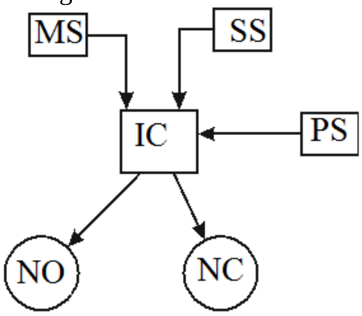


FIGURE 1 Function block scheme of the control system

4 Experimental validation

In order to validate the model developed, the programmed, performed and simulated paths of the end effector are compared. Thus, using of direct kinematics solution the configuration of the platform can be computed. As an example, on the basis of obtained algorithm using Matlab made calculations and diagrams were constructed for translational and spherical motion.

The experimental device, consisting of the platform robot prototype was created to test the efficiency of the active support and its control system. Sensors of the movement were installed in the initial situation when rods are in a starting position. Using force sensors and sensors of pressure values of the efforts operating on a rod and pressure in working cavities of hydraulic cylinders were defined. The controller processed these values and used by the program of the managing director of the parallel manipulator. Then, according to the set sequence, the control unit exercised to control the movement of a platform of the parallel manipulator. The controller processed the received data from the information and measuring system according to the set program, and the graphs of the dependence of movement of a rod and pressure in a hydraulic cylinder of the drain valve were displayed on the SCADA monitor.

5 Conclusion

Based on the new structure topology and application of the multilink spherical joint, has been created the current model of a new platform type robot with six degrees of freedom. Based on the working model, as well as solution of the direct kinematic problem, it has been proved that the new robot has a number of material advantages versus the Gough-Stewart platforms. First, each of the six drives can move independently on the others. Second, by changing in a specified way the lengths with drivers of a certain set of connecting links, it is possible to obtain any desired spatial position of the movable platform with regards to the stationary one. Third, the structure topology of the new platform type manipulator ensures solution of direct kinematic problems. Due to the said properties and capabilities, this platform type robot can be used as an active controllable support, that to be installed between the protected item and source of the sudden mechanical impacts.

References

[1] Stewart D A 1965 Platform with six degrees of freedom *Proceedings of the Institution of Mechanical Engineers. London* **180**(15) 371-85
[2] Dasgupta B, Mruthyunjaya T S 2000 The Stewart platform manipulator: a review *Mechanism and Machine Theory* **35** 15-40
[3] Merlet J P 2006 *Parallel Robots* Springer Publishers, Dordrecht
[4] Angeles J 2002 *Fundamentals of Robotic Mechanical Systems: Theory, Methods and Algorithms* (Second Ed.) Springer pp. 520
[5] Sholanov K S 2015 *Platform robot manipulator* WO/2015/016692/ 5.02.2015
[6] Sholanov K S, Abzhaparov K A, Zhumasheva Zh T, Ceccarelli M A 2016 New parallel manipulator hydraulically actuated, JoMaC *International Journal of Mechanics and Control* **17**(1) 49-58 ISNN 1590-8844

Establishment and research of robot system model in production process of magnesium ingot

Nursara Tursyngali* , Mukhit Baibatshayev

Institute of information and telecommunication technologies, The Kazakh National Research Technical University after K.I.Satpaev, 050013, Satpayev Street, 22a, Almaty city, Republic of Kazakhstan

**Corresponding author's e-mail: nur.sara@mail.ru*


Abstract

Magnesium Ingot is a new type of lightweight, corrosion-resistant metallic material with low specific weight, high strength per unit weight, and superior chemical stability. It is widely used in automotive, light industry, metallurgical, chemical, electronics and instrument manufacturing industries. Since the automation of the magnesium ingot process is a promising project. Compared with the prior technology, the technology of pouring liquid magnesium on a foundry conveyor of the present invention has a high degree of automation, reduces pollution, reduces the labour intensity of the workers, and makes the process accurately controlled, and also indirectly improves the product quality.

Keywords: high degree automation, accurately control, product quality

1 Introduction

Metal magnesium is a new type of lightweight and corrosion-resistant metal material that was developed in the 20th century. The application of magnesium is mainly concentrated in the four major fields of magnesium alloy production, aluminium alloy production, steelmaking desulfurization, and aviation industry. It is widely used in automobile manufacturing and light industry, metallurgical industry, chemical industry, electronic industry and instrument manufacturing. The superior performance and beautiful appearance of magnesium alloys are favored by manufacturers such as computers, home appliances, and mobile phones.

It has the advantages of low specific gravity, high unit weight strength, and high chemical stability, which makes the aluminum-magnesium alloy and its magnesium castings highly favored, and the metal magnesium industry has developed rapidly. Therefore, the requirements for the automation degree of the magnesium ingot production system have been increasing with the increasing demand for magnesium ingots by various companies. On the other hand, the high temperature environment of the smelting system is harmful to the health of the staff.

In order to solve these problems we designed a fully automated magnesium ingot production system, which can finish following three steps automatically without interruption of human:

1) Shoot liquid metal from the trough into the magnesium ingot molds
2) Transport the filled magnesium ingot mold
3) Stack magnesium ingots

In addition to these operations in the existing technology, the operator also manually manages the flow rate of the liquid metal stream entering the molds by changing the slope of the crucible.

2 Overview

This fully automated system improves the production efficiency of magnesium ingots and avoids workers from being exposed to harsh environments, as well as avoids foaming in the ingots by adjusting the height and inclination of the trough to improve product quality.

At the same time this system has some drawbacks as complex, expensive and high unemployment rate.

3 Decision

This highly automated system can be used in our smelting plants. Shooting liquid metal from the trough into the magnesium ingot molds, transporting the filled magnesium ingot mold and stacking magnesium ingots are realized synchronously, therefore, save time and increase production efficiency. The system has its blades for drainage, which can prevent the metal liquid from spilling out of the mold, to save resources. I believe that these smelting plants improve or perfect their production lines by implementing this highly automated system.

4 Conclusion

The automation of production processes is the most pronounced trend that is gaining popularity in most smelting plants and corporations. This is because of low human labor and high production efficiency.

The system in this work will meet market demands popularly. The organizations can reach their target by implementing this full automated pouring liquid magnesium on a foundry conveyor technology.

References

[1] Vostokov O K 1980 Device for pouring metals and alloys into molds *USSR Bulletin* **38**
[2] Beletsky G V, Rybin A V, Petukhov G A, Zlobin E C 1981 Device for pouring metals into molds *USSR Bulletin* **34**
[3] Baibatshayev M Sh, Beisembayev A A, Kurmashiv N M, Kolomiytsev A V, Konysbekov M K, Ryzhov V G 1986 A device for transferring a stream of metal into molds on a casting conveyor *USSR Bulletin* **23**
[4] Baibatshayev M Sh, Beisembayev A A 1994 Device for pouring metal into molds on a casting conveyor *KZ Bulletin* **3**

Research and modeling of ZigBee wireless sensor networks characteristics, based on OPNET Modeler 14.5 application software package

Sandugash Orazalieva[1]* , Tatyana Golubeva[1], Gulbahar Yussupova[2], Muborak Yakubova[1]

[1]*Almaty University of Power Engineering and Telecommunications Kazakhstan*
[2]*Kazakh National Technical Research University after K.I.Satpaev Kazakhstan*

**Corresponding author's e-mail: orazalieva-sandugash@mail.ru*

Abstract

Analysis of routing organization methods, ZigBee technology, simulation based on use of OPNET Modeler 14.5 application software package.

Keywords: wireless networks, ZigBee, modeling, application programs.

1 Introduction

In variety of industries there is a need to create wireless networks with different number of sensors and actuators, where low data rates are required, but stability (self-recovery), reliability, ease of deployment and operation are at the forefront.

The work goal is to analyze various methods of routing organization and the use of simulation to determine the characteristics of ZigBee networks with 802.15.4 standard.

2 Overview

ZigBee technology is beginning to be widely used in practice to create wireless sensor networks, building automation systems, automatic meter reading devices, security systems, control systems in the industry etc [1, 2].

3 Decision

In this paper we are taking a look at basic technologies for routing ZigBee networks with 802.15.4 standard. Also comparative analysis of various routing technologies has been performed.

Figure 1 shows the simulation method on Opnet Modeler 14.5 for determining network characteristics: the speed, the memory that is required for the load transfer, the delay value and the average and current values of the load upon data transfer over the network.

Simulation results on the graphs, which include traffic, delay and load, shows that the network as a whole works steadily in the process of continuing the model time.

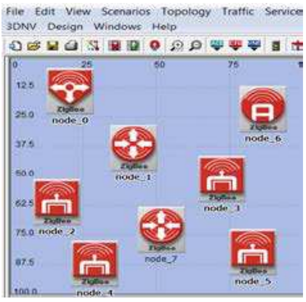


FIGURE 1 Simulation of ZigBee network with two routers

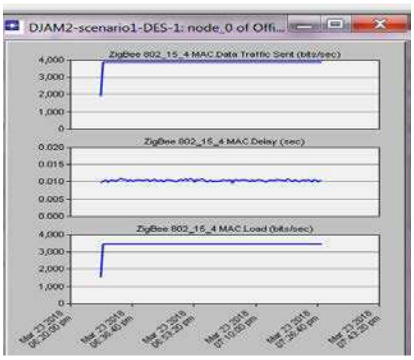


FIGURE 2 The simulation results with two routers in the network

4 Conclusion

Simulation performed in the ZigBee network based on Opnet Modeler 14.5 shows that when the network expands, the load values and the occupied memory change, but the delays remain constant in magnitude during the model time changing.

After some time, the network works steadily and its parameters remain almost unmodified.

References

[1] Drew Gislason 2008 ZigBee Wireless Networking Newnes
[2] Zub M A, Krasichkov A A 2009 Metodika postroyeniya dinamicheskikh setey na baze tekhnologii ZigBee standarta 802.15.4. Sbornik mezhdunarodnoy konferentsii «Informatika i komp'yuternyye tekhnologii 2009» DonNTU (In Russian)

Research of the features of biometric characteristics of phonemes of the Kazakh language

Liazzat B Ilipbayeva, Dana Zh Utebayeva*, Ulzhalgas O Seidaliyeva

Satpayev University, 22 a, Satpayev str., Almaty, RK

**Corresponding author's e-mail: donika.joldybay@gmail.com*

Abstract

Nowadays, biometric features are actively used in many areas related to ensuring the security of access to information and in the tasks of unique identity identification. As well as, it is well-known that the study of the biometric properties of the phonemes is an important factor in speech recognition, speech protection and determining the accent features of language. The use area of speech recognition and the definition of accentual features of languages will be continuously expanded in the near future in connection with both the undoubted convenience for the user of voice commands and with the progress in the accuracy of speech recognition. Thereby, broad study of the biometric characteristics of Kazakh phonemes is becoming increasingly important.

In this article, we will consider researching of the features of biometric characteristics of phonemes of the Kazakh language.

Key words: speech-processing, phonemes, biometric characteristics of phonemes, pitch and formants

1 Introduction

In recent years, the main trend in researching is in the field of speech recognition. The development of modern speech technologies goes towards implementing a full cycle of learning speech recognition systems with biometric characteristics to determine the accentual features of languages. In addition, the biometric technologies in the near future will play a major role in the issues of personal identification in many areas. Moreover, the use of biometric technologies are varied: access to jobs, and network resources, data protection, access to certain resources and security.

Development of high-precision speech understanding technologies is necessary not only for speech recognition and for translating it into text, also to understand the content of the conversation in order to answer questions and maintain a dialogue. This technology has been developed for many languages such as English, Russian, Spanish, German and etc., but not for Kazakh language. In this article, we started our research from the part which has considered the biometric characteristics of phonemes of the Kazakh language. The study of the biometric features of phonemes is the fundamental beginning of speech recognition.

2 Biometric features of speech

It is known that, by the biometric features of speech is implied pitch frequency, fundamental frequency, formants, step period and so on.

For speech recognition, speaker verification, speech synthesis, etc., one must extract the features of the speech segment such as fundamental frequency, formants, linear predictive coefficients (LPC), mel frequency cepstral coefficients (MFCCs), cepstral coefficients, line spectral pairs, 2-D and 3-D spectrogram. There are some time-domain features and some transform-domain features, such as frequency domain, cepstral domain, wavelet domain, discrete cosine transform (DCT) domain amd so on [2].

We will mainly consider fundamental frequency, formants, introduction to LPC and its relation to formants and the measurements of fundamental frequency and formants of phonemes of Kazakh language in this study. It has been studied pitch and formant measurements in time domain, frequency domain, spectrum domain and cepstral domain.

Voiced speech is generated when the excitation comes from a periodic pulse train generated by vocal cords. These vocal cords vibrate with their natural frequency of vibration like a tuning fork and generate pulses at regular intervals. We can extract the parameters related to vocal tract, functioning as a circular waveguide are formants, LPC, etc [2].

A speech signal consists of different frequencies, which are harmonically related to each other in the form of a series. The lowest frequency of this harmonic series is known as the fundamental frequency or pitch frequency. Pitch frequency is the fundamental frequency of vibrations of the vocal cords. This frequency generated by vocal cords in the form of the filter to produce a speech signal. Thus, speech is basically a convolved signal [2].

In the Kazakh language there are 37 phonemes, 12 of them are vowels and 25 are consonants. Specific phonemes of the Kazakh language: ә, і, ө, ү, ұ, ң, ғ, қ, һ. By the program Matlab and Praat it was studied and obtained biometric features of phonemes of the Kazakh language. It has been done speech analysis by fundamental frequency, formants, LPC coefficients and its relation to formants and the measurements of fundamental frequency of phonemes of the Kazakh language.

These biometric characteristics is the fundamental beginning of speech synthesis and speech recognition.

So, by the biometric characteristics of phonemes, fundamentals of recognition systems that require preliminary training for Kazakh phonemes were considered, as well as those capable of recognizing the voice of the announcer.

3 Conclusion

In this study, we considered performing independent researches in the field of speech recognition and synthesis. It was carried out the study for fundamental frequency, formants, pitch frequencies of phonemes, oscillographic and spectral studies of speech signals, and a specialized system of speech analysis of the Kazak language.

References

[1] Jayan A R 2016 *Speech and Audio Signal Processing* Delhi1 10092 68

[2] Shaila Dr, Apte D 2017 *Speech and Audio Processing* Delhi **37**

Functional structure of autonomous intelligent agent

Stefan Varbanov[1], Yuriy Dyachenko[2*], Inna Skarga-Bandurova[2]

[1]*"Konstantin Preslavsky" University of Shumen, 115 Universitetska str., 9712, Shumen, Bulgaria*
[2]*Volodymyr Dahl East Ukrainian National University, 59a Tsentral'nyi, Severodonetsk, 93406, Ukraine*

**Corresponding author's e-mail: yuriy.y.dyachenko@gmail.com*

Abstract

We develop the requirements for the cognitive architecture of autonomous intelligent agent that could be grounds for the creation of general artificial intelligence. We consider intelligence that embodied in an autonomous intelligent agent as an entity that could perform cognitive actions without its predetermined sequence. We suppose that intelligence is an emergent property of a system which manifested in actions formed on the base of self-referential meaningful processing of information. One of the realizations of cognitive architecture of autonomous intelligent agent is an artificial neural network with a feedback loop in the meaningful processing of information. As a promising area of further researches, we see the reproducing of permanent plasticity of natural neural networks that particularly formed semantically through meaningful processing of information.

Keywords: cognitive architecture, artificial intelligence, autonomous intelligent agent, self-referencing, meaningful processing of information, systems theory, feedback loop

1 Introduction

Spectacular progress has allowed intelligent and cognitive technologies to take giant steps in partial acquiring of human abilities in working [1, 2] and teaching [3]. But up to now, we can't create the autonomous human-like cognitive system. We intend to solve the problem of modeling of natural intelligence. In this field we distinct problem of creating of the autonomous cognitive agent. Here we used term agent for an entity that pursues its goals by interacting with an external and internal environment. The ultimate goal of research in cognitive architectures is to achieve human-level artificial intelligence (AI) [4]. In this paper, we plan to investigate roots of intelligent behavior in metaphysics, systems theory [5], informatics and cognitive science to create cognitive architecture. On basis of this architecture, we develop ways to implement this outlines as the autonomous intelligent agent.

2 Overview

According to the factor of subjectivity, the living system is able to accumulate in its brain information estimated as biologically significantly meaningful and to use it effectively in the future [6].

We define meaning as a relationship between internal and external semantic spaces. We suppose that meaning is the instrument for the formalization of subjectivity. In this approach meaning is the reflection of subjective estimation of the environment. We make a conclusion about meaning as the result of acting of subjective evaluation of information. Therefore, intelligence is an emergent property of the system in the world which manifested in actions (affecting) formed on the base of meaning. Thus, the first condition of autonomous activity of intelligent agent is a meaning.

In addition to sequential processing of feedforward signals, information in mind processed involving feedbacks to influence sources of signals to adjust processing. Thus, second condition of autonomous activity of intelligent agent is self-reference of intelligence.

So we stated that central condition for the indeterminate activity of intelligence is self-reference of intelligence as consideration of itself as a meaningful model. What are the ways of the embodiment of autonomous intelligent agent based on this condition?

3 Decision

Based on information processing nature of subjective experience we suppose that self-referential meaningful processing of information is a key feature of intelligence. So, development of autonomous intelligent agent is impossible without the acquisition of self-awareness as self-referencing of intelligence due to consideration of itself as a meaningful model.

The physical realization of autonomous intelligent agent we saw as based on artificial neural networks (ANN) with a feedback loop in the meaningful processing of information. Whereas traditional computing is based on pre-determined logical reasoning, ANN represents evolution-based reasoning after learning. ANNs are related to cognitive modeling because in human brain cognition emerges from the activity of neural networks that carry information from one cell assembly or brain region to another. Earlier we distinguished two features of the proposed core of cognitive architecture: 1) self-referential loop in 2) processing of meaning. Based on this we propose the realization of cognitive architecture of autonomous intelligent agent.

In this scheme, artificial cognitive functions realized through observing and modeling [7]. Observing ANN acquired external information from the environment as input and produced perceptions as interpretations of sensory information and recognize symbols from external symbolical system. In Modelling ANN experience and concepts as models formed and memorized on the basis of Observing ANN output with feedback that change Observing ANN through learning. On the basis of internal concepts from artificial cognition and external symbols in Self-referential ANN formed meaningful actions as output. In this scheme we suppose arrows as 1) informational influence on ANN; 2) structural and parametric influence on ANN such as neural plasticity in natural neural nets.

One of most prominent approach to deal with meanings could be based on Eliasmith's semantic pointers as neural representations that carry partial semantic content and are composable into the representational structures necessary to support complex cognition [8]. We suppose that one of possible operating with meanings in the artificial system can be provided by computing of vector representations.

We saw a possibility to check the abilities of the proposed core of cognitive architecture in the software package for simulating large-scale neural systems Nengo that helps implement complex high-level cognitive algorithms. For this we need to estimate the scale of ANN that needs to operate with a meaning of self in the self-referential loop.

Another challenge is a static character of ANN in comparison with natural neural networks. In modern paradigm, ANN is running with a fixed structure and the weights of the interactions between the neurons after training. But for autonomous activity, natural neural networks realize the permanent plasticity that semantically formed through meaningful processing of information. To acquire it we have to manage both information flows and changes (structural and parametric) in ANN.

4 Conclusion

General AI needs to prove himself through autonomous intelligent activity based on analysis of environment and its meaning in it. This implemented as a cognitive architecture of autonomous intelligent agent through self-referential meaningful processing of information. This core of cognitive architecture could be embodied in the artificial system through using of ANN with a feedback loop in the processing of meanings.

Acknowledgements

The publishing of this thesis was possible thanks to the support of the Episkop Konstantin Preslavsky University of Shumen (Bulgaria) and its program of the development of the research project: RD-08-104/02.02.18 „Applied models of artificial intelligence for data analysis and optimization of administrative systems“.

References

[1] Nenkov N, Dimitrov G, Dyachenko Y, Koeva K 2016. Artificial intelligence technologies for personnel learning management systems *2016 IEEE 8th international conference on intelligent systems* 189–95

[2] Nenkov N, Varbanov S 2016 Application of intelligent business system within the administrative information system for complex services *International Journal of Innovative Technologies in Economy* April 2016 **2**(4) 10-3

[3] Nenkov N, Dyachenko Y, Petrova M, Bondarenko G, Pustovit V 2017 Intelligent and Cognitive Technologies in Education of International Economic Relations Students and Human Resource Development in Enterprises: Methodology in Language *European Journal of Sustainable Development* **6**(4) 353-60

[4] Kotseruba I, Gonzalez O, Tsotsos J 2016 A Review of 40 Years of Cognitive Architecture Research: Focus on Perception, Attention, Learning and Applications. *The Computing Research Repository*

[5] Luhmann N 1995 *Social Systems*. Stanford University Press: Stanford

[6] Soloviov O, Soloviov S 2009 On crucial dissimilarities of determinism in informational networks of the human brain and computers *Shtuchnyi Intelekt* **3** 11-22

[7] Nenkov N V 2016 Project solutions Models and Algorithms in Artificial Intelligence *Balkan and Near Eastern Journal of Social Sciences* **2**(3) 64-6

[8] Eliasmith C 2013 *How to Build a Brain: A Neural Architecture for Biological Cognition* New York, NY: Oxford University Press

Software realization of the BLIF to EDIF file converter

Viktors Gopejenko[1, 2*], Siarhei Fedziukovich[1]

[1]ISMA University, Riga, Latvia
[2]Ventspils University College, Ventspils, Latvia

**Corresponding author's e-mail: viktors.gopejenko@isma.lv*

Abstract

BLIF format and XILINX (ISE Design Suite 14.7) development environment have been used to present asynchronous schemes. Taking into account that XILINX supports VHDL/Verilog, EDIF, Schematic and NCD file formats BLIF to EDIF converter has been developed. The description of the software application realization for the BLIF to EDIF file format conversion is provided.

Keywords: BLIF, EDIF, file format converter, XILINX

1 Introduction

It was necessary to develop the software for the conversion of the scheme description formats in order to simplify the workflow and the communications both for the engineers and researches working in the field of research and development of the integrated chips. BLIF to EDIF conversion realization has been planned for the first version of the software application.

BLIF (Berkeley Logic Interchange Format) format is used to describe the hierarchic schemes on the logical level in the text form. A scheme is an arbitrary combinational or sequential logical network. Boolean function describing the calculations of the value of the only output of the element is given for each combinational element [1].

EDIF (Electronic Design Interchange Format) is a neutral format which contains the electronic schemes and the list of the connections. This is one of the first attempts to create the neutral format for the data exchange for the electronic automatization of the designing. The goal has been to create a common format as opposed to the proprietary formats [2]. It was expected that with the EDIF implementation the number of the required translators should be decreased to the number of the considered systems.

Both formats are well established and are extensively used in their specialized areas.

2 Realization

The decision to develop the following high-level algorithm has been made:

1. To develop and realize the software model of the BLIF and EDIF formats
2. To realize the algorithm of the software model format transformation
3. To realize the parser of the initial BLIF-code for its transformation into the software BLIF model
4. To realize the transformation algorithm of the EDIF model into EDIF text file.

It is possible to isolated unnecessary but always required step to add the user interface.

The development of the application is based on the domain driven approach. Domain driven design (DDD) is a set of the principles and schemes that help the developers to create elegant object systems. If used correctly it leads to the creation of the software abstractions that are called the models of the domain areas. A complex business logic that eliminates the space between the real conditions of the area of the product application and the code is included in this model.

It is not possible to get all values that it is necessary to add to the resulting EDIF file from the initial BLIF code/model. The mechanism for the user interaction has been developed to get the missing data.

In the framework of the initial BLIF code transformation realization to the software model the algorithm for the INIT attribute calculation. It was deceived to isolate the given functional into the separate routine. The given routine allows the user to calculate INIT values for the given BLIF and output them into the separate INIT format file.

Given work describes the software realization of the BLIF to EDIF file format conversion. The developed software application has received positive reviews from the researchers of the integrated chips. The further development of the given product can be the expansion of the supported formats to satisfy the demands of more researchers and engineers.

Acknowledgments

This work is supported by ERAF Project „Methods and Tools for the Design in Reconfigurable Environment" Nr. 1.1.1.1/16/A/234.

References

[1] Sentovich E M, et al. 1992 Sis: A system for sequential circuit synthesis: technical report UCB/ERL M92/41, EECS Department / E-resource: University of California, Berkeley – https://www.eecs.berkeley.edu/Pubs/TechRpts/1992/2010.html – Date of access: 11.11.2016

[2] EDIF (Electronic Design Interchange Format - https://en.wikipedia.org/wiki/EDIF

Development of virtual infrastructure for "Believe IT" company using Microsoft Hyper-V

Artis Pūciņš[1], Viktors Gopejenko[1, 2*]

[1]ISMA University, Riga, Latvia
[2]Ventspils University College, Ventspils, Latvia

**Corresponding author's e-mail: viktors.gopejenko@isma.lv*

Abstract

Today, a virtual environment is becoming more pressing and increasingly used, the use of virtual infrastructure in companies has become very popular. Employees are becoming more mobile because they are not linked to the workplace if virtual infrastructure is used. The main thing for a user is to have a device that can connect to a virtual workstation created on the server. Virtual workstation is created on the server with assigned resources and operating system. The use of these virtual workstations also increases data security because all data is on the server, rather than for example, on a portable computer that can be stolen, lost or destroyed. The company also benefits from reducing the need of many physical resources. With the creation of the virtual infrastructure, it is possible to combine several virtual servers on the single physical server as well as multiple virtual workstations. Virtual infrastructure can be created with the tools designed by different companies.

Keywords: Microsoft Hyper-V, virtual environment

1 Introduction

Today virtual environment is a day-to-day ingredient. One way to operate a virtual infrastructure for a company is to assign a virtual workstation to each employee, where one can connect to one of the remote desktop programs via VPN, and without any problems connecting to the virtual workstation from the computer, tablet or even a smartphone. It is also possible to create virtual servers by combining them into one physical server, reducing use of host resources (room, electricity, number of physical servers.

2 Overview

This work is aimed at improving and optimising the use of physical infrastructure by creating a virtual infrastructure by sticking to the following:

- Analysis of existing infrastructure
- Creation of a virtual infrastructure concept
- Analysis of Hyper-V virtualization program
- Cost analysis
- Creation of virtual infrastructure

3 Decision

Only the physical infrastructure is created in "Believe IT" company. Employees can only access the company's internal resources (network drives, e-mail, intranet and systems from their workplaces. The purpose of the virtual infrastructure is to provide the possibility to work from home or any other place where it is possible to connect to the Internet via employee's device. It is also possible to optimize the server hall, combining multiple servers into one, freeing up space, as well as reducing power consumption.

4 Conclusion

The use of virtual infrastructure is gaining popularity both in the small and large companies taking into account the possibility of saving resources, increasing the data security and reducing the costs.

Data storage systems as the company's operating efficiency tool

Viktors Gopejenko[1, 2*], Maksims Smolakovs[1]

[1]ISMA University, Latvia
[2]Ventspils University College, Ventspils, Latvia

**Corresponding author's e-mail: viktors.gopejenko@isma.lv*

Abstract

The modern IT infrastructure, as well as information as a strategic business asset, means that more and more businesses are turning to storage service providers. However, government organizations and state agencies cannot always use these services, so they are purchasing and maintaining their own systems. Selecting the right storage solution based on needs of the agencies can be a complex process due to government procurement regulations. Therefore, they are trying to use electronic procurement system.

Keywords: data storage systems, performance, electronic procurement system

1 Introduction

Modern businesses are creating more data than ever before. Customer records, transactional data, and website analytics are just a few of the list that businesses may use every day to promote and sell their products. This endlessly increasing volume of data has created a need for storage solutions that meet a variety of requirements such as security, accessibility, and scalability.

The data storage system is a complex of software and hardware designed to manage and organize the reliable storage for large amounts of information, and fault-tolerant high-performance servers to access the storage devices. The best way to select the appropriate storage solution is to establish a precise and detailed list of requirements. The most important criteria for such choice are:

- Performance (MB/sec, IOPS, RPM, etc.)
- Desired RAID level(s)
- Raw capacity versus useable capacity
- The number of the host connections
- The number of the storage partitions
- Specific OS support
- Reliability, availability, serviceability (RAS)
- Amount of memory cache
- Specific features (such as Snapshots, remote replication, etc.)

The next factor we should consider when choosing a storage solution is the storage type. SANs typically utilizes Fibre Channel connectivity, while NAS solutions typically use TCP/IP networks, such as the Ethernet. But the real difference is how the data is accessed. SAN accesses the data as blocks, while NAS accesses the data as files. Finally, we need to consider the cost of the data storage solution. We often know our budget limits and can easily tell if something is in our price range in IT. Planning and implementing the storage solution takes a lot of time and effort. There is no one universal solution to finding and figuring out what storage is going to meet most of company's needs. Taking the factors mentioned above into consideration will help us to pinpoint which vendor has the closest match for data storage requirements

2 Overview

This work provides guidelines on the criteria for selecting the data storage choices enabling the administrators and business managers to make a well-thought decision. Additionally, different types of storage systems, storage networking technologies as well as concepts related to storage security and storage management were analyzed.

3 Conclusion

The existing data storage system at the State agency does not satisfy the needs and requirements for storing and collecting information on services provided to clients. After detailed requirements collecting and electronic procurement system exploring, the decision was made.

Considering the correlation between the functionality, the price, and the quality the EMC Unity 300 Hybrid data storage system has been chosen. The EMC Unity provides a solution that meets our current needs and is future proof as well.

References

[1] Marc Farley 2001 Building Storage Networks second edition
[2] EMC Information storage and Management (Second Edition) EMC Education Services, Wiley 2009
[3] Vvedenije v sistemy hranenija https://habrahabr.ru/company/dellemc/blog/125828/ *(in Russian)*

Building and virtualization a failover cluster of servers in a logistics company

Aleksejs Djukarevs, Alexander Mrochko*

ISMA University, Riga, Latvia

**Corresponding authors e-mail: aleksandrs.mrocko@isma.lv*

Abstract

Information technology today is an integral part of doing business. Not only computing power is developing, but software systems that help to effectively manage complex corporate information infrastructure. New approaches are emerging for organizing, distributing and managing the resources of computing centers. One of the most modern approaches to the organization of the corporate information infrastructure is the virtualization of computing systems.

Keywords: Information technology, information system, private virtual network, virtual machine.

1 Introduction

Virtualization is the process of creating a software representation of something as opposed to its physical implementation. For companies of all sizes, this is an effective way to reduce costs for the IT infrastructure with the ability to improve efficiency and adaptability. Virtualization can be used for applications, servers, storage systems and networks.

When building and virtualizing a failover cluster of servers in a logistics company, the following issues should be considered:

- overview of virtualization technologies;
- analysis of the principles of building fault-tolerant high-availability systems;
- analysis of the features of the implementation and configuration of a failover cluster in a particular enterprise.

2 General

Company VMware today is the leader in virtualization technologies. She developed and implemented innovative technology *Vmware vSphere*.

Virtualization platform Vmware vSphere is a complex of software components (Vmotion, Distributed Resource Scheduler, etc.) that allow creating an efficient virtual infrastructure with high flexibility.

One of the main problems of IS construction remains the problem of ensuring their high reliability, the complex indicator of which is the *availability factor* K_a [1]

$K_a = T_0 / (T_0 + T_d)$.

The reliability of technical components of the IS is most often realized by hardware and software. Special software is an essential part of high availability systems. The creation of a cluster of servers also provides a high level of availability, a high degree of scalability and easy administration.

On the *VMware vSphere virtualization platform* can create 2 types of clusters: *High-availability cluster* (HA) and *Distributed Resource Scheduler cluster* (DRS), which are managed using *VMware vCenter*.

High-Availability cluster of servers, focused on maximum reliability, provide minimal downtime (T_d) due to hardware redundancy.

3 Conclusions

Analysis of the available IT resources and software licenses at the logistics enterprise allowed to justify the use of virtualization technology on the *Vmware* platform for improving IS. A fault-tolerant cluster of 3 physical servers united in a single management group was created and the main parameters of the fault tolerance system were configured.

References

[1] Системы высокой готовности и отказоустойчивые системы http://wm-help.net/books-online/book/54998/54998-4.html

Mind-management as a modern management tool for an organization

Lyudmila Shymanovska-Dianych, Tymur Ishcheikin*

Poltava University of Economics and Trade, Ukraine

**Corresponding author's e-mail: ludad 5846@gmail.com*


Abstract

Everyone who is related to management and entrepreneurship has heard about a relatively new direction, "Mind-Management". To be precise, this direction began its development back in the late 1970s. XX century in the UK. However, for the different countries this is a truly new trend, which has not received sufficient attention from the public.

Keywords: mind management, mind maps, project management

1 Introduction

Mind-management is the direction of time-management, therefore, its fundamental goal is to save time resources. And, as is known, time is on a par with human resources the most valuable assets of a modern organization. This trend is the result of globalization, that is, the removal of barriers in the international environment, and, as a result, tougher competition. One of the most popular methods of Mind-Management is the "mind-maps". Mind-maps are a tool that allows: to effectively structure and process information; think, using all of your creative and intellectual potential [1, 2].

Also there are such variants of the translation of the phrase "Mind-maps" as "Mental maps", "Thinking maps", "Maps of the mind" etc. Areas of application of mind-maps are presented in the table 1.

It is believed that the developer and creator of this method is Tony Buzan, a British psychologist and author of techniques for remembering and organizing thinking. His work is aimed at increasing the effectiveness of brain use by optimizing more information [1, 2].

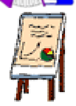
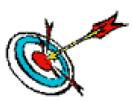
Mind maps is a graphical method that allows to visualize any problem / theme / process, or rather see not only the goal, but its structure, as well as the ways to achieve it.

In fact, this method is an effective completion of brainstorming, a way to quickly solve the problem. Consequently, by means of intelligence cards, the process of goal-setting is simplified, and the efficiency in this case increases.

The construction of mind maps reminds a certain game with a creative beginning, when drawing up maps it is recommended to use illustrations, graphics and bright colors, which in turn helps not only to structure the information, but also to memorize it on a visual level:

- at the first stage it is necessary to determine the central, starting "point" of the map - a fundamental problem; at this stage it is important to clearly set the goal, therefore it is recommended not to ignore SMART criteria (specific, measurable, achievable, relevant, time-bound);
- the next step is to determine the ways to solve the highlighted problem (the "intelligence card" is read clockwise, starting from the upper right corner), that is, we define the tasks;
- the third stage, in fact, is the most "labor-intensive", since it is necessary to define methods for achieving the fundamental goal: there can be a great many of them (that is why it is recommended to use bright colors).

TABLE 1 Applications of mind-maps

	<u>Training:</u> creation of clear and understandable lecture notes maximum return on reading books / textbooks writing essays, course projects, diplomas
	<u>Memorization:</u> preparation for exams remembering lists: what to do / whom to call / ...
	<u>Presentations:</u> you give more information in less time, while you are better understood and remembered business meetings and negotiations
	<u>Planning:</u> time management: plan for the day, week, month, year... development of complex projects: new business
	<u>Brainstorm:</u> generation of new ideas, creativity collective solution of complex problems
	<u>Making decisions</u>: clear vision of all "for" and "against" a more balanced and thoughtful decision

What is this method important for a modern organization? With their help, we can greatly facilitate the performance of such intellectual works as:

- solving problems and non-standard tasks;
- rapid writing of easy-to-understand texts;
- effective training; successful public speaking;
- making decisions;

- task management;
- project management;
- strategic planning;
- monitoring of business processes;
- management of meetings;
- management of corporate knowledge;
- organization of effective team work, including remotely working employees;
- other areas of intellectual activity [3, 4].

Initially, mind-maps were compiled "by hand", the development of the Internet and technological progress did not pass by and the management.

Today, there are a huge number of electronic programs that can be used to build a mind-maps in a shorter time, for example: Bubble.us, Coogle, FreeMind, iMindMap, MAPMYself, Mind42, Mindjet, MindManager, MindMeister, MindNode, Mindomo, Popplet, Realtime Board, Scapple, SimpleMind, SpiderScribe, XMind. However, regardless of the chosen method of constructing mind maps, their effectiveness does not become less: with their help, details are not lost; there is the possibility of making additions and changes at any stage of the method construction; the possibility of making mistakes is reduced.

2 Overview

This work discusses the advantages, disadvantages and conclusions on the following issues:

- role of the Mind-Management in the management of a modern organization
- spheres of application of the Mind-Management
- mind-maps as a tool of the Mind-Management

3 Decision

As an example of the application of the Mind- Management, examples of the development of the mind-maps for visualization and systematization of information will be considered when developing the company's development strategy. Tools of the Mind-Management allow not only to generate a strategy with which key employees agree, but also to launch it into work.

4 Conclusion

The "mind-maps" method is not universal, but simplicity and accessibility make it possible to apply it in any sphere of intellectual activity.

"Mind-maps" is an additional method for forecasting and analyzing the external and internal environments of an organization, this is the method by which complex things acquire simplicity, this method allows to convey complete and reliable information to every employee.

References

[1] http://www.tonybuzan.com/about/mind-mapping/
[2] https://cs.wikipedia.org/wiki/Tony_Buzan
[3] Internet Library - http://bookboon.com/
[4] Internet Library - http://www.free-management-ebooks.com/

Technology for creating brand book for the purpose of forming the image of the student government MO KNUE

Anastasiia Khmil*

Simon Kuznets Kharkiv National University of economics, Ukraine

**Corresponding author's e-mail: khmilasya@gmail.com*

Abstract

Practical experience of creating the special brand book of the Youth Organization of the Simon Kuznets Kharkov National University of economics is presented in the thesis. Particular attention is paid to the description of the technology of its development: the terminology is defined, layout rules are taken into account, an example of the structure of the brand book, its special elements - logo, colors and style of design are given.

Keywords: typography, layout design, graphic design

1 Introduction

Today, in the sphere of the development of printing products, there has been the tendency of a widespread use of different types of graphics to improve the visualization of business, government structures for the consumer. One of the most significant printing products, which gives an idea of the company, is the brand book. Most organizations use it to acquaint the consumer with their history, activities, and services. Consider the technology of creating a brand book on the example of a proprietary brochure of the Youth Organization of the Simon Kuznets Kharkov National University of economics (MO Simon Kuznets KHNUE).

2 Decision

Using the example of a set of uniform rules for the use of corporate style, we will consider the technology of creating a brand book for the MO Simon Kuznets KHNUE. Consider the concept of "brandbook", which is understood as the most important strategic document, which contains all the information about the brand: from the description of the concept and philosophy of the enterprise, the positioning strategy and ending with the smallest nuances for creating a corporate identity [2]. This brochure makes it possible to convey the values of the company to the consumer, its history in a simplified version.

To create this type of printing products, it is necessary to take into account the layout rules, style elements (photos, patterns, textures), basic colors, fonts (for headings and main text), develop a modular grid and split the necessary text into sections.

The classic beech brand consists of the following sections:

1. Description of the company (history, departments).
2. Projects / goods / services.
3. Branded products / elements of corporate identity.
4. Souvenir and promotional products.

Before creating a brand book design, you need to determine its technical characteristics. So, for example, the brand book MO of Simon Kuznets KHNUE) is presented in the format 200 mm x 200 mm (up to the cutoff 204 mm x 204 mm), 44 pages, coated paper (gloss), laminated cover, page density: internal pages 130 g / m2; cover of 200 gr / m2; double-sided printing on two staples, circulation 5 pieces.

After defining the technical characteristics of the publication, you need to choose the right software. The standard program for making layout is Adobe InDesign.

The next step in the program is to create a layout (modular grid) edition. Repeated turns of this booklet are divided into 8 columns (one column with two sides (of the field), two columns to the left takes a picture, one column separates the text and the image, the text takes three columns). An example of pages of brand book is shown in image 1 and image 2. Also, the brochure accommodates of the pages with different modular grids.

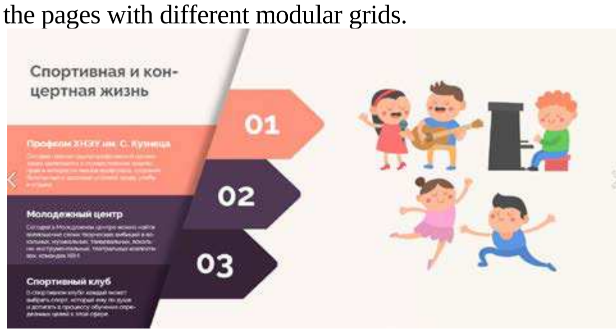


FIGURE 1 An example of brand book pages (description of organization functions)

To make text, it is important to choose a font design. In our example, the two main font Open Sans and Raleway (for titles) has been applied. These fonts are a sans serif, which implies the convenience of reading the text in the electronic version. According to the rules of layout, the main text should be typed in the same font, it is impermissible to change the size of the page on different pages of the book. Also, there should be no "corridors" from the horizontal spaces that coincide horizontally in the adjacent lines.

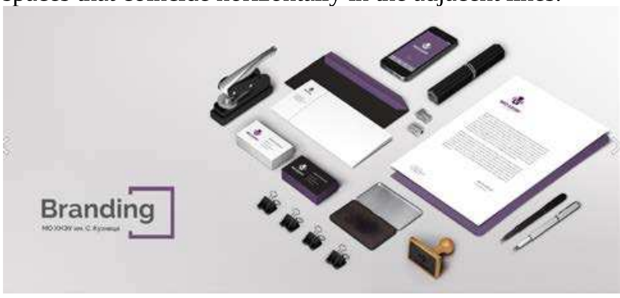


FIGURE 2 An example pages of brand book *(firm products of the company)*

It is important to note that each organization has its own corporate colors. All elements of brand-name products are assigned strictly defined colors. So, in MO of Simon Kuznets KHNUE – it's purple and yellow. Purple color was not chosen by chance, since it attracts attention. The yellow color also has an amazing feature to penetrate into a person's memory. Depending on their shades, yellow color acts on the perception of a person in different ways: the color of the egg yolk is associated with friendship, lemon with insignificance and "acid", golden with power and a sense of superiority [1]. It is important to note that all graphic images that should be placed in the publication affect the overall perception of the brochure. Therefore, photos should be selected in warm colors. For a qualitative representation, they must be converted from the RGB color model to the CMYK color model (for printing).

The technology for creating such a printing product involves not only the selection of fonts, colors and layout rules, but also the choice of style. To create a beech brand, the "memphis" style was chosen, which is popular in 2017-2018. It dates back to the 80s of the 20th century. Its distinctive features are geometric figures (lines, squares, circles, etc.), which are located on the canvas (sheet) in a chaotic order. Also the style is characterized by bright colors and text placement without modular grids. The style of "memphis" symbolizes rebelliousness, going beyond what is a distinctive feature of the youth of the 21st century. An example of a style is shown on the cover (Figure 3).

FIGURE 3 An example of the application of the "memphis" style in the visualization of the cover of the brand book

An integral part of the brand book is the process of creating a logo. The MO of Simon Kuznets KHNUE logo consists of two parts: an icon and a text. The trademark was created by combining the letter "M" and the tower of the university itself. The text was made using the Open Sans Bold and Open Sans Regular font. The color range is invariable - violet and its shades. Also in this section you can see the variations of the placement of the logo (on different backgrounds, company's proprietary products).

As a result of the work done, it can be argued that the brand book is a collection of artistic techniques and technical characteristics that allow creating a single style and character of the organization for presentation to the consumer.

3 Conclusions

Using the above principles and stages of creating a brand book with the aim of creating a single corporate identity, a successful testing was carried out, within which it was possible to create the final proprietary product for the MO of Simon Kuznets KHNUE, which contains all the necessary information for the consumer.

References

[1] Eaton D I 1975 *Porous glass support material* US Patent No. 3 904
[2] *How to develop a brandbook: steps, rules, examples* **E-resource:** https://www.kom-dir.ru/article/1812-brendbuk

Historical trends in the distribution of income and their impact on national labor markets

Hrant Bagratyan*, Ivan Klipa

University of Banking, Kyiv, Ukraine

**Corresponding author's e-mail: hrant.bagratyan@gmail.com*

Abstract

Social inequality in the world over the past 100 years was cyclical. After the two World Wars, a fairly long period of decreasing inequality ensued. However, at the end of the 20th and the beginning of the 21st century, the tendencies toward increasing inequality emerge again. This particularly affects the development of Ukrainian economy, where a high concentration of wealth and a lack of middle class are inhibiting the growth of economy.

1 Introduction

By the end of the 20th century the signs of increasing inequality in the world are becoming evident, the trends of labor integration are clearly superior to the labor division trends, the growth of well-being in general is increasing, but the poverty is not decreasing. The middle class is washed away everywhere and the unemployment rate remains stably high. At the same time, unemployment among women exceeds its level among men. Because of this, the growth rate of the world economy can not be considered satisfactory. In Ukraine, all these issues are becoming more acute. The only exception is that unemployment rate among women is lower than that among men. In general, to accelerate the pace of economic growth, our country will have to make serious adjustments within its social policy and wealth distribution.

2 Overview of the study area

Recently, a lot of fundamental research on the historical trends of inequality has appeared. According to T. Piketti, by 1890 – 1910, in countries such as Great Britain, France and Sweden, 10% of the richest owned all national property: the share of the top decile reached 90%, and one percent of the wealthiest owned more than 50% of all property. "In countries with a particularly high level of inequality, such as the United Kingdom, the share of the top centile even exceeded 60%. At the same time, the intermediate 40% owned slightly more than 5% of the national property (from 5 to 10%, depending on the country), that is, almost the same amount of property as the poor, which then, just as today, owned less than 5 %. The "Malthusian era" is over. The rapid growth of the economy, and subsequently growth of incomes, began. Though initially, it was very uneven among various strata of the population. In other words, the middle class did not exist, because the intermediate 40% were almost as poor in property terms as the 50% of the poorest"[1].

However, in the literature this point of view is not supported by other famous economists. G. Klark believes that the industrial revolution has reduced inequality in incomes within society. But the inequality between societies has increased due to the industrial revolution [2]. Most likely, as it seems to us, there are no contradictions here: Clark talks about the industrial revolution period as a whole, while Picketti describes its initial stage.

But at the end of the 19th and the beginning of the 20th century, a century-old inequality stabilized, and after WWI it began to decline. At the same time, in the post-war years, economic growth rates have declined. In the conditions of permanently growing salaries, the growth of the economy did not happen due to the expansion of demand. By the way, in the post-war period there was a sharp jump in inflation, while in Germany it came to hyperinflation. Inequality has declined and the revolutionary wave in most European countries and the US has faded. Nevertheless, the increase in consumption, the reduction of accumulation, the mass distribution of shares among the population hindered investments in the real sector of the economy and, soon, the global economic crisis erupted.

After the crisis, inequality began to decline again, while World War II, which soon erupted, triggered a new wave of inequality reduction and income increase for workers and low-paid employees. This continued until the 80's of the 20th century. Since the end of the last century and until now, according to many researchers (P. Krugman, T. Picketti, G. Clarke, E. Libanova), the inequality began to grow again, despite the fact that, according to the Gini coefficient, everything looks normal. However, it is obvious that WB data on the Gini coefficient do not meet modern requirements: in particular, the distribution of the population into quintiles actually distorts inequality, creates the illusion of well-being.

Recently, many reputed organizations are increasingly resorting to the measure of wealth in their inter-country and inter-regional comparisons of well-being. Thus, *Global Wealth*, which is a research institution of the Swiss *Credit Suisse* bank and is currently considered the most authoritative in the world, refers to wealth only free unencumbered assets, those which can be invested. It is easy to see that unlike the World Bank and other organizations, *Global Wealth* does not include in its measure of wealth elements of consumption (as the WB does in calculating the Gini coefficient), but only those elements that can be used to "produce" new wealth. So, according to these data for the last year (mid-2016 – mid-2017), the cumulative well-being index of the Earth increased by 6.4% and reached 280 trillion dollars (for 2007 – 2017 this increase was 27%). Half of the world's wealth (50.1%) is owned by only 1% of the population (the figure has returned to the level present at the end of the 19th century). This suggests that at the present time and, apparently, in the next decade, the share of rich people and big business in the structure of investments in creating new elements of human and fixed capital will be much larger than their share in GDP production. All over the world, the share of the population with an income of less than 10 thousand dollars per year is 70%, with income of 10 to 100 thousand dollars – 20%, with income of 100 to 1,000 thousand dollars – 8% and, finally, with more than 1 million dollars – 0,1%. Similar figures for post-Soviet countries (including Ukraine) are 82%; 16.6%; 1.3% and 0.01% [3]. It is quite obvious that in the next decade the polarization of consumption in favor of the rich will increase. There is no basis for optimistic hopes on an account of the middle class. Even worse is the outlook for Ukraine and other post-Soviet states, if the macroeconomic policies of the governments of these countries do not turn resolutely towards the small and medium-sized businesses and if the share of self-employed population does not increase. Along with the mentioned trends in the distribution of wealth, European integration will present new challenges to the Ukrainian labor market.

First of all, in Ukraine, as well as in Europe as a whole, the difference in payment between skilled and unskilled labor will be reduced. G. Klark's researches have shown that between the years 1220 to 2000 the premium for qualification in the field of construction has reduced by 4 times [4]. Modern IT technologies further narrow the gap between skilled and unskilled labor.

Secondly, a noticeable trend is the narrowing of the gap in earnings of men and women. The historical trend has changed, has gone oblique. Thus, English women employed in agriculture in the years 1770 – 1860 received only 43% of the earnings of male workers [5]. To a large extent this was due to the fact that under the conditions of relatively primitive labor tools, the gross physical strength of men was valued. Later, when the time of industrial societies came, the role of convergence of working specialties irrespective of gender increased. Nowadays, when the technological society dominates and the tendencies of integration prevail over the specialization tendencies, the earnings of women are quickly approaching to the earnings of men. According to the UK statistical office, current hourly wages of women without a qualification constitute 80% of the wages of unskilled men in the country [6]. In Ukraine, women have always been highly appreciated. For example, while women make up 39.5% of the workforce in the world on average, in Ukraine this figure is 48.3%. In this regard Ukraine is ahead of most of the developed countries of Europe and the world: Britain (46.4%), Germany (46.2%), Italy (42.1%), China (43.7%), Holland (45.7%), Poland (45.2%), Sweden (47.4%), the United States (45.9%), France (47.2%), Japan (42.7%), etc. In 2017 the global figure for the unemployed averaged at 5.77% of the total workforce, and female unemployment (6.22%) was higher than that of men (5.47%) [7], while in Ukraine these figures were respectively 8.8%, 7.7% and 9.8%. In economic literature, this is even called *Ukrainian specificity* [8].

3 Conclusion

Thus, our country will have to work hard to overcome the problems of inequality, stimulate employment in small business and realize the comparative advantages of the country in order to accelerate the pace of economic growth. At the same time, it seems that Ukraine needs to make wide use of its comparative advantage in using women's labor.

References

[1] Пикетти Т *Капитал в XXI веке* Пер. Александра Дунаева. Интернет ресурс: https://coollib.com/b/331388/read#t2 см. главу «Крупнейшее новшество XX века – имущественный средний класс»

[2] Кларк Г 2013 *Прощай, нищета! Краткая экономическая история мира* пер. с англ. Н.Эдельмана. – 2-е изд. – М.: Издательство Института Гайдара с.18

[3] *«Global wealth report 2017: where are we 10 years after the crisis»* https://www.credit-suisse.com/corporate/en/articles/news-and-expertise/global-wealth-report-2017-201711.html.

[4] Кларк Г 2013 *Прощай, нищета! Краткая экономическая история мира*/ пер. с англ. Н.Эдельмана. – 2-е изд. – М.: Издательство Института Гайдара с. 381

[5] Burnette J 1997 An Investigation of the Female-Male wage gap during the Industrial Revolution in Britain *Economic History Review* **50**(29) 257-81

[6] United Kingdom, Office of National Statistics 2006 *Annual Survey of Hours and Earnings* http://www.statistics.gov.uk/pdfdir/ashe1006.pdf

[7] https://data.worldbank.org/indicator/SL.UEM.TOTL.MA.ZS?view=chart

[8] 2010 *Інтеграція України та Росії в європейський трудовий простір: монографія* /Г.Багратян, І.Кравченко, О.Гулевич, Д.Вассіліу – К.: УБС НБУ – с.74

Psychological aspects of personnel management of tourism enterprises

N Bakalo, V Makhovka*

Poltava National Technical Yuri Kondratyuk University, Tourism and Administration Department, Pershotravneviy Avenue, 24, Poltava, Ukraine

**Corresponding author's e-mail: mahovkavika@ukr.net*

Abstract

Under the current conditions, a travel company must promptly and effectively reform its management structure and its functions. Any transformation in an enterprise involves the need for change in the process of personnel management. This is due to the fact that the management of personnel is a key element of the effective operation of the tourist enterprise.

Keywords: travel company, personnel management, HR, tourism enterprises

1 Introduction

Tourism is an important factor in economic development, social services and culture of Ukraine. Government documents set tourism as one of the most promising and priority areas of the national economy and culture.

2 Main part

Today, skilled staff is one of the main elements of the success of any tourist enterprise. This is due to the fact that it depends on the personnel of the organization its successful operation in the market of tourist services. Therefore, the management of the tourist company should pay attention to the psychological aspects of its management.Psychology of management is a branch of psychological science that studies the psychological patterns of management activity, namely: the role of human and psychological factors in management, the optimal distribution of professional and social roles in a group (team), leadership and leadership, processes of integration and team cohesion, informal relationships among its members, psychological mechanisms for the adoption of managerial decisions, socio-psychological qualities of the head, etc.

The effectiveness of management activities of the management of the tourist enterprise is manifested in the following elements: creation of a favorable psychological climate; strengthening team cohesion; satisfaction of employees of the enterprise by the activity of its managerial staff.

One of the most important activities of a tourist enterprise manager is the management of human resources and the identification of their best features. In the future it will be able to benefit the company. This manager of a travel company can reach the following way: satisfaction of employees from the work performed; payment and working conditions; internal sense of employees from the tasks and duties performed; support from the management of the company; satisfaction of employees from the socio-psychological climate in the team, etc.

It should be noted that the head of a tourist enterprise can also offer a labor collective a set of values associated with: self-realization of the labor collective – new challenges, implementation of new thoughts and ideas, freedom of action; constant self-education and development of professional abilities of employees – advanced training, trainings, career development; reward for the work performed – assessment of the activity of the members of the collective, payment of labor, system of bonuses and awards, social activity; the formation of corporate culture.

Activities related to the organization of human capital in a tourist enterprise is significant. Considering that tourism is based on human resources management and direct direct contact between employees of the enterprise and clients. In this process, the following elements should be highlighted: formation of long-term plans for creation of human capital of the enterprise; assessment of tourism enterprises needs in staff and assessment of their personal qualities; monitoring of the process of selection of employees; care, on the part of the management, concerning the professional growth of the employees of the enterprise; the need for rapid provision of information to employees; creating a system of tangible and intangible incentives that will improve the efficiency of the staff of the tourist enterprise

3 Conclusions

Consequently, modern tourism business requires taking into account the psychological aspects of personnel development in the management. This activity should focus as much as possible on the implementation of the creativity of the employees and focus on their professional and personal development. This result can be achieved through the creation of a favorable psychological climate in the team, support from the owner and manager, payment and working conditions, and the system of material and non-material motivation. It is the motivation and assessment of the psychological aspects of personnel management that plays an important role in the success of the tourist enterprise.

Organizational engineering in the system of management of an enterprise

R Bilovol, O Goloborodko, I Amelina*

Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi Avenue, 24, Poltava, Ukraine, 36011

**Corresponding author's e-mail: bilovolri@ukr.net*

Abstract

Risks, radical changes, transformations in the modern socio-economic system of the enterprise require from its management constant monitoring of internal and external economic, technical, marketing, information, social environments.

The enterprise management system should be viewed as the result of organizational changes that ensure the processes of carrying out changes in all its constituent elements: goals, tasks, organizational structure of management, production and management technologies, resources: human, financial, material and information. Ensuring the interaction of certain elements of the organizational system requires the grouping of tasks and work and functions in the relevant divisions of the enterprise in accordance with a specific goal.

Keywords: organizational engineering, enterprise management system, engineering functions

1 Introduction

It is organizational engineering that provides a set of organizational measures, which includes: distribution of responsibilities, delegation of authority and definition of management levels of the enterprise; the formation of a favorable moral and psychological climate, encourages staff to work actively to achieve their own goals and objectives of the enterprise; designing a communication system that can ensure the development, adoption and implementation of effective management decisions; building an organizational management system capable of ensuring the internal organization of all the specific elements of the enterprise, but also its adaptation to changes in the factors of direct and indirect effects of the external environment.

2 Main part

Organizational engineering is the direction of organizational development, focuses on engineering approaches to organizational problems and represents a solution to a particular problem or a combination of them. However, in any case, engineering in solving problems is the process of creative analysis and modeling, the interconnection of ideas and concepts with the aim of creating a new, optimal solution, a project of the enterprise management system from a "clean slate".

Although the problems that are solved with the help of engineering differ in the scale of the complexity, a process approach is applied to solve them, which involves the implementation of specific engineering functions in the management of the enterprise: the study of problems and the development of an action plan; design; determination of cost and financial parameters of the project; creation of material infrastructure; organization of production; production and control [1, c. 43].

The most important advantages of the engineering system include: increasing the efficiency of investments in connection with the appearance of real levers of influence on the budget / budget of the project; shortening the deadlines for the execution of work and production costs; the attractiveness for customers of the prospect of consolidating in one hands the necessary set of services related to the implementation of investment projects; the appearance of real prerequisites for the transition to effective professional management in connection with the concentration in the hands of the engineering company of technical and cost information on the project; reduction of investment and other risks for the enterprise using the engineering system; Increase of competitiveness in the domestic and foreign markets in connection with the recognition by the business world of the effectiveness of the use of engineering [2, p. 56].

3 Conclusions

Thus, in modern conditions for the development of a particular enterprise or industrial society, engineering is an integral part of the investment and innovation process, since it allows more closely involving all participants in the project development from project documentation to commissioning the facility, which significantly shortens the period of project implementation and increases the effectiveness of their development and implementation. Engineering is constantly looking for the application of the latest scientific achievements in solving actual problems of management effectiveness of enterprises.

References

[1] Blynov A O 2016 *Reynzhynyrynh byznes-protsesov: Uchebnoe posobye* A.O. Blynov, O.S. Rudakova, V.Ia. Zakharov M.: YuNYTY 335 c
[2] Kyselev A D 2010 *Upravlenye znanyiamy korporatsyy y reynzhynyrynh byznesa: Uchebnyk* N.M. Abdykeev, A.D. Kyselev; Pod nauch. red. N.M. Abdykeev. - M.: YNFRA-M 382 c

Heoretical aspects of product quality management as a factor of competitiveness of enterprises in international market

I Chernysh, A Glebova*

Poltava National Technical Yuri Kondratyuk University, Tourism and Administration Department, Pershotravneviy Avenue, 24, Poltava, Ukraine

**Corresponding author's e-mail: irinachernysh@gmail.com*


Abstract

This article deals with the issue of determining the value of quality management as a factor of the competitiveness of enterprise that deals with foreign economic activity.

Keywords: Business, administration, management, quality, development, enterprise features, foreign trade

1 Introduction

Modern economic processes are characterized by the development of both positive and negative trends, caused by a number of objective and subjective reasons. Thus, the accession of the Ukrainian economy to the WTO and the further European integration of Ukraine means an aggravation of the conditions for carrying out entrepreneurial activities both on the domestic and foreign markets. The level of quality of products of many enterprises is very low because of the unsatisfactory condition of material and technical supply and use of obsolete equipment; Secondly, most enterprises do not have experience in conducting competition; Thirdly, the long-term socio-economic crisis caused the low purchasing power of Ukrainian consumers. Moreover, new problems have been added to the numerous problems of the past, namely: a decrease in the innovative activity of enterprises, inadequate management of market conditions, the pursuit of profit in the short run, to the detriment of the long-term strategy of producing competitive products.

Thus, today, it is extremely necessary to form new approaches to improving the quality of products, which will ensure the enterprise effective implementation of foreign economic activity. First of all, it is necessary to provide a general description of the concept of "quality".

2 Main part

The quality category is one of the most difficult among those with which specialists have to deal. The category of product quality is used to select items for meeting both production and individual needs, planning production and evaluating its results, determining its complexity and effectiveness, organizing labor, creating new products. In the course of the study of the quality category, scientists faced the problem of the versatility of this concept. There is no clear definition of the concept of quality. Almost every author interprets it in his own way. In one study, when managers of 86 US companies were asked to give a definition of quality, analysts received dozens of different characteristics, including those that can be generalized. According to the majority, this is: improvement, invariability, waste reduction, speed of delivery, consistency with prescribed procedures and procedures, provision of a good and useful product, accurate implementation from the first time, customer satisfaction, full service and consumer provision.

Of course, the interpretation of this concept in various world organizations, authors and researchers also has some differences.

Having examined the definitions of various authors, as a conclusion, one can create a personal interpretation of quality that, in my opinion, can absorb the main provisions of previous definitions and will be most relevant in the context of this work.

Quality is a complex category that combines a set of characteristics and properties of products that are able to meet or exceed consumer needs and producers' needs for economic benefits, while being the main competitive factors in the success of any organization in the domestic and foreign markets.

The most important condition for the successful development of the economy today is the production of competitive products of enterprises. At the same time, the foundation of competitiveness is quality. Consumer surveys show that among all competitiveness indicators (price, delivery time, service, etc.), the quality determines the choice of products by 70%. The validity of these provisions confirms the success of developing countries (South Korea, China, Turkey, etc.), whose products are popular all over the world because of the high level of its quality.

3 Conclusions

The process of globalization in the economy exacerbates competition, because the expansion of the market allows the buyer to choose the goods of almost all world producers. As a result, each of them fights with others in a certain area. In such conditions, only those who survive at high quality at a low price survive.

That is, quality is one of those properties of the product, it ensures competitiveness. Comparing these two concepts, one can see similar features and differences. First of all, quality is an absolute indicator, because it is the result of production activity, the totality of characteristics and properties that are incorporated into this product according to certain requirements. Competitiveness can be considered as a relative indicator. This is because the requirements for quality can be different in different markets, and therefore the competitiveness in the markets, for example, Germany and Ukraine will be significantly different. Similar to these concepts is that both are characterized by the degree of customer satisfaction from the proposed product or service. Also, these concepts have common features in the economic definition of the quantitative values of these indicators. It is important that the concept of quality in the globalization of the economy should be collective, that is to combine the values, each individual country puts forward, into a single integrated concept, it will be easier to apply to enterprises for foreign economic activity in order to achieve the most effective results of activities.

References

[1] Ukaz Prezydenta Ukrainy „Pro zakhody shchodo pidvyshchennia yakosti vitchyznianoi produktsiъ" vid 23 liutoho 2001 roku № 113 *Uriadovyi kurier* 2001 **42** s.10

[2] Zakon Ukrainy „Pro standartyzatsiiu" vid 17.05.2001 r. №2408-III *Vidomo Verkhovnoi Rady* 2001 **31** s. 145

[3] DSTU ISO 9001-2001 *Systema upravlinnia yakistiu. Vymohy*. K.: Derzhstandart Ukrainy, 2001

[4] DSTU ISO 9000-2001 *Systema upravlinnia yakistiu. Osnovni polozhennia ta slovnyk* K.: Derzhstandart Ukrainy, 2001

[5] DSTU ISO 9004-2001 *Systema upravlinnia yakistiu. Nastanovy shchodo polipshennia diialnosti* K.: Derzhstandart Ukrainy, 2001

[6] DSTU ISO 9001...4-95...98 *Standarty z upravlinnia yakistiu ta zabezpechennia yakosti* K.: Derzhstandart Ukrainy, 1998

[7] Zakon Ukrainy „Pro pidtverdzhennia vidpovidnosti" vid 17 travnia 2001 roku № 2406-Sh *Vidomosti Verkhovnoi Rady (VVR)* 2001 **32** s. 169

Opportunities for developing ecotourism in Latvia

Denis Vasiliev

Hotel School Riga

Abstract

Latvia has a great potential for development of ecotourism industry. Latvian boidiversity is very rich in comparison to many other European Countries. Furthermore, Latvian landscape mosaic is very diverse and picturesque, with many virgin ecosystems. Given the growing popularity of ecotourism and the UN as well as the EC support of activities contributing to sustainable development, above considerations indicate great opportunities for promotion of this industry in Latvia.

Key words: Latvia, ecotourism, sustainable tourism, landscape diversity, business opportunities

1 Introduction

Ecotourism industry is rapidly growing globally, providing tremendous business opportunities (Transparency Market Research, 2017). At the same time in line with global agenda of sustainable development (UN, 2015) this type of business has potential to secure governmental and intergovernmental (Bhyian et al., 2011; EC, 2018). Latvia has a unique landscape composition and relatively high biodiversity, which could potentially attract environmentally conscious tourists, yet this industry is still underdeveloped in this country (Leitis, 2012).

2 Ecotourism potential in Latvia, outline

Latvia has a unique environment. This country due to diverse soil composition has a high concentration of diverse and picturesque landscapes at a relatively small area (CBD, 2014). Furthermore due to low industrial activity and a hue forest area, Latvia has high level of biodiversity and virgin ecosystems (CBD, 2014). Therefore, in Latvia conditions for development of ecotourism are quite good allowing people from different countries to explore unique Latvian nature with a great convenience.

3 Conclusions

Given the unique Latvian nature and the fact that ecotourism industry is growing and is supported both by the UN and EC, perfect opportunities for Latvian business arise, which are worth exploiting.

References

[1] Bhyian Md A H, et al. 2011 The Role of Government for Ecotourism development: Focusing on East Coast Economic Region *Journal of Social Sciences* **7**(4)

[5] CBD 2014 *5th National Report to the Convention on Biological Diversity* CBD, Latvia

[6] EC 2018 *Sustainable Tourism* **E-resource:** https://ec.europa.eu/growth/sectors/tourism/offer/sustainable_en [Accessed on 27.03.2017]

[7] Leiyis E 2012 *Ecotourism in Latvia: problems and solutions in sustainable tourism industry development* Latvian University, Riga

[8] Transparency Market Research 2017 *Global Ecotourism Market: Overview* **E-resource:** https://www.transparencymarketresearch.com/ecotourism-market.html [Accessed on 27.03.2018]

[9] United Nations 2015 *Sustainable Development Goals* **E-resource:** http://www.un.org/sustainabledevelopment/sustainable-development-goals/ [Accessed on 27.03.2018]

Strategies of Latvian enterprises in international competition

B Aliev[1], Yu Kochetkov[1, 2*]

[1]*Baltic International Academy, Lomonosova Str. 4, LV-1019 Riga, Latvia*
[2]*Institute of Science and Innovative Technologies, Liepaya University, Liela Str. 14, LV-3401 Liepaya, Latvia*

**Corresponding author's e-mail: Jurijs.Kocetkovs@rtu.lv*


Abstract

Competitiveness is an active state of the economic system, when the process of creating competitive advantages occurs. It is known that competitiveness is a multivariable function, but its basis is the competitiveness of goods, commodity production. To achieve a competitive GDP structure, it is necessary to increase the production of high-tech products, which should outpace the share of services. In Latvia, many companies, which do not having sufficient funds to conduct their own scientific research, use the strategy of following world leaders, acquiring and introducing high technologies developed by others. In such a situation, the role of state institutions is very important both in facilitating the acquisition of high technologies and in training skilled personnel to be able to master and operate these technologies.

Keywords: competitiveness, international competition, strategy of following world leaders

1 Introduction

The emergence of products and services on the world markets requires from any developing country, its regional systems and individual enterprises, serious structural shifts and the development of innovative factors of competitiveness. The main idea of civilized construction in the 21st century is the concept of sustainable development, including regional economic systems and companies. With the emergence of a new model of socio-economic development, the problem of increasing the competitiveness of regions, companies and states becomes one of the main issues [1]. Competitiveness is an active state of the economic system, when the process of creating competitive advantages occurs. This process is the basis for the progressive development of society as a whole.

2 Main contents

The World Economic Forum regularly publishes the competitiveness rankings of countries in its Report [2]. The global competitiveness index (GCI rankings) is based on the three categories of variables that promote economic growth in the medium and long term: technologies, public institutions and the macroeconomic environment. Latvia, as a whole, in international competitiveness rankings has been occupying positions from the 30th to the 50th in recent years, but lags behind its neighbours: Estonia and Lithuania.

It is known that competitiveness is a multivariable function, but its basis is the competitiveness of goods, commodity production. Services cannot serve as the basis for competitive reproduction. To achieve a competitive GDP structure, it is necessary to increase the production of high-tech products, which should outpace the share of services. For this purpose, it is necessary to use a set of macroeconomic levers and ensure the connection of science and production.

For successful investment activities of the state and regional economic structures, as world experience shows, the following conditions are necessary:

1. A sufficiently high level of development of science and the use of the R & D results. A high share of expenditure on fundamental and applied scientific research in the budget (4%–6%).
2. State support of innovative projects of national importance, which are competitive in world markets.
3. Favourable legislative framework for allocation of financial resources and creation of funds used for financing national projects, which stimulates the business to invest in production.
4. Formation of significant regional investment funds in terms of volume as a financial base for strategic investments.

National projects should be associated with significant investments in production, providing an innovative breakthrough in regional economic systems. This will ensure an increase in the competitiveness of manufactured goods or the creation of qualitatively new products that competitors cannot offer.

All the major well-known companies in highly developed countries invest very large funds in R & D, which allows them to successfully compete with similar companies in world markets. For example, at the beginning of the 21st century, investments in R & D of American auto giants (Ford Motor, General Motors) amounted to 6–7 million dollars per year. The largest companies in the world, working both in the sectors of material production and services, spend a huge amount of money on R & D. This guarantees them high competitiveness.

It is very difficult to enter the mass world markets of expensive, sophisticated, science-intensive production. It requires large financial investments in research and subsequent implementation of research results in the production of goods; competitiveness has a high price to pay. For developing countries, including Latvia, the most important problem is the concentration of capital in a certain area with the aim of achieving competitiveness in the chosen industry, which already has certain conditions for this purpose and experience.

According to the authors of the research, Latvia cannot be attributed to highly developed countries in terms of technology. It is rather in an intermediate state between industrial raw materials countries and industrial high-tech countries. The share of expenditures in the budget of Latvia on fundamental and applied research is one of the lowest in the European Union. In Latvia, a legislative framework should be developed for concessional financing of innovative projects of regional significance. At present, the scale, complexity and heterogeneity of world markets are increasing. Therefore, it is impossible to use deterministic approaches to the modelling of regional socio-economic systems. This has led to the use of nonlinear self-organising models of systems and a synergistic concept of markets [3].

Economic systems of any level, including that of enterprises, should not be analysed from the assessment position of “costs–output”, but rather it is necessary to find various development alternatives with managerial influence and without it. An alternative to traditional goal functions (optimality, profit maximisation, etc.) is the achievement of a positive or negative synergetic effect. The synergetic effect, unlike the economic effect, arises under conditions of system bifurcation, when there can be implementation with a certain probability of some kind of randomness. Achieving a synergistic effect in socio-economic systems leads to a change in the quality of systems and the trajectories of their development.

The key concepts are as follows. A phase is a set of homogeneous elements that have the same properties and are part of a system that has boundaries. The system is homogeneous, if it consists of one phase (without boundaries of phases). A catastrophe means a loss of stability. Dynamic processes within a single phase are characterised by the fact that random variables in the system have a normal distribution law. Structural phase transitions arise when the internal order of the system changes.

The phenomenological theory of phase transitions results in practical conclusions concerning transient processes in socio-economic systems [3]:

1. Real transient processes in economic systems can only be “blurred” (fuzzy). Blurring is the essence of the phenomenon of phase transition and is caused by the appearance of a boundary between phases.
2. All phase transitions have several stages. Therefore, a change in the state of the system during a phase transition cannot be described by a smooth function. The transition process can be represented only by a piecewise smooth functional dependence.

At each stage of the phase transition, a change in the state of the system can be described by the equation:

$$ln\frac{\eta}{1-\eta} = ln\frac{\eta_i}{1-\eta_i} + \varepsilon\left(\frac{D-D_i}{D_i}\right)^n$$

where η – the order parameter; D – the measure of external influence (political, legal, conjuncture, etc.); η_i, D_i, ε, n – the characteristics of the system at each stage.

International competition covers longer periods of time than in the case of industry-specific inter-firm competition. Defining an international competitive strategy, it is necessary to take into account the following factors: the relative unity of national companies in the competitive battle, a broad time frame, intersectoral proportions and the availability of a scientific and technical component [4]. The international competitive strategy, as a rule, refers to the common features of the sustainable elements of the strategies of national companies in world markets, which are manifested in the foreign economic, industrial, scientific and technical policies of the state and bring profit.

As far as the scientific and technical progress is concerned, a subject of competition can occupy one of three positions:

- first, to actively participate in the creation of new knowledge and in conducting R & D;
- secondly, to actively borrow and practically apply the scientific results obtained by others;
- thirdly, to recognise and use technological achievements according to their natural diffusion, without applying special efforts.

Active fundamental scientific research is not usually carried out by individual enterprises; it is conducted by scientific organisations that receive funding from the state. These organisations strive to move up the “ladder of development” of science and technology. The first international competitive strategy is the strategy of scientific and technical leadership, which is based on dynamic industries that use the latest scientific and technological achievements.

The second strategy is the strategy of dynamic catch-up, following the leaders [5]. This strategy is determined by the treatment of scientific and technological progress as a way to move to the next higher stage of development at the expense of others, while investing one’s own funds. Companies acquire high technologies developed by others, introduce them and try to enter the markets with their updated products.

The above-mentioned strategies require significant financial investments in the implementation and further improvement of the results of scientific and technological progress. Companies that do not have sufficient funds or do not want to invest, naturally, use *the third strategy of passive perception of science and technology achievements.* Such companies are usually defeated in the competitive struggle in world markets.

3 Conclusions

In Latvia, many companies, which do not having sufficient funds to conduct their own scientific research, use the strategy of following world leaders, acquiring and introducing high technologies developed by others. This also requires quite a lot of money for the acquisition of modern equipment, devices, tools, training and retraining of personnel, etc. In such a situation, the role of state institutions is very important both in facilitating the acquisition of high technologies and in training skilled personnel to be able to master and operate these technologies. The use by some companies of the third strategy of passive perception of the achievements of science and technology is non-productive and unpromising.

References

[1] Andreeva L, Mirgorodskaya E 2004 A view of systemic competitiveness as a dominant element of sustainable development of the economy *The Economist* **1** Moscow *(in Russian)*
[2] *The Global Competitiveness Report* 2015 Oxford University Press
[3] Kuznetsov B 2005 The hypothesis of a synergetic market in the light of L. Landau's phenomenological theory of phase transitions *Journal of Economic Issues Russian Academy of Sciences* **8** Moscow *(in Russian)*
[4] Ray A 2004 Competitive strategies of the state and firms in export-oriented development *Journal of Economic Issues Russian Academy of Sciences* **8** Moscow *(in Russian)*
[5] Baskakova M 2004 Japanese economic model. World Economy and International Relations *Journal of the Russian Academy of Sciences Nauka* **1** Moscow *(in Russian)*

Human vs artificial intelligence in the process of labor

Nadiya Azmuk*

Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: azmukna@gmail.com*

Abstract

Artificial intelligence acts as a new subject of the labor market. Artificial intelligence gives positive business effects and carries risks to global workforce. The author has explored the place of artificial intelligence in the process of labor in different groups of work.

Keywords: worker; artificial intelligence (AI); process of labor

1 Introduction

Business with the use of artificial intelligence gets a lot of positive effects. However, artificial intelligence carries risks associated with human toil. This will lead to employment losses. In this paper, we will explore how to change employment. We describe the place and role of artificial intelligence in the labor market. We will try to answer the question: will artificial intelligence completely replace the employed?

2 Overview of the study area

Digital technology is changing process of labor. The artificial intelligence is taking place a process of labor. The role of a worker is taken over by artificial intelligence, which is the "real-time" mode provides the same service or product that an employee would provide. In this case, the work activities are carried out in the form of a programmed influence on the subject of labor with the means of labor using digital technologies.

By 2030 from 400 to 800 million people will be able to be dismissed because of automation. While 3 to 14 percent of the global workforce (75 million - 375 million workers) will need to switch occupational categories. (MGI, November 2017) [1].

Digital technology is changing the structure of labor force demanded. Some occupations disappear from the labor market; new ones appear instead of them. New occupations make new demands on workers.

The interest is European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL) [2]. The resolution is an attempt to settle a new fast-growing market of robots and artificial intelligence. This is an attempt to strike a balance between human rights and not impede innovation.

The resolution contains the characteristics of smart robots. It considers the possibility of giving the robots the legal status of the «electronic persons» in cases where, in future they will take independent decisions or otherwise interact with third parties independently of each other.

The main characteristics of artificial intelligence in future will be separated labor from a worker.

Where is the place of artificial intellect in the process of labor today?

We divide the human labor into three groups: routine, creative and social.

These three groups allow us to illustrate the different place of artificial intelligence in the process of labor.

Creative work involves the use of human potential to create new knowledge, product. Creative work is inherent in any sphere of economic activity. However, not all employees are able to innovate. Here artificial intelligence helps the employee and does not replace. For example, the use of augmented reality by designers, architects (Figure 1).

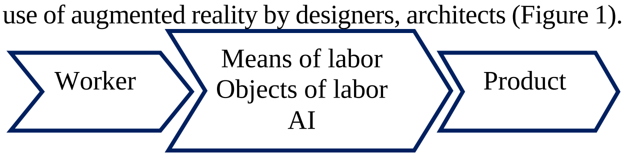


FIGURE 1 Human vs AI in creative work

Routine work will be replaced in a total AI. Under routine work, we mean monotonous, repetitive operations. An example of substitution of routine human labor is ATMs, POS terminals, ticket sales terminals. (Figure 2).

FIGURE 2 Human vs AI in routine work

The third group of labor is working with people. It has the goal of helping people, in overcoming personal and social difficulties. A social worker is a qualified consultant and communicator. A social worker primarily requires a high level of humanity, developed intuition, empathy. These qualities are inherent in people, but not in artificial intelligence (Figure 3)

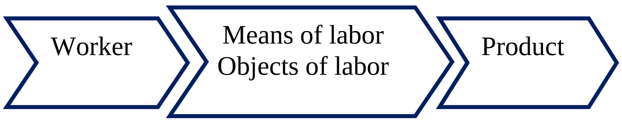


FIGURE 3 Human vs AI in social work

Today workers have advantages over artificial intelligence in creative and social activities. Therefore, workers must offer skills that can not be automated. Such skills can be creativity, emotional intelligence, and social interaction.

3 Conclusion

The robotics market is developing rapidly. Therefore, there are questions of changing the place of artificial intellect in the process of labor which are opened for researching and discussing.

References

[1] *What the future of work will mean for jobs, skills, and wages, November* 2017 Report McKinsey Global Institute https://www.mckinsey.com/global-themes/future-of-organizations-and-work/what-the-future-of-work-will-mean-for-jobs-skills-and-wages

[2] *European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics* (2015/2103(INL) **E-resource:** http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0051+0+DOC+XML+V0//EN&language=EN#BKMD-9

The 16th INTERNATIONAL SCIENTIFIC CONFERENCE
INFORMATION TECHNOLOGIES AND MANAGEMENT 2018
April 26-27, 2018, ISMA University, Riga, Latvia

The impact of IT-technologies on business

Daria Kravchenko

Simon Kuznets KHNUE, Ukraine

**Corresponding author's e-mail: dashunykravchenko@gmail.com*

Abstract

Currently, technology is developing very rapidly. IT-technologies penetrate in every sector of the economy and help to efficiently conduct business for entrepreneurs, and users receive high-quality goods and services. At the moment, technology plays a very important role in the effectiveness of enterprise management and over the past year, technology has changed the way how businesses works. This work is attempt to show how we use IT-technologies for business doing simplification.

Keywords: impact, business, innovations, IT technologies

1 Introduction

The result of scientific and technological progress is the introduction of modern technologies in all spheres of life. Economics and business are not an exception and they widely use software to simplify their work.

To survive, the company must constantly adapt to changing environment. The firm cannot remain stable today – it must manage to change so that:

- meet constantly changing customer requirements;
- keep up with competitors in a highly competitive environment,
- improve internal processes, expand the range of goods and services;
- set the real goals for the staff, ensure their implementation with sufficient, creative freedom of action within the framework of tactical tasks;
- develop first of all those business processes that are oriented towards fulfillment of customer expectations.

Information technology has changed not only the way of work – they have changed the way of business strategic thinking. The first high-speed computers were used by entrepreneurs mainly to automate processes that were previously performed manually by a large number of low-skilled employees;

Today, IT-technologies are used not only to automate the collection and processing of data, but also to implement new ideas, new ways to obtain a competitive advantage.

In modern conditions, information systems play an increasingly important role in achieving strategic goals of companies, providing the business with a competitive advantage in the market.

The interaction of information technology and business is manifested in the following:

- IT increases the efficiency and competitiveness of almost any business;
- now all business are moving to the Internet, so any company needs to have a strategy for a new reality;
- if the company does not have a strategy of working in virtual space – it does not have a future.[2]

Consider the information technologies, which is currently used in sphere of business. The information technologies (image 1) contribute to the effective implementation of entrepreneurial activities, which, in turn, affects the competitiveness of both products and companies [1].

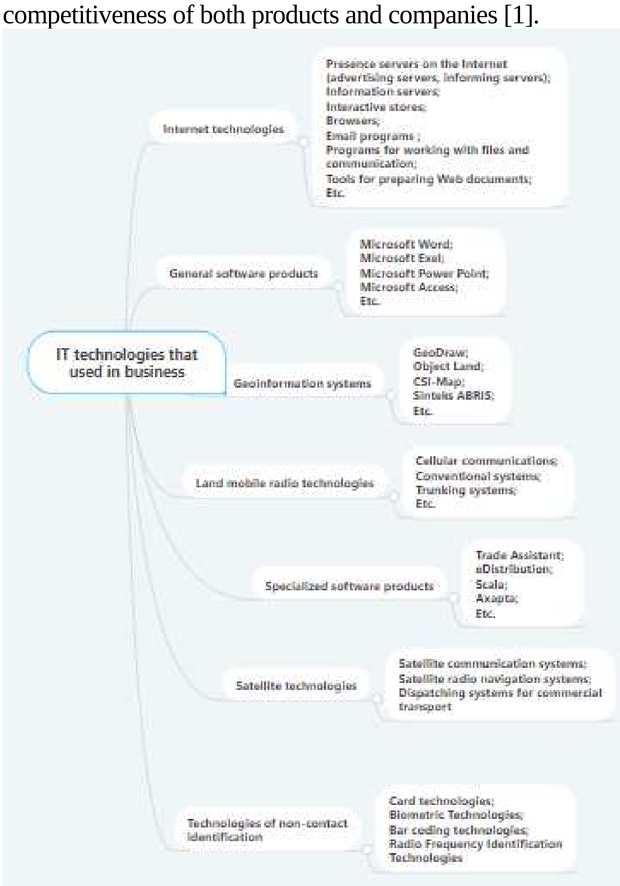


FIGURE 1 Software that used in business

To date, there is a huge amount of software aimed at optimizing the activities of the companies regardless of the specificity of their products or services. Adaptation of software products for the specificity of companies was achieved through the modularity of these information systems. In this case modularity should be understood as the ability of the system to provide users the ability to customize and select functions based on the specifics and complexity of the enterprise. The companies-developers have created flexible automation systems that allow to form a single system consisting of separate modules integrated with each other [1].

2 Overview

The aim of this research is to develop recommendations on the use of IT-technologies in business to enhance its sustainable functioning.

Disclosing the content of the goal, there is a number of tasks:

- to investigate the changes in business
- to consider the functions of IT-technologies in business
- establish the main directions of adaptation of software to the needs of entrepreneurs

3 Decision

The basic process of using IT technologies in business is to collect a huge amount of data that should be used to make a balanced, correct, informed decision. On the one hand, the ability to automate the collecting and processing of data, the development of communications and Internet technologies makes it possible to speed up the decision-making process. On the other hand, the accumulation of analytical data in decision-making for decision-making in business and the sphere of accuracy of value judgments.

Consider the software products that are currently used to analyze the processes of the enterprise:

- "Microsoft Dynamics AX" is an integrated ERP II class system, created for medium and large multi-industry enterprises of various sectors of the economy.
- "Scala" is an effective tool that allows you to manage various areas of activity of the enterprise. For many years now it has been used in more than 90 countries
- "Trade Assistant" is a trading organization management system designed for operational management and controls over the state of inventory in warehouses and cash on settlement accounts, conducting commodity and payment transactions, storekeeper operations, maintaining a complete balance, and for comprehensive analysis information accumulated in the system database.
- "Oracle E-Business Suite" is a full-featured complex of integrated business applications that allows you to manage the activities of enterprises of any field of activity

Modern technologies change business - new services are born, the methods of customer service are expanding. With the constant development of business and the complexity of processes, the software should be able to support all the changes accompanied by the active introduction of new information technologies, such as cloud solutions, large data, mobile services, etc.

Companies that have an effective IT infrastructure receive a serious competitive advantage. Effective infrastructure should be as reliable, safe, high-performance, scalable and manageable.

The creation of an IT infrastructure is a complicated and long-term task, requiring specialized knowledge and serious material costs. At the same time, it is possiblity to maximize the effect of the functioning of the IT infrastructure only with its completeness and complexity. It is necessary to understand clearly that the use of IT infrastructure gives concrete benefits to the enterprise, but at the same time entails costs in the form of the total cost of ownership.

4 Conclusion

IT technology has changed the rules of doing business, which makes it very easy for one side to work, but also makes it constantly adapt to current trends. Due to the constant changes in the enterprise, cannot create long-term strategies.

Also usage of specialize software is too expensive for many companies many companies cannot afford this type of products.

Therefore, the enterprise is not always ready to accept such technical changes because of some reasons, but it need to do it to stay in business and be competitive.

References

[1] Butenko Y A 2012 *Innovation and information technology in business: main trends and development prospects* https://cyberleninka.ru/article/v/innovatsii-i-informatsionnye-tehnologii-v-biznese-osnovnye-tendentsii- i-perspektivy-razvitiya

[2] *Modern information technologies in business* https://www.hse.ru/data/2015/10/12/1076105010/Movies%20information%20technologies%20v%20businesses20-%202.pdf

Practice-oriented training of specialists on tourism and hospitality in the system of the higher education of republic of Belarus

Tatyana Fedartsova*

BSPU, Belarus

**Corresponding author's e-mail: fedortsova_t@mail.ru*

Abstract

The needs of modern system of the higher education of Republic of Belarus and business of tourist industry for experts with the practice-oriented preparation; The problems of training the personnel of the tourist sphere for the real sector of the economy and ways of their solution are shown.

Keywords: practice-oriented training, competence, employers, higher education

1 Introduction

The system of higher education in the Republic of Belarus is developing taking into account the global tendencies in the sphere of higher education, the strategy of the country's transition to innovative economy is the main source of the country's staff capacity building.

In the republic there are 43 state institutions of higher education, of which 30 universities, 9 academies, 4 institutes. Training of personnel with higher education is carried out in 15 educational profiles, including 384 specialties, 317 focus areas and over 1000 specializations [1].

2 General

It is possible to realize high-quality training of university graduates in many different professions if we introduce practice-oriented training of students.

According to the needs of innovative economy, information society, educational needs of citizens of Republic of Belarus there is the STATE PROGRAM "Educational and youth policy" for 2016-2020 which main objectives are improvement of quality and accessibility of education. The subprogramme No. 5 "Development of system of the higher education" is created for the solution of several issues, one of which – improvement of quality of training specialists, efficiency of the pracrice-oriented preparation and deepening linkages with the organizations - customers of personnel.

Practice-oriented training of specialists in the system of higher education, increasing the effectiveness of interaction between the labor market and the education system, the opening of branches at the enterprises of the republic, research activities is in line with the strategy of the country's transition to an innovative economy, development of the higher education system, taking into account world trends, which improve the quality of education and the image of the higher education system of the Republic of Belarus in the global educational space [1].

The relevance of the research topic determined the existence of contradictions between the quality of training specialists with higher education in tourism specialties and the requirements of modern employers: expenses of time and financial resources for the training a young specialist who has arrived at a travel company. Currently there is no possibility for postgraduate adaptation and training a specialist for several years by modern business.

Formation of practical competences for the training of future specialists in the field of tourism and hospitality is one of the main concerns of the faculties and departments involved in the training of these specialists. Bring educational programs to the real economy, combine theory with practice, this will allow to form interaction between the institute and tourist organizations, where the employer acts as a customer in the labor market.

Practice-oriented education in the field of tourism and hospitality can be represented by the following approaches:

1. Organization of training, production and pre-diploma practices of students and deepening of relations with organizations by customers, opportunity of acquiring practical experience in the real sector of the economy.
2. Use of modern methods of organization of educational processes that motivate students in the process of training and competence of innovation activity.
3. Cooperation with employers in the organization of students' learning process.
4. Creation of resource training and practical bases in educational institutions in cooperation with tourist organizations.

3 Conclusions

New needs and new challenges await the modern system of higher education in the Republic of Belarus in the transition of the country to an innovative economy and taking into account the world trends in the system of higher education. In this regard, specialists in the field of tourism and hospitality of our country need to have a set of general competencies, regardless of what our society and the education system will be like.

References

[1] *Ministry of Education of the Republic of Belarus* **E-resource:** http://edu.gov.by Date of access: 01/04/2018

Peculiarities of formation of marketing and logistic systems at modern enterprises of the building industry

A Glebova, O Zernyuk*

Poltava National Technical Yuri Kondratyuk University, Tourism and Administration Department, Pershotravneviy Avenue, 24, Poltava, Ukraine

**Corresponding author's e-mail: alliaglebova@gmail.com*

Abstract

The article discusses the peculiarities of formation of marketing and logistic systems at modern enterprises of the building industry.

Keywords: marketing, logistics, management, system.

1 Introduction

In the current conditions of production and tough competition, the development of construction enterprises is possible only if there are stable links and effective interaction of internal and external processes. Therefore, there is a need to manage interdependent processes in the markets of suppliers and consumers based on marketing information. Accordingly, increased attention requires, as well, the management of the movement of material and information logistic flows, ensuring the coordination of supply and demand for construction products.

2 Main part

In the system of scientific knowledge today you can find different opinions regarding the independence of marketing and logistics, or their close interdependence. The development of market relations determines the need to intensify research on the problems of systemic joint use of marketing and logistics as a unified process of meeting the needs of consumers. Insufficiently effective use of marketing integration, forms and determines the demand, and logistics, ensures the promotion of goods to the consumer, leads to inconsistencies in inventories and sales in the demand for goods, possible downtime due to disruption in supplies, higher prices for goods, logistics operations, consumers. That is, the creation of a single market of sellers and buyers with the priority of the latter is objectively necessary. In such a market, the manufacturer, intermediary and seller must fully consider the full range of customer requests and at the same time ensure the maximum possible efficiency of logistics operations, taking into account the specifics of the market. The organizations of the construction complex, as such, having a wide network of production links, for this purpose it is necessary to widely use effective logistic models, create systems for integrating marketing and logistics functions, and form integrated distribution and interaction systems with intermediaries in marketing channels. It is these problems that make it necessary to seek new ways of managing and organizing the activity of construction enterprises. Perspective management concepts, through which you can radically change the situation, is the close integration of the concepts of logistics and marketing. However, as a result of the lack of a common methodology for an integrated system approach to the problem of optimization, logistics and marketing are rarely used in an integrated form.

The issue of finding new solutions is not only and not so much within the framework of marketing and logistics, as in the spheres of their intersection it is extremely relevant. It is in this direction that a systemic synergetic effect can be achieved [1]. The issue of disclosing the content of marketing logistics, concerns the interaction of marketing and logistics, has its own specifics. Logistics and marketing by goals and objectives are, in essence, parts of a single whole [2]. The links between marketing and logistics are so strong and intertwined that it is sometimes difficult to separate the spheres of interest of two key business concepts [1].

An integrated approach to the management of logistics necessitates its close link to the organization of production, marketing, financial activities of a construction enterprise. It is very important and a clear understanding of the prerogatives of logistics and marketing as applied sciences. For this, according to AN Gadzhinsky, it is enough to have answers regarding marketing and logistics on the following issues: object, subject, research methods, results and applied sphere of science. The fundamental difference between marketing and logistics is that marketing is mainly focused on external transactions of the enterprise, while logistics - on the internal. Thus, the interaction of marketing as a concept of market-oriented management and logistics as a flow-oriented management concept creates opportunities for improving the material and information utility and value of the goods for the consumer. At the same time, the functions of marketing and logistics intersect [3].

3 Conclusions

The marketing and logistics system is a complex system that is connected with the research and optimization of all types of flows of the construction organization that accompany the physical movement of goods by the selected channel, the way from the producer to the end user with the purpose of complete, timely and qualitative satisfaction of effective demand, chains of distribution and commodity circulation [1]. The effectiveness of such a system depends on the magnitude of the effect obtained due to the achievement of the main objective of the marketing and logistics system, and on the magnitude of the total costs for the creation and operation of this system. Despite the fact that the construction industry is the most open system in comparison with other branches of production, the functioning of marketing and logistics systems at construction enterprises should be viewed as a key element of a competitive market strategy. Taking into account the fact that marketing logistics is coordinating in relation to all actions that in one way or another are related to customer service, the introduction of the principles of marketing logistics and the formation of its system into economic practice requires the availability of a powerful information system without which it is impossible to effectively manage the construction business.

References

[1] Kozlov V K, Uvarov S A *Funktsyonalnaia yntehratsyia marketynha y lohystyky* **E-resource:** http://www.spb.ru

[2] Oklander M A 2008 *Lohistyka: Pidruchnyk* / M.A. Oklander – Kyiv: Tsentr uchbovoi literatury 346 s

[3] Hadzhynskyi A M 2013 *Lohystyka: uchebnyk dlia bakalavrov* / A.M. Hadzhynskyi 21-e yzd. – M.: Yzdatelsko-torhovaia korporatsiia «Dashkov y Ko» 420 s.

Social impact of in-house share service business centers implementation in multinational companies

Olena Grishnova, Adrian Kozlovskyy

Taras Shevchenko National University of Kyiv, Ukraine

Abstract

Implementation of Shared Service Business Centers is a gaining momentum trend across multinationals in late 2000-s-2010-s. Despite the fact that such organizational model may bring significant economic effect, especially for diversified businesses, social risks that accompany this way of business construction may diminish both – company intellectual capital and expected economic outcome of new system. Analyzing of such risks and development of corrective action-plan may prevent negative factors realization.

Keywords: Shared Service Business Centers, reengineering of business processes, social risks, risk-management.

1 Introduction

Increasing volatility of modern economy prompt multinational companies to seek break-through ways of cost optimization. In this case, many of them choose third party providers or in-house Shared Service Business Centers (SSBC) to serve some functions (mainly IT, HR, Finance and Governance). The goal of such organizational structure construction is to boost support function performance, optimize costs, and create additional value for the business itself [2]. Despite the above-mentioned economical and management benefits, practical experience of SSBC implementation shows that social consequences of such changes may be significant and high risk of decrease in quality of business-processes appears.

2 Overview of the study area

Implementation of in-house SSBC have become an increscent trend for multinational companies in recent years. Frequently projects related to transformation of business-model (by creating SSBC) includes also changes in IT-infrastructure, digitalization of HR-processes [1] and standardizing of software solutions for all company business units.

Altogether such big changes as business model transformation, IT-refreshment and HR-digitalization lead to several consequences: 1) liquidation (or transformation) of departments across the functions; 2) creation of new departments in frame of SSBC; 3) standardization of processes across country business units; 4) and update of software solutions in IT and HR.

Experience of SSBC implementation in multinational shows, that social impact of transformation may be very essential and sometimes unpredictable. Main influence factors are:

- increase in dismissals – some of the people can't accept upcoming changes in their responsibilities and start looking for another job; common situation is that management does not wholly communicate the information about upcoming changes and people leave the company because they are afraid to be fired; there are situations that employer has to dismiss employee as there is no place for him in new organizational structure – this may reduce the level of effectiveness of such employees during the time remained and risk that some of the processes will not be properly transferred to new responsible increases;
- establishment of new units in frame of SSBC also contains high social effect – starting from the need in large number of specially qualified employees that will work on one location and ending up with communication problems during transfer period between prior personnel and newcomers;
- cultural peculiarities may also have huge social impact in frame of SSBC model implementation: 1) international tension between different nations (for example across foreign Yugoslavian countries, Ukraine and Russia, India and Pakistan etc.) may extremely decrease the level of service if SSBC is located in one of contradictory countries; 2) different time zones in SSBC and country units that it serves may lead to lengthening of business processes and deterioration of communication level between countries personnel and SSBC. Consequently, such situation may force the increase of business complexity and tension across country units; 3) different location of SSBC and country units (SSBC may serve one or even few businesses across many countries) decreases the ability of quick reaction, which finally weakens the competitiveness of country units and demotivates personnel; 4) language barriers may also decrease the level of business servicing from SSBC side – starting from communication problems across different countries and ending up with challenges in document workflow processing which may not only decrease level of service, but create tax risks for country units.
- main social risks are hidden among the transformation

of business-process and business-departments functions: 1) usually implementation of SSBC results in transferring or firing of supervising position with transition of some functions to line or middle management. Such situation may increase the level of discontentment of management that stays, especially if no additional benefits for them are expected; 2) the responsibility of task completion from employees that are expected to be fired may significantly decrease in last months of their work; 3) disbalance in professional duties of SSBC and business units employees may also increase the social tension and turnover ratio. Duties of SSBC employees mostly are monotonous and most of high-qualified staff quickly get bored; on the contrary mostly management-related and intellectual tasks are remained on business units side – thus level of overtime work increases and people get burned out from work; 4) automatization or deautomatization of processes due to changes in software may increase the social tension, as some of the employees will have to find another job (due to automatization of their duties) while another employees will have to take on the responsibilities that previously had been already automated; 5) practical cases shows that in case of radical software changes (for example – change in accounting and analytical software, or HR-digitalization) many people cannot get used to new system and decide to leave. Another part of the problem appears if testing of new software had not been done properly – this may cause improper flow of processes which increases the social tension, ruins business processes flow and creates risk of economic losses; 6) organizational transformations needs huge human resource and engagement of personnel for trainings conducting and participating – this could lead to augment of overtime work and discontent of employees.
- differentiation of structural units to SSBC and business units may also increase the social tension in collective by creating artificial borders which arise from organizational structure.

All the above-mentioned may not only increase the turnover ratio, swing social tension and decrease employees professional level, but also lead to leveling of all economic benefits that had been expected to be got via SSBC implementation.

3 Conclusion

Implementation of SSBC in multinational companies may be a good way of processes standardizing, cost cutting and increase in productivity. However, during SSBC-model development and implementation project team, consultants, management and HR representatives should consider all the social-related risks that may appear during and after SSBC launch. Neglecting of such factors may not only increase social tension, but also break down all the economic and process benefits that such system may generate.

References

[1] Грішнова О.А., Заїчко О.С. Новітні технології в економіці персоналу: нові можливості й нові виклики / О.А. Грішнова, О.С. Заїчко // Вісник економічної науки України. – № 2 (31). – 2016. – С. 52-57.

[2] Grishnova O.A., Zaiichko O.S. Novitni tekhnolohii v ekonomitsi personalu: novi mozhlyvosti y novi vyklyky [New technologies in social economy: new possibilities and new challenges] – Visnyk ekonomichnoyi nauky Ukrainy - №2 (31)

[3] Shared Services: what global companies do – Key trends and perspectives // Capgemini Consulting [Electronic resource]. – Available at: https://www.capgemini.com/consulting-fr/wp-content/uploads/sites/31/2017/08/shared_services_what_global_companies_do.pdf

Competitiveness in the conditions of global instability: prospects of agrarian enterprises financing

Mariya V Hunchenko*

Poltava National Technical Yurii Kondratuyk University, Poltava region

**Corresponding author's e-mail: Ukraine Gunchenko_m@ukr.net*

Abstract

In the article psychological strategies of human behavior in conflict situations are considered. The models of the process of rupture of conflict relations that can be realized in the management process are analyzed.

Keywords: conflict, conflict situation, strategy of behavior, communicative conflicts.

When there is a misunderstanding between people and even more controversy, it can lead to a communicative conflict that is seen as a special type of communication, a special condition of communicative behaviour of the people. Conflict is also characterized as communication, which manifests inconsistency in the actions of people who care about their interests. If cooperation and rivalry considered it's "healthy communication", then the conflict – as "unhealthy". Source communicative conflicts become actors of communication, cause - contradiction communicative goals and methods interactions that are used. The object of conflict it's interests. Feature communicative conflict it is that him participants almost never realize no matter, no object conflict. Reflection Conflict situation each one of him participants not corresponds to the real state of affairs. Such conflict becomes psychological, and therefore difficult is solved. On the one hand, the conflict considered as a method development him participants, and on the other - as evil, negative phenomenon, because he break up relationship between people.

What helps eliminate communicative conflicts? Psychologists point to communicative abilities or communicative competencies of this. Totality ideas about ways, actions and tools software communicative goals, implementation selected communicative roles and communicative competence man. At the same time we must understand that availability knowledge is not it means is, what such a man will never fall into conflict situation or even does not create it itself.

The experts call two such strategies for breaking the relationship: the first is the "strategy of the voice" - when the participants of the process during the negotiations try to find out the reasons that interfere with the relations, eliminate them and restore relations; the second is the "exit strategy" - when the participants finish the relationship. When using both the first and second strategies, the participants can carry out their intentions, following the following directions: "orientation to another", that is, an attempt not to harm the other party, and "self-orientation", that is, the desire to profit at the expense of losses of the other party.

Depending on these orientations, the following directions of the relationship between the relationships are distinguished:

- mediated - is used "disguised" exit "when the initiator reports the gap relationships , but finished refuse from that if will receive some kind of benefit for yourself, or "dumb exit" when the parties know about the gap relations, but not discussed this is keeping it your own reputation. Indirect strategy are realized more slowly, and they give both partners opportunity to settle your relationships;
- direct - when initiator openly informs the other side of the gap relationship. But that's it he may to do, depending on from its own orientation, in the following ways:
  - "as a realized fact" - when the partner is declared to be terminated relationships without leaving no one opportunities for further continuation relations;
  - "as parting by agreement" - when the situation is debated without arguments, but and without hostility;
  - "as a conflict of accusations" - when they arise displeasure and desire search guilty.

Of course, named strategies and directions is most generalized model the process dissolution relationship. Impossible appreciate some kind of from strategies as the most effective. In real practice business relationships usually are used mixed forms actions. The manager is important be able to recognize the beginning of a possible one dissolution relationships from so that in if necessary or desire catch to take measures of preservation them.

Thus, the essence of economic security can be defined as a state of the economy and government institutions, which provided for the guaranteed protection of national interests, the independence of the chosen economic policy, social dimension of economic reforms sufficient defense capabilities even under adverse conditions of internal and external processes.

References

[1] 2003 *The Pfeiffer Book of Successfull Conflict Management Tools* / ed. by Jack Gordon, San Francisco: Pfeiffer 430 p

[2] De Dreu C K W, Beersma B, Steinel W, Van Kleef G A 2007 *The psychology of negotiation: Principles and basic processes* In A. W. Kruglanski & E. T. Higgins (Eds.), Social Psychology: Handbook of Basic Principles (2nd ed. pp. 608–629). New York: Guilford

[3] Van Kleef G A, De Dreu C K W, Manstead A S R 2004 The interpersonal effects of emotions in negotiations: A motivated information processing approach *Journal of Personality and Social Psychology* **87** 510-28

Challenges of ICT in education

C Koryuhina[1], T Shamshina[2*]

[1]*ISMA University, Lomonosova Str. 1, LV-1019, Riga, Latvia*
[2]*TSI, Lomonosova Str. 1, LV-1019, Riga, Latvia*

**Corresponding author's e-mail: samsina.t@tsi.lv*


Abstract

The article examines advantages and disadvantages of ICT in education, singles out scientific and practical problems of its implementation and makes suggestions for improving this process. Besides, it studies UNESCO initiatives on ICT incorporation into the curricula, thus, reinforcing national potentials in ICT usage in education in the world.

To cope with the challenges ICT poses to higher education, in the authors' opinion, is possible through a coordinated effort by the teachers, continuity of approaches to education, as well as quality and effectiveness at development of educational competences.

Keywords: education, ICT, UNESCO, IITE, technology

1 Introduction

Technical advancement of the modern world, popularity of social networks are significantly changing the direction in education. Both the future of the education, and of society in general depends nowadays on understanding by all participants of educational process of the direction of a strategic development of education [1].

ICT (Information and Communication Technologies) is a generic term referring to technologies, which are being used for collecting, storing, editing and passing on information in various forms [2]. Schools can use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information. This involves using digital technology, communication tools and/or accessing, managing, integrating, evaluating and creating information in order to function in a knowledge society. What is more, most 21st century skill lists include ICT and ICT-related skills [3].

2 General part

Worldwide research has shown that ICT can lead to improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, for instance, proved that an increase in student exposure to educational ICT through curriculum integration has a significant and positive impact on student achievement, especially in subject areas such as mathematics, science, and social study [4].

Addressing student needs to access technology supporting their learning, meeting teacher technology requirements, and providing digital tools within budget might be a challenging task.

When teachers are digitally literate and trained to use ICT, their expertise can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace [5]. At the same time we must address the challenges faced by education due to the fast changes in society, economy, and technologies:

- How might technological changes impact the society, labour market needs, higher education systems and institutions?
- How can and do countries and institutions address these changes?
- In what ways are the skills required by the market changing?
- How should higher education institutions adapt to the changing learning needs?
- What impact will the availability of new technologies and online resources have on how people learn?
- Are national systems of recognition of learning outcomes and credentialing prepared to accommodate the results of open education?[6]

There are many advantages of ICT use. For example, through ICT, images can easily be used in teaching and improving the retentive memory of students; teachers can easily explain complex instructions and ensure students' comprehension; teachers can create interactive classes and make lessons more enjoyable, which could improve student attendance and concentration. ICT offers the opportunity for distance learners to use online educational materials, get quick access to them, as well as provides learners with additional resources to assist resource-based learning.

On the other hand, teachers with a lack of experience using ICT tools may find it difficult to incorporate this practice into their lessons; sometimes setting up the devices can be troublesome, to say nothing of limitations of budget and, thus, inability to afford the latest IT devices. Besides, ICT may limit students' imagination, critical thinking and analytical skills. Computer-based learning has negative physical side-effects, such as deteriorating eyesight or backache. The problem of plagiarism is very common as many students tend to focus on copy/paste from the Internet and find it difficult to generate their own ideas.

UNESCO guides international efforts to help countries understand the role ICT can play to accelerate progress toward Sustainable Development Goal 4(SDG4), a vision captured in the Qingdao Declaration. This is the first global declaration on ICTs in education, which aim is to unleash the full potential of ICTs to achieve the educational targets for equity, access, quality and lifelong learning in the Sustainable Development Goals (SDGs) for the next 15 years. In its Preamble, it affirms, "To achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICT — including mobile learning — must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more efficient service provision." It encourages governments, industry partners and all other education stakeholders to join forces and share resources to create equitable, dynamic, accountable and sustainable learner-centred digital learning ecosystems [7].

What is more, in 1997 the UNESCO Institute for Information Technologies in Education (IITE) was established as an integral part of UNESCO by the General Conference of UNESCO at its 29th session with the mission to serve as a centre of excellence and provider of technical support and expertise in the area of ICT usage in education. Offering advice and guidance on reinforcing national potentials in ICT usage in education in the world, IITE predicts changes in the curricula, such as:

- New balance between informal and formal learning should be established.
- Curricula must address not only the knowledge and competences of a given moment, but the ability to learn and act in a changing world
- Digital competencies need a more flexible updated curriculum that is also shaped by students themselves.
- More online and more personalized learning, more contact with the society.
- Redesign of courses, plans for semesters and even the duration of programs. Alternative online assessment.

Besides, the role of HE institutions will change, namely, online distance learning and campus-based learning will merge or take over each other functions and the share of online distance learning would be growing in the coming years.

The role of teachers will transform into the role of facilitators of knowledge, guides, mentors, e-tutors, and counselors. Some experts even expected that teachers would not only deliver or transfer knowledge, but would become "pedagogical engineers", "digital resources designers" and "digital courses designers". As teacher educators play a major role in successful implementation of ICT in education all this calls for urgent need for retraining of teachers [6].

3 Conclusion

To sum up, with its advantages and limitations ICT poses serious challenges to higher education institutions, which are already going through considerable changes. In future higher education will look quite different in terms of the mission and functions of higher education institutions, modes of teaching and learning, pedagogical approaches, student-teacher relationships and the role of teachers. To stay competitive teacher educators should use ICT to support existing pedagogical practices, but be aware of its potential drawbacks. Only a coordinated effort by the teacher educators will ensure success of ICT in a reasonable manner.

References

[1] Koryuhina C, Shamshina T 2015 Open Education: continuity of approaches and risks. In: Information Technologies, Management and Society *Theses of the 13th International scientific conference "IT&M 2015", 16-17 April, 2015, ISMA University, Riga, Latvia. ISSN 1691-2489, p. 227*

[2] SER 1997 ICT en arbeid: advies informatie- en communicatietechnologie en arbeid. Den Haag: SER Sociaal Economische Raad *(in German)*

[3] European Commission 2018 *Digital Learning & ICT in Education* https://ec.europa.eu/digital-single-market/en/policies/digital-learning-ict-education

[4] ELMO 2017 *What'sICT in education? Using ICTs and Blended Learning in Transforming TVET* in ed. C. Latchem. UNESCO and COMMONWEALTH OF LEARNING, 2017 http://www.elmoglobal.com/en/html/ict/01.aspx

[5] Goodwin K 2012 *Use of Tablet Technology in the Classroom* Strathfield, New South Wales: NSW Curriculum and Learning Innovation Centre

[6] *UNESCO 2016 Futures for ICT and Higher Education: Changes Due to the Use of Open Content* http://iite.unesco.org/pics/publications/en/files/3214745.pdf

[7] UNESCO 2015 Qingdao Declaration *International Conference on ICT and Post-2015 Education* www.unesco.org/new/en/education/resources/in-focus-articles/qingdao-declaration

Correlation of 1st year students testing results on maths with examination marks: conclusions and proposals

V Labeev[1], C Koryuhina[2], T Shamshina[1*], Yu Shamshin[2]

[1]TSI, Lomonosova Str. 1, LV-1019, Riga, Latvia
[2]ISMA University, Lomonosova Str. 1, LV-1019, Riga, Latvia

**Corresponding author's e-mail: jekaterina.korjuhina@isma.lv*

Abstract

The article poses a problem of equalization of first-year students' knowledge on different subjects. On the initial stage the authors find it necessary to test students' knowledge on a given subject, and after the analysis of the results to either form groups of different level of knowledge or by offering consultations and assigning individual tasks whatsoever achieve the goal of knowledge equalization, i.e. as far as it is possible to bring all the students to more or less average level of comprehension. This method has proved to be workable in different disciplines, such as maths, IT, English for Business Communications, etc.

Keywords: testing of knowledge, the analysis of results, consultations, individual tasks, equalization of progress

1 Introduction

Nowadays rendering paid services when training is characteristic of the higher education [1].This tendency is observed both in the higher educational institutions having the state grant when a certain part of students is enlisted on the budget places, and in private educational institutions.

The plan of students' acceptance on the budget places in many ways depends on higher educational institution opportunities to provide material and technical resources and availability of teaching staff. Enrolment takes place in conditions of severe competition among educational institutions and, therefore, the level of knowledge of entrants of the main subjects isn't adetermining factor [2].

2 General part

Taking into account the fact that the budget of non-state educational institution significantly depends on number of students, one of conditions of successful performance of the higher educational institution is preserving the students' number in it.

The approved method of the solution of this problem is the following procedure of equalization of student progress [3]:

1. Testing of knowledge of the enlisted students.
2. The analysis of results and on its basis development of recommendations and methodical instructions (for the specific student or group of students);
3. Implementation of corrective programs through thematic consultations, additional individual tasks, additional classes.
4. The admission of students to examinations following the results of accomplishment of recommendations (in case of their failure penalties are determined) [4].

Below are the research results received in the analysis of the first year students of computer department. For this purpose all examinees were broken into 4 subgroups depending on the received estimates. The received results of number of estimates are yielded as a percentage (Table 1), (Table 2), (Table 3).

TABLE 1 Testing results

Points	3701	4702	4703	2701	01	2701B	Total
0-3	0,46	0,20	0,48	0,50	0,46	0,30	0,39
4-5	0,36	0,30	0,26	0,38	0,38	0,30	0,32
6-7	0,14	0,42	0,22	0,12	0,16	0,30	0,24
8-10	0,04	0,08	0,04	0	0	0,10	0,05
St.	18	20	22	8			

TABLE 2 Exam results

Points	3701	4702	4703	2701P	4701	2701B	Total
0-3	0,32	0,08	0,37	0,25	0,25	0,17	0,24
4-5	0,32	0,25	0,33	0,63	0,34	0,33	0,37
6-7	0,32	0,54	0,26	0,12	0,21	0,33	0,32
8-10	0,04	0,13	0,04	0	0	0,17	0,07
St.	22	24	26	8	23	18	121

TABLE 3 Changes of statistical data of testing results in comparison with examination results

Points	3701	4702	4703	2701P	4701	2701B	Total
0-3	-0,14	-0,12	-0,11	-0,25	-0,21	-0,13	-0,15
4-5	-0,04	-0,05	0,07	0,25	0,04	0,03	0,05
6-7	0,18	0,12	0,04	0	0,17	0,03	0,08
8-10	0	0,05	0	0	0	0,07	0,02

3 Conclusion

So, having applied and analyzed the procedure of performance equalization described above, a certain correlation of tabular data can be observed:

1. The tables provided in theses show that selection is representative, reflects actual state of affairs and, therefore, proves the validity of the offered suggestions and recommendations.
2. The number of students with poor performance is

decreasing.

3. The number of students with very good performance is almost equal.
4. Number of students with good performance is more, than students with satisfactory knowledge.
5. Positive changes are reached due to reducing number of students with poor knowledge.

References

[1] Высшее техническое образование: проблемы и пути развития: *материалы VII Международной науч.-метод. конф. (Минск, 20 - 21 ноября 2014)* Мн.: БГУИР, 2014 р 362 https://www.bsuir.by/m/12_116088_1_85196.pdf

[2] Labeev V**,** Shamshina T 2015 Recommendations for optimizing the course of higher mathematics for technical specialties In: *Статья в Сборнике научных трудов по материалам международной заочной научно-практической конференции «YOUTH FORUM: TECHNICAL AND MATHEMATICAL CIENCE»** **3**(9) part 1, 9-12 November 2015 Voronezh: ФГБОУ ВО «ВГЛТУ» p 120-5

[3] Shamshina T, Labeev V 2011 Delivering a Course of Fundamental Exact sciences to the First-Year Students *Abstracts of Inter-higher school scientific and educational conferemce "Actual Problems of Education", 24-25 February 2011, Riga, Latvia - Riga: TSI, p.24*

[4] Shamshina T, Labeev V, Koryuhina C 2014 Variability of on Assessment of Knowledge in Distance Learning *Theses of The 12th International Scientific Conference "Information Technologies and Management", 16-17April 2014, Riga, Latvia - Riga: ISMA University, p. 294-5*

The future of hospitality management: where specialized software and hotel operations meet

O Mancheva-Ali, V Dimitrova

National Military University "Vasil Levski", Veliko Tarnovo, Bulgaria

**Corresponding author's e-mail: o.mancheva@uni-vt.bg*

Tecnlogical factors have an influence on the overall activity of hotels and their competitiveness on the tourist market. The introduction and utilization of new technologies is linked to the ambition of entrepreneurs and managers to achieve certain goals. The connection between tourism and information technologies is a natural one, as they both belong to the service sector. According to Eurostat (2011), compared to the other sectors, the service sector is the most sustainable one in terms of economy, which is proven by the fact that it was only slightly affected by the global economic crisis (data for the period 2008-2010), and the last to suffer consequences, amounting to 10,6 % (based on turnover). In Bulgaria, a strategic delay in the introduction and development of computer solutions for the business is observed, compared to the global trends. Interestingly, our country considers tourism and ICT priority sectors for economic development; however, not all governmental decisions have a positive impact on them.

The data of a number of studies in the past pointed to an alarming 58% of hotels which did not use information and computer technologies. Only 12% of them used reservation systems.

The purpose of the current paper is to elaborate on the role of specialized software in the activity of hotel facilities and also to present the types of software offered on the Bulgarian market.

The point of departure for our study was the character of hotel activity, which is divided into the following areas: front office, floor household, catering, storage property, additional services, administrative activities. Every area has to do with the hotel system, to a different extent.

The front office is responsible for certain activities which are closely related to the guest. A total of 71,4% of the activities are entirely and another 28,6% only partly performed with software.

For the optimal functioning and interaction between the hotel software and the staff, in view of achieving the set targets, the hoteliers are faced with the question which product to choose.

Many experts consider software as one of the most important elements in the hotel management. They suggest that, when choosing software, the following factors should be taken into account [5]:

- *User-friendly* – the system should be intuitive and consistent;
- *Web-based* – providing access of the system to the Internet anytime and on every type of device – laptop, computer, smartphone or tablet;
- *Highly effective* - interaction with all processes and levels in the hotel as well as connectivity of the system with other computer programs (restaurant software, SPA module, accounting program etc.);
- *Offering a solution for seasonal hotels* – the possibility for payment of monthly fee for the time when the program is used;
- *Data security* – of key importance for storing information in the system.

The fulfillment of these requirements leads to the following results:

- Reduced time for training of staff;
- Flexibility and independence in the operation of the facility through permanent Internet access;
- Speed, accuracy and precision of the information in line with the goals of the management;
- Flexibility of the software product leads to reduction of the costs of the seasonal hotels;
- Data safety.

These factors are directly related to the tasks, which the hotel software is expected to solve:

- Reduction of costs on suppliers, production, storage and availability of goods and services, as well as all the administrative and institutional costs;
- increasing sales volume through expanding the market to potential customers;
- providing a high level of service to achieve better quality;
- increasing the competitive advantages of the tourist service market;
- helping managers to achieve their goals;
- facilitation of the strategic planning of activities in the enterprise.

The combination of proper design of the hotel system, tailored to the specific activities in the facility, and problem-solving capacity, ensures high demand and application of specialized systems in almost all hotels. Thus, high-quality service and data safety are ensured.

The current paper is aimed to identify some potential solutions for hotel management.

The survey introduces hotel software products, identified on the Bulgarian market, in the order of their appearance in a google search. The table contains the following data: software company, name of the product, year of the establishment of the company, type of software (according to the authors[1]), as shown in table A2. It is not possible to identify all programs, due to poor presence on the Internet, insufficient or outdated information. The data

[1] *Published at https://www.degruyter.com/view/j/kbo.2017.23.issue-1/kbo-2017-0063/kbo-2017-0063.xml. In a summary, the types of software identified by the authors are: Basic (with partial offering of features), BTS - high technology (offers all features, including planning) and connecting (high tech, suitable for hotel complexes and chains)*

are from November 2017. The number of programs is 21, that the predominant type is high-tech with 57% of all identified programs, followed by the basic with 38% and the connecting with a 5% share on the Bulgarian market. (*https://www.degruyter.com/view/j/kbo.2017.23.issue-1/kbo-2017-0063/kbo-2017-0063.xml*).

The choice of the most suitable software for a hotel facility is an important and responsible task; a task that every entrepreneur and manager needs to complete in order to ensure the efficient execution of hotel operations. That choice is made even harder due to the lack of representation of the software companies. Very often the decision the hoteliers make is irrational and inefficient and can lead to the loss of the financial resources.

By placing the emphasis on the characteristic features of the specific software products and creating a system for decision-making assistance, a more efficient implementation and application of the specialized hotel programs will be achieved. That is the next research goal that the authors set for themselves.

Specific of customer service in electronic business environment

I Spica, B Berzina, E Spics

ISMA University, Scientific Institution Business Competence Centre, Lomonosova Str. 1, Building 6, LV-1003 Riga, Latvia

**Corresponding author's e-mail: inese.spica@gmail.com*

Abstract

Nowadays a significant amount of goods and services are sold in electronic business environment, for example, at electronic market places. Demands for goods and services via internet resources are very popular in Latvia and other countries. Modern trade cannot be considered as a solely national phenomenon. The object of the present research paper is electronic business environment. The subject of the research paper is analysis of the customer service in electronic business environment. The objective of the research paper is to study the integration process of micro and macro electronic business environment and customer service problems, to elucidate the factors influencing the customer service effetiveness, to develop proposals for solving problems and for customer service management mechanism by making use of relationship between these factors in investigation of customer service in Latvia.

Keywords: Customer, service, electronic micro business environment, electronic macro business environment, management

1 Introduction

Nowadays a significant amount of enterprises more often are founded as joint stock companies with international capital. Customer service internationalisation and globalisation process are characterised by features like internationalisation of company management, differences in the places of location of company management, differences between the culture of national business and the company owners, abilities to adjust to the demands of the electronic market as well as international culture of organisation.

2 Research methods, period and research basis

The objective of the research paper is to study the specific of customer service in electronic business environment.

The tasks advanced in order to reach to objective:

1. to indentify the concept of electronic business micro and macro environment and their main economic indicators,
2. to carry out analysis of the factors influencing customer service in the process of electronic business micro and macro environment integration,
3. to carry out analysis of indicators characterising the specific of customer service in electronic business micro and macro environment.

Theoretical study methods are reported analysis of marketing, customer service, electronic business micro and macro environment, electronic market, management information systems, study of correlation between customer service factors and electronic business environment.

Empirical pilot methods are observation for the purpose of studying mutual influence between customer service factors and electronic business environment, study of documents regulating customer service in electronic market in Latvia, analysis of the electronic business environment in Latvia, economic and statistical analysis of the customer service results in electronic market and electronic business environment in Latvia, economic experiment, study of public and non-governmental institutions data in Latvia.

Research basis are customer service, electronic market, electronic business environment in the Republic of Latvia, the main characteristics of customer service, electronic market and electronic business environment of the European Union.

The research period is from the year 2000 till the year 2018, separate theme have been studied for a shorter period of time or buy way of comparison.

3 Discussion

Sales via the Internet are a promising area of development. It offers access practically to people all over the world to go shopping or exchange goods and service at the electronic market. Undoubtedly, language barriers and legislation differences in various countries shall be taken into account. The internet creates the possibility for new services and goods.

The impact of the service sector on the Republic of Latvia economy has really been substantial.

Services are not things, they are processes or activities, and these actvities are very intangible in nature.For most services, four basic characteristics can be identified: 1) services are more or less intangible; 2) services are activities or a series of activities rather than things; 3) services are at least to some extent produced and consumed simultaneously; 4) the customer participates in the production process at least to some extent [1].

Correlation between customer service and the electronic business environment takes place continuously. This interaction is complicated and becomes apparent in many and various ways. On the one hand customer with its activities influences the electronic business environment, but on the other hand, the electronic business environment makes the customer to act in one way or another.

Besides the electronic business environment factors in their turn together with other business environment factors interact with the business and makes it to develop customer service strategy and tactics suitable for the electronic business environment, as well as makes the business to function according to developed strategy and tactics at the electronic market.

4 Conclusions

Since customer service is one of business areas, it is subjected to the changing influence of electronic business environment, and analysis of customer service theory and practice enables to establish that customer service theory and practice in the course of development changes just under the influence of electronic business environment.

References

[1] Gronroos C 1990 *Service Management and Marketing*, Toronto: Lexington Books, 298 p

Turbulence in the global market for higher education

Iryna Kalenyuk[1], Oleg Kuklin[2]

[1]*Kyiv National Economic University named Vadym Hetman, 81 Melnikova Street, Kyiv, Ukraine 04050*
[2]*Cherkasy State Business-College, 243 Chornovola Street, Cherkasy, Ukraine 18028*

**Corresponding author's e-mail kalenuk@ukr.net*

Abstract

In modern conditions, the development of higher education is characterized by processes of diversification of financing and organization, internationalization and globalization. The formation of the global market for higher education is accompanied by an aggravation of competition between countries and universities, a change in the position of the main regions - competitors.

Keywords: internationalization, globalization, global market for higher education

Strengthening the internationalization and globalization carries a transformative impact on the economic conditions and the forms of organization of educational activities. The main current trends should include the following: increasing the role of education in the development of the knowledge economy); diversification of funding sources and the organizational forms of educational activities); internationalization and globalization of education.

The 21st century has brought new waves and processes for the development of higher education and the global market for educational services. These are rapid processes and undeniable tendencies of globalization, the internationalization of higher education, the spread of its mass character and the intensification of competition at all levels, and so on. These trends were so clear that they were identified as dynamic vectors for the development of higher education. The first confirmation of this was the rapid increase in the number of foreign students in the world, with rates higher than the total number of students. The number of foreign students slowly increased from 0.8 million in 1975 to 1.7 million in 1995. From the beginning of the XXI century it is gaining momentum: in 2005 - 3.0 million, in 2010 - 4, 2 million, 2011 - 4.4 million, in 2014 - 4.6 million people. In table 1 presents data on the general and regional dynamics of the number of foreign students in the world:

TABLE 1 Dynamics of the number of foreign students in the regions of the world [1]

Regions	2010	2010	2012	%
Africa	100 031	178 716	196 568	197
Asia	334 562	726 054	806 281	241
Europe	935 879	1 984 442	2 160 874	231
Northern America	569 640	880 427	961 967	169
Latin America and Carrabin	28 945	76 041	71 468	247
Oceania	118 646	350 165	330 886	279
World	2 087 702	4 195 845	4 528 044	217
OECD	1 604 601	3 181 939	3 415 975	213
EU	822 025	1 686 734	1 822 330	222
G20	1 730 913	3 432 928	3 712 641	214

In recent years, the turbulence of the global educational environment has undergone rapid changes, which rapidly change the balance of forces and cause the emergence of new processes and phenomena. This is manifested, above all, in reducing the market share of the OECD countries. In general, the share of OECD countries fell from 76.4% to 71.9% during 2007-2014. The positions of many active figures (Australia, Austria, Germany, France, Great Britain and others) have decreased or remained at the same level, although the total number of foreign students has increased.

The main subject of attracting foreign students is the United States, while it is possible to maintain its leadership positions through very active actions to attract foreign youth. At the same time, President Trump's policies made adjustments, and over the past year, the United States has suffered a sharp decline in the inflow of foreign youth. (about 19% of the world market), but it's only.

Against this background, Canada and European countries are improving their position. There are new active actors in 2007-2014: China (increased its share from 1.4 to 2.5%, and the total number of foreign students in 2.5 times - from 42.1 thousand to 108.2 thousand), Saudi Arabia (from 0.6% to 1.7%, the number of students increased more than 4 times - from 17.7 thousand to 71.8 thousand), the Russian Federation (from 2% to 5%, the number of students 3.5 times - from 60.3 thousand to 213.4 thousand) and others. In general, among the countries - leaders of the world market of educational services are: USA, Great Britain, Australia, Germany, etc. (Table 2).

TABLE 2 The number of foreign students in some countries of the world and the share of the world market (%), 2000 - 2011 [2]

Countries	**Number of foreign students, 2011**	**Part of global market**			
		2000	*2005*	*2010*	*2011*
Australia	262 597	5,6	6,5	6,6	6,1
Austria	70 558	1,6	1,3	1,7	1,6
Belgium	51 572	2,1	1,7	1,3	1,2
Canada	203 823	6,1	2,8	4,7	4,7
France	268 212	7,3	8,7	6,3	6,2
Germany	272 696	10,0	9,5	6,4	6,3
Italy	73 461	1,3	1,6	1,7	1,7
Japan	151 461	3,6	4,6	3,4	3,5
New Zealand	72 796	0,4	2,5	1,7	1,7
Sweden	50 078	1,4	1,4	1,1	1,2
Switzerland	58 943	1,4	1,4	1,3	1,4
United Kingdom	559 948	11,9	11,7	13,0	13,0
USA	709 565	25,3	21,6	16,6	16,5
OECD	3 316 209	85,5	84,2	77,3	77,1
Countries — non members OECD	982 199	14,5	15,8	22,7	22,9
Russia	171 499	2,2	2,9	3,9	4,0
Southern Africa	82 553	0,8	1,9	1,5	1,9
Ukraine	42980	1,0	1,0	0,9	1,0

Internationalization of education is manifested not only in the growth of the number of foreign students. Academic mobility as an expression of the internationalization of higher education itself is extremely diverse and has the following forms: the departure of scientists abroad for work, internship, teaching (for a short time), for participation in conferences; joint scientific work (writing articles, monographs, performing research grants); Participation of students, postgraduates and teachers in various short-term training programs (courses, certificate programs, summer schools, etc.).

An important indicator of the export orientation of the economy is the ratio of foreign students and the total number of students in their country. Among OECD countries, the number of foreign students in relation to the total number of students in the country is the largest (44%) in Luxembourg. This figure is 19% in New Zealand, 18% in Australia and the United Kingdom, 17% in Switzerland, and 15% in Austria. On average, 6% of foreign students in OECD countries, in the EU 22 - 8%. [1]

An important feature of the world education market is that the percentage of foreign students, as a rule, in all countries increases with the level of education. The smallest one is for short-term and bachelor's programs of higher education, while significantly higher - for master's and doctoral programs, which is clearly evident from the data in Table 3:

TABLE 3 International student mobility in OECD countries, % [1]

Countries	**The share of foreign students at different levels of higher education**					**%, 2014/2013**
	All higher education	*Short programs*	*Bachelors programs*	*Masters programs*	*Doctors programs*	
Australia	18	13.3	13.1	40	34	6
Austria	15	1.0	18.6	18	25	8
Belgium	11	4.9	8.2	20	37	24
Canada	10	9.0	8.1	14	27	12
Denmark	10	13.1	5.5	17	30	2
Finland	7	-	5.2	12	19	4
France	10	4,4	7,3	13	40	3
Germany	7	0	4,4	12	7	7
Ireland	7	1,1	5,8	14	23	11
Japan	3	3,4	2,5	8	19	2
Luxemburg	44	11,3	25,3	68	85	3
New Zealand	19	27,4	14,3	23	45	18
Sweden	6	0,2	2,4	9	33	0
Switzerland	17	0	9,9	28	53	5
United Kingdom	18	5,5	13,7	37	42	3
USA	4	2,0	3,5	9	35	7
OECD	6	3,0	4,9	12	27	5
EU22	8	4,5	6,1	13	22	4

Of course, for each country, the issue is important not only to attract foreign students to their national education system, but also the dynamics of their youth's departure for studying abroad. It should be noted that this indicator is under the influence of many factors. The increase in the flow of travel abroad for training is far from always due to the unfavorable situation in the country. The impact of globalization manifests itself in the fact that young people are increasingly active in their search. As a result, we can see both emerging and developed countries in the leaders of the importing countries. Table 5 shows data on the number of foreign students by country of origin. Among the main leaders of the importing countries, we see different countries: China, USA, Saudi Arabia, Turkey, Japan, Vietnam, Russia, etc. Characteristically, the dynamics of the departure of young people abroad for the purpose of education is also very diverse in different countries. In countries such as Greece, Turkey, Japan, and the United Kingdom, the number of student dropouts tends to decrease. While countries such as Saudi Arabia, Vietnam, Brazil, Russia, Mexico, Ukraine, USA, Georgia, Tajikistan and others, show a clear upward trend.

TABLE 4 The number of students studying abroad - immigrants from the country of origin [3]

	1998	2000	2010	2015	2017	%, 2017/1998
China	151 055	165 348	570 449	818 803	847 259	561
USA	38 208	43 482	57 506	67 356	68 580	180
Saudi Aravia	9 941	10 626	42 651	86 223	85 277	858
Vietnam	7 858	9 148	47 268	68 038	70 328	895
Russia	26 096	28 634	50 403	57 332	56 915	218
Turkey	51 067	51 604	51 885	45 921	45 331	89
Ukraine	13 064	20 891	36 203	68 279	76 181	583
Greece	62 059	63 676	29 226	37 092	37 484	60
Latvia	2 875	3 005	5 064	5 804	5 737	200
Japan	57 088	59 302	40 330	30 491	30 850	54
Brazil	15 596	17 274	27 753	42 645	43 438	279
United Kingdom	28 142	22 328	24 600	31 433	33 109	118
Mexico	13 149	14 230	26 072	30 194	30 646	233
Thailand	21 553	21 007	28 304	28 672	29 768	138
Sweden	12 819	12 601	15 540	17 378	17 567	137
Azerbaijan	4 882	4 862	14 302	39 970	41 762	855
Georgia	3 857	4 367	8 736	8 888	9 084	236
Tajikistan	1 292	1 396	8 342	15 677	20 623	1596

Conclusions

The development of the modern education market at the global level is characterized by dynamic dynamics and complex structural processes associated with increased competition between countries. The core centers and, respectively, the leading export-education countries have been formed. Rigid competition is constantly changing the position, however, the unconditional leaders remain: the United States, Great Britain, Australia, France, Germany, Russia, Japan, Canada. New actors rushed out and gradually replaced leaders: China, Turkey, Saudi Arabia, Korea, South Africa, and others. The most attractive for foreign students is the curriculum of the master's and doctoral levels. The landscape of imports of educational services is also changing. The most active donors of foreign students are very different countries: strong countries (USA, UK, Japan), successful developing countries (Turkey, Brazil, Mexico), as well as countries with some developmental problems (Ukraine, Vietnam, Georgia and etc.)

References

[1] *Education at a Glance 2016: OECD Indicators* http://dx.doi.org/10.187/eag-2016-en/

[10] *Education statistic* **E-resource:** https://knoema.com/WBEDS2017/world-bank-education-statistics?region=1002250&indicator=1036270

[11] *Education statistic* **E-resource:** http://data.uis.unesco.org/Index.aspx?DataSetCode=EDULIT_DS&popupcustomise=true&lang=en#

Green thinking and no waste in catering and novel food from plant by products

Daiga Konrade

Hotel Management College, Riga, Smilšu 3, Riga, LV- 1050

e-mail: daigakonrade@gmail.com

1 Introduction

One third of food products or 1.3 billion tonnes for human consumption gets lost. EU's approach is that the disposal of by-products and food waste should be minimized and used further to produce alternative products [1].

Around 100 million tonnes of food are wasted annually in the EU. If nothing is done, food waste could rise to over 120 million tonnes by 2020 [2]. Global quantitative food losses and waste per year are roughly 30% for cereals; 40-50% for root crops, fruits and vegetables [3]. In catering vegetable pre-processing produce by-products such as peel, thick, squash, cores, kuchen, seeds that can be used in the manufacture of other foods as they contain a lot of biologically active and valuable compounds such as fibre, vitamins, micro and macronutrients, organic acids.

Food processing waste has the potential to be converted into useful products and utilized as functional supplements [4]. Mostly every catering establishment produces salads, juices, soups, boiled and fried vegetables. Catering facilities and households are at the very end of the food supply chain. Food waste is a major problem that must be reduced to achieve a sustainable food supply chain. Prevention is most important at the end of the value chain, where the largest number of sub-processes have already taken place and occur in vain if the food is not used for its intended purpose.

Most favourite fruit in Latvia is apple (*Malus domestic*) served in restaurants in form of apple pies, apple juices, salads, jams, puddings and in some cases produced in wine or cider. A lot of pomace is left after juicing (approximately 40-50%) and peel after peeling. Apples and their seeds has the high content of dietary fibres and antioxidants recognized to prevent many human diseases such as cardiovascular and lowering blood cholesterol [5].

Carrot (*Daucus carota*) is the second most popular vegetable in catering after potatoes. It is processed in soups, carrot pies, juices. After juice production the pomace is left approximately 60-80%. Peel of carrots is about 8-15% of whole vegetable. Peel and pomace are still rich in biologically active substances as carotene, mostly β-carotene, which is the precursor of vitamin A, it is rich in other vitamins like riboflavin, thiamine, vitamin B complex, minerals, phytochemicals and phenolics [4, 6, 7].

Pumpkin (*Cucurbita pepo*) is classified as berry or fruit vegetable and it is rather favourite in several Latvian cuisine dishes such as soups, pumpkin bread, pumpkin pie, dishes with meat and juice as well. Pumpkin contains many biologically active components - proteins, peptides, sterols, antioxidants and carotenes, for example, β-carotene, which the body converts to the important antioxidant of vitamin A.

Pumpkin seeds are good source of carotenoids, including lutein, α - carotene, and β-carotene. The seed oil is rich source of unsaturated fatty acids, such as, linoleic, oleic, palmitic, and stearic acids. The oil is also rich in vitamin E, including both gamma-tocopherol and alpha-tocopherol [8].

One of the usages of the by-products might be their incorporation in the manufacture of extruded products. The production of foodstuffs by the extrusion method is a way to turn starchy products (grains, potatoes) into readily available and usable products such as breakfast cereals, pasta products, snack bars, chips [9].

Sensory acceptance is also very important for consumers as well as for restaurant attenders.

Therefore, the aim of the study is to describe the product. And evaluate sensory acceptance of crisps with addition of apple, carrot and pumpkin by products and the further inclusion in restaurant menus.

2 Materials and methods

Research was carried out at the scientific laboratories of the Faculty of Food Technology at Latvia University of Life Sciences and Technologies and at JSC MILZU.

For development of crispbreads as raw materials 1880 type rye flour (JSC Dobeles dzirnavnieks), oat flour, apple, carrot and pumpkin by-products were used. By-products obtained from local juice producers and from JSC Vairāk Saules and LTD Terrosk.

The aim of the sensory testing is most acceptable samples for consumers. Samples with 20% added by products were not submitted for evaluation, as their appearance did not meet the standards for crispbreads.

9 different samples were offered to consumers to determine the degree of assurance trouble. In experiment were involved young people 15-25 years of age and testing of Hedonic scale with 5 points.

1. Like very much
2. Rather like
3. Neither like or dislike
4. Rather don't like
5. Doesn't like very much

The most acceptable for consumers after ranking test were crisps with 10% of apple by products, 5% and 10% of carrot by products and 5% of pumpkin by products. Extruded products with apple by product have no significant difference in terms of certainty, but there was a difference between samples with 15% by product addition ($P \leq 0.05$, $\alpha = 0.05$, freedom level 3, $T = 5.4$, $c2 = 7.81$). The difference in acceptance is probably of different taste as dietary fibres and other biologically active substances like phenolics, organic acids, carotenes can change sensory profile of foods [11].

Questionaries' was evaluated for 5 local restaurants to understand if they are ready to start green thinking and no waste politics in their business and promoting new products from by-products after juice extraction or peeling. Answers were positive as more and more people are understanding necessity of zero waste in food production and turning to green or organic thinking in nowadays.

3 Conclusions

Minimizing waste and usage of by products in new functional product from rye and oats development is possible. Addition of 10 % of apple, 5 % of carrot and pumpkin by products didn't changed sensory features of crisps and were the most appealing. Catering companies collecting and cooperating with other green thinking establishments can reduce by product throwing and increase the products that bring back value added.

References

[1] Plazzotta S, Manzocco L, Nicoli M C 2017 Fruit and vegetable waste management and the challenge of fresh-cut salad *Trends Food Sci. Technol.* **63** 51–9

[2] Turon X, Venus J, Arshadi M, Koutinas M 2018 *Food Waste and Byproduct Valorization through Bio-processing: Opportunities and Challenges* **9**(4) 5774–77

[3] Vaqué L G 2015 Food Loss and Waste in the European Union : A New Challenge for the Food Law? **1979** 20–34

[4] Konrade D, Klava D, Gramatina I 2017 Cereal crispbread improvement with dietary fibre from apple by-products pp. 1143–8

[5] Colin-Henrion M, Mehinagic E, Renard C M G C, Richomme P, Jourjon F 2009 From apple to applesauce: Processing effects on dietary fibres and cell wall polysaccharides *Food Chem.* **117**(2) 254–60

[6] Arscott S A, Tanumihardjo S A 2010 Carrots of Many Phytochemicals Acting as a Functional Food *Compr. Rev. food Sci. food Saf.* **9** p. 223-29

[7] Kaur J, Kaur A, Ahluwalia P 2014 Effect of pre-dehulling treatments on chemical composition, functional and pasting properties of whole oat flour *Carpathian J. Food Sci. Technol.* **6**(2) 83–91

[8] Mala S, Sathiya Mala K, Kurian A E 2016 Nutritional Composition and Antioxidant Activity of Pumpkin Wastes *Ijpcbs* **6**(3) 336–44

[9] Konrade D, Klava D, Sabovics M, Kince T, Kruma Z 2016 Plant by - products as source of natural antioxidants for production of crispbreads **6**(3) 3001

[10] Balázs S P 2012 Sensory evaluation in food industry pp 1–32

[11] Yde C C, Bertram H C, Theil P K, Knudsen K E B 2011 Effects of high dietary fibre diets formulated from by-products from vegetable and agricultural industries on plasma metabolites in gestating sows *Arch. Anim. Nutr.* **65**(6) 460–76

Informational economy: extension of opportunities of human development in social and labor sphere

Iryna Kravchenko*, Armen Aleksanyan

Economics and Management Department SHEE «Banking University» (Kyiv)

**Corresponding author's e-mail: irina.kravchenko999@gmail.com*

Abstract

The gradual transition to the information economy leads to changes in the social and labor sphere, changes in the content of work and forms of its organization, expansion of human development opportunities through the implementation of digital technologies, modern approaches to business process organization, development of digital infrastructure.

Keywords: human development, information technologies, social and labor sphere, productive employment.

1 Introduction

Rapid development and dissemination of information technologies change the social and labor sphere and create new opportunities of productive employment, form the demand of new professions - in the field of artificial intelligence, digital technologies, development and support of mobile applications, various online services. Implementation of productive employment opportunities in the context of information technologies is also associated with significant threats - in the most global dimension, the question is whether Ukraine will be able to take a worthy place in the modern digital world, whether the pace of technological development will be sufficient for a decent representation of the country in the international market, will we be able to at least a little stop the pace of outflow abroad qualified professionals?

2 Overview of the study area

Different aspects of the dissemination of information technologies and the formation of the information economy have been investigated in the papers of Yu. Bajal, D. Bell, P. Drucker, J. Jalilo, M. Castells, A. Kolodyuk, F. Mahlup, E. Toffler and others, as well as analytical reports of international organizations - World Economic Forum, Organization for Economic Cooperation and Development, etc. Issues of productive employment and the expansion of opportunities of a modern person are studied by O. Grishnova, A. Kolot, E. Libanova, G. Mishchuk and others.

Considering social and labor issues through the prism of the information economy, we propose to use indicators that characterize the opportunities of productive employment in the conditions of the information economy for the estimation of human rights in the social and labor sphere: "Average wage (at comparable prices in 2016), UAH / month", "Employment rate of the population,%", "Knowledge-based jobs,% of the work force (estimated by international experts)" and "Influence of ICT on the business model, scores (according to international experts)". The values of the indicators in 2012-2016 are presented in Table 1.

TABLE 1 Indicators that characterize human development opportunities in the social and labor sphere in 2012-2016

Indicators	**Year**				
	2012	*2013*	*2014*	*2015*	*2016*
Average salary, UAH / month	3041,0	3282,0	3480,0	4195,0	5183,0
Consumer price index	99,8	100,5	124,9	143,3	112,4
Coefficient for transfer to the comparative prices of 2016	2,018	2,022	2,012	1,611	1,000
Average wage (at comparable prices in 2016), UAH / month	6136,0	6635,6	7000,9	6756,9	5183,0
Employment rate of the population,%	66,9	67,3	64,5	64,7	64,2
Knowledge-based jobs,% of the work force (estimated by international experts)	32,1	32,1	33,9	26,3	33,7
Influence of ICT on the business model, scores (according to international experts)	4,1	3,9	3,6	3,9	3,8

Note: Compiled by the authors [1-6]

The dynamics of the studied indicators in general is negative, especially brightly it can be observed on the example of real wages, which in 2016, compared with 2012, decreased by 953,0 UAH / month. A negative trend is also a decline in the employment rate of the working-age population - in 2016, compared with 2012, it decreased by 2,7 percentage points.

Describing the indicators presented in the international ratings "The Global Information Technology Report", in particular "Knowledge-based jobs, % of work force" and "Influence of ICT on the business model, scores", it is worth noting that, according to experts from the World Economic Forum (The World Economic Forum) [2-6], the infrastructure of information and communication technologies in Ukraine needs further development. In addition, there is no clear state policy aimed at developing information and communication technologies, which, together with unfavorable conditions for innovation and weak legal principles of the economy, threatens the country's great potential for economic and social benefits.

3 Conclusion

At present, complex multi-vector processes in the social and labor sphere, which are strongly influenced by globalization tendencies, a systemic socio-economic crisis, as well as unfavorable investment climate, are taking place. A well-considered socio-economic policy is an important condition for overcoming existing asymmetries in the social and labor sphere, expansion of human development opportunities and a dynamic transition to the information economy.

References

[1] 2017 *Праця України у 2016 році. Статистичний збірник* К.: ТОВ Видавництво "Август Трейд" 234 p
[2] *The Global Information Technology Report 2012 Living in a Hyperconnected World. The World Economic Forum* **E-resource:** http://www3.weforum.org/docs/Global_IT_Report_2012.pdf
[3] *The Global Information Technology Report 2013 Growth and Jobs in a Hyperconnected World. The World Economic Forum* **E-resource:** http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf
[4] *The Global Information Technology Report 2014. Rewards and Risks of Big Data. The World Economic Forum* **E-resource:** http://www3.weforum.org/docs/WEF_GlobalInformationTechnology_Report_2014.pdf
[5] *The Global Information Technology Report 2015. ICTs for Inclusive Growth. The World Economic Forum* **E-resource:** www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf
[6] *The Global Information Technology Report 2016. Innovating in the Digital Economy. The World Economic Forum* **E-resource:** http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf

Investments in the tourism industry

Iryna Krekoten

Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi Avenue, 24, Poltava, Ukraine, 36011

Abstract

It is important to note that tourism has a significant impact on the economy and development of the region, on the infrastructure of the region, facilitates the flow of currency into the country, encourages the creation of new jobs. So, in maximizing the benefits of tourism, each country develops a tourism policy, which is one of the directions of the socio-economic policy of the state.

Keywords: region, infrastructure, tourism, politics, state

1 Introduction

It is important to note that tourism has a significant impact on the economy and development of the region, on the infrastructure of the region, facilitates the flow of currency into the country, encourages the creation of new jobs. So, in maximizing the benefits of tourism, each country develops a tourism policy, which is one of the directions of the socio-economic policy of the state.

The development of the tourism industry seriously affects the development of the entire economic system. At the same time, the impact on the economy is both direct and indirect.

2 Main part

Increasing investment attractiveness is a complex and continuous process. With the help of the regulatory influence of the state, the tourism industry directly influences through the relevant ministries and departments, national tourist organizations. However, it is possible and significant influence with the help of legal levers, support of its infrastructure and international policy [1].

Since in the process of forming interbudgetary relations in the development of the tourism industry in Ukraine at the regional level, certain contradictions in state regulation are manifested, which makes it ineffective [2].

Therefore, attracting foreign capital to the tourism industry should not avoid attracting investments of a domestic entrepreneur. We want that the privileges granted to enterprises with foreign investments should be provided to domestic enterprises that operate within this sector of the economy. This will encourage more investment activity and act as a factor in creating investment attractiveness of both countries in general and a particular region. It should be noted that national investments are more important than foreign investments, because they are a direct indicator of public confidence in public policy. After all, it is domestic investors who are interested not only in maximizing profits, but also in stabilizing the country's economy and efficient use of available resources.

The tourism industry is characterized by its unique structure, namely a number of elements, including various service industries: restaurants, hotels, rest homes, laundries, shops specializing in selling local artisans' products and art objects, etc. Therefore, tourism industry enterprises are quite capital-intensive for high cost of real estate and equipment.

3 Conclusions

So, the development of tourism generates certain social and additional costs for supporting the environment. Enough rapid development of tourism and full dependence on it poses the following dilemma: if to stop further development, this threatens the economic recession; if we do not restrict tourism in further development, then the country's natural and cultural resources will become poorer and depreciate. In this case, the decision is usually difficult to take.

It is important to conclude that an effective and full-fledged analysis of the factors of investment attractiveness as a means of developing the recreational sphere will allow us to build an effective model of enterprise management for this type of activity, both at the micro and macro levels, and is the goal of further scientific research.

References

[1] Chernysh I V 2014 *Sposoby pidvyshchennia investytsiinoi pryvablyvosti yak zasib rozvytku turystychno-rekreatsiinoho kompleksu rehionu* IA Markina, Naukovyi visnyk PUET: Economic Sciences 275-8

[2] 2014 Protyrichchia derzhavnoho finansuvannia turystychnoi haluzi v Ukraini: Rehionalnyi aspekt *Ekonomika. Upravlinnia. Innovatsii.* **2**(12) 211-4

Professional and personal competences of “ideal manager”

Nikita Mayurnikov

BSPU, Minsk, Belarus

Abstract

Nowadays**,** the profession of a manager is one of the most in-demand occupations on the HR market.

However, are all “excellent managers” able to justify their name? I've always believed that any person can achieve good results, if they set goals and pursue such goals steadily, without looking back. Still, such person will not be able to become an ideal manager, because such qualities as commitment, persistency, firmness and optimism are not enough to reach the goal

Keywords: manager, management

1 General

Apart from the above-mentioned qualities, a manager must be given great personal charisma, possess the capability to take balanced and calculated decisions in a crisis environment, be sociable and intelligent, have teamwork skills, and ability to cope with stress. Besides these qualities, an ideal manager must be well-educated and have expertise in the sphere of economics, sociology, exact sciences, and specialized disciplines. As regards exact sciences, for example, one can attribute mathematics to such sciences, starting from the multiplication table to the linear programming, as the vast majority of managers have to be involved in numerical calculations: making forecasts, multifactor development models, etc. Economic sciences: a standard complex of microeconomics and macroeconomics, political economics, economical industrial management, international economic relations. These disciplines are the foundation, which each manager must be familiar with. Sociological sciences: psychology, demographic analysis, analysis of trends in preferences of young population, NLP fundamental. These are a stratum of knowledge, which also has a great significance for qualification of an ideal manager or for their career progression. Specialized disciplines: such disciplines are directly related to the type of activities a manager is involved in. One cannot become a successful leader, unless they have a thorough understanding of the specific field, your company is involved in.

Any manager must have background knowledge concerning managing other companies in other industries. By all means, they must be able to use state-of-the-art IT solutions and communication means; they must understand, how and using which tools they will ensure efficient management and strategic development of their company on the basis of all possible components of the existing management system.

One may single out three main components, which form a complex of policies implemented by any modern company in an effort to ensure sustainable strategic leadership in a fluid environment.

The first component is the policy of HR management. It is commonly known that personnel is the company’s main resource required for the company’s success. In the modern Western companies, personnel has been dubbed “human capital” for quite some time now. Statistically, 64% of a company’s income is ensured by the adequate selection of high-end talent. Thus, managerial tools of the HR policy must ensure effective staff recruitment, allow management of the introduction process for new employees during the trial work period, and facilitate individual achievements and assessment of work efficiency of employees.

The next component is the financial policy. The main managerial tools of the financial policy must ensure adequate financial planning, implementation of an effective management accounting, budget enforcement, and allow current and final assessment of the key financial performance indicators.

The first component is the marketing policy. It includes such elements as product strategy, market research, sales promotion, logistics, pricing, marketing informational system. It establishes the company’s marketing approach, when “meeting market demands” is the fundamental criterion for the company’s activities assessment, starting from the business philosophy and selection of the vector of development, to manufacture and sale of goods and provision of services.

The foregoing items are the skills and knowledge, which are indispensable for an ideal manager. I have not mentioned knowledge of the world history and foreign language speaking skills, as these are the minimum skills and knowledge, required for any self-respecting manager.

Most of the managers think that taking the right decisions, managing personnel or a company is easy, but no matter how optimistic we are, this opinion is totally wrong. In order not to make such mistakes, we must remember what the term “manager” itself means.

The term was brought to us from the West; it was embedded into our thinking long ago, and became a part of our vocabulary. Its meaning is: a person responsible for controlling or administering a particular direction of company’s activities.

The following synonyms of the verb “to manage” may be found in dictionaries (such as Oxford Illustrated, Webster's Third New International, etc.): "be in charge of", "implement", "have at one's disposal", "dominate", "organize", "regulate", "order", "govern", and "form".

All these actions have a unidirectional nature, which allows us to get an approximate understanding of the word "to manage" and who a manager is in fact, as often the notion is indistinct.

Thus, an ideal manager must be able to unite all employees, mobilizing them for achievement of the set objectives. Such managers build teams capable of unaided and unsupervised implementation of the corresponding functions. An ideal manager evaluates the results of the activities, assesses the work efficiency of the subordinate employees (jointly and separately) in the course of implementation of the assigned task, and assesses his/her own efficiency when ensuring the operations of these employees. He/she must adhere to strict ethical principles, have an analytical mind-set, be a man of action, responsive, yet self-composed. He/she must be result-oriented, yet this trait must not interfere with the work process itself. An ideal manager must be steadily involved in market formation, production facilities development, enhance financial and human potential of their company.

2 Conclusions

Such a long list of requirements to ideal managers' qualities, skills and knowledge is explained by the fact that they have to perform several parallel roles. A manager is a leader, a diplomat, a mentor, an innovator, it is not only an occupation and profession; first of all, it is also a mission. Not every person can become an ideal manager – only those who are educated, target-oriented, unconditionally loving their work, whose capacity for leadership is inborn, will be able to grow into a qualified, high-calibre, ideal manager.

References

[1] Adizes I 2014 *The Ideal Executive. Why You Cannot Be One and What To Do About It* The Adizes Institute Publications: Carpinteria, California
[2] Bushkova-Shiklina E V 2007 *Tsennostnye orientatsii menedzherov i protsess prinyatiya upravlencheskikh reshenii: korrelyatsionnye svyazi* Avtoreferat dis / kand. sotsiol. nauk. Nizhnii Novgorod

Development of tourism industry in Poltava region

Oleh Maksymenko

Economic Theory and Economic Cybernetics Department Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi avenue, 24, Poltava, Ukraine, 36011

Abstract

Nowadays, it is important to monitor the state and prospects for the development of the tourism industry not only in the country, but also in the regions. Thus, the tourist business in Ukraine is experiencing fierce competition from other states, but in Ukraine recently a number of government decisions have been adopted to strengthen and expand the legislative base for tourism. Note that the tourism industry is a set of various subjects of tourist activity (hotels, tourist complexes, campsites, motels, boarding houses, public catering establishments, transport, culture, sports, etc.) that provide reception, maintenance and transportation of tourists.

Keywords: tourist industry, tourism, business, region.

1 Introduction

The development of the tourism industry plays an important role in solving social problems of the state. Throughout the world, new jobs are created at the expense of tourism, the social standard of living of the population is maintained, and the country's budget is filled. The development of the tourism industry contributes to the improvement of: the infrastructure of the region, the level of education, medical care, the introduction of new means of disseminating information, and the like. Tourism is primarily a system that provides information about the history, culture, customs, spiritual and religious values of the city, region, country, namely tourism directly affects the social, cultural and economic life of the state.

2 Main part

Recently, tourism in Ukraine is defined as one of the priority areas of social and economic development both in the country as a whole and in its regions and cities, as evidenced by the Concept of the State Target Program for the Development of Tourism and Resorts for the period up to 2022 [1], but there are many obstacles to its successful functioning, the definition of which at the regional level has become the goal of this work.

The format of the development of the tourism sector is vividly reflected in the development program. The state program must first and foremost solve these and other problems of Ukrainian tourism. It is envisaged to create conditions for attracting foreign and domestic investment and credit funds for the development of the material and technical base of the tourism industry through the development and implementation of mechanisms for attracting and distributing extrabudgetary funds [2].

Poltava region occupies a special place in the history of Ukrainian culture and is the spiritual capital of Ukraine. On the territory of the region, events that determined the fate of Ukraine took place more than once, therefore Poltava has many recreation places, historical monuments and other outstanding objects that can attract the attention of tourists not only in its region, but also in other regions of Ukraine, as well as tourists from foreign countries.

The current infrastructure of tourism services in the Poltava region does not yet meet the needs of world tourism, it is actively developing, however, it can serve as a basis for creating a more modern infrastructure that will meet world standards and take into account relevant recreational, cognitive, humanitarian, business, environmental and other requirements.

3 Conclusions

So, in order to make the tourist industry of the Poltava region occupy a prominent place in economic growth, it is necessary to solve a number of such priority tasks at the state level:

- to develop programs for the development of the tourism industry of each district of the region and plans for capital construction and investment;
- solve the issue of training of tourist personnel (courses, technical schools, colleges, institutes, universities);
- coordinate clear cooperation of tourism organizations with transport agencies, cultural institutions;
- to evaluate the economic efficiency of tourism and the recreational assessment of the territories;
- determine the favorable for the development of tourism and the treatment of the territory;
- to develop methods for substantiating the norms of simultaneous loading on various natural complexes.

References

[1] *Kontseptsiia Derzhavnoi tsilovoi prohramy rozvytku turyzmu ta kurortiv na period do 2022 roku* 1 serpnia 2013 r. **638-r E-resource:** http://www.zakon0.rada.gov.ua

[2] 2017Ekskursiina diialnist yak odna iz skladovykh turystychnoi sfery *Elektronne naukovo fakhovoho vydannia* **3**(08) "Skhidna Yevropa: ekonomika, biznes ta upravlinnia" 211-4

Key problems of ensuring food security in the context of globalization

I Markina*, M Somych, D Diachkov

*Poltava State Agrarian Academy, Poltava region, Ukraine, *Corresponding author's e-mail: iriska7@ukr.net*

Abstract

The paper considers the essence and the role of food security. The main aspects of food security (i.e. socio-economic and political-economic one), are defined by author. The following components of food security are identified: food independence, the economic accessibility of food for the population, the share of total household expenditure on food, physical accessibility of food, quality and safety of food, and the level of stocks of basic food resources. The principles of the food security policy formation are characterized: availability, stability, efficiency of use, accessibility.

Keywords: agricultural enterprise, agro-food industry, food security, globalization, international economics, national security, socio-economic relations

When operating in the conditions of uncertainty and destabilization of the national economy, domestic enterprises are faced with various threats and risks that lead to an increase in the danger of the activities of the business entities of the agro-industrial complex. The stability of functioning and the rate of development of enterprises in a market economy are determined not only by the state of financial, economic and personnel security, but precisely by the level of protection of the food-security situation of the enterprise.

Since food resources are formed in the sphere of agro-industrial production, the economic entities that function in this sphere not only provide the population with food, but also guarantee the socio-economic stability of the society, as well as the external economic security and political independence of the country as a whole.

In the existing economic literature, food security is a relatively new economic category, which has been studied and analyzed multilaterally. The definition of the term "food security" can be translated as being about three As: accessibility, affordability and availability of food [4].

Ensuring food security is the most relevant area of interstate interaction, as it covers a wide range of national, economic, social, demographic and environmental factors.

Therefore, food security is considered to be a powerful geopolitical factor and a main tool for ensuring the sustainability of socio-economic processes in any country.

In general, the concept of "food security" has two aspects: the socio-economic (ability to provide the population needs in food produce) and the political-economic one (the ability to mobilize the country's domestic resources and agro-industrial potential to meet these needs).

In the modern economic literature, there are only three main approaches to the definition of the essence of food security. Thus, for example, representatives of the first approach traditionally use the level of food consumption as a criterion of food security without taking into account what sources it is generated from (these can be own or external sources).

On the contrary, the second approach is based on eliminating the country's dependence on uncontrolled food imports.

And finally, the third approach is based on the country's self-sufficiency in food and protection of the domestic producer by creating the necessary conditions for the production of a wide range of competitive food products [2, p. 49].

In the world economic theory, the following components of food security can be distinguished: food independence, the economic accessibility of food for the population, the share of total household expenditure on food, physical accessibility of food, quality and safety of food, and the level of stocks of basic food resources.

In the present-day context, the term "food security" should be considered as a set of socio-economic relations that arise with regard to providing the population with food and the relevant standards for quality and quantity, which are based on the innovative development of reproductive processes in agriculture and ensuring the economic security of the agro-food sector of the economy [5, p. 30].

So, in the framework of the given research it is expedient to define the term "food security" as a set of economic relations in the society, arising from the provision of all its members with food of the relevant quality and quantity standards. With this approach, it becomes possible to solve the contemporary food security problem at the level of each country, whose goal may be to provide all the citizens with constant access to the food products. This policy should be based mainly on the following principles:

1. availability;
2. stability;
3. efficiency of use;
4. accessibility, which can be understood through the following dimensions of food security:
   - the availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports;
   - a population, household and individual must have access to adequate food at all times;
   - food products should be properly processed, stored and preserved, and consumers must be sure that they consume products of acceptable quality, which are safe for their health;
   - food products should be available both in terms of their physical availability, and in relation to the purchasing power of consumers [1].

The feedback of food security and competitiveness should be emphasized in particular, because the main condition for achieving food independence is related to the effective activity of commodity producers and the improvement of the general state of the economy. In this regard, the competitiveness of business activities significantly influences the food policy of the country.

At the same time, the effective activity of agriculture and processing industries contributes to the development of markets for raw materials and food products, as well as the creation of new jobs. It also supports the employment of the population and creates conditions for maintaining their incomes, and increases budget replenishment by increasing tax deductions [3].

The globalization of the economy inevitably brought the problem of food security to the category of the most urgent and unimaginable problems of all people in the world. The reduction of food safety risks requires recognition of the concept of multifunctionality in the agrarian sphere, fulfills not only the function of food provision for the country's population, but also the complex function of the social way of life of the rural population. To this is added the vital ecological function of preserving and growing the fertility of agricultural lands, agrolandscapes, reclamation, supporting the diversity of flora and fauna etc.

Thus, the problem of ensuring the national economic security on the basis of achieving its food security, not only has a certain agrarian specificity, but also is a complex problem directly related to the competitiveness of the national economy, the development of the world food market and foreign economic relations. Consequently, the world community needs to seriously interfere and influence the production, consumption and distribution of food products.

References

[1] Belousov A S 2016 *Food security – as a component of economic security*
[2] Kazembaev M E 1997 *How to ensure food security?*
[3] Klimova N V 2011 *Food security in ensuring the country's competitiveness*
[4] Lupenko Yu O 2012 *Strategic directions of the development of agriculture of Ukraine for the period till 2020 year*
[5] Safin U Z 2008 *Issues of ensuring food security in Russia*

Consolidation of media retail against modern digital platforms

Andrii Chuzhykov*

Associate professor, PhD (Economics) Kyiv National Economic University named Vadym Hetman, 54/1 Peremohy Avenue, Kyiv, Ukraine 03057

**Corresponding author's e-mail: no.dsgn@gmail.com*

Abstract

Nowadays platforms like Google's YouTube and Facebook Live or Instagram create new content. This content is absolutely user generated. So platforms don't pay for this content to be created unlike traditional TV or movie content which comes at high production costs. So platforms have a steady stream of low (or no) cost content that is typically unique to the platform. That's why focusing on consolidating expensive traditional content, the TV and media industry is doubling down on a strategy that is quickly declining in effectiveness. Even worse, as several competitors do this at the exact same time, the cost of content will only continue to go up. That's mean that media platforms starting to push out the traditional media from global markets.

Keywords: Consolidation, digitalization, media platforms, modern monopoly

In current position of the development of global media networks, there is a clear demarcation line of opposition between traditional media markets with large technological media giants. At the same time, the dynamics of confrontation between traditional markets and media monopolies tends to clearly increasing of the benefits of the latter. A striking example is the research by Applico [1], company founded in 2009 as a platform for structural counteraction and "anti-advisory" assistance to the traditional media market and media entrepreneurship to counter the media giants of Amazon and Google. It is precisely this confrontation that gives enough reason to assert that the traditional media markets suffer considerable distress from technological monopolies.

The site Applico was posted article by the founder and CEO of Alex Mosed. The businessman is thinking about how traditional markets are fighting big technological giants and why their dynamics tends to be reduced.

Today, Amazon, Apple, Google, Alibaba and Facebook are definitely leaders because tech-business is rapidly developing and its major players are making huge profits. The current existing business case can be characterized by the following thesis: "You sell what you have and after sale. This is what still yours, "and therefore, there is no need for a platform business need to do anything. Content is at the expense of users who post content to the network. Most interesting, according to Mosed, is that platforms such as YouTube or Instagram, translating the task of creating content for users, save a significant part of the cost, while receiving a continuous stream of content.

"The example of the biggest players in this field, such as YouTube, Facebook or Instagram, proves that consumers are content customized to taste," Moshed commented. We will assume that this is due to the fact that users are tired of the effect of "tired improvisation" of professional media and want to see on the screens of their devices the same ordinary and true people as they are. As such, it even more connects consumers to platform content.

In the field of mass communications, there are other processes, on the one hand - consolidation and consolidation concentration. Such types of activity was covered by the period of the tech revolution. For example, Disney, Viacom, or Fox were redeemed by large media companies. Three years ago, AT & T completely absorbed DirecTV and became the world's largest paid pay-TV service. The same Disney bought the share of Fox assets, and Discovery Channel merged with Food Network, HGTV and Travel Channel. Television today looks a rather mature industry, if not to say outdated, so it's not surprising that large media corporations are experiencing significant competition from platforms such as YouTube and Facebook.

Absorption and consolidation help TV companies stay afloat and maintain a stable stock exchange for some time, but how long this trend will be considered dominant to assert is difficult. According to Mosed [2], the main thing that attracts an advertiser (and hence a significant portion of the revenue) to services like YouTube and Facebook is their universal ability to track the effectiveness of advertising, as well as analytics, personalization and targeting required in this case. Traditional media in this regard are very much inferior to new, inaccurate icons.

It is entirely rhetorical to consider what should be done to large companies that are largely affected by the dominance of technological giants. It is also worth noting that most likely they will not help the fact that they spend billions on "consolidation," instead of experimenting with their business model. This strategy will not stop the inevitable dominance of platforms, but at best it will slow down. Platforms will continue to control the larger part of the market.

Conclusions

Spending billions to consolidate supply is an easier decision for public companies threatened by modern monopolies than investing in their own business model disruption. But these strategies won't prevent the disruption – at best they will only slow it down. The endpoint is inevitable: the platform business model will gain more and more dominance. The only way for a large, traditional enterprise to truly compete against a platform business threat is to build or buy their own. Incumbents in media, television, b2b distribution and retail should all look to Walmart's stunning ecommerce turnaround as an example. Only by embracing platform innovation will they be able to compete with the modern monopolies that are taking over advertising.

References

[1] Johnson N L, Moazed A 2016 *Modern Monopolies: What It Takes to Dominate the 21st Century Economy* K.: New York, p 28

[2] *Consolidation Won't Save Media and Retail from Facebook, Google and Amazon* **E-resource:** https://www.applicoinc.com

Hotel property in Belarus

Hanna Minkevich

BSPU, Minsk, Belarus

Abstract

Hospitality is one of the notions of civilization, which, thanks to progress and time, has become a great industry. The hotel industry specializes in providing one of the most important tourist services - accommodation services. In some cases, the provision of food services is included in the hotel business [3].

Keywords: hotel property, hospitality, tourism

1 General

The main center for attracting tourists to Belarus is the largest city - Minsk. It acts as a cultural, business and sports capital of the country, which requires the creation of an appropriate hotel infrastructure.

In Minsk, on the beginning of 2018, there are 44 hotels and 7 hotel complexes, some of them are international hotel chains, for example, Double Tree by Hilton Minsk, which was put into operation in 2017.

The main number of rooms is concentrated on 3* hotels, which is explained by the specifics of the formation of the hotel real estate market: the construction and commissioning of the main hotel fund was realized in the 70-80s, new objects began to appear relatively recently.

Most of the existing hotel complexes have a state or mixed ownership, and only a few have a private form.

The leading sources, forming demand in the market, are business contacts, active and cognitive tourism, sports, exhibition and entertainment events of international and national level [2].

The biggest increase in the hospitality market occurred in 2014 - Beijing Hotel Minsk*****, Renaissance Minsk Hotel****, Victoria Olimp Hotel****, Victoria na Zamkavay***, Arena Hotel Minsk***, Slavyanskaya*** and Monastyrsky Hotel***, the hotel Belarus Hotel*** has been reconstructed. Also, several hotels of level 2* were put into operation.

The World Hockey Championship contributed to the active development of the hotel infrastructure in Minsk, the hotel fund in 2014 grew by 2300 rooms. The number of organized tourists arriving in the republic in 2014 was 137.4 thousand people, which is 0.5% more than in 2013.

In 2017 in hotels and hotel complexes in Minsk was placed 658.2 thousand rubles. People, out of them 144.8 thousand (22%) are residents of Belarus. This is 19.4% more than in 2016.

It should be noted that the number of citizens of the Republic of Belarus increased by 10.5 thousand people (7.8%), the number of guests from other countries - by 96.5 thousand people (23.1%).

At the moment, a significant number of investment projects for the construction of hotels and other facilities with hotels in its composition are under implementation and development. So, there is information about 20 projects in different degree of readiness, at least, while construction work is underway (including completed) for at least 14 sites [1].

Tourism is becoming more global with each new day. Many enterprises of the hospitality industry, uniting in large economic complexes, overcome the boundaries of individual states and entail the breaking of national barriers. These new economic entities, corresponding to a higher level of concentration and centralization of production and capital, contribute to the approval and dissemination of international standards for tourism services.

The main modern trends in the development of the hotel industry include the following tips:

- spreading the sphere of interests of the hotel business to products and services previously provided by enterprises of other industries;
- the growing democratization of the hotel industry, which greatly contributes to the increase in the availability of hotel services for the mass consumer;
- strengthening the specialization of the hotel business allows you to more clearly focus on certain segments of consumers, taking into account various characteristics;
- the development of new types of tourism stimulates the construction of hotels in ecologically clean regions, the formation of "green" floors and rooms in ordinary city hotels;
- globalization and concentration of the hotel business;
- deep personalization of the service and full concentration on the requests and needs of customers;
- wide introduction of new means of communication and information technologies, allowing deep and systematic economic diagnostics;
- the introduction of new technologies in the business strategy of hotel companies, in particular the widespread use of the Internet to promote hotel products and services.

2 Conclusions

Thus, summarizing all of the above, it should be noted that today the hospitality industry is a powerful economic system of the region or a tourist center and an important component of the tourism economy.

References

[1] *Hotel Real Estate* M.: UniTer, 2015
[2] *The state program "Belarus hospitable" for 2016-2020*
[3] Kuskov A S 2009 *Hospitality: a textbook* M.: Dashkov and Co 328 s

Teachers' and learners' use of aids and visuals in the English as an fl classroom

D Nasriddinov, D Normamatova

Gulistan State University, Uzbekistan

In the modern era of language teaching, different initiatives are taken to provide best possible language input to the learners. In every language institute, language laboratory is an essential part. It provides the learners with maximum language exposure outside the classroom. Learners can practice all the language skills using the resources of the language lab for developing their language proficiency.

These advantages are especially important in foreign Language Instruction because the language deficiencies of the learners are compensated by the visuals.

'Videos, like other theme-based materials, are effective springboards for other content-based classroom activities. They provide background information and proper stimuli for subsequent reading, writing, speaking and listening activities' Myer observes, the use of video in the classroom is highly motivational for young students. They are stimulated to acquire new words and phrases, while they are learning about the target culture and they are receiving renewed input of the target language.

Moving pictures carry even more information. The combination of sound and vision is dynamic, immediate, and accessible. This means that communication can be displayed in a sensorial context, and the many factors in communication can be perceived easily by viewers as well as the language learners. A video's images, speech, movement, and music provide a rich mix of meaning-building cues. The outstanding feature of video films is their capability to present complete communication situations.

Videos can be used for many phases of teaching: presenting information, giving background to a topic, playing various forms of dialogues and interactions, lectures, and any output from TV channels. For example, there is a whole range of documentaries, news programs, dramas, comedies, and shows. The power of television as a medium is duly acknowledged, even if its benefits and disadvantages are a matter of controversy. As a result, videos lose their impact if they are over-used and teachers tend to find that students lose their cognitive focus if they watch too much. It would be just like the soporific television watcher, the famous "couch potato".

Video provides this environment, and this helps learners to understand a particular discourse and improve their long-term listening comprehension, as well as their "confidence in speech". A study by Canning-Wilson (2000) notes that in order to make the listening input easily comprehensible the scenes with utterances should be back up by body language. It is important too that the students who were in sound-only conditions were less successful maintaining the interest and concentration in listening. For Canning what is more important is that video provides visual stimuli that can help students generate predictions and speculations activating their background schemata.

The purpose of the pre-viewing activities should be focus on the comprehension of the video and the idea of enhancing the thematic unit. With the viewing activities, the teachers should help students to focus on important features, and avoid passive attitude that students usually take when watching a video. The post-viewing activities, the use of new knowledge should be stimulated (Stoller, 1993). Another important point to highlight when selecting the video for the lesson is that it should be motivating and between 30 seconds and 4 minutes, with complete information, telling a whole story (a trailer) or a section of a story (scene).

Thanks to YouTube special features, teachers can collect several related videos together in a playlist in order to illustrate the concepts of a lesson or spark discussions about a topic. In YouTube the possibilities are almost infinite; teachers can find from videos of real life to trailers or movie scenes.

References

[1] Cramer R L 2004 *The language arts: A balanced approach to teaching reading, writing, listening, talking, and thinking* Boston, MA: Pearson
[2] Cunning-Wilson C 2001 Practical aspects of using video in the foreign language classroom *The Internet TESOL Journal* **6**(11)
[3] Freeman D L 2000 *Techniques and Principles in Language Teaching* Oxford: Oxford University Press
[4] Harmer J 1997 *How to teach English* White Plains, NY: Longman
[5] www.useingvideo.com
[6] www.bestreferat.com

Online sales services for retail travel business

Julija Rimlina*

ISMA University, Latvia

**Corresponding author's e-mail: jrimlina@gmail.com*

Abstract

Technological progress is developing rapidly, capturing all areas of life of the modern consumer. Travel industry has faced significant changes last ten years, new technologies have made direct sales more affordable. Travel company in a new environment has to change its strategies looking at what services will be highly demanded and to adjust its business processes.

Keywords: automatisation, travel, technology, product integration, online sales

1 Introduction

According to statistical information presented on a biggest travel exhibition ITB - World Travel Monitor 2017 the number of outgoing trips has increased by 6,5 %, reaching nearly 1,2 billion international trips.

The consumer has different sources for choosing and buying all parts of the travel package:

- Using aggregator services
- Through OTA
- Using airlines online sales services and hotel booking systems separately combining all necessary arrangements for the travel.
- Offline in travel agency, retail point.

About 56% of tourism companies in Spain confirmed the increase in turnover over the past year, according to a survey conducted by Amadeus. So after a many-year reduction in the number of travel companies that was caused by a growing share of online sales the tendencies are changing. Latvian travel business is not so much involved in the online sales yet, but consumers are changing and companies who want to maintain and increase sales have to to think about their strategy.

Travel agencies sales global trends shows that they have lost their positions or totally went out from different market shares, like:

- Air tickets offline sales. Online ticket sales market due to globalization has gone to a big players and to airline direct sales. Online aggregators sites provide suppliers and customers technological tools for comparing prices and conditions, simplifying the process of ticket selection and purchase.
- Hotel sales, as most of the market shares moved to a big DMSs and online platforms like - booking.com.
- Rent a car are usually renting directly online.

The rate of change in the travel industry is accelerating. Travelers are more empowered and demanding than ever before. They want choice, transparency in pricing and personalization. Technology is the main driver behind this change, as new ways of working are opening up a myriad of possibilities for travelers and the brands that serve them.

Expert knowledges are the basic product for service oriented companies to engage the customer and the main factor why the tourist product sales through offline channels does not decrease, despite the development of online platforms.

The vacation cost is high and often it is one of the most expensive purchases of a household during a year, for another big - real estate, a car, repairs, expensive equipment people normally use a bank loan.

Creating its own travels, combining different services like air tickets, accomodation, transfers, etc. sometimes doesn't bring the expected result, but using professional travel expert services customer could be more confident about your travel arrangements.

Taking into account that such giants as booking.com are slightly rising commission basis for using its platforms, hotels looking for the cheaper sales channels like DMCs (Destination Management Company) and Tour Operators.

So after many years Travel companies became more competitive selling group travels compared with the client's individual online reservations.

So what kind of services could travel companies offer to the changing market to save its positions? How can travel agencies keep up with change in technology and customer expectations?

2 Overview

Travel packages online selling system is a possible way for Travel Company to enter online market with it own products. It has to be developed meeting the requirements of the modern consumer:

1. Be intuitive and easy to use.
2. Give the client the fullest possible information about the product (tour), so that there is no need to switch to another resource.
3. Remember the client and his preferences, offering a relevant suggestion.
4. To offer a personal cabinet.
5. Work not only as a b2c, but also as a b2b platform.

3 Decision

Travel distribution systems use various ways of exchanging data, such as XML, Json, Extranet and others. During the last five years, it has been changed world travel market, uniting travel data from different part of worldwide travel service in a reservation systems. Travel company could use these possibilities to expand the presence of it's package services to the all world.

Travel companies can significantly reduce its costs for the online system content, and add to its offer additional products using the possibility of data exchange. As well as get additional sales, giving its own API to other travel market sellers.

Travel companies can rely on ready-made solutions presented on the market or develop its own.

Ready-made solutions advantages are technical support and update of the system provided by developing company, as well as additional modules such as accounting, cms, crm, fare compare, connection to wholesaling companies and GDSs, dynamic packaging solutions. Disadvantages, respectively, setup fee, monthly and per pax fee.

Deciding which solution to use also important to consider the plan and the cost of the marketing program for entering the online market.

Also, there are several systems that could be used not investing much money adding its I-frame to the company's webpage. But the commissions normally are very low and no any possibilities to develop company sales.

4 Conclusion

Travel companies have several solutions how to enter the online sales market and the way of realizing it depends on all aspects of the company's work, risks and future profitability.

References

[1] https://www.itb-berlin.de/en/
[2] http://www.ipkinternational.com/en/
[3] http://www.amadeus.com
[4] http://www.peakwork.com
[5] http://www.kiwi.com

Emulation problems while using the sphere of shemotechnical model of NI Multisim in the training process

Vjaceslavs Orehovs*

Riga Aeronautical Institute, Latvia

**Corresponding author's e-mail: v.orehovs@rai.lv*

Abstract

Emulation problems, appearing during distance training classes with students of electro-and radiotechnical specialities in the sphere of NI Multisim are cleared out and practical recommendations of emulation problems elimination are offered.

Keywords: Internet technology, NI Multisim packet, emulation problems, educational process

1 Introduction

During traditional forms of educational process, the possibility of physical experiment realization is gradually narrowing due to absence or restriction of students access to the most interesting and unique equipment, scientific and technological experiments, proposing the great interest in the modern fast changing world. Tendency to overassessment of traditional educational methods efficiency is more and more developing in direction to information-telecommunication technologies. The first plan stands for conceptional model of virtual instrument [1].

2 Overview

Keeping in mind 'programming with programming', the main function of NI Multisim sphere involves not only calculations, but activities with real objects research. These functions predetermine the specified approach of training courses for various electro-and radiotechnical subjects. Moreover, 'virtual tendency' in higher education admit not only new approach and obsolete material base modernization, but organization of distance training concerning laboratory classes, which provide practical ability forming methods, available at a quite emerging level [2].

3 Decision

However, practical distance training work in NI Multisim accompanies some problems, which concern users. Mainly, reasons carry technological character. They cover typical problematic situations, when model of some functional assemblies realization fails or when model of several devices in this sphere due to low reliability of received results becomes unacceptable. The author gives practical recommendation and methods to avoid 'narrow place' modelling', based on own experience using sphere of NI Multisim in the process of subjects 'Electrotechnique' and 'Electronics' in the training process.

4 Conclusion

Proposed recommendations simplify establishing and optimizing the training schemes and therefore expanding possibility of distance training process.

References

[1] Osipjan M M 2013 K voprosu modelirovanija izmeritelnih tehnologiy v srede *LABVIEW, Izv.NAN RA i GIUA, Ser.TN, T. LXVI* **4** 360-5

[2] Bikovskij N A, Uspenskaja N N 2017 Primenenie programnogo paketa MULTISIM v laboratornom praktikume po elektrotehnike I elektronike *Sovremennie problemi nauki i obrazovanija* **5**

Innovative investment and international competitiveness of national economies

Yevgen Panchenko[1]* , Halyna Kuzmenko[2]

[1]*Kyiv National Economic University named Vadym Hetman, 54/1 Peremohy Avenue, Kyiv, Ukraine 03057*
[2]*Ukraine, Central Ukrainian National Technical University, 8, University Avenue, Kropyvnytskyi, Ukraine 25030*

**Corresponding author's e-mail: kaf404-mm@ukr.net*


Abstract

In context of post-industrial development of global economy role of innovative investment raising in international competitiveness of national economies. In theses contain in key indicators of the competitiveness national economy, the most effective options for formation and development of national innovation system.

Keywords: Innovation, investment, competitiveness, national economy, indicators

The financial determinants of innovation development of all the subjects of the global economy play a key role in providing their high competitiveness in all sectors. This position has become an important starting point for most countries in the search of the most effective options for the formation and development of national innovation systems. Those countries include Ukraine that became members of the Free Trade Association with the European Union. It is quite understandable that the position of researchers and practitioners is to enhance the role of the innovation financing system in the general model of managing the global competitiveness of national economies. Several conclusions of specialists in this field will be provided in relation to that.

First of all, let us admit the position of the well-known authors of the project "Improving Strategies, Policies and Regulation of Innovations in Ukraine", implemented with the support of the European Union. The authors of the section "Financing Innovations" K. Khalme and I. Bulkin emphasize: "The main motivation of governments is to ensure the availability of financing for innovative companies, given their crucial role in building up and innovating modern economic systems" [1]. The authors of the national report "Innovative Ukraine-2020" note: "The system of financial support for innovation should consider macroeconomic, political and other factors, including the state and type of financial system in each country. High investment risks of invested capital loss, which are natural for innovation activities, create barriers to private investment in this area" [2]. Finally, the latest report of the Committee on Science and Technology Policy of OECD on March 16, 2017 emphasizes that in modern conditions, innovation policies, especially in the financial sphere, play a critical role in promoting domestic growth [3]. All the above positions on the importance of financing innovative activities are based on the increasing role of innovative factors in increasing the global competitiveness of national economies, as Table 1 shows.

TABLE 1 Correlation between The Global Innovation Index (GII), ICT Development Index (IDI) and the indicators of the development of the national economy in 2017 [4]

Indicators	**Correlation coefficient**	
	GII	*IDI*
GDP per capita	0.8902	0.8012
Human Development Index	0.9513	0.9417
Global Competitiveness Index	0.6814	0.8187
Technological Development Index	0.9402	0.9012
Economic Efficiency Index	0.9217	0.8418

As can be seen from the above table, the high correlation coefficients between the innovative and informational development of society prove the key role of innovations in increasing key indicators of the competitiveness of national economies. To the greatest extent, this refers to the indices of human and technological development, the correlation coefficients for which exceed 0.94. However, for the other indicators both coefficients also have a high level in the range of 0.68-0.89. Considering that, we should agree with the position of the authors of the report "Innovative Ukraine-2020" mentioned above, who note that "innovation is the defining characteristic of modern scientific, technical, manufacturing, socio-economic and all social processes. The future of Ukraine depends on the ability to use innovative mechanisms: whether it will move towards becoming one of the developed countries, or will remain a stagnant country out of scientific, technical and social progress. This is related to the general patterns of social development, according to which the world is transitioning from a mostly manufacturing to an innovative type of development. Those countries, which have understood this in time and built economic systems in accordance with this historical imperative, have success, respect and glory. Counties that failed to do that have problems, failures and despair. Innovation is not only the key to dynamic development, prosperity and personal success, but also a way to provide the sovereignty of the country and its competitiveness in the modern super-complex world.

Conclusions

Scopes, directions, institutions and other aspects of financing innovative activities are determined mainly by the features of national and regional innovation systems. With consideration of that, analysis of the experience of financing innovations in the European Union deserves attention for Ukraine in the context of their European integration development vector. We should admit the key role of the program tools for financing innovation in the European Union. This is the framework program "Horizon 2020" for research and innovations of the EU, which was launched in 2014. It includes three main components: Framework Programme for Research and Technical Development; Competitiveness and Innovation Framework Programme; European Institute of Innovation and Technologies [5].

References

[1] 2011 *Improving Strategies, Policies and Regulation of Innovations in Ukraine* European Aid/127694/C/SER/UA, K.: Fenix p 19
[2] 2015 *Innovation Ukraine-2020: National Paper National Academy of Science of Ukraine* K. p 209 *(In Ukranian)*
[3] *Making Innovation Benefit All: Policies for Inclusive Grows* Paris: OECD, p 9
[4] *The World Bank Data* **E-resource:** http://dat.worldbank.org
[5] *UNDP. Human Development Report* 2016 **E-resource:** http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf
[6] *Global Competitiveness Report* **E-resource:** http://www.weforum.org/does/WTF_GlobalCompetitivenessReport_2016-17.pdf
[7] *The Global Innovation Index* **E-resource:** http://www.globalinnnovationindex.org. – 11.12.2017
[8] *ITU.ICT development Index 2016* **E-resource:** http://www.itu.int/net4/ITU-D/idi/2016/index.html - 23.12.2017
[9] *Global metric for the environments* **E-resource:** http://epi.yale.edu/
[10] *The Framework Programme for Research and Innovation* **E-resource:** http://ec.europa.eu/programmes/horizon2020/eh/what-horizon-2020

Methods of adaptive personnel administration

Mila Pesocka

The Department of Tourism and Administration, Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi avenue, 24, Poltava, Ukraine, 36011

**Corresponding author's e-mail: mila.pesockaya@gmail.com*

Abstract

A modern manufacturing enterprise is a complex complex, whose dynamism and coherence are provided by a management mechanism. The mechanism of enterprise management is, first of all, a hierarchical system of administrative bodies and management structures, through which the main tasks are coordinated and the goals facing the enterprise (firm) are achieved, internal communications are established, performance control is exercised, levers of influence are used that cover activities all links and workers of the enterprise - from the worker to the director.

Keywords: administration, adaptive, personnel.

1 Introduction

Adaptive management, in the opinion of the majority of scientists, means a set of actions and methods that determines the ability of the control system to respond to changes in the external environment, which in turn leads to a narrowing of the investigated concept [1].

Management of a system with a complex organization is a multi-level and multi-purpose structure. Adaptive management is an effective principle for these enterprises and organizations, because it is close to human logic, namely, quickly and adequately respond to changes in the current situation.

2 Main part

First of all we have to figure out what is the definition for adaptability. It is arguably even more important. Adaptability indicates how easily (and cost effectively) the system will support business and technical requirements that aren't yet known. The following characteristics will help you determine whether a system is sufficiently adaptable. So, a new world requires revolutionary changes that will often have to break free of the past.

Today, the principles of adaptive administration are divided into two types: general and with the use of mathematical tools in the theory of R. Bellman [2].

TABLE 1 General principles of adaptive administration

General principles of administration:
1. Degree of turnover of each of the proposed actions that can be applied in practice
2. Knowledge of the processes occurring in socio-economic systems is the basis for decision-making
3. The aim of the study should be to solve problems and answer the results
4. Adaptive management models can be used to summarize knowledge that is a forward-looking reality that can be monitored and analyzed
5. Monitoring should focus on specific adaptive management mechanisms
6. A highly qualified specialist for whom the task is to distribute knowledge in the field of control and research of the management system, as well as the development of requirements and recommendations for employees

Principles of adaptive control with the use of mathematical tools can be represented as follows – Table 2.

TABLE 2 Principles of adaptive administration with the use of mathematical tools

The principles of management with the use of mathematical tools
1. Adaptive control is considered as control under conditions of a random functioning environment with an unknown distribution function
2. The integration mechanism is the basis of the adaptation mechanism, and as a consequence, numerical optimization methods are given priority, using sequentially the measured data
3. The randomness of the objective function and the use of methods of the theory of static solutions

The main task of adaptive management is the establishment of personnel and the introduction of effective human resource management systems and business processes.

Implementation of the previously discussed principles and tasks of adaptive personnel management is possible through the use of a system of methods for influencing workers [5].

Management methods are ways to implement managerial influences on the organization's personnel to achieve the objectives of production management.

In a modern organization, staff is one of the key resources to achieve the organization's goals. The correct approach to managing the resource management leads to an increase in the profitability and profitability of the enterprise, the formation of a stable social and psychological climate and as a result of effective management of the organization. In addition, the administrative, economic and socio-psychological methods of personnel management are becoming more effective in modern conditions.

3 Conclusions

Modern economy dictates clear rules of market strategy and the management of the organization should use all methods and principles of management to create an effective organizational structure in order to optimize working conditions and, as a consequence, increase the company's profitability.So, an adaptive administration system is the main part of enterprise management. It affects the factors that affect the effectiveness of the organization and maximize revenues.

References

[1] 2002 *Velykyi entsyklopedychnyi slovnyk. – 2-e yzd.*, Pererab. i dop. – M.: Velyka Rosiiska entsyklopediia. – SPb.: Norynt p 1456: il.

[2] Bushmeleva H V 2016 *Adaptyvne upravlinnia promyslovymy pidpryiemstvamy v konkurentnomu seredovyshchi: avtoref. dys .... d-ra ekon. nauk.* Izhevsk: UDHU p 52

[3] *Vikipediia – vilna zahalnodostupna bahatomovna universalna internet-entsyklopediia* **E-resource:** http://www.wikipedia.org

[4] Dudchak V V 2016 *Teoretyko-metodolohichni aspekty formuvannia systemy adaptyvnoho upravlinnia promyslovym pidpryiemstvom: dys .... d-ra ekon. Nauk.* Rostov-n / D: RYNKh p 306

[5] Lihinchuk H H 2015 *Menedzhment* M .: MIEMP p 138

Challenges and opportunities of entrepreneurship in age of data economics

Evita Pilege*

ISMA University, Latvian College of Culture, Latvia

**Corresponding author's e-mail: evita.pilege@gmail.com*

Abstract

The development of data technologies has reshaped almost all sectors, especially economics. As a result of today's rapid development of data analysis technologies and digital revolution a new term data economics has emerged. Data has become a precious resource for various parties. Alongside the opportunities presented by the new situation entrepreneurs encounter new challenges both in internal and external environments. To foster the best possible use of the potential of new situation and maintain the competitiveness, entrepreneurs need to implement data-driven strategies, choose the best organisational structures and transform their business models. However, there are a few issues that should be solved in external environment by policy makers and representors of educational sector, as the new economic situation demands changes in legislation and educational system. The last one is crucial for the development of analytic and creative minds with digital competencies. This paper examines the mentioned challenges in the global economics for entrepreneurship and education and provides recommendations for possible solutions.

Keywords: Business models, entrepreneurship, data, analytics, education

1 Introduction

Nowadays it is a non-negotiable statement that digital data is an essential resource for economic growth, competitiveness and innovation. The rapid development of information technologies has led to the global changes in economy and entrepreneurship and created data economy. Analytics underpin many of the most important decisions that is made by individuals and societies [1]. The changes come with opportunities as well as challenges that should be solved on various levels.

Firstly, on national, supranational or transnational level the legislative question about data usage and exchange should be solved. The world is undated with data and it is estimated that data production will be reaching 45 ZB by 2020 [2]. In order to maintain global competitiveness leading economic unions needs to develop new data policies and harmonize them.

Secondly, the entrepreneurs should adopt their strategies to the new data economy age, adapt their organizational structures and reshape the business models to ones which support data-driven decision-making process and more predictive analysis [3].

Thirdly, there is a need for transformations in education in all levels, starting from elementary schools to high schools. In order to change the organizations' strategy and successfully implement business model transformations there is a need for professionals who understand both sides: the development of information technologies and the advantages that they can offer as well as the business principles. Nevertheless, there has been lot of discussions about interdisciplinary and vocational training approach in education, there is a shortage of professionals with skills that are demanded in a labour market [4].

2 Overview

This work discusses the challenges, already started and possible solutions on the following issues:

- Importance of data usage policies in data economics;
- Implementation of data analysis strategy in a business;
- Educational programmes on data and business analysis.

3 Decision

One of the activities that has already started to materialize is a development of business analysis and data design programme. The approbation starts at the academic year 2018/2019. In order to understand the skillset, knowledge and competencies needed in labor market, depth interviews are conducted with seven executives and project managers from publishing, information technologies, NGO sectors. Furthermore, to gain broader understanding of data analysis related skillset needed in Latvia's labor market a content analysis of job advertisements and research papers has been carried out. Acquired results are compared with insights revealed in the interviews. Based on the analysis carried out author proposes to develop a higher-education programme with focus on three areas: business management, data analysis and information design. All interview participants acknowledged that there is a need for interdisciplinary educated professionals who not only knows how to analyse data but also understands business and can communicate the analysis results clearly and understandably to all involved parties (colleagues, executives, clients and other stake-holders).

4 Conclusion

The development of information and communication technologies has reshaped economics and the decision-making process in various sectors. To foster the best possible use of information that organizations have and to make better and faster decisions 1) policy makers should solve the legislative question about data usage and exchange, 2) entrepreneurs should adopt their strategies and business models to the new data economy age, 3) representatives of business, science and education should cooperate and develop education programme with focus on three areas: business management, data analysis and information design.

References

[1] KPMG 2016 *Forrester Consulting Building trust in analytics. Breaking the cycle of mistrust in D&A* https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2016/10/building-trust-in-analytics.pdf

[2] European Parliament 2016 *Big data and data analytics. The potential for innovation and growth* European Parliament Briefing document 589801

[3] Hagen C, Ciobo M, Wall D, Yadav A, Khan K, Miller J, Evans H, 2013 *Big Data and the Creative Destruction of Today's Business Models*

[4] Plota S 2017 *Digital competencies and Creativity as the driving force of global competitiveness*

Case method as one of the methods of staff assessment in the company

Olena Bilinska*

Poltava University of economic and trade

**Corresponding author's e-mail: belinska-lena@rambler.ru*

Abstract

Using case studies in staff assessment is becoming increasingly popular in Ukrainian companies. In order to create an effective system of staff assessment, companies need to use the capabilities of different methods, taking into consideration theirs purpose and specific of activities. One of the way how to form qualified staff in the company can be case method. The case method is considered one of the most effective tools used to determine the specific skills and potential of professionals.

Keywords: cases, staff assessment, management

1 Introduction

A case is a story, which describes us a problematic incident, event or situation [1]. Main mission of case is to make sense of the theoretic material and to discuss their key issues in practice way. The typically reports information about certain aspects of the situation make theoretical studding more practice and important in managing. In casing, all participants can evaluate all opinions and make decision in forming common opinion.

The case method has some main characteristics:

1. the use of actual organizational problems;
2. possible participation of the maximum number of people in their study, clarification of other points of view, comparison of different views on decision-making;
3. the minimum degree of dependence by each other;
4. trainees have the right to both correct and wrong answers, since, despite the possible incompleteness of situations, they are taken from real life.

Today, most of the companies prefer use case method for selection necessary staff in theirs needs. It is very important form properly selected staff, because of these employees will depend the further development of the company. Case method in the system of staff assessment provides an additional opportunity to enhance the necessary knowledge of staff in accordance with the tasks of the company. Also, case method can be used for periodic staff assessment like additional or separate methods of evaluating form.

2 Overview

Application of cases expand the boundaries of assessment and coordinate the results of work. That make job more interesting or innovative, or have a marked impact on staff. Also actively engage staff in new experiences and use assessments that promote a variety of forms of learning.

So, using cases give such opportunities for the companies:

- acquiring the skills of using theoretical material to analyze practical problems;
- formation of skills for assessing the situation, choosing and organizing the search for basic information;
- production of skills to formulate questions;
- development of skills to make multivariate approaches to implementation of the action plan;
- formation of skills to make decisions independently under conditions of uncertainty;
- formation of skills and methods of comprehensive analysis of situations, forecasting of ways of development of situations;
- formation of skills and competencies of constructive critique.

3 Decision

Forming effective staff assessment system with using cases have some advantages, not only educational, but also has great educational potential positions of the personality qualities:

- development of hard work;
- development of creativity;
- formation of ability to compete;
- formation of readiness to assume responsibility for the results of their own analysis of the situation and for the work of the entire group;
- forming self-confidence;
- formation of the need for achievement;
- development of strong-willed qualities, purposefulness;
- forming skills in the group;
- formation of skills of communicative culture;
- the formation of a socially active and vital competent person capable of self-development, self-improvement and self-realization.

4 Conclusion

To use the case method effectively, you need to create special conditions:

- providing a sufficiently high complexity of cognitive problems that students need to address;
- creating a logical number of questions about the cognitive problem that prompts student youth to find the truth;
- creating an atmosphere of psychological comfort in the audience, which should facilitate students' free expression of thought, not afraid of mistakes;
- devoting special time to comprehending ways to solve the problem;
- organization of special training of teachers for the implementation of the methodology.

So, using cases in staff assessment give opportunity to solve such problems:

- assessment of the competencies of the candidate for a vacant post in those areas which are key for this post;
- staff assessment of the company when selected in the personnel reserve;
- effective use of human, financial and time resources, since there is no need for the expert on the functional direction or observer to be involved, the presence of a special room, equipment and equipment.

References

[1] Clardy A 1994 *Fifty Case Study for Management & Supervisory Training*
[2] Mikhailova E A 1999 *Case and case method*
[3] http://www.asean.org/storage/images/2013/economic/matm/

The appliance of the fundraising definition for start-ups and SMEs

Olena Cherniavska, Liliia Hnypa-Chernevetska, Anna Bychkova, Wang Zhijun*

Poltava University of Economics and Trade, Ukraine

**Corresponding author's e-mail: mhei_me@ukr.net*

Abstract

In the context of the emergence of new instruments and mechanisms for attracting capital for entrepreneurial activity, the modern model of financing small and medium-sized businesses undergoes significant changes. Alternative sources of funding for the venture at the start-up and early development stages (crowdfunding, business accelerators, etc.), as well as for financing growth (private placements, initial offer of crypto-currencies, etc.) are gaining ground, which gives grounds for rethinking the essence of the basic concepts and categories financial model of small and medium-sized businesses. This work is an attempt to find the new approach of considering the fundraising.

Keywords: fundraising, financing, start-up, small and medium entrepreneurs

1 Introduction

In particular, in the practice of financing small and medium-sized businesses, the concept of "fundraising" is increasingly used as a concept of forming a financing model based on the attraction of traditional and alternative sources of financial resources. In this connection, it is necessary to dwell on certain specific aspects of the definition of fundraising. The essence of the problem lies in the fact that in practice, the term "fundraising" is used to refer to the activities of non-profit public organizations to attract funding sources.

2 Overview

The traditional interpretation of the essence of fundraising is represented in the dictionary Webster [1], Cambridge [2] and Oxford Learner`s Dictionaries [3], Encyclopedia Britannica, and others. As we can see, fundraising mechanisms are widely used to finance the activities of political parties, educational organizations, charitable foundations, etc. At the same time, fund-raising activities are carried out in the form of charitable events, attraction of donors, use of financing opportunities at the expense of government organizations.

3 Decision

However, well known, in modern conditions, many alternative financing instruments that have been used for non-profit organizations successfully applies at various stages of small and medium-sized business development, especially at the earliest phase, when the business has not yet properly legalized and its revenues are predominantly uncertain or have expected character. It's not just about the simplest ways of financing at the expense of relatives, friends or credit cards, but also about more complex instruments such as crowd-funding in its various forms, as well as attracting the funds of specialized funds that provide venture capital on various terms. With the advent of new instruments and funding opportunities for SMEs, the use of the term "fundraising" for commercial organizations is just as justified as for non-profit organizations.

The validity of this statement is confirmed by some sources. In particular, at the Internet-encyclopedia Wikipedia, we find, that although fundraising typically refers to efforts to gather money for non-profit organizations, it is sometimes used to refer to the identification and solicitation of investors or other sources of capital for for-profit enterprises [4]. Traditionally, fundraising consisted mostly of asking for donations on the street or at people's doors, and this is experiencing very strong growth in the form of face-to-face fundraising, but new forms of fundraising such as online fundraising have emerged in recent years, though these are often based on older methods such as grassroots fundraising.

Also, the validity of this statement is confirmed by some sources. In particular, it is necessary to pay attention to the remark, which is given on the pages of the Internet resource Syndicate Room [5]. The essence of the remark is that while companies traditionally sought to raise finance from banks, or other institutions and wealthy investors, crowdfunding and other fund-raising methods allows early-stage ventures to raise finance from a much larger pool of investors.

4 Conclusion

Thus, we will define the fundraising for startups and growth of SMEs as the activity of raising finance through the issuing of shares or from debt for needs of start-ups and developing the business on the different stages of their lifecycle.

References

[1] Fund-raising. Merriam-Webster Dictionary https://www.merriam-webster.com/dictionary/fund-raising
[2] Fundraising. Cambridge Advanced Learner`s Dictionary & Thesaurus https://dictionary.cambridge.org/dictionary/english/fundraising
[3] Fundraising. Oxford Learner`s Dictionaries https://www.oxfordlearners dictionaries.com/definition/english/fundraising
[4] *Fundraising. Wikipedia* https://en.wikipedia.org/wiki/Fundraising
[5] *Syndicate Room* https://www.syndicateroom.com/learn/glossary/fundraising

The impact of globalization on the development of tourism management

Yurii Karpenko, Vladimir Stetsenko*

HEIU «Poltava University of Economics and Trade», Ukraine

**Corresponding author's e-mail: 9410020@gmail.com*

Abstract

The article studies the phenomenon of globalization, nature and factors that characterize its content; the identification of structural relationships and the interaction of individual elements. There are identified theoretic-methodological and applied issues for the development of tourism management in the conditions of globalization, basic regularities, contradictions and mechanisms for globalization of relations in tourism.

Keywords: tourism, socio-economic tourism institute, globalization, trans-nationalization, modernization

1 Introduction

For decades tourism has undergone steady growth and diversification to become one of the fastest growing economy spheres in the world. Modern tourism is closely linked to the development and covers an increasing number of new destinations. This dynamic has transformed tourism into a key stimulus of socio-economic progress. Today, the volume of the tourist market is equal to or even exceeds the export of oil, food or cars. The tourist business has become one of the main players in the international trade market and at the same time is one of the main sources of income for many developing countries. This growth goes hand in hand with increased diversification and competition between the destinations [1].

Modern tourism is often called the phenomenon of consumer society for several reasons. First, it is one of the most visible manifestations of globalization in the cultural, economic and political dimensions. Second, mass tourism simultaneously acts as a product of globalization. Only during the period of intensive development of transnational relations it became possible to create relatively cheap and affordable international passenger transport and global telecommunication system, which provided unprecedented mobility for the population. Finally, modern consumer society with a large middle class demanding a type of recreation like tourism, so the latter has become a prominent driver of growth in the service sector and the economy as a whole [2]. All this determines the relevance of trend studies in globalization of relations in tourism with its important economic role and the need to justify directions for resolving contradictions in the process of functioning for socio-economic institute of tourism.

2 Globalization as an inevitable process for the world development

We analyze the views of famous scientists on the driving forces and the reasons for modern process of globalization in the economy. So, characterizing the concept of «globalization» M. Kozlovets believes that it is expedient to consider them in two aspects: theoretic-methodological and scientific-branch. The first involves finding out the general nature of this phenomenon and process, and the second one involves its specific essence and manifestation in specific spheres of social life. In his view, globalization is the process of establishing relationship in economic, social, political, spiritual, cultural and other spheres of life for different societies, which is regulated by the policy of states, their leaders and other subjects. Globalization is a change in the whole hierarchy of human life. It is internally contradictory and paradoxical process, because another aspect of globalization is the localization process, which contains the phenomena of integration and disintegration [3, p. 119-129]. E. Semeniuk states that globalization represents both achievement of the world community and its most acute problems. It simultaneously determines new contradictions within humanity by helping to optimize some aspects of life. It is quite natural: without contradictions there is no development and social progress. It is important for such contradictions not to turn into antagonistic conflicts that threaten humanity with global catastrophe [4, p. 15]. O. Bilorus and V. Vlasov agree with the ruling opinion and believe that globalization is a universalization for all spheres of public life that brought a new stage for internationalization of economic life, break-up of national borders, development of the world markets for goods, services, finance, labor, information, that is, the apotheosis of the global market economy [5, p. 18-25]. The thesis on the interpretation of this category is based on the views of researchers from Swiss Economic Institute who have developed the KOF Index of Globalization and define globalization as a process that is destroying national borders, integrating national economies, culture, technology and management, as well as forming complex relationships and interconnections, mediated through a variety of flows, including people, capital, ideas, etc. [6].

The following group of scientists is considering globalization in the subject-object plan. Thus, O. Valuyskiy believes that globalization is a new measure for the universality of human existence. It is a complex and contradictory process of people ascension to the formation of the global human community under the influence of powerful social and information changes in all spheres of society. The scientist believes that globalization and international tourism can be regarded as contradictory unity of the objective and subjective matter. Globalization is an objective phenomenon, a process that can be influenced and capable of managing the unitary efforts of people. However modern mankind has not become a subject that is able to direct its own development of humanitarian and socio-cultural trajectories. As a result, the present stage of globalization not only enriches the creative powers of an individual and society, but also causes the phenomena that complicate the life of an individual and society. Consequently, globalization affects international tourism: in some situations, it opens up favorable prospects, in others - creates problems and dangers. In order to ensure sustainable development, international tourism must adapt to change [7, p. 309-311].

S. Sidenko noted that the significant contradiction of modern globalization aims at uniting the world by its homogenization and universalization on the basis of reference institutes, technologies and patterns of behavior. So this process faces fundamentally incompatible political systems and cultural norms, levels of socio-economic and political development of countries, ways of life, systems of values that are difficult to unify. Therefore, the attempts to accelerate this universalization in political, economic, and cultural spheres often have a character of forcing [8, p. 89-92].

O. Snegova has an interesting and worthy idea. She thinks that globalization is inextricably linked with the processes of modernization of society, that it is an objective process embodied in the interaction of interconnected trends. Unlike globalization, modernization is carried out purposefully and implemented in the form of projects. The differences between the two processes are considered in their direction. Globalization develops both vertically and horizontally, and the modernization vector is directed vertically: from «uncivilized» to «civilized». In the subject-object plan, modernization is evaluated in two ways: from the standpoint of the general historical development of modernization process in societies it is objective; and from the standpoint of implementation and alternatives for development – modernization process is subjective. According to the researcher, globalization is a modern form of modernization, during which the ratio of objectivity and subjectivity in the processes of cultural interaction in favor of the former changes, so it does not override the need to control the globalization processes [9, p. 165-167].

After analyzing the main approaches to interpretation for the category of globalization and its modern forms, some generalizations and conclusions are to be made. First, globalization as a process has a different interpretation, which can be given a different meaning and content depending on the type of participants (subjects) of the global economy or a specific sphere of society's activity. Second, globalization is a controversial phenomenon that reflects the change in the quality of the world economic development, international relations and has both positive and negative consequences. Third, globalization has different forms of manifestation – economic, political, cultural, informational and geo-demographic, which influence the development and functioning of the world economy and society.

The consideration of this issue will not be complete without justification of the factors for globalization and its manifestations in various spheres of reality. Thus, N. Navrotska believes that globalization of the world economic relations is a close and steady combination of individual factors that contribute both to its extensive (spatial) and intensive (qualitative) development. The main factors determining the modern content of globalization in the economy: intensification of external commodity flows; intellectualization of the economy; trans-nationalization of production; struggle for possession of resources and their distribution; international labor migration; globalization of financial markets; formation of the international infrastructure; development of regional integration; establishment of the global regulatory role for international economic and financial institutions; unification of consumer preferences and standards of life; formation of economic ideology of globalism; global association of socio-cultural spheres [10, p. 99-101].

This idea is confirmed by V. Zaitseva, who details and specifies the factors for the process of globalization. She notes that globalization of the world economy was caused by the following interconnected factors: international division of labor; finance internationalization; new information and technology systems; increasing competition between new industrialized countries and leading industrialized countries; homogenization of the international consumer market [11, p. 58-59].

According to M. Simonova, the process of globalization was promoted mainly by three factors:

1. Liberalization of the capital market and deregulation of financial services;
2. Opening of markets for trade and investment, which stimulated the growth of international competition;
3. Information and communication technologies in the economy. In each of these cases, market mechanisms and specific government policies played an important role as determinants of these changes. In its value, globalization could be seen as a phenomenon that is driven by the strategies and behavior of firms that responded to these changes. Governments also played an important role through international organizations [12, p. 396].

A. Proskurina and G. Gordeyeva distinguish the following factors that determine globalization:

- Production-technical – sharp increase in production, international forms of its implementation, qualitatively new level of means of transport and communication, which ensures the rapid expansion of goods and services, resources and ideas with their application in the most favorable conditions;
- Scientific and technological – economic benefits of using the advanced scientific and technological, technological and qualification level in the relevant areas of foreign countries, to accelerate the implementation of new solutions at a relatively low cost;
- Economic – unprecedented concentration and centralization of capital, contributing to the formation of a single market space;
- Information – a radical change in the means of business communication, exchange of economic, financial information, which creates opportunities

for prompt, timely and efficient solution for industrial, scientific, technical, and commercial tasks both overseas and within individual countries;

- Social – weakening of the role of habits and traditions, social relations and customs, overcoming national limitations, which increases the mobility for people in the territorial, spiritual and psychological relations, promotes international migration;
- Political – opening the tight state borders, facilitation of freedom for movement of citizens, goods and services, capital and development of specialized international organizations;
- Ecological – unification of the efforts for the world community, consolidation of resources, coordination of actions in various spheres [13, p. 64-65].

The scientists see globalization process as an inevitable process of the world development and the place for their social economic institute of tourism. According to V. Shalaev, globalization can be considered as the spread of mass production and mass consumption society on the basis of the Western system (primarily the liberal-consumer system) of values, goals and models of organization for social life, introduced in the form of attraction and subordination. At the basis of the global project for the development of the world based on such a system of values is the essential transformed factor of capital, its needs, interests and goals (K. Marx). There is no doubt that the capital, as a transformation of social life for people, generations and individuals, performs the most important and objectively significant function of the organizer and regulator of the economy, production and business. But at the same time, this transformed form is subjugating to itself, leveling out all important social institutions, without them social life of people, morality, law, religion, family, etc., is impossible including tourism, which is an inalienable property of the consumer society, generated by the Western concept of globalization [14, p. 14]. However, in our opinion, social economic institute of tourism can become precisely the mechanism of resolving contradictions in the development of the global economy, achieving the main socio-political goals, unity and consensus in the views, reducing uncertainty in relations, means of preventing conflicts, overcoming the disharmony, formation of harmonious relations in society through the achievement of a compromise between morality and benefits on the basis of social partnership.

3 The development of tourism institute in the conditions of globalization

At present, the development of globalization does not depend on the will and interests of individual countries, but also on international organizations that are influential in the international financial and economic bureaucracy, their decisions not only de facto, but de jure are duties for nominally sovereign states. Globalization therefore receives an institutionally deliberate design. The leading international economic organizations turn into centers of institutional and legal framework of the world economic order, their activity is increasingly interconnected and ideological support is provided by international groups of mass media.

The exit of enterprises from the national boundaries is due to the specifics of tourism activity and its products - tourist product, which consists of goods and services for tourism purposes. The first part of these goods and services arises in countries that generate tourist flows, the second part – in the countries and regions that are on their way (transit region), the third one – in destination countries. Therefore, most of the tourist enterprises directly or indirectly participate in the international division of labor, foreign economic relations with regard to the purchase and sale of tourist products [15].

In the conditions of globalization for social life, jointly-divided relations of concentration, integration, internationalization of enterprises in the sphere of tourism and state authorities on the basis of partnership are intensified. The combined tourism enterprises in the association with hospitality industry, professional tourist associations, international organizations, trade unions, youth organizations, national associations of travel agencies under the auspices of the World Tourism Organization (UNWTO) – successor to the International Union of Official Tourist Organizations (IUOTO) founded in 1934. As of August 2016 [16], UNWTO has 156 member states, as well as 6 territories – associate members, 2 observers and more than 400 people (members of UNWTO Business Council, UNWTO Council for Education and UNWTO Tourism Management), representing private business, educational institutions, tourist associations, local administrations, etc. It should be noted that in 1975 it consisted of only 65 member states, and Ukraine joined its membership in 1997. At present, the largest shares among individual regions has Africa 32 % and Europe 27 %; in other sub-regions, America – 15 %, East Asia and Pacific – 12 %, Middle East – 8 % and South Asia – 6 %.

Modern tourism is prone to globalization, it means that interdependence of states and separate regions forming the world community, gradual integration into a common system with common rules and norms of economic, political and cultural behavior, raising the level of trust between the subjects of governance and the strengthening of partnerships seems particularly relevant. Globalization in tourism is characterized by a single information space for market players, the availability of services for consumers in different parts of the world, international representative offices of tourism business and channels for distribution of products, location of production, taking into account the maximum possible realization of competitive advantages, advantages from the international scale of activity, high costs for product improvement and changing technologies, state regulation of the industry (introduction of common standards for the provision, stimulation and support of certain types of tourism, protection of consumer rights) [17, p. 9].

The legal framework for state regulation in the field of tourism is provided by the Global Code of Ethics for Tourism [18], which is a comprehensive set of basic principles of work and moral standards, recognized as binding on this type of activity. This document was adopted by UNWTO General Assembly in 1999, and in April 2016, at the 17th meeting of the World Tourism Ethics Committee, its status was changed to an international convention governing relations between subjects of international law through the creation of appropriate rights and responsibilities. In order to provide Member States with assistance in achieving Millennium Development Goals and in the United Nations Program, UNWTO in most cases deals directly or indirectly with this Code of Tourism and its principles. Issues such as climate change, biodiversity, poverty reduction, protection of vulnerable groups, economic and social sustainability of tourism development, empowerment of local and indigenous communities, access to education, training and decent employment, as well as responsible business practices in tourism sector are the most important areas for UNWTO activities [19, p. 14]. The main purpose of this document is to promote the benefits of tourism development among population and minimize its negative impacts in all spheres of social environment.

The growth of the role for sustainable development has necessitated the emergence of an organization that would deal with its methodology and evaluation. This organization has been established by Global Sustainable Tourism Council (GSTC) [20] with a global membership, including the UN agencies, non-government organizations, national and regional governments, leading tourism companies, hotels, tour operators, individuals and communities, seeking to achieve the best practices in the field of sustainable tourism. GSTC is an independent, non-profit, neutral, virtual, non-headquartered organization with volunteers registered in the United States. The GSTC mission is to establish and manage global benchmarks for travel sustainability and tourism based on their own developed criteria. These criteria form the basis of its activities as a global accreditation body for certification programs. GSTC does not directly certify any products or services, but it accredits those who form, provide and produce it. The developed GSTC criteria are divided into two groups: criteria for the destination and sectoral criteria. These are the basic principles with minimum requirements for any tourist business or destination to achieve in order to protect and maintain the natural and cultural resources of the world while simultaneously providing tourism potential as an instrument for preservation and elimination of poverty. These principles are based on four pillars: sustainable management; socio-economic consequences; cultural implications; environmental impact (including resource consumption, pollution reduction, bio-diversity and landscapes protection).

The main components for globalization of international tourism include: expansion of international economic ties in tourism production, growth of internationalization for tourism production factors (through increased direct and portfolio foreign investments, exchange of knowledge and technologies, removal of migration restrictions, etc.), spread of transnational corporations (TNCs) in tourism business (the characteristics of which are the interchangeability and interdependence of the organizational structure, their orientation to the information resources on markets with high consumption) [21, p. 27]. The processes of globalization stimulated the rapid development of TNCs and the tourism industry. On one hand, the operation of TNCs in the field of tourism has much in common with the activities of TNCs in other industrial or service sectors. There are used certain identical strategies and instruments of foreign expansion of corporations, approaches to the formation of the organizational structure of the corporation, sources of global competitive advantages. On the other hand, the specificity of the tourist product, its pricing, competition, direction of international tourist flows forms a number of features in the processes of formation and development of tourist TNCs, their interaction with the governments of the host countries, definition of standards for corporate construction [22, p. 119].

Globalization in tourism – the process of a sharp increase in international tourist flows, services, information and technology, which results in strengthening relationship and interaction between enterprises and organizations of tourism business worldwide, and its forms of global integration. Along with the general features, it has certain characteristics, which is mainly related to features of tourism products, which is a set of services provided by enterprises and organizations of various fields and sectors of activity. In this regard, most TNCs working in the travel market are created due to sectoral principle – hotel and restaurants business, transportation, etc. [23, p. 15].

The basis for globalization in the field of tourism is the process of trans-nationalization in the hotel business. According to the MKG Hospitality database and company reports, the largest hotel chain in the world is the Intercontinental Hotels Group, which retained its title since 2004, lost its leadership to Marriot International, when the latter had over 1 million rooms in 2015 not due to organic growth, but as a merger with Starwood Hotel & Resorts. According to Marriott International, for today, the company has more than 6,000 hotels in 122 countries, with revenues of more than $ 17 billion in 2016 fiscal year. Also, five of the leaders have changed as a result of entering the market by Shanghai Jin International Hotels Development Co Ltd, a subsidiary of the Jin Jiang Hotels Group, Chinese state-owned company that acquired 81 % of the shares of Keystone Lodging Holdings Ltd, owner of Plateno Group for $ 1.53 billion. As a result, this group now has over 6,000 hotels in 55 countries with more than 100 million employees working there.

In restaurant business the processes of trans-nationalization occur in fast food. According to press releases of the companies, there were marked out 10 of the largest fast food networks in the world: the leader is McDonald's (35,000 restaurants around the world), its net profit grew by 3.5 % in 2016 and amounted to $ 4.69 billion; Subway, which works due to franchise (42,000 restaurants in 107 countries); KFC (18,900 restaurants in 188 countries); Starbucks (over 23,000 stores in 64 countries); Burger King (13,500 restaurants in 90 countries); Pizza Hut (11,500 restaurants in 94 countries); Domino's Pizza (11,000 restaurants in 70 countries); Dunkin Donuts (11,000 restaurants in 33 countries); Taco Bell (6,500 of Restaurants in 20 Countries); Dairy Queen (5,700 restaurants in 30 countries). It should also be added that Taco Bell, KFC, Pizza are the brands of American corporation-operator of the restaurant business Yum! Brands Inc. They showed growth in 2016 by 33 % with a net profit of $ 1.352 billion.

Among the international carriers was such a form of global partner airlines as airline alliances. The global triad Star Alliance, SkyTeam and Oneworld, which includes 52 large and medium-sized airlines (or 1.5 % of the approximately 3,200 airlines in the world), which controls about 60 % of world-wide passenger traffic with routing coverage in virtually all parts of the world: Asia, America, Africa, Europe, Australia and Oceania. Airlines – members of the three global alliances are based in more than 110 international hub airports (or 27.5 % of the approximately 400 airports in the world serving international and regional transportation). The substantial share of global air transportation belongs to countries of registration of members for global alliances: the USA, Great Britain, Japan, France, Canada, Germany and Italy. The main reason for the formation of airline alliances is the expectation of a synergistic effect, that is, getting more efficiency from joint work than individual companies could achieve, as well as reducing costs, what is becoming increasingly important in times of global financial and economic crises and natural disasters. In addition, consolidated air carriers seek to achieve a scale effect. An increase in the scale of production leads to a reduction in the cost of products (services). However, there is always a saturation point in which, with the increase in the program of production, the cost of production is not reduced, as this factor can exhaust itself [24].

At the moment, tour operators are controlled by global corporations and concerns, which usually have the character of integrated structures (network of travel agencies, hotels, airlines, cruise ships, Internet portals and other assets in the field of tourism), among the leading in the world market are the following:

- TUI Group (Germany) – a company after merging with a subsidiary TUI Travel (UK) in 2014, which in turn formed at the result of the 2008 merger of the parent company TUI AG and First Choice Holidays PLC became a leading tour operator which owns: a fleet with more than 100 aircrafts, 14 cruise liners and more than 300 hotels. According to the official Internet resource of the company (http://www.tuigroup.com): in 2016 its staff was more than 76,036 employees, turnover in 2015 – € 20.01 billion and net profit – € 380 million. TUI Ukraine is represented in Ukraine since 2010. It was created as a result of reorganization of the travel agency Voyage Kyiv, the network of travel agencies «Galopom po Europah», and the entry of Turtess Travel tour operator in 2013;
- Thomas Cook Group (UK) – a company formed as a result of the acquisition of C&N Touristik (Germany) in 2001 and the merger with My Travel (UK) in 2007. This concern has airline affiliates: Thomas Cook Airlines, Thomas Cook Airlines Scandinavia, Airworld, Thomas Cook Airlines Belgium, Spies and more than 3,000 tourist offices, some of which operate on franchising. Target group – middle class. According to the official website of the company (https://www.thomascookgroup.com): as of early 2016, the number of its employees is more than 21.8 thousand people, turnover in 2015 – £ 7.834 billion, and net profit – £ 19 million;
- Kuoni Travel (Switzerland) – a division of the Kuoni Group, which deals with tour operator activities. According to the official website of the company (http: // www. Kuoni.com): as of early 2014, the number of its employees is more than 11,621 employees, income in 2013 – ₣ 154.2 million, and profit – ₣ 69.2 million;
- JTB Corporation (Japan) – the largest travel agency in Japan and one of the largest travel agencies in the world, serving tourists mainly from Asia (http://www.jtbcorp.jp).

The growing role of modern information and telecommunication is a feature of the process of globalization in the tourism sector that promotes the development of partnerships technologies, in particular, the presence of the so-called global online travel agencies in the market of services, where the trade in services takes place exclusively on-line (lack of offices, representations, direct contact with employees). Among the leading online travel agencies are the following (http://www.travelweekly.com), with a turnover in 2013, respectively: 1) Expedia – $ 39.4 billion; 2) Priceline (Booking.com) – $ 39.2 billion; 3) American Express – $ 30.3 billion; 4) Carlson Wagonlit Travel – $ 26.9 billion; 5) BCD Travel – $ 22.4 billion; 6) HRG North America – $ 16.0 billion; 7) FCA USA – $ 13.1 billion; 8) Orbitz Worldwide – $ 11.4 billion; 9) AAA Travel – $ 3.8 billion; 10) Fareportal / Travelong – $ 3.5 billion.

As we can see, due to the growth of the speed of movement and the volume of goods, services, technologies and the trans-nationalization of capital; a process of economic integration between countries is taking place, which promotes the transformation of national economies all over the world. However, now, the scientific understanding of these processes indicates that globalization is accompanied by processes of opposite orientation, in particular, regionalization of relations, is one of the hallmarks of our time. In the opinion of the overwhelming majority of scholars, globalization is radically changing priorities in the system of competitive advantages of the regions: it deprives regions of traditional advantages, as local resources become global. Globalization not only minimizes the importance of traditional regional competitive advantages, but also reduces the role of distance as a protective barrier in competitive processes. Consequently, globalization transforms the regions into full participants in international economic relations, but at the same time it needs to identify and protect the unique local competitive advantages as imperatives of increasing international competitiveness in the conditions of global competition [25].

According to the latest UNWTO statistical data in 2016, the number of international tourist arrivals increased by 3.9 % (1235 million), which is 46 million more than in the previous period. It was the seventh year in a row at an average rate of growth in international tourism after the global economic crisis of 2009. UNWTO's research showed that in 2016 the number of international tourist arrivals increased in the interval from 3.5 to 4.5 % per year, which corresponds to the long-term prospect development of tourism by 2030. The tourist flows in 2016 were influenced by three main factors: unusually strong fluctuations of the exchange rate, lower oil prices and other commodities and the growth of global security concerns. In the African, Asian and Pacific sub-regions of UNWTO, an increase of about 8 % of tourist arrivals has been recorded, with the most visited European region showing a growth of only 2 %, the American sub-region showed an increase of 4.3 %. Arrivals in the Middle East were heterogeneous and declined by 4.1 %, due to the unstable geopolitical situation in the region, in particular the armed conflict in Syria [26].

Consequently, modern geopolitical reality and its impact on the strategy of socio-economic development are based on the security and political stability in the world as the main conditions for the sustainable development of tourism. The current global political climate increases the risks for all participants in the international tourist market. Among the main geopolitical factors that directly affect the dynamics and distribution of tourist flows are: political upheavals, the impact of which on tourist flows is most clearly traced at the example of the Middle Eastern countries; terrorist attacks, where tourism is the most attractive phenomenon used as an instrument of political influence, since tourism allows terrorists to achieve their goals – publicity, economic ruin, ideological confrontation with tourism (which is obviously associated with Western capitalism and globalization); military conflicts that can destroy the tourism industry in a short time, which cause a global transformation of the structure of tourist flows in tourist regions and the decline of tourism industry. Consequently, modern international tourism is an economic activity with significant social and political consequences. As a form and process of spatial activity of a global scale, it is due to socio-economic and cultural factors, as well as the general dynamics of political systems. At the same time, tourism is not only the recipient of international relations, but also an active political actor – a participant in the political process, which, due to tourist and economic interaction, influences political decision-making. Tourism has repeatedly served as a channel for establishing trust and interaction in the certain states with a different socio-political structure. It is also a factor in economic and political modernization and a support for political stability [27, p. 14-20].

Tourism is part of the process of globalization, since the tourist flow between countries contributes to the flow of capital, goods and information from one country to another, development of trade, transport, communication systems, etc. Tourists are consumers of goods from different countries, which are exported and therefore they are leaders of this process [28]. Income from international tourism in 2015 grew by 4.4 % (taking into account exchange rates and inflation) compared to 2014 and amounted to $ 1,260 billion [29]. The economic efficiency of international tourism is primarily due to the inflow of foreign exchange funds, which improve the balance of payments giving an idea of the country's participation in the world economy, scale, structure and nature of its foreign economic relations, impact of globalization processes and liberalization of the economy. Therefore, it is also advisable to consider the place of international tourism in the balance of payments. According to UNWTO and the World Trade Organization (WTO) in 2014, the results of current overseas operations and the balance of financial transactions in international tourism amounted to $ 1,468 billion, market share respectively – 6.1 %. The market share of international tourism in developed economies for the same period amounted to 6.5 % at the amount of $ 955 billion, and in the developing economies, respectively – 5.5 %, which recorded an increase of 0.1 % compared to 2013 at $ 502 billion [30].

An integral part of the political factor of globalization, one of the key drivers of global change in society is its demographic dimension. Demographic globalization, translating the most expensive model of consumer behavior, enhances socio-economic polarization of population. The polarization of the modern world contains a very fierce contradiction between people who have the opportunity to enjoy all the achievements of technotron civilization, and other people, one third of them live in conditions «humiliating human dignity». According to Antoine de Saint-Exupéry, the traditional poverty, which was perceived by the majority of the population as an organic state when the achievements of technotron developed countries are spreading to the rest of the world and perceived by people as profound inferiority of their own being. As an example of this provision, one can recall the discussions that took place in the official circles of Spain during the time of Franco and Portugal at the time of Salazar’s tourism. Advocates of the development in this industry talked about its obvious economic dividends; the opponents argued that a foreign life would come to the country that would lead to a complete erosion of the ruling regimes. So it happened. Indeed, deprived of access to the world's information resources the population of Spain and Portugal did not realize (to a sufficient degree) the level of their poverty. The more these countries became open, the better they could see the defect of their «ground» development strategy. Hence the pressure on the political regimes, which makes them move to liberalization [31, p. 134]. A modern example is Euromaydan and the Revolution of Dignity in Ukraine 2013-2014. The growth of protest sentiment in society was recorded by sociologists in 2012, there were enough reasons for dissatisfaction with the authorities, but when in 2013 the Cabinet of Ministers of Ukraine headed by M. Azarov suspended preparations for signing The Association Agreement with the European Union and the geopolitical vector changed in the direction of the Customs Union headed by Russia, that forced people go out in the streets for protests. Despite the fact that this agreement contained many issues of cooperation in the field of justice, freedom, security, trade, financial, economic and sectoral cooperation, etc. The promise of power was the idea of a visa-free regime, understood by most representatives of the middle class who saw Europe as tourists and remembered how difficult it was to get visas to migrant workers who still knew how to work in Europe without documents. Consequently, demographic globalization manifested itself in the active transmission of the image and lifestyle of various groups of people from different countries. However, today, there is a two-way process. If previously developed countries have exported their way of life and the lagging ones passively perceived it, now there is a powerful reverse process. One could recall the wave of the spread of Buddhism in Western Europe and the United States. However, the consumer model is a component of a modern lifestyle in developed countries. The model of consumer behavior is a product of export from the developed countries [31, p. 135].

4 Conclusion

Thus, the institutional environment and economic institutions, where social tourism institute occupies one of the leading places has become the main actor with the economic life structured in the context of globalization in the global economy. Globalization of relations in the field of tourism is multifactorial and multi-dimensional process due to the growth of population mobility of the planet in the conditions of the emergence and spread of modern means of transport, information and communication technologies, international forms of economic activity of TNCs, liberalization for relations of the world economic activity and socio-economic changes in society.

References

[1] UNWTO Annual Report 2016: World Tourism Organization UNWTO http://media.unwto.org/publication/unwto-annual-report-2016

[2] Zaytsev V 2014 Dengi *Ekonomicheskiy ejenedelnik izdatelskogo doma «Kommersant»* **35**(993) 59-68 *(in Russian)*

[3] Kozlovets M A 2009 *Fenomen natsionalnoi identychnosti: vyklyky hlobalizatsii: monohrafiia* Vyd-vo ZhDU im. I. Franka: Zhytomyr *(in Ukrainian)*

[4] Semeniuk E 2007 Visnyk Natsionalnoho universytetu «Lvivska politekhnika» 578: *Filosofski nauky* 10-5 *(in Ukrainian)*

[5] Bilorus O 2010 *Visnyk NAN Ukrainy* **3** 17-26 *(in Ukrainian)*

[6] *KOF Index of Globalization* http://globalization.kof.ethz.ch

[7] Valuiskyi O O 2013 *Hlobalizatsiia suchasnoho svitu ta problemy mizhnarodnoho turyzmu Turyzmolohiia: kontseptualni zasady turyzmu: monohrafiia* VTs «Akademiia»: Kyiv p 307-15 *(in Ukrainian)*

[8] Sidenko S 2004 *Mizhnarodna ekonomichna polityka* **1** 72-93 *(in Ukrainian)*

[9] Snegovaya O A 2013 Istoricheskie, filosofskie, politicheskie i yuridicheskie nauki, kulturologiya i iskusstvovedenie *Voprosyi teorii i praktiki* **12**(38) I 165-7 http://www.gramota.net/ materials/3/2013/12-1/39.html *(in Russian)*

[10] Navrotska N A 2012 Naukovi pratsi *NDFI* **3** 97-102 *(in Russian)*

[11] Zaitseva V M and Korniienko O M 2012 *Visnyk Zaporizkoho natsionalnoho universytetu* **2**(8) 55-65 *(in Ukrainian)*

[12] Simonova M D 2009 Mirovaya ekonomika i mejdunarodnyie ekonomicheskie otnosheniya *Ekonomicheskie nauki* **10**(59) 394-8 *(in Russian)*

[13] Proskurina A V, Gordeeva G M 2008 Trudyi Pskovskogo politehnicheskogo instituta. Estestvoznanie i matematika. *Gumanitarnyie nauki* **12** 64-8 *(in Russian)*

[14] Shalaev V P 2015 Turizm kak novyiy sotsialnyiy institut v globalnom obschestve potrebleniya Turizm kak faktor modernizatsii ekonomiki i razvitiya regionov *I Vserossiyskoy nauchno-prakticheskoy konferentsii s mejdunarodnyim uchastiem (Yoshkar-Ola, 19-21 noyabrya 2015) Povoljskiy gosudarstvennyiy tehnologicheskiy universite: Yoshkar-Ola p 9-27 (in Russian)*

[15] Lebedev K A 2017 Ekonomika i sotsium **1**(32) http://www.iupr.ru *(in Russian)*

[16] *Member States: World Tourism Organization UNWTO* http://www2.unwto.org/ru/members/states

[17] Esimova D D, Gaynutdinov D 2014 *Nauka i turizm: strategii vzaimodeystviya* **3** 5-11 *(in Russian)*

[18] *Hlobalnyi etychnyi kodeks turyzmu: Vsesvitnia turystychna* orhanizatsiia 1999 http://zakon2.rada.gov.ua/laws/show/983_001 *(in Ukrainian)*

[19] *Doklad Vsemirnoy turistskoy organizatsii o pretvorenii v jizn Globalnogo eticheskogo kodeksa turizma 2010 A/65/275* Distr.: General. 10 August 2010 Generalnaya Assambleya OON: Nyu-York *(in Russian)*

[20] *The Global Sustainable Tourism Council (GSTC)* https://www.gstcouncil.org

[21] Kucherenko K 2013 *Halytskyi ekonomichnyi visnyk* **4**(43) 21-7 *(in Ukrainian)*

[22] Maryniak Ya O 2013 *Naukovi zapysky Ternopilskoho natsionalnoho pedahohichnoho universytetu imeni Volodymyra Hnatiuka. Ser.: Heohrafiia* **2** 116-23 *(in Ukrainian)*

[23] Seleznëva I V 2012 *Razvitie integratsionnyih protsesov v sfere mejdunarodnogo turizma v usloviyah globalizatsii: avtoref. diss. na soiskanie uch. stepeni kand. ekon. nauk: spets. 08.00.14 «Mirovaya ekonomika» Krasnodar (in Russian)*

[24] Rojko M, Kibalnikov O *Mirovyie aviatsionnyie alyansyi: vchera i segodnya globalnogo partnerstva: Delovoy aviatsionnyiy portal «ATO.ru»* http://www.ato.ru/content/mirovye-aviacionnye-alyansy-vchera-i-segodnya-globalnogo-partnerstva *(in Russian)*

[25] Voroshilova G O 2016 *Mejdunarodnyiy nauchnyiy jurnal «Internauka». Seriya: «Ekonomicheskie nauki»* **1** http://www.inter-nauka.com/ua/issues/2016/1/738

[26] *UNWTO World Tourism Barometer – Advance Release 2017 Volume 15, January English version* http://cf.cdn.unwto.org /sites/all/files/pdf/unwto_barom17_01_ january_excerpt_.pdf

[27] Parfinenko A Yu 2015 *Aktualni problemy mizhnarodnykh vidnosyn* **126 I** 12-23 *(in Ukrainian)*

[28] Macleod Donald V L 2004 *Tourism, globalisation, and cultural change: An island community perspective (1st ed.)* Channel View Publication: Clevedon; Buffalo; Toronto

[29] *UNWTO Tourism Highlights 2016*: World Tourism Organization UNWTO http://www.e-unwto.org/doi/pdf/10.18111/ 9789284418145

[30] *Barometr mejdunarodnogo turizma YUNVTO: Statisticheskoe prilojenie 2015 13, Iyun* http://www.e-unwto.org *(in Russian)*

[31] Galetskiy V F 2003 *Problemyi prognozirovaniya* **6** 128-38 *(in Russian)*

International Co-operative Integration in the context of sustainable development: perspectives for Ukraine

Oleksandr Manzhura*

Poltava University of Economics and Trade, Ukraine

**Corresponding author's e-mail: manzhura11@ukr.net*

Abstract

The development of the cooperative sector in the national economies and their integration allows to realize the entrepreneurial initiative of citizens, provide employment for the population and strengthen their social protection. Strategic directions for the development of the largest cooperative societies in the world (ICA, EC, Eurocoop) are the implementation for the strategy of sustainable development in the world, since cooperative enterprises are oriented on values, not only for profit, they share international principles and act together to create a better world through cooperation. An important direction of Ukraine's European integration is the adoption and implementation of cooperative principles, values and the development of a national cooperative model by intensifying cooperation of the cooperative sector including European and international cooperative.

Keywords: international co-operative integration, cooperative, cooperative movement, sustainable development.

1 Introduction

Cooperative forms of management are organically inherent in modern society and contribute to its progressive economic development. The development of the cooperative sector of national economies and their integration allows to realize the entrepreneurial initiative of citizens, provide employment of the general population and strengthen their social protection. International co-operative movement, including European, is powerful and organizationally decorated. Every sixth person on the planet is a co-operator. Cooperative businesses have been playing a key role in international development for more than 100 years, contributing to the development of approximately 3 billion people worldwide, thanks to a cooperative business model that focuses on people's interests.

In September 2015, the UN General Assembly approved the resolution "Transforming our world: An agenda for sustainable development for the period up to 2030", which identified 17 major goals and 169 objectives for humanity that would ensure the development and balance of all three components of sustainable development: economic, social and environmental [1].

Co-operatives are enterprises focused on the interests of people, they are owned and controlled by their members in order to realize common interests. Since cooperative enterprises are focused on values, not only on profit, they share the international principles and work together to create a better world through cooperation. Co-operative economic development allows you to create sustainable enterprises that provide long-term jobs, help improve people's lives and care for the environment. Under these conditions, the development of national cooperative movements and their integration are important.

2 Overview

The largest non-governmental cooperative association represented by cooperatives around the world is the International Cooperative Alliance (ICA). It represents 306 cooperative federations and organizations in 106 countries, has sectoral organizations such as the International Cooperative Agricultural Organization (ICAO) and the Cooperative Banking Association (ICBA), the International Association of Mutual Insurance Cooperatives (ICMIF) and Tourism (IAT), World Consumer Cooperatives (CCW), International organizations: Fisheries Cooperatives (IFCO), Health Cooperative Cooperatives (IHCO), Residential Cooperatives (ICA Housing), Industrial, Artistic and Service Production Cooperatives (CICOPA). The International Cooperative Alliance works at the global, regional levels to create an institutional environment that will foster the development of cooperatives. The global strategy for development for cooperatives includes: By 2020, they are to become the fastest-growing form of the enterprise, the cooperative business model is to become predominant for most people, cooperatives will become recognized leaders in economic, social and environmental development [2].

The unification of cooperatives takes place not only at the world level, but also at the level of individual groups of countries. In November 2006, the European Cooperative Association Cooperative Europe (EC) was formed, which included organizationally integrated at the European level: the European Union of Consumer Societies (Eurocoop), the European Confederation of Industrial and Social Cooperatives (CECOP), the European Cooperative Association Banks (EACB), European Union of Social Pharmacy (UEPS), European Association of Housing Cooperatives (EAHC) European Agricultural Organization (Cogeca), European Association of Mutual Insurance and

Insurance Cooperatives (AMI CE). Eurocoop - the union of national unions (unions) of consumer cooperatives. Its members are the national organizations of consumer cooperatives in 19 European countries and Israel [3]. 160 thousand enterprises in Europe, which work in all sectors of the economy - these are cooperatives. They fit perfectly into the EU 2020 strategy, which is aimed at sustainable economic development and the transition to a "green economy". Consideration of the international cooperative movement as the basis for sustainable development of the world requires analysis of the readiness of national economies to create conditions for the development of national cooperative business models and their integration at the global, regional and national levels.

3 Decision

The degree of success or failure of a cooperative model within a particular country depends on a holistic range of "institutions" (norms, values, views, rules, habits and procedures), as well as interacting historical, social, cultural, legal, political and economic elements of the institutional environment.

Co-operative economic index (CEI) is used to assess the level of development of cooperatives. This indicator is dominated by European countries (France, Finland, Italy, the Netherlands and others) in the top ten countries with the largest cooperative economy. This is largely due to the fact that Europe was the birthplace of modern cooperatives. Among the 33 countries surveyed, the lowest cooperative index in South Africa and Turkey. But the low CEI does not mean that there is no place for co-operatives in these countries, but it says that there is a great potential for their development. Therefore, it is necessary to investigate the causes of low CEI in some countries [4].

There are some correlations between the viability of the cooperative economy and the institutional environment for their development. The cooperative sector, as a rule, is smaller in societies characterized by great social inequality, corruption, concentration of power in one's hands. The favorable overall business environment, the high level of democracy development and public administration have a positive impact on the development of the cooperative sector. Today, in Ukraine, organizational integration of the cooperative movement is also being organized in order to strengthen cooperation opportunities for its legal and economic protection. Unfortunately, at present, only the Central Union of Consumer Societies of Ukraine (Ucoopspilka) has an ICA and Eurocoop membership. In certain indicators that characterize the socio-economic potential of Eurocoop, Ukraine has different meanings. So she is the leader in the share of consumer societies (42.11%), as well as in the market volume (22.04%). However, the proportion of members is only 1.55% of the total by Eurocoop, and the turnover of the market is only 0.65%. This testifies to the current structure, but the low-performing activity of Ukrainian consumer societies, which have reformed their essence and are slowly adapting to market conditions of functioning.

4 Conclusion

An important direction of European integration of Ukraine is the adoption and implementation of cooperative principles and values. The integration of the Ukrainian cooperative movement into the European territory requires the definition of strategic directions for the development of the national cooperative model and the intensification of co-operative sector cooperation with European and international cooperative associations. The main directions of development of the cooperative model should be: strengthening of cooperative principles in the economy; the establishing in Ukraine a socio-political, economic and legal consensus on issues of the cooperative movement; guarantee of inviolability of cooperative property and complete autonomy in its management; equal functioning of cooperative formations on equal footing with other subjects of the national economy; realization of investment-innovative model for development of cooperative systems including financial and credit support.

References

[1] *Transforming our world: the 2030 Agenda for Sustainable Development* http://www. sustainabledevelopment.un.org/post2015/ transformingourworld

[2] *Sectoral organisation of the International Co-operative Alliance* http://ica.coop/en/ica-sectoral-organisations

[3] Artemenko I A 2009 *Rol' kooperacii' v rozvytku social'nogo partnerstva u krai'nah Jevropejs'kogo Sojuzu ta v Ukrai'ni [The Role of Cooperation in the Development of Social Partnership in the Countries of the European Union and in Ukraine* **E-resource:** Ukrai'ns'ka kooperacija - Ukrainian Cooperation **2** http://www.ukrcoop-journal.com.ua/ *(in Ukrainian)*

[4] *Doing Co-operative Business Report Methodology and exploratory application for 33 countries* http://www.ica.coop/en/facts-and-figures

Practical steps to implement the concept of Learning Cities

Nataliya Kuznetsova*

PhD in Economics, Head of Economic Department, Cherkasy State Business College, Ukraine

**Corresponding author's e-mail: nataliya.kuznetsova14@gmail.com*

Abstract

In this article the author has investigated the role of Learning Cities and lifelong learning as the basis for ensuring of the sustainable development of the world community. Also this article has tracked the chronology of formation the concept of learning city and the practical ways to its implementation. The author has determined the importance of cooperation between representatives of local authorities, business entities and specialists in the sphere of formal and non-formal education during transformation of cities into the learning rank.

Keywords: learning cities, lifelong learning, key features, concept

1 Introduction

Today modern development of the global community is focusing on a large-scale transformation of the concept of the world, where everyone is guaranteed justice, social integration and healthy environment. This concept has been declared in The 2030 Agenda for Sustainable Development where 17 targets and 169 tasks have been worked out. These targets and tasks are aimed at ensuring safe and healthy living conditions for each person, contributing to his personal development and prosperity. In this regard, there is a need to change existing models of social and economic development of cities and countries, their orientation to achieve the global goals.

One of the main factors for achieving the goals of sustainable development is the implementation of the concept of learning cities and the widespread introduction of lifelong learning globally. The learning cities play an important role of "architects and executors of strategies", contribute to the continuous education of the population, creative human capital formation at the local levels, and the basis for stable economic, social and environmental development of the world community as a whole.

For the first time, the issues of formation and development of learning cities were reviewed and coordinated with the UNESCO initiative at the I International Conference on Learning Cities in 2013, in Beijing. As a result of the consolidated work of the conference participants, the concept of the learning city was developed, which was set out in the Beijing Declaration and supplemented in the document "Key Features of Learning Cities". According to this concept, it is made a determination of a learning city as a city which effectively mobilizes its resources in every sector [1, pg.10; 2, pg. 6] and it includes the following:

1. promote inclusive learning from basic to higher education;
2. revitalize learning in families and communities;
3. facilitate learning in the workplace;
4. extend the use of modern learning technologies;
5. enhance quality and excellence in learning;
6. foster a culture of learning throughout life;
7. create individual empowerment, forming social cohesion, firm civic position;
8. stimulate economic and cultural prosperity of the cities, transform them into the zones of creative business.

To implement the concept of learning cities, the UNESCO Institute for Lifelong Learning (UIL) in Mexico City within the II International Conference on Sustainable Cities in 2015 adopted The Mexico City Statement on Sustainable Learning Cities. This document has outlined the eight strategic directions for sustainable learning cities. To implement these strategies, the Global Network of Learning Cities (GNLC) has been created to promote the ideas exchange between the cities and to promote the creation of opportunities for lifelong learning in all the countries of the world community.

And two years later, the III International Conference on Learning Cities (ICLC) took place from 18–20 September 2017 in Cork, Ireland. As the result of this Conference, The Guide to Action for Learning Cities Creating has been worked out [3].

This document outlines the main aspects of urban activities (actions) in order to promote their sustainable development:

1. green and healthy learning cities (environmental sustainable development);
2. equitable and inclusive learning cities (individual empowerment, intercultural dialogue and social cohesion);
3. employment and entrepreneurship in learning cities (economic development and cultural prosperity);
4. culture (cultural expression and heritage, and diversity).

It should be noted that the central focus of attention in the concept of learning cities is the human resource as the main source of their development. Therefore, in order to promote the development of sustainable cities, greater responsibility is placed on national governments, which must create appropriate conditions for cities for life-long learning, adult education, non-formal and informal education, and education in the family and communities, in small and in large cities [3, pg. 6].

The role of the learning cities is important not only in terms of their sustainable economic and social development, but also for the personal development of their citizens with the goal of building the potential of creative human capital that can anticipate new global challenges and find the right answers to them. The preparation and formation of an intellectually developed human resource in the cities should be ensured by a modern education system with a high level of teaching quality.

An example of the introduction of the education continuous system in their cities is demonstrated by the United Kingdom as a country with a dynamically developing creative economy, where in April 2017 a new Law on Higher Education was adopted, replacing the previous law in force since 1994. The priorities of the vocational education system, according to the new law, are:

- high quality of educational organizations;
- expansion of opportunities for training students;
- growth of employment opportunities of graduates;
- correspondence of the training cost to the quality of services [4, pg. 20].

According to the Conference Report [5, pg. 11] in 2015, 12 cities received the UNESCO Learning City Award – the first-ever award of its kind in the history of UNESCO. In 2017, 16 cities across all UNESCO regions received the award: Villa María (Argentina), Contagem (Brazil), Mayo-Baléo (Cameroon), Hangzhou (China), Gelsenkirchen (Germany), Giza (Egypt), Larissa (Greece), N'Zérékoré (Guinea), Surabaya (Indonesia), Limerick (Ireland), Okayama City (Japan), Pécs (Hungary), Câmara de Lobos (Portugal), Suwon (Republic of Korea), Tunis (Tunisia) and Bristol (United Kingdom of Great Britain and Northern Ireland). These all cities have demonstrated particular progress in developing the learning city initiative and made outstanding progress in implementing the Key Features of Learning Cities.

2 Conclusions

Thus, today the world community is actively introducing the concept of their sustainable development into the practice of urban development, the basis of which is a system of lifelong learning. Taking into consideration all above mentioned, we can state, that conceptual approaches and practical actions (steps) should be developed for the transformation of cities into the rank of trainees at a city level. They are:

1. development of business education new format and educational practices that disseminate the ideas of lifelong learning;
2. popularization of education through involving business, cultural and educational institutions, and civil society into the educational process. With the help of such inter-sectoral cooperation, it is possible to find a vector of modern education development, the formation of a favorable creative environment;
3. integration of education and training in all the socio-economic processes at the local level, targeting the needs of the local territory and its inhabitants (societies, organizations);
4. sharing resources and achieving the synergetic effect through this.

So, it is possible to ensure the activation of creative potential at the local level and the formation of the creative business sector in the regions due to the joint actions and cooperation of representatives of local authorities, business entities and specialists in the sphere of formal and non-formal education.

References

[1] UNESCO Global Network of learning cities 2015 *Guiding Documents* UNESCO Institute for Lifelong Learning : Hamburg, Germany p 21

[2] Beijing Declaration on Building Learning Cities 2014 *Aducatar* **1**(23) 16 – 19 (*in Russian*)

[3] Learning Cities and the SDGs: A Guide to Action 2017 *UNESCO Institute for Lifelong Learning* Hamburg, Germany p 24

[4] Education and Creative Industry in the Mirror of International and Domestic Practices 2017 *A bulletin on the sphere of education.* Analytical Center under the Government of the Russian Federation **13** (September) p 24 (*in Russian*)

[5] *Conference Report: Third International Conference on Learning Cities (ICLC), Cork, Ireland (18-20 September 2017) 77p* http://unesdoc.unesco.org/images/0026/002607/260734e.pdf

Brand value of higher education institution

Remigijus Kinderis*, Judita Jonuševičienė

Klaipeda State University of Applied Sciences Jaunystes Str. 1, LT-91274, Klaipeda, Lithuania

**Corresponding author's e-mail: r.kinderis@kvk.lt*

Abstract

The article analyses the concept of the brand in various aspects, distinguishes the main elements/characteristics of the brand, their groups and importance for companies and consumers. The empirical part presents the results of higher education institution (hereinafter – HEI) brand value research in the following dimensions: brand recognition and awareness, brand association, loyalty to the brand and the quality of its services. Conclusions and recommendations for strengthening the brand value of the higher education institution are presented at the end of the article.

Keywords: brand, brand value

1 Introduction and research methodology

Relevance. In the last twenty years, marketing research has been increasingly focused on strengthening brand and customer relationships. It is considered the most important asset of the company [1], [2], [3], [4]. Scientists agree that effective labelling helps: to reduce the risk of product quality levels for consumers; the company to stand out on the market among its competitors; reduce funds for advertising; to become a leader in the market among products of the same category. In addition, the brand's characteristics help companies to protect the product legitimately and its properties against counterfeiting [5], [6]. Trademark management (brand name) is considered one of the key competences of the company or organization, which must be clearly understood and developed as it directly affects marketing activities and, in individual cases, determines their success or failure. It should also be borne in mind that branding is very important for the consumer to make a final decision on the purchase of a product [7].

Problems. In spite of the advantages and importance of the aforementioned brands and the desire of higher education institutions to have the highest ratings, researches that analyse the brand and its management in higher education institutions are still lacking [8], [9]. Therefore, the authors of the article raise a problematic question: what brand elements are important in developing a brand and determining its value at a higher education institution?

The aim of the article is to determine and evaluate the value of the HEI brand. **To achieve the aim, the following tasks have been set:** 1) To carry out the theoretical analysis of the brand value and its determination; 2) To analyse the recognition and awareness of the brand of the HEI; 3) To investigate the associations of the HEI between different social groups; 4) To determine the brand loyalty of consumers and employees of the HEI and their opinion about the quality of its services.

Restrictions on the study. The study has been conducted to explain the value of a high school brand and its results apply only to that institution. The data collected during the survey reflect only the opinion of the investigators presented during the research, which cannot be absolute.

Originality/meaning. The original study is based on the value of a high school brand. High schools seldom carry out such kind of research in Lithuania. The results of the research were submitted to the head of the high school.

Research methodology. Comparative analysis of scientific literature, quantitative research method, using written questionnaire, statistical data processing using SPSS 23.0 and MS Excel programs.

2 Results and conclusions of the study

The first part analyses the concept of the brand and its dimensions.

The second part of the article presents the research methodology, which shows that a quantitative research was carried out on the value of the brand.

The third part presents the results of the research and at the end of the article, conclusions and recommendations are provided:

1. the brand is a characteristic of a product or a company that affects its uniqueness and value in the market and the behaviour of the consumer's purchasing. The authors propose that the characteristics be differentiated into tangible (name, mark, symbol, package, name, emblem, label, etc.) and intangible (exclusive product features, value, loyalty, associations, etc.);
2. When analysing the awareness of the HEI brand, it has been determined that students, teachers, administrative staff of the higher education institution in the first instance remember the brand, and people who do not have a direct connection with the HEI, first of all remember the brand of another higher education institution. Staff of the HEI

consider the brand as a leader in Western Lithuania, but students and individuals who are not affiliated with the higher education institution under study do not consider the brand as the leader among higher education institutions. All social groups of respondents noted that the HEI brand is well remembered quickly recognized and they have heard about its services. The brand was most noticed by social networks and friends as well as acquaintances' recommendations, with the least impact on television and radio. Recommendations: to consolidate leadership positions through brand awareness, student loyalty, logo renewal, and appropriately selected media channels. It also necessary to clear the positioning message among Lithuanian higher education institutions;

3. In the study of the HEI brand associations between different social groups, the majority of respondents agree with the statement "I respect and appreciate people who use the services of the HEI brand". People who have no direct relationship with the HEI consider the brand as the least favourable equity. It has also been found that the majority agree that the HEI brand is associated with modernity, higher education; good practical training, attractive environment and innovation, but one third question whether the brand is associated with security, leadership and spontaneity. Recommendations: Strengthen branding associations in terms of security, leadership and stinginess, courage;
4. Most of the respondents are satisfied with access to the services provided by the HEI; almost half of the respondents agree that the services provided are of high quality. Comparing the social status within this statement, students of higher education, teachers and administrative staff are more likely to agree with this statement than those who do not have a direct connection. Researchers consider themselves as loyal to the brand, agree that the HEI provides services of high quality, and would choose them again in the future. Lecturers and administration staff are most loyal to the brand, while students and graduates are less loyal. More than one third of the respondents question whether they would like to acquire the brand of the HEI. Compared to social status, most students of other higher education institutions and graduates of the higher education institution are in doubt about it. Recommendations: to improve the quality of provided services continuously, study environment and share the achieved results with the public. To apply more effective tools to enhance student loyalty and brand loyalty.

References

[1] Aaker D 1991b *Managing Brand Equity: Capitalizing on the Value of Brand Name* New York, NY: The Free Press

[2] Blackett T 1993 Brand and trademark valuation – what's happening now*? Marketing & Research Today* May p 111-13

[3] Kapferer J N 1997 Strategic Brand Management London: Kogan Page

[4] Mourad M, Ennew Ch, Kortam W 2011 Brand equity in higher education *Marketing Intelligence & Planning* **29**(4) 403-20

[5] Keller K L 2013 *Strategic brand management: Building, measuring, and managing brand equity (4th edition)* Harlow UK: Pearson Education Limited

[6] Keller K L 2008 *Strategic brand management: Building, measuring, and managing brand equity (3rd edition)* Upper Saddle River NJ: Prentice Hall

[7] Kay M J 2006 Strong brands and corporate brands *European Journal of Marketing* **40**(7/8) 742-60

[8] Veloutsou C 2007 Identifying the Dimensions of the Product-brand and Consumer Relationship *Journal of Marketing Management* **23**(1/2) 7-26

[9] Hemsley-Brown J, Oplatka I 2006 Universities in a competitive marketplace: a systematic review of the literature on higher education marketing *International Journal of Public Sector Management* **19**(4) 316-38

The development of tourism in the Republic of Belarus

Anastasiya Savitskaya

BSPU, Minsk, Belarus

Abstract

In the Republic of Belarus a large number of objects interesting from the point of view of excursion tourism are historical and cultural monuments, historical centers, temples, fortresses, palaces, places connected with important historical events and with outstanding historical figures, museums, reserves, sanctuaries.

The purpose of this work was to analyze the prospects for the development of excursion tourism in Belarus.

1 General

The history of tourism in Belarus dates back to the mid 19th century. The first description of traveling around Belarus was published in 1853-1856 by famous Belarusian publicist and ethnographer P.M. Shpilevsky in the magazine "Sovremennik". In 19th century it was prestigious to travel and make notes about your impressions and experience. Therefore, many Russian travelers of that time wrote much about Belarus.

The first organized trips around Belarus were made during the summer holidays by the Vitebsk gymnasiums' teachers and their students in the 1860s; they traveled along the Western Dvina.

Till the Russian Revolution in 1917 only wealthy people could afford travelling. But from 1917 tourism has been developing in a completely different way. It became affordable to ordinary people. The centers of tourism activities were factories' clubs. Sunday tours and hikes were extremely popular, there appeared Recreation Centers. The first Recreation Center was established in Minsk in 1922.

In the late 1920s there began a massive touristic movement. In 1931 the Belarusian Society for Proletarian Tourism and Excursions organization bureau was established in Minsk as well as similar local institutions in Vitebsk, Bobruisk, Orsha, and Zhlobin. There appeared some Belarusian newspapers and magazines devoted to tourism. In June 1951 the Minsk excursion base of the Central Tourist and Excursion Department of the Soviet Union Central Council of Trade Unions was established. In 1958 on the picturesque shore of Lake Naroch appeared the first tourist centre with total capacity of 80 people.

Already in 1975 there were 2000 tour guides which conducted tours covering 900 different topics.

In the early 80's Belarus was included in 9 All-Soviet Union tourist rotes. In total in 1987 all system of tourist organizations in Belarus conducted about 1,500 excursions. The decline of the travel business begins in 1985 and is caused by the shift of tourist organizations to self-financing.

Some people stopped travelling. It became unprofitable to conduct sightseeing tours, in small towns museum excursions disappeared, as people stopped going to museums. Most organization bureaus stopped conducting sightseeing tours and switched to shop tours.

For a long time, the bureaus conducted excursions only on military topics, there was a necessity to reconsider and expand the variety of topics.

However, as national self-consciousness and people's interest in history and present state of their homeland developed, the need for excursions as a source of knowledge began to grow again. As a result most popular tourist rotes to Mir, Nesvizh, Slonim, Zhirovichi, Novogrudok and Polotsk were revived. There were also launched some new routes, as for example the open-air museum Menka, the museum and ethnographic complex Dudutki. The establishment of the Ministry of Sport and Tourism in 1995 was a success, sinse it allowed the government to restore control over the country's tourism sector.

In September 1996, the Belarusian Association of tourist guides and escorting interpreters was instituted. According to its charter the aim of the association is to develop the concepts and strategies of the tourist opportunities of the Republic of Belarus, to create a database of sightseeing objects and tourist routes, to work out and conduct the excursions and trips that would contribute to the revival of the cultural, economic, spiritual and ethical education of people. According to the estimates of the Belarusian Research Institute for Project Urban Planning, about 1, 8 thousand of material monuments can be used in sightseeing tourism out of 14392, the total number of material monuments on the territory of Belarus. However nowadays less than 1/3 of all objects are highlighted during the excursions. In the most developed recreational areas (as in Minsk, or Brest), where sightseeing trips to the countryside are popular, this indicator is slightly higher, but does not exceed 50%. The wider use of cultural and historical objects in sightseeing tourism is challenged with the fact that some of them have not been restored, there are no access roads or the surroundings aren't properly decorated. A number of architectural monuments are still used for household purposes.

The tourist potential of Belarus is about 2 thousand objects. The distinctive feature of excursion objects of Belarus is the prevalence of historical monuments (57% from total number), 23% are monuments of architecture and only 7-8% are natural and archaeologica monuments.

The tourist potential of the Republic of Belarus is based on the diversity and beauty of belarusian nature, the uniqueness of the historical and cultural heritage.

The sites of the Republic of Belarus are worth seeing in frames of educational and sightseeing tourist trips. There are a great number of historical and cultural monuments, historical centers, temples, fortresses, palaces, museums, reserves, nature-sanctuaries, places connected with important historical events and with outstanding belarusian figures.

2 Conclusions

The excursion potential of the Republic of Belarus, based on the diversity and beauty of nature, the uniqueness of the historical and cultural heritage. For more effective development of tourist development in the Republic of Belarus, it is necessary to use elements of unique natural complexes and monuments of architecture and history as much as possible and comprehensively.

References

[1] Dedinkin A L 2007 *Tourist and excursion potential of Belarus: the teaching method. complex* Vitebsk. state. un-t; avt.-sost. Dedinkin AL - Vitebsk 58 p

[2] Dolzhenko G P 2009 *The fundamentals of tourism* / G.P. Dolzhenko. - Moscow: 320s

Security knowledge management based on the comprehensive approach

S Dimitrova, S Stoykov

Keywords: management, strategic management, security knowledge management

The dynamic changes in the security environment pose new challenges the member states of the Euro-Atlantic structures that have already been dealing with a number of trials stemming both from emergency crisis management operations and from the long-term tasks of recovery and development. This itself is an indication that the Alliance cannot take on all of these challenges alone. Hence, in order for it and the other international security organizations to achieve their common goals, there is a growing need for more effective interaction. As a response to this need, the NATO Member States adopted a comprehensive civil-military approach to security at the Riga Summit in November 2006. This was also called upon by the recognition of the importance of political, economic, information and social factors as a complement to the indisputable defense dimensions.

The comprehensive approach can be seen as a methodology for analysing complex situation and decision-making which gives the managing authorities the ability to solve complex security planning tasks in a timely manner and with the necessary precision.

The purpose and object of the comprehensive approach is to create "simple" quantitative and qualitative descriptions of the complex processes in the security system that allow for investigating and describing those processes without loss of information. This gives us the ground for considering the comprehensive approach as the third level of the systematic approach. It includes a system analysis (aiming at understanding the security environment as a system), the harmonization of all military and non-military means across the engagement area and feedback provided by key performance measurement metrics and of metrics for assessing the extent of implementation of the planned actions.

Several security models can be applied in science and practice using the comprehensive approach. These models can also be used to reveal the impact of the structure-forming elements of the comprehensive approach and its impact on building the security system.

The first model provides a comprehensive overview of security in terms of risks and threats which is to be used to decompose security into military, economic, social, environmental, demographic, information, and other.

The second model can be the understanding of security as a broad concept related to the state of society and personality, where real danger of political and economic harm is excluded while the main interests, freedoms and values of citizens are guaranteed alongside with the lack of imbalances, critical environments and prerequisites in the social system, which creates a favorable environment for the development of cabilities.

The third model is the search for implementing the comprehensive approach by achieving a synergistic effect derived from the analyzes of the first and second models with an integrated approach to complementing military and civilian capabilities using the military security component. Efforts are focused on expeditionary capabilities and civil-military cooperation - especially in the field of military support to civilian authorities as an addition to a well-developed expertise for civilian support of military operations.

This model is at the heart of the development of NATO's New Strategic Concept and the review of the European Union Security and Defense Policy, which culminated in the adoption of a European Security Strategy.

The implementation of the comprehensive approach allows for adapting the country security in the conditions of the dynamically changing priorities of the State Budget. It enables the integration of military and civil resources for achieving common capabilities. In this way, it is not necessary to maintain separate resources for the whole range of missions and tasks, but to make more effective use of the ones available nationally and internationally.

The comprehensiveness of the educational process creates the best possible conditions for the formation of a successful strategic thinking model by boosting people's confidence and provoking their willingness to act when it comes to their making decisions that will result in subsequent heavy responsibilities. An advanced improvement of the way the educational institutions in the security system ara managed will allow for distinguishing talented people who are experts in decision-making and capable of taking the responsibility for the decisions made.

In order to implement the comprehensive approach in the field of security, education, research and training should not only be in line with it, but also be more widely used in their planning, organization and exectution by determining the possible directions as well as the ways and means for its implementation.

A prerequisite for the application of the comprehensive approach should be the increased awareness of the dynamics of the changing components of the security environment, as well as the search for appropriate methods for analyzing the state of the said components and for forecasting their development. It is no longer enough for education and research to provide only knowledge and skills – more and more often now they are expected to contribute to building a wider view of the security and defense processes.

The implementation of the comprehensive approach requires the realization of the opportunities for joint training of civilian and military specialists. This guideline for implementing the comprehensive approach leads to sharing the lessons learned from NATO's practice in building trust and security among partners and other international and local organizations, which provides for better interaction between them.

The comprehensive approach to the education and training process in the security system implies the improvement of the learning process through the introduction of innovative methods, tools and approaches. The comprehensive approach is not a panacea for all security issues and a universal method of research, education and qualification in the security system. But, as a philosophy, way of thinking, and approach to managing the processes of establishing the security that society needs, it is an instrument and a powerful tool for integrating the efforts of all resources and capabilities for the achievement of better results.

References

[1] 2000 *Aristotle, Metaphysics* COHM Publishing, Sofia
[2] *European Security Strategy – A Secure Europe in a Better World* https://www.mod.bg/bg/doc/strategicheski/20110401_ESS.pdf
[3] Marinov R 2017 *Analysis of the European Union Critical Infrastructure Protection Legislation* ISSN 1314-1937
[4] *National Research Development Strategy 2020 – adopted by Decision of the National Assembly of the Republic of Bulgaria on 28.07.2011* http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=708
[5] Draft of the Updated National Security Strategy of the Republic of Bulgaria 2017. 24102017_ASNS_Locked.pdf_%20(2).pdf
[6] Slatinski N 2010 *The Five Security Levels* Sofia, Military Publishing House
[7] *NATO's Strategic Concept 2010, adopted at the Lisbon Summit 2010*

Information technology for building a model of financial forecasting

E V Skakalina*

PhD, Department of Computer and Information Technologies and Systems, Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi avenue, 24, 36011, Poltava, Ukraine

**Corresponding author's e-mail: elenaskakalina2501@gmail.com*

Abstract

The solution of the problem of formation of the financial forecasting model (FFM) is realized using information technology using the methods of genetic algorithms, fuzzy neural network model (FNNM). As a software implementation, the Genetic Algorithm Input Selection of ST Neural Networks, MATLAB Fuzzy Logic Toolbox is used. The model adequately reflects the core of the main economic indicators and makes it possible to predict their changes.

Keywords: economic indicators, genetic algorithm, selection of input data, fuzzy sets

The most important feature of the American socio-economic model is its orientation toward accelerating the pace of scientific and technological progress, the formation of an innovative model of the economy. The US economy is the world's largest economy in terms of nominal gross domestic product (GDP), accounting for at least a quarter of world GDP since the end of World War II. It is one of the most diversified national economies in the world and has been leading the world economy for the past 100 years. These factors determined the choice of the US economy as a subject area for verification of information technology for forecasting economic indicators [1]. The use of standard deterministic methods of forecasting faces a number of problems - the definition of necessary and sufficient parameters (arguments) for assessing the state of the studied subject area, the so-called "curse of dimension", when the number of indicators and evaluation criteria taken into account is limited by the speed and size of computing resources, the phenomenon of "super-system" . The use of intelligent methods, which include genetic algorithms [2], the apparatus of fuzzy sets [3], the theory of self-organizing systems [4] allows to increase the depth of the forecast by revealing hidden patterns and relationships among poorly formalized global financiall indicators.

Information technology of FFM construction has the following structure:

Step 1 - the initial set of economic indicators is formed (the dimension of the set is 45).

Step 2 - using the genetic algorithm, the dimension of the initial set is reduced from 45 indicators to 12, selected by GA as the most significant. Selection errors were minimal (0.000909).

Step 3 - with the help of the apparatus of fuzzy sets, the FNNM of each indicator is constructed. After the generation of the Sugeno type fuzzy output system, a hybrid network is trained with a specified error level of 0 and a number of cycles of 400. In the FNNM, 81 rules are obtained.

Step 4-Test the FNNM on the training set of data. The test result showed the deviation of the actual US GDP from the model (FNNM) in the range (0,099376% - 0,18479%), which confirms the correctness of the proposed information technology (Fig. 1).

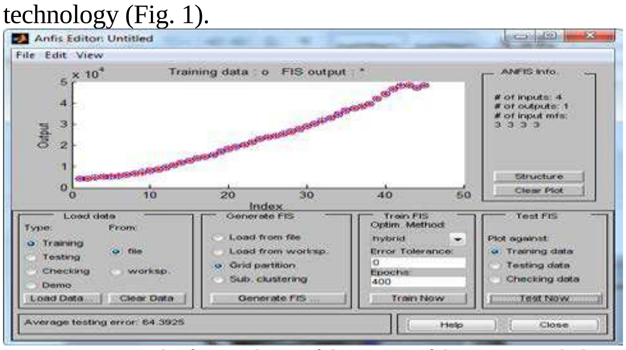


FIGURE 1 Graph of coincidence of the testing of the FNNM with the incoming sample

Step 5 - with the help of FNNM we compute the forecast values of the 12 macroeconomic indicators of the US economy selected by step 2 up to 2020. The results of the computational experiment showed that the range of deviations of the model values of the parameter from the real ones lies in the range from 0.064326% to 9.2%.

Lowering the dimension of the initial set of macroeconomic indicators was carried out using the Genetic Algorithm Input Selection software package of ST Neural Networks. The formation of the FNNM was carried out using the software of the MATLAB Fuzzy Logic Toolbox, using the adaptive neural-fuzzy inference (ANFIS) system of the Sugeno type [5].

The quality of FNNM depends to a large extent on the choice of parameters that determine the "core for analysis" and forecasting. The aggregate of 12 parameters of the US macroeconomics that can be used as input variables of the FNNM is considered. The generalizing properties of FNNM largely depend on the composition of the training sample.

Verification of the FNNM showed the adequacy of the information content of the initial data to the level of informativeness of all the available statistical data. The obtained model allows to predict the further development of macroeconomic indicators.

References

[1] *The official website of the U.S. Bureau of Labor Statistics Major Economic Indicators* **E-resource:** www.bls.gov

[2] Ciftcioglu O, Bittermann M S 2009 Adaptive formation of Pareto front in evolutionary multi-objective optimization *Evolutionary Computation, W. P. d. Santos, Ed. Vienna: In-Tech, pp. 417-44*

[3] Jantzen J 2004 *Tutorial On Fuzzy Logic* TU of Denmark

[4] Skakalina O V 2015 Applied aspects of using the method of group consideration of arguments in the short-term forecasting *Scientific Bulletin of the National Mining University* **6**(150) 80-8

[5] Jang J S R 1993 ANFIS: Adaptive-Network-Based Fuzzy Inference System *IEEE Trans. Systems & Cybernetics* **23**

Cluster project: electronic online educational and certification system for employees of the tourism industry

Alona Rogale-Homika*

LLC "TRANSPORT BUSINESS SERVICE" (TA TBS Travel), Dzirnavu 91, Riga, LV-1011, Latvia

**Corresponding author's e-mail: rogale.alona@gmail.com*

Abstract

Electronic online certification system for employees of the tourism industry was developed by the cooperation of three travel agencies based in Latvia in order to improve tourism services standards and develop sustainable certification program for the employees of the tourism industry. The system was developed in accordance with tourism industry qualification standards.

Keywords: online certification system, online education, new technologies, tourism

1 Introduction

The modern technologies are influencing different industries among which are tourism and tourism related education [1]. Many jobs will be replaced by robots or "become obsolete" [2]. However, some of the jobs will transform according to the needs of the modern market. In this case tourism education should comply with the needs of the modern tourism industry and provide the relevant education.

The aim of the following paper is to represent the cluster project – on-line educational and certification system with the aim of further implementation of the project in the local market.

2 Cluster project

On 12th of September, 2012, the Association of Latvian Travel Agents and Operators (ALTA) has entered into agreement No L-KAP-12-0003 with Investment and Development Agency of Latvia (LIAA) about implementation of the Sustainable Tourism Cluster of Latvia, co-financed by the European Regional Development Fund.

The aim of the cluster was to promote interdisciplinary collaboration between travel agents and operators, tourism service providers, research and educational institutions thus facilitating the growth of sustainable tourism of Latvia and related company competitiveness; innovating, exportable tourism product formation, at the same time provide optimum added value to clients and end consumer of sustainable tourism.

Within this cluster project, three travel agencies (cluster members) collaborated in order to improve tourism services standards and develop sustainable certification program. As a result of this collaboration Electronic online certification system for employees of the tourism industry "Horizont" was developed.

The system provides educational program in 10 different fields of study, which include:

1. Legislative provision of the tourism sector
2. Tourism geography and environment
3. Basic components of the tourism service
4. Creation of tourism product
5. Specificity of tourism types
6. Travel documentation and sources of information
7. Tourism business environment
8. Customer service
9. Tourism marketing
10. Human resource in tourism industry

System saves time, which is usually used for individual new staff trainings, and can be used both as a tool to evaluate the level of knowledge of the employees, as well as a training tool for the new staff members [3].

3 Conclusions

Education and training are an integral part of the company's development in today's changing and highly competitive business environment. But this is usually limited by time or funding factors. Electronic online educational and certification system "Horizont" for employees of the tourism industry can be considered as an alternative and modern way of education and improvement of knowledge.

References

[1] Arapova L A 2010 Modern Technologies in Tourism *NIITTS: Technological problems of Service* **2**(12) *(in Russian)*
[2] Hsu C H C 2018 Tourism Education on and beyond the horizon *Tourism Management Perspectives* **25** 181-181
[3] www.tourismtraining.lv 05.04.2018

Public sector in the doctrine of sustainable development of Ukraine

Yevgen Hirnyk*

PhD student, Taras Shevchenko National University of Kyiv, Kyiv

**Corresponding author's e-mail: zatara_deluxe@mail.ru*

Abstract

The article deals with the main strategies of development of the public sector of the economy in the context of the socially oriented economy of Ukraine in the conditions of globalization.

Keywords: public sector, social policy, welfare, balanced development, institutional, innovation

1 Introduction

In the development of the socially oriented economy of Ukraine there is a purposeful process of search, preparation of consciousness, implementation and commercialization of scientific and technological innovations, which allow to increase the efficiency of social production, improve the vital functions of society and individuals, including the high degree of social security of the individual. It is a question of an ever-increasing amount of resources, at the expense of which are carried out the costs associated with meeting the needs of the population in public goods, which is the goal of social policy.

2 General

Implementation of structural policy requires structural restructuring and increasing the competitiveness of the Ukrainian economy, taking into account differentiated approaches to determining the priorities of social development of each of its regions, the structure of economic complexes, local conditions, their characteristics and needs of the population. The key among them can be considered: the creation of new high-tech industries and the development of those activities oriented towards the use of local resources; restructuring of industry in the regions, increase of production of socially oriented products, which involves the expansion of high-tech production, attracting to the economic turnover of auxiliary (adjacent, complementary) products on the basis of scientific and technological achievements; development of small and medium business and social infrastructure, creation of social hubs, sociopolis, foresight centers, which could become "growth points", "points of crystallization" of a socially oriented economy of the national type; the expansion of ties with international organizations in the development of the public sector and the transfer of social technologies; creation, exploitation, evaluation and accreditation of public charitable organizations in the field of infrastructure and the transfer of social and humanitarian technologies that promote the development of social standards; assistance in the development of the international transfer of social technologies and social cooperation, protection of social interests of citizens [2].

This circumstance will qualitatively increase the efficiency of the public sector of the economy, which serves not only as a result of innovation transformations, but also as a guarantor of the stability, sustainability of economic development.

For the development of the public sector, it is important to consider that the objective function of a socially oriented economic system is the creation and accumulation of a gross domestic product (GDP) with a high level of social efficiency, since any economic system correlates the social production of a social product / service with its social consumption, and to a degree Such a ratio is the level of GDP.

At the same time, in the institutional architectonics of the social economy, social needs should be understood as an internal impulse of social activity, which should be guided by the optimum consumption. This optimum should correspond to the modern technical and technological structure, formed on the basis of social policy within the framework of economic laws of Ukraine. In the doctrine of balanced development, Ukraine 2030, it is indicated that Ukraine's main task is to create a sound economic system that will, firstly, respond to national security strategies; secondly, strengthening and effective competitive development in accordance with the goals of balanced development; and thirdly, raising the level of social standards of living. To solve this problem, the following goals are defined: poverty eradication in all its forms; achieving food security; ensuring a healthy lifestyle; promotion of the achievement of the goals of welfare; quality education; promoting inclusive and sustainable economic growth; creation of a sustainable infrastructure for promoting innovation.

The conscious social needs of each particular subject of economic and political activity must take the form of social interests (a conscious desire to satisfy contemporary social needs), and act as an objective motivating motive for social activity. Economic motives are interpreted as internal motivating causes of social action, and social incentives as external stimuli that "push" socially-oriented actions to meet social needs. The socio-economic system should align the institute of the strategy of socially oriented economy (conceptually designed representations, ideas and views on social activities that reflect the interests of consumers of the social product) with the economic regime of the social system. On the other hand - the economic laws of social and individual consumption with the existing social policy [2].

Social production is interconnected with social policy and structure, which is exerted by the powerful influence of economic resources. It is the availability and level of use of economic resources that correlates the social production of a social product / service with a possible economic sphere of the social sector, which is in the field of attraction of the socio-economic process. Taking into account the social aspect of the public sector, we proceed from the assumption that the economic regime in the institutional architecture of the social economy, which is the institutional conditions for the practical organization of social activity, is characterized by the social production of a social product / service in accordance with specific forms of social policy. It is implemented within the framework of specific social institutions that provide the development of the public sector. As a result, the economic strategy of the social sphere in the applied plan is implemented in the form of economic norms and balanced by economic powers within the social activities of a certain institution of social development [1]. An important place in this development belongs to the public sector as an institute of economics.

The main task of building a successful future of Ukraine in the context of deploying global meta-trades and in accordance with the goals of balanced development is to create a reliable economic system, functioning of which will ensure a high level of social standards of living. This will allow to allocate funds, firstly, to the development of communal enterprises, medical and educational institutions of various forms of ownership; secondly, the formation, support and development of small and medium-sized businesses; thirdly, to expand the sphere of activity of charitable, religious organizations (socially-voluntary sector); fourth, to raise the level of pensions and other forms of material support [3].

3 Conclusions

The article suggests that Ukraine’s involvement in the processes of globalization makes it possible to transfer the Ukrainian economy to new racks of high-tech production and, in parallel, to a higher level of public consumption, due to the integration of Ukraine into the European community.

References

[1] Kraus N M 2015 *Stanovlennya innovatsiynoyi ekonomiky v umovakh instytutsional'nykh zmin [The formation of an innovative economy in the context of institutional change]* TSUL: Kyiv *(In Ukrainian)*

[2] Zhylins′ka O I (Ed.) 2017 *Ukrayina 2030: Doktryna zbalansovanoho rozvytku [Ukraine 2030: Doctrine of sustainable development]* Kal′variya: Lviv *(In Ukrainian)*

[3] Tsishchik N V 2010 Transformatsiyni protsesy v suspil′nomu sektori ekonomiky yak faktor funktsionuvannya domohospodarstv [Transformation processes in the public sector of the economy as a factor in the functioning of households]. *Naukovyy Visnyk Volyns'koho Natsional'noho Universytetu Im. Lesi Ukrayinky [Scientific Bulletin of the Volyn National University Named After. Lesia Ukrainka]* **2** 29-34

Typology of endowment funds in modern practice of financing academic entrepreneurship in the EU

Leonid Leis*

PhD student, Kyiv National Economic University named Vadym Hetman, 54/1 Prospect Peremogy 03057 Kyiv Ukraine

**Corresponding author's e-mail: lbgmbh@t-online.de*

Abstract

The article is classified endowment funds according to the criterion of profit distribution from its functioning. Specific features of the functioning to different kinds and types of endowment funds in European universities. Disclosed the advantages to different types of endowment funds.

Keywords: endowment fund, academic entrepreneurship, financing, universities

Modern needs of European universities in financing their own education programs are constantly increasing. At the same time, there is a general trend towards a reduction in state financing of the education sector and creation of more competitive conditions for the development of various forms of university activity. Since the academic entrepreneurship is not explicitly provided for most of the university statutes, the management of the higher educational institution is looking for alternative sources for its financing. Endowment fund is one of such sources.

The economic essence of the endowment fund is that it accumulates charitable contributions and donations which provided targeted to the university, but initially without the donators definition of the purpose of their use. Subsequently, these funds are used by the university itself as their owner, but under the management of a third entity - usually a management company - in order to obtain a profit. In Europe, the largest experience with endowment funds has been accumulated in the universities of Great Britain. For example, Oxford University is actively working towards replenishment of the endowment fund, and in the Institution of the fund management employs more than 100 people, and branches are open even in the USA and Canada. The purpose of the fund is an annual allocation of 250 million pounds to support students, faculty and innovative research [1, c. 50].

The key of general characteristics of the practice of endowment funds in European universities can be considered in the following ways. First, endowment funds in the practice of European universities are created mainly through donations and the own assets of universities, usually those that are difficult to alienate (land, fixed assets, etc.). At the same time, such funds are managed by means of specially established departments and directorates, and by invited third-party organizations (asset management companies). An important common feature of endowments is that most of the proceeds from the capitalization of such funds are sent by universities to the payment of fellowship and financing of innovative activities.

Secondly, the endowments are developing as external sources of financing the activities of the universities and in fact they are a competing direction of investment. In contrast to investments endowments are formed as charitable funds, and the profit from their involvement in market processes is distributed among third parties for their needs, in particular for the needs of the educational process.

In conclusion, the scientific value of the allocation of different kinds and types of endowment funds is to determine the features and characteristics of different types of endowments. This allows developing methodologically effective mechanisms for managing them. To sum up, the classification of endowment funds open new opportunities to search for the most optimal model for each specific subject of academic entrepreneurship, for each individual university.

References

[1] Davydenko T M 2014 Fund for Management of Targeted Capital and Association of Graduates of VSU - Instruments of Economic Sustainability of Universities / T.M. Davydenko, O.P. Kamshilina *Vestnik VSU* **1** 48-51

Institutional principles of realization of European economic development in Ukraine

Valerii Osetskyi

Doctor of Sciences (Economics), Professor, Head of research group, Taras Shevchenko National University of Kyiv, Kyiv

**Corresponding author's e-mail: val_osetski@ukr.net*

Abstract

This paper presents the European experience of budget planning of capital expenditures for economic development in Ukraine based on an institutional approach.

Keywords: economic development, budget funds, capital expenditures, institutionalization, European Union

1 Introduction

Economic development of the state is of great importance for achieving the goals of integration into the European community, because Ukraine's success depends on directing financial and innovation potential to the development of the most competitive spheres of economic activity. The experience of the European Union states that the most successful economic development was where they were able to build the institutional structure of a market economy, taking into account traditional values, norms and rules of social life. Obviously, there is a correlation between levels of economic development and the state of institutions, between economic and institutional dynamics [1].

2 General

In this context, the classification and hierarchy of institutions and institutions should be in line with the level of economic development of the country, which is an evolving system, defines the institutional order, environment and structure of the national economy.

The creation of this hierarchy aims to clarify and streamline the terminology used in describing the institutional organization of the economy, the innovation system, public finances on the example of the European Union.

The problem of developing the institutional framework for the policy of investment support for the development of the Ukrainian economy should be considered in the context of the European integration course and the implementation of the Association Agreement with the EU.

The strategic objective of the European economic policy of Ukraine is to identify and create conditions for the realization of long-term investment priorities. Due to the acute limited budget resources, economic development at their expense is impossible. Therefore, embodying measures to stimulate economic development and solving social problems, the state should focus on certain areas, investments in which will provide cumulative effect in certain areas, activate reproduction processes and direct private capital to state-defined priorities. In essence, in order to prevent the scattering of scarce budgetary resources in the state, both at the national and local levels, priority directions of budget investments of economic development should be established.

Among the priorities of the socio-economic development of the country, the importance of attracting investments for modernization, renewal of fixed assets and further development of mechanisms of public-private partnership, in particular in the institutional sphere, are not lost. At the same time, it is planned to invest in the development and implementation of reforms at the expense of not only budget resources, but also the use of foreign direct investment in the economy of Ukraine.

At the state policy level, it is important to set up a program of capital investments for the medium and long-term, taking into account national priorities that will be implemented with the involvement of budgetary funds and under state control, organizational measures for implementation of the program, mechanisms for monitoring its implementation, financial sources and preparation of proposals. on adjusting for its results [2].

The European experience of budget planning of capital expenditures in the formation of an institutional environment gives grounds for distinguishing its institutional components as analytical elements and structural factors. Analytical elements are needed to inform participants of the process of capital expenditures allocation on investment needs and priorities, and include macro-analysis, sectoral (sectoral) analysis and evaluation of specific projects.

The need to take into account structural factors is due to the limited amount of budget expenditures allocated for capital financing. In view of this, there are issues related to the addition of capital expenditures to budgets with funds from other sources, including the structural funds of the European Union. Taking into account the provisions of Chapter 28 of the Association Agreement with the EU, Ukraine can participate in the work of some EU agencies and programs. It should be noted that not all agencies and programs of the European Union are currently open to our country, and the participation of third countries in these countries often requires the implementation of EU directives, as defined by their charters. The selection of projects for budget financing may be due to the need to comply with the EU directives, as defined in the Association Agreement with the EU.

General directions of forming a model of European macroeconomic policy should be based on institutional constraints identified by analytical elements and structural factors. In order to solve institutional problems, it is important to approve, at the legislative level, the priorities of economic development, which may be carried out in the medium-term budgetary outlays.

In Ukraine, when preparing proposals for capital expenditures, the relevant ministries carry out the analysis and selection of projects within the limits of their annual budget for the short-term perspective. The transition to the medium-term planning of capital expenditures in the framework of the formation and implementation of innovative strategies for economic development is necessary. The European practice of ensuring the efficient use of budget funds for capital expenditures indicates the need for specialized institutions to establish common priorities for economic development.

3 Conclusions

It is proved that for the development of the Ukrainian economy the greatest problem is to ensure the efficient use of budget funds in the context of the European integration course and the implementation of the Association Agreement with the EU.

References

[1] Ivashina O F 2009 *Instytutsionalizatsiya ekonomichnoho rozvytku [Institutionalization of economic development]* Dnipropetrovsk: Nauka ta osvita (In Ukrainian)

[2] Yefymenko T I 2014 *Finansy instytutsiynykh sektoriv ekonomiky Ukrayiny [Finances of the institutional sectors of the economy of Ukraine]* Kyiv: DNNU “Akad. fin. upravlinnya” (In Ukrainian)

Some aspects of alternative tourism development in the world and Latvia

Svetlana Iudaeva*

ISMA University, Latvia

**Corresponding author's e-mail: yudaevacvetlana@mail.ru*

Abstract

The article is devoted to the development of alternative tourism in the global economy. An attempt is made to explain the growth of demand for specific tourism products in the post-industrial society. The prospects of development of this direction of tourism in Latvia are considered.

Keywords: alternative tourism, tourism product, tourism industry, sustainable tourism.

1 Introduction

A specific feature of the modern postindustrial society is mobility, the desire for regular movements for cultural, educational, recreational and other purposes. Increasing growth rate of tourist migrations are a motivating factor for international tourism business in its search for new forms of effective and sustainable development of tourism. This takes into account such trends in consumption as the saturation of typical scenarios of mass tourism, the desire to maximize their impressions and adventures, the transition from rational to emotional approach to travel. The expansion of cognitive tourism, the emergence of its new types and forms was facilitated by the surge of interest in their own and other people's identities, communication with the native speakers of another languages and cultures.

These trends have predetermined the introduction of the term "alternative tourism" into scientific turn. Next, let`s focus on some feature of this type of tourism, and also consider the opportunities and limitations for its development in Latvia.

2 Overview

As with many definitions that related to the scientific glossary of tourismology, alternative tourism does not have an unambiguous interpretation in the literature. With a narrow approach, this type of tourism is understood as traveling on original and traditional routes without using the services of travel companies. In other words, it should be a self-organized (independent) trip, realizing the need for a person in an unusual holiday, non-systemic character. It is pertinent to note that modern high-tech products, such as Google Glass, SMATT ATCH, currently make planning and management of trips much easier for tourists. From the motivational point of view, distinctive features of such trips are the maximum rapprochement with natural and cultural environment of the destination, aesthetics of observation, non-interference, respect for the local people, study of their customs.

In the broad sense of the word, alternative tourism is an umbrella term that unifies all non-mass types of leisure tourism. In this case, alternative tourism includes as quite traditional types of tourism - educational, health, sports, religious, special-interest tourism, and became popular relatively recently ones - adventure, ethnographic, special-event, ecotourism, agrotourism etc. Specific forms of alternative tourism can be very unusual: survival tours, tours for lovers of watching exotic birds / butterflies in their natural habitat, disasters tourism etc.

A common feature for all of these quite different, in terms of motivational-targeted approach, types of tourism is the personalization of tours, offer unusual schemes and products. In most cases, alternative tourism develops in the format of so-called "soft" tourism and is based on the principles of responsibility, accessibility and sustainability. Its effects directly or indirectly contribute to the nature protection [1].

Tourism is traditionally one of the most important strategic parts of the Latvian economy. The substantial recreational potential of the country is quite well studied by science, so we will not focus here on its assessment. It can be only noted, the total contribution of tourism to GDP (including wider effects from investment, the supply chain and induced income impacts) was EUR 2,4 in 2017 (9.2% of GDP) and 85.1% of these revenues were provided by leisure tourism. In 2017, the total contribution of tourism to employment, including jobs indirectly supported by the industry was 8.9% of total employment (79,500 jobs) [2]. Still, it is below the European average, although close to them. The stability of the Latvian tourism business is negatively affected by geopolitical, demographic, seasonal and some other factors.

Problems of diversification of tourism products and flows have long been discussed in the expert environment, at the level of both the state and business. In addition to other tools and mechanisms, new opportunities for the sustainable use of available recreational resources can be realized as a result of the integrated development of alternative tourism. As the experience of some European countries suggests, one of the most important effects in this case is the minimization of seasonal and territorial imbalances, as well as the economic revival of the most underdeveloped areas.

It should be noted the undoubted success of some Latvian companies in the promotion of alternative tourism products. Interesting projects are implemented in the field of medical, environmental, rural, event tourism. However, the European market in these segments is highly competitive [3]. Unlike mass tourism, the competitive advantages of alternative tourism are more complex. It is difficult to attract travellers, whose trips are based on specific motivation, simply by low prices and stereotyped products.

Expansion of alternative tourism services market in Latvia requires high expenses for creation and improvement of infrastructure (including the use of modern ecological technologies), marketing and innovations. It is new ideas, creative approaches and a package of effective marketing activities that make attractive destinations in the format of alternative tourism.

In this regard, there is a need for system approach to training of qualified specialists capable of de-signing, advertising and promoting specific products on the domestic and global market.

Another mechanism to stimulate the development of alternative tourism is the improvement of marketing strategies of Latvian parishes. It is necessary to work out and use modern, high-tech methods of microbranding, including the marketing of image, attractions, events, ethnic. In the case of small-sized destinations, there are often problems of domination of point tourist sites and products, and as a consequence - the difficulties of forming complex tourist tours. One of the business solutions here is the formation of tours linking different territories, or even countries. Such experience is applied in the field of cultural and educational tourism: most often international cooperation takes place with other Baltic States, Belarus and Russia. At the same time, there is also a great potential for cooperation in the field of alternative tourism.

3 Conclusion

Finally, it should be noted that alternative tourism and its basic principles are in the best interests of the Latvian economy, its residents, the preservation of ethnic and ecological environment. Life and traditions of the local population are naturally in harmony with the ideas of slow, contemplative tourism. However, in order to gain international competitiveness in this segment of the tourism market, management, marketing and organizational innovations and more interesting, relevant products are needed.

References

[1] Георгиев Г, Василева М 2010 Система защищенных территорий в Болгарии и реализация концепции устойчивого и альтернативного туризма *Мир экономики и управления*

[2] *Travel & Tourism Economic Impact 2018 Latvia* https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2018/latvia2018.pdf

[3] *UNWTO Tourism Highlights* 2017 Edition http://tourlib.net/wto/WTO_highlights_2017.pdf

Kaizen philosophy and its role in management

G Kabduyeva* , M Zhivitere

ISMA University, 1 Lomonosova Str., LV-1019, Riga, Latvia

**Corresponding author's e-mail: guldenkabduyeva@yahoo.com*

Abstract

This thesis aims to describe Kaizen philosophy and its specifics. Also, it shows how decisions made in business are enforced and made depending on Kaizen-oriented management. The thesis tries to explain the difference of Kaizen from western management approach and the advantages of Kaizen at different levels of an organization. It highlights how it is important for the strategic needs and success of any organization with an example of Toyota Company.

Keywords: Kaizen, Toyota, management, continuous improvement, Japan

1 Introduction

In Japanese, the word "KAIZEN" means "Continuous Improvement". Masaaki Imai, the consultant in the field of quality management, introduced it. This process includes everyone in an organization. Another advantage of Kaizen philosophy is that it requires relatively low material costs. This idea is so natural and obvious to many Japanese people that they just follow it without hesitation. It is in large measure responsible for the competitive success of Japan.

2 Overview

The economic "miracle" in Japan was like a wake-up call for other developing countries. The change of national policy for the development of transport and communication technologies was made. The international trade and investment increased dramatically. For this reason it would be appropriate to give an example cited by Ha-Joon Chang in his book "Bad Samaritans". This example will explain the uniqueness of Japanese management system Kaizen as a whole.

Once a car manufacturing company of developing country exported its cars to the United States of America. The company was small and it only made shoddy products. The car from that developing country was not successful in the United States. Everyone said that there was no future for the company. The year was 1958 and the country was Japan. The company's name was Toyota. This company moved to car production in 1933 but before they have been producing textile machinery. Now, Toyota is one of the well-known organizations in the World.

How did the company achieve this success? The first reason was, of course, Japanese Government financial support. The second reason was the most well-known practical application of Kaizen concept had been developed for the Japanese Corporation Toyota Motor Corporation. It lies at the basis of total quality management and includes measures to prevent waste, innovation and work with the new standards. The father of Kaizen philosophy, Masaaki Imai, said in his lectures that Toyota is the first company, which have started to use continuous improvement tools and achieved success not only in Japan but also in the rest of the World. There is a main inference; Kaizen philosophy and fast-growing economy of Japan are closely interrelated with each other. Imai also emphasized that many companies in the country implemented this method after the Toyota Company's success. He started a research concerning Japanese economic "miracle". Mr. Imai picked the companies in the United States for better understanding and analyzing, because "cognition comes through comparison". There were the following findings and results: almost all Japanese companies use similar management tools, which are different from Western organizations. He used Japanese term Kaizen to describe those tools and make a distinction from Western approaches. Hence, the author proved that Kaizen is one of the key instruments of fast industrialization of Japan.

As it was mentioned above, Kaizen stands for "continuous improvement" and should be not get confused with the word "change". Kaizen is oriented to make things better. It includes many other management tools such as, Quality Management, process management and it is a part of strategic planning in any type of organization. Nowadays, Kaizen is used or implemented in many countries after recognizing of its effectiveness.

3 Conclusion

For the firs time Kaizen philosophy had been applied in a number of Japanese companies, especially in Toyota, in the recovery period after the Second World War and since had been spread around the world. As it was mentioned above, in Japanese, the word "KAIZEN" means "continuous improvement." On the basis of this strategy, everything is involved in the process of improvement - from managers to workers, and its implementation requires a relatively small expenditure. Kaizen or Continuous Improvement is a flexible concept in management. Its tools can be adopted in any kind of business. But it should be noted that application of one of its tools will not help to achieve success, but the effective use of combination of those techniques will help to achieve the goals and fulfill a mission and vision of an organization. Kaizen is a method, which supports cooperation and flexibility, and shortens time of a business activity. Hence, it stands for everyday improvements. As it was proved, Kaizen is different from western management systems and has its own methods, which correspond to Japanese cultural specifics. Despite of it, it is successfully implemented outside Japan. Nowadays, there are so many companies around the World, which have implemented this philosophy.

References

[1] Chang H J 2008 *Bad Samaritans: The guilty secrets of reach nations and threat to global prosperity*, London, Random Hous, ISBN: 9781905211371

[2] Imai M 1986 *Kaizen: The Key to Japan's Competitive Success* 1 ed, NY, McGraw-Hill ISBN: 0-07-554332-X

Improving management system in the public health organizations at the present stage

M Yelubayeva[1, 3*], M Petrova[2], M Zhivitere[3]

[1] *Karaganda State Medical University, Gogolja Str. 40, 100000 Karaganda, Kazakhstan*
[2] *St.Cyril and St.Methodius University of Veliko Tarnovo, T. Tarnovski Str. 2, 5003, Veliko Tarnovo, Bulgaria*
[3]*ISMA University, 1 Lomonosova Str., LV-1019, Riga, Latvia*

**Corresponding e-mail: elubaeva_maral@mail.ru*

Abstract

At the present time healthcare is actively developing field in Kazakhstan. There are a lot of practices and standards, which are currently implementing. Nowadays, there are developing programs and tools created by the government. The one of the strategies is the decentralization. There are also the new approaches for management system in healthcare industry. This work shortly describes the ways of healthcare development in the Republic of Kazakhstan.

Keywords: public health, healthcare, Kazakhstan, management, medicine

1 Introduction

Public health is an important sphere of social life of the people. The nation's health is the priority of a country's national policy. At the present stage, improving the governance and management in the health care industry is one of the key elements for the reform and development in this field. For this reason, a strategy and a tactic are designed, and main priorities are determined. These aspects are reflected in the state development program of Public Health of the Republic of Kazakhstan "Salamatty Kazakhstan" for 2011-2015.

2 Overview

On the basis of the tactical goals in the country, the strategy of executive functions of decentralization of public health authorities is maintaining with its phased transfer to governmental, non-governmental and community organizations. It is accompanied with the increasing autonomy of public providers. Contemporaneously, centralization of certain functions is provided as well: financing of medical care by the state, medicament supply and supervision in healthcare service. Moreover, the gradual introduction of an institution of professional managers and transparent forms of administration in health service organizations are promoted, including latest management techniques. Also a lot of attention is given to the modern and effective methods of health care resources. There are plans to attract private companies that will aim to manage state and departmental medical facilities, and with this purpose, to develop private sector in order to improve the efficiency of health service. Consequently, the public-private partnerships and transfer facilities, equipment rental, and asset management businesses will be widely used in the future.

For the purpose of personnel retention, especially in health care organizations located in rural areas, the practice of forming task orders of local executive bodies will be offered with the aim to train public health professionals. It will be done on a basis of agreements and likewise by attracting private investment and sponsorship funds.

The adopted strategy "Kazakhstan - 2050", by the Head of the state, carries forward the new tasks: providing affordable and good quality health care; diagnosis and treatment of the widest range of diseases; development of preventive medicine; implementation of "smart medicine" service, remote prevention and treatment, "e-health", providing the entire spectrum of health care for all children under the age of 16; legislative strengthening of the minimum standards of living.

3 Conclusion

As it was mentioned above, healthcare is an important sphere of the social life. The health of the nation is a priority direction of the national policy of Kazakhstan. At the present stage, the improvement of the management system in the healthcare sector is the one of the key moments in the reform and development of this sphere.

The country continues strategy of decentralization of the executive functions of public healthcare authorities with the transfer of their part to the public, non-governmental and private organizations. At the same time, funding is provided for the state-guaranteed medical care, provision of medicines and control in the healthcare sector. Gradual introduction of the institute of professional managers is continuing.

In order to consolidate the personnel located in rural areas, the training of health professionals, including the basis of agreements through attraction of private investments and sponsorship, will be proposed.

References

[1] Petrenko N A 2015 *Management in Public Health-workbook (in Russian)*

[2] Petrova M 2014 *Informatization of public administration in Bulgaria* Ed. FABER. Veliko Tarnovo (*in Bulgarian*)

[3] Petrova M, Tepavicharova M, Boykova L 2017 Improvement of the efficiency and competitiveness through the implementation of benchmarking in the organizations *KazUMO, Almaty, Kazahstan, Bulletin of Ablai Khan KazUIRandWL series ЇNTERNATIONAL RELATIONS and REGIONAL STUDIES"* ISSN 2411-8753 **1**(27) 5-6, pp. 79-8

[4] *The problems of healthcare development at the present stage in Kazakhstan* https://articlekz.com/article/8040

[5] *State healthcare program for development in the Republic of Kazakhstan* https://www.enbek.gov.kz/ru/node/332663

Innovation – sources of competitive advantage in the value chain of tourism enterprises

Viktoriia Riashchenko[1]* , Maksym Bezpartochnyi[2]

[1]*ISMA University, Latvia*
[2]*Poltava University of Economics and Trade*

**Corresponding author's e – mail: viktorjas@gmail.com*

Abstract

Purpose – The purpose of this paper is to illustrate how essential is innovation in the tourism industry. First of all, we will describe various techniques to be innovative in the tourism industry using the modern available technology and the computer development. Second of all, we will show how essential it is to be creative and innovative in the tourism industry in order to stay on top of the competition and it is a very competitive industry. In addition, we will provide several examples of innovations in the tourism industry in different countries and compare the similarities and differences.

The paper defines the concept of innovation and shows how it is applicable in the tourism industry. In addition, our paper will show how pertinent it is to be innovative to succeed in the industry in order to provide as much flexibility, comfort and happiness.

The development of modern tourism primarily depends on the development and implementation of innovative technologies aimed at improving customer service and expanding tourist service opportunities. The purpose of this paper is to convey how essential it is to understand the market dynamics for tourist services and to stay abreast in order to ensure the efficiency and profitability of these particular specialties of services.

Keywords: tourism, tourist industry, innovations, creativity, technological innovations

1 Introduction

The article will provide information about the approaches and the directions of development of innovative activity in the sphere of tourist services and their competent use at the enterprises of the given branch. Furthermore, it provides important information on key innovative technologies, their contents, applications and effectiveness. The objectives of this paper is to analyze the innovation processes in tourism, the opportunities for innovation in tourism, and provide examples of application of innovation in tourism. We will especially provide examples in tourism innovations in Latvia too.

Competitive advantages of the organization are unique tangible and intangible resources owned by the organization, as well as strategically important for this organization business areas that allow it to win in a competitive struggle. Competitive advantages represent a high competence of the organization in the tourism industry, which gives it the best opportunities to overcome competition, attract consumers and maintain their commitment to its brand.

Competitive advantages of the organization are unique tangible and intangible resources owned by the organization, as well as strategically important for this organization business areas that allow it to win in a competitive struggle. Competitive advantages represent a high competence of the organization in the tourism industry, which gives it the best opportunities to overcome competition, attract consumers and maintain their commitment to its brand.

At the heart of competitive advantages lie tangible and intangible resources (Figure 1). To tangible resources (tangible assets) are the material and financial assets of the organization, which are reflected in the balance sheet. Under intangible assets (intangible assets) are understood the qualitative characteristics of the organization, namely not related to people (prestige, image) and intangible resources, which are related to human capital (personnel qualification, experience, competence, corporate culture, management team).

In addition, the individual strategic directions of the organization (marketing, marketing, finance, etc.) in which it succeeds can be a source of competitive advantages. The organization will also occupy a leading position in comparison with its competitors in case of a monopoly on the market, which is why many large organizations of the tourism industry are currently trying to seize the market through globalization and integration of companies.

Thus, the competitive advantage is the position of the organization in the market, allowing it to overcome competition and attract consumers. Competitive advantages allow the organization to have a profitability above the average for companies in this industry or this market segment.

Innovations in tourism should be considered as systemic events that have a qualitative novelty and lead to positive shifts that ensure sustainable operation and development of the industry in the region.

The innovation process in tourism is quite specific. It receives its recognition, on the one hand, through the tourist market and the degree of customer satisfaction, and on the other hand, mainly thanks to the adoption of joint decisions by tourism organizations, regional authorities, local self-government bodies.

Based on the provisions of the Agreement on Trade in Services (GATS), in tourism innovation activity develops in three directions:

- introduction of innovations (organizational innovations) related to the development of the enterprise and tourism business in the system and management structure;
- marketing innovations that allow to cover the needs

of target consumers or to attract clients not covered for a given period of time;

- Periodic innovations (product innovations) aimed at changing the consumer properties of a tourist product, its positioning and giving a competitive advantage.

In modern understanding, innovations in tourism are planned, targeted, inevitable, managed and practical changes and innovations at the level of organizations involved in tourism, public associations and states aimed at developing tourist flows and creating a proposal that satisfies and exceeds individual demand as much as possible.

2 Overview

At the same time, competitive advantages are divided into two types:

1. the advantages of high rank (associated with the organization's excellent reputation, a well-known brand, qualified personnel, advanced marketing, based on the use of new technologies, modern management, long-term relationships with consumers, etc.) tend to persist for a longer time and , respectively, allow the organization to achieve higher efficiency;
2. the advantages of low rank (associated with the availability of cheap labor, rich tourist resources, etc.) are not so stable, as they can be used by competitors.

3 Decision

All components of the tourism industry must be influenced by scientific and technological progress. Only such interaction of all elements of the tourist industry can lead to the emergence of a significant synergetic effect, expressed as growth of the tourism industry. As a result, the one who first of all gives to the tourist product new consumer qualities and properties wins and is able to interest the consumer with these innovations.

4 Conclusion

Findings – Based on the current literature and examples provided, we will illustrate how the use of technology can enhance the innovations and creativity in the tourism industry and especially why it is essential to be innovative and creative to stay on top of the competition.

Originality of the research – The paper emphasizes the use of technology together with innovations and creativity in order to succeed in the tourism industry. Using technological innovations to provide flexibility and convenience for the customers and clients.

References

[1] Bertsch G, Schobersberger W, Blank C, Ostermann H 2011 Importance of wellness quality criteria and positioning of wellness cooperation brands *International Journal of Leisure and Tourism Marketing* **2**(3) 194-208
[2] Bunich G A, Startsev V A 2012 *Tourist Product: Theory, Practice, Innovative Aspects*: p 236 http://unitech-mo.ru/upload/iblock/bd8/bd884c5abfa40397c2becf97d1acb942.pdf
[3] Malakhova N N, Ushakov D S 2008 Innovations in tourism and services Publishing Commercial Center "MART", Rostov-on-Don: Publishing Center "MART" p 224
[4] Novikov V S 2007 *Innovations in tourism Training manual* M.: Publishing Center "Academy" p. 208
[5] *Training manual / Sevastyanova S.A. - M.: "KNORUS"*: Sevastyanova S.A., 2007, Regional planning of tourism and hotel industry, p. 256.
[6] Steinhauser C, Jochum B 2006 *Markenpolitik im Gesundheitstourismus am Beispiel von "Alpine Wellness" [Brand policy in health tourism using the example 'Alpine Wellness']* In A. Krczal and K. Weiermair (Eds.), Wellness und Produktentwicklung, Erfolgreiche
[7] *Innovation in Hospitality* https://stenden.com/fileadmin/user_upload/documenten/research/Innovation_in_Hospitality/Lectorale_Rede_Dr_Gehrels_Innovation_in_Hospitality.pdf
[8] *World Tourism Organization UNWTO* www.unwto.org.en
[9] http://bujet.ru/article/237360.php
[10] https://www/deutschertourismuspreis.de/innovationsfinder/magdeburg-marketing-kongress-tourismus-gmbh-mein-besuch-schlaeft-besser.html
[11] http://www.grani.lv/daugavpils/83736-fotoreportazh-s-festivalya-voenno-istoricheskoy-rekonstrukcii.html
[12] http://jtl/lv/turisma-inovacijas-latvija
[13] http://www.oecd.org./sti/inno/34609098
[14] https://www/poehalisnami.ua/tourist/virtualrea;ity?ctnid=kiev
[15] http://reports.weforum.org/travel-and-tourism-competitiveness-report-2017/country-profiles/#economy=LVA
[16] https://www.staedte.sh/de/nightlife-fuer-kinder
[17] Baltic Health Tourism Report Dr Melanie Kay Smith University of Tartu, Pärnu College doi: http://wellnesseducation.pc.ut.ee/wp-content/uploads/2016/05/Baltic-Health-Tourism-Report.pdf
[18] Nordic Innovation 2011 *Innovating and re-branding Nordic wellbeing tourism* http://www.nordicinnovation.org/Global/_Publications/Reports/2011/2011_NordicWellbeingT ourism_report.pdf.
[19] *The Travel & Tourism Competitiveness Report 2017* http://ev/am/sites/default/files/WEF_TTCR_2017/pdf

Intellectual component of global leadership

Kyiv National Economic University named Vadym Hetman, 54/1 Prospect Peremogy 03057 Kyiv Ukraine

L Tsymbal*

**Corresponding author's e-mail: l.tsimbal@ukr.net*

Abstract

Global leadership is a sign of economic power of the subject in modern conclusions. Classically, global leadership is determined through a system of macroeconomic indicators that demonstrate the place and role of the country in the identified processes, so one of the key indicators is the size of GDP. However, the structure of such indicators and indexes has been expanding lately. Global leadership is based on intellectualization and scientific achievements at the present stage of economic development.

Keywords: intellectual leadership, global leadership, R&D

It is scientific developments and the level of innovation of the economy that are becoming a prerequisite for the success of the global arena [1]. The development of science and technology leads to the expansion of the ability of developing countries to participate and influence global processes. So, developing countries can freely compete with developed countries in the field of technology, but all the other indicators of development of these countries will differ significantly from the developed countries. There is a transition from the tripartite model of the world to a multipolar one (if 10 years ago, the US, EU and Japan occupied the leading position on the technological map of the world, today this situation is changing). Intellectualization of production is gaining in importance, expanded access to education, the development of information and communication technologies, and the possibilities of mobility lead to an increase in the level of education of the population and its technological preparation.

Modern economies have a high level of dependence on the skill level of the workforce, the level of investment in research projects and research. Branch-leaders are science-intensive activities that have emerged only in recent years. The current knowledge flows determine new trends in financial, business services, educational, health, pharmaceutical, air and space products. These goods become motivators-integrators for the opportunities of competition in the global market.

Rapid growth and development patterns are characteristic of developing countries and vice versa - developed countries show a slowdown in this pace, due to the exhaustion of opportunities for development in the process of linear innovation. However, developed countries have more opportunities to shape the realization of non-linear innovations and a new stage of development. Such an active development of developing countries is due to the concentration of their attention in science-intensive industries, an increase in the share of resources involved in R & D and education. However, developed countries show a steady high share of development spending, while developing countries only increase this potential.

R&D expenses are the basis for the development of innovations that can determine the country's place on the global map of the world. In general, countries with significant R & D expenditures are among the TOP-20 countries of the world by the level of the innovation index. At the same time, innovations gain weight for countries of different levels of development, as they become the basis for the formation of competitive advantages in leading industries. For formation of the rating, both resources and results are researched. Incoming resources are institutes, human capital and research, infrastructure and complexity of the market. The results are patents, scientific articles and creative results [2].

Also the efficiency of innovation is important, it is classically high in high-developed countries, but some developing countries show a significant improvement in this indicator. Evaluating efficiency takes into account the ability to make contributions to education, research for the social and commercial effect; number of engineering graduates and workers in the field of science and technology; possibilities of realization of talents in business structures; high proportion of exports of creative goods.

In this way, promotion of innovation is a priority task of the state to ensure sustainable competitive advantages. In general, to increase the intellectual potential, it is necessary to concentrate on the participation and distribution of flows of ideas, know-how, international mobility. A new global space is formed that has unique characteristics and is represented by drivers of economic development - intellectual.

References

[1] *Science and Engineering Indicators 2016* **E-resource:** https://www.nsf.gov/statistics/2016/nsb20161/uploads/1/nsb20161.pdf
[2] Kulkarni A 2017 *Index shows the global innovation gap is growing / Anand Kulkarni* **E-resource:** http://www.universityworldnews.com/article.php?story=2017080106484882

Implementation of project management concept for innovations in the context of organization design

M Vasylchenko* , O Khrystenko, A Chaikina

The Department of Management and Logistics, Poltava National Technical Yuri Kondratyuk University, Pershotravnevyi avenue, 24, Poltava, Ukraine, 36011

**Corresponding author's e-mail: drogomyretska@gmail.com*

Abstract

The given paper is dedicated to the determination of the necessity of project management implementation for innovation and change. It is defined that project management is one of the most important competencies for organizations that are seeking to achieve sustainable competitive advantage. That is why many public and private organizations are interested in changing their corporate culture and organization design towards project orientation. Finally, it is concluded that implementation of the project management concept within an organization is considered to be a full business process, because it contributes to business value creation and requires the adoption of new managerial techniques as well as new philosophy of business.

Keywords: innovation, organization, organizational behaviour, project management, project management system

1 Introduction

Nowadays many and many organizations all over the world are experiencing uncertainty because of vast economic changes and turbulence. Consequently, innovations are often considered as means of responding to these conditions and challenges. "It is a hot topic in organizations, driven by the need to compete in an era of increasing competition, rapid technological and market change, and escalating requirements for solutions to complex problems" [4, p. 3].

There is a variety of publications [2; 3; 5; 6] that are related to the investigation of innovation outcomes and how they are produced. Accordingly, in the given paper the authors decided to focus on how any project, especially innovative one affects the organization design.

2 Main part

Project management is a matter of survival for many organizations [1, p. 452]. As a tool to achieve the organization's goals within the initially determined time, quality and the allocated budget, project management requires the productive use of knowledge, skills and techniques in order to meet or exceed the needs of stakeholders from a certain project.

Project management can be viewed from different viewpoints. The first one is that project management is a software tool that helps to implement various projects within an organization. Another view is that all projects in organization should be properly planned, controlled and implemented from a central location through the use of an intermediate computer system.

The implementation of project management concept for innovation is a strategic decision by the organization to change the existing way of decision-making process and the way of allocation of resources between different projects.

In this regard, it is not a trivial matter to implement the project management strategy in any organization. Therefore, a new organizational structure and design have to be communicated to the personnel within the organization, as well as other critical stakeholders of the projects that are being realized.

Some individuals from personnel of an organization may require additional training to develop their knowledge, skills and competence. On the contrary, managers of all levels of management in an organization should be able to show their support for the innovation process and change outcomes. Moreover, it is the only responsibility of the top-level managers to define and analyze the core benefits of changing to the project management organization within the business entity. After the decision is made to convert the organization's assets into a project management design, a specific strategy must be developed for the transition functions to the new organization design improvement.

On the basis of the above considerations, it should be mentioned that one of the major advantages of converting to project management system implementation is that projects are characterized by greater visibility to their exceptional fit and profitability within the business entity as the peculiar building blocks, necessary to achieve the main goals and objectives. In practice, many organizations operating in different industries find that the ineffective projects are being realized because of the lack of criteria for defining really worthy projects. As a result, modern project management requires a particular attention to the allocation of resources to those projects that can have the more importance to the organization's success and the sustainable competitive advantage achievement.

So, once selected and implemented, these projects must receive not only priority for resources and support, but also timely decisions for issues concerning them all. And finally, policies and procedures supporting the project management system in an organization will encourage the optimal allocation of critical resources between projects.

3 Conclusions

Project management is considered to be an asset of any modern organization that changes the way business is conducted through a wide variety of projects. Project management concept is closely related to the business entity's activity and to the specificity of its design for project management implementation and alignment of projects with the organization's goals, its approved policies and procedures. Obviously, all these listed elements are joining efforts to develop the criteria for the selection of the prospective and innovative projects, as well as managing the organization to achieve the most benefits from each project.

References

[1] Ghaben R, Jaaron A A M 2015 Assessing innovation practices in project management: The case of Palestinian Construction Projects *International Journal of Innovation and Scientific Research* **17**(2) 451-65

[2] Jeremiah R 2017 *R&D configurations and innovation outcomes: The Case of Swedish R&D Offshore. Dissertation for the Degree of Doctor of Philosophy, Ph.D. in Business Administration, Stockholm School of Economics* **E-resource:** https://www.hhs.se/contentassets/85ded4ca9b574ab6ba846a5f82975067/sse-phd-diss-2017-rupin-jeremiah_oct-11-v1.0_rev.pdf

[3] Malerba F 2016 *Sectoral systems of innovation and production* OECD Blue Sky Forum III, Ghent, Belgium **E-resource:** https://www.oecd.org/sti/008%20-%20BS3%202016%20GAULT%20Extending%20the%20measurement%20of%20innovation%20.pdf

[4] Midler C, Killen C P, Kock A 2016 Project and innovation management: bridging contemporary trends in theory and practice *Project Management Journal* **47**(2) 3-7 DOI: 10.1002/pmj.21587

[5] Quintane E, Casselman R M, Reiche B S, Nylund P 2010 Innovation as a knowledge-based outcome **E-resource:** http://blog.iese.edu/reiche/files/2010/08/Innovation-as-a-knowledge-based-outcome.pdf

[6] Simpson P M, Siguaw J A, Enz C A 2006 Innovation orientation outcomes: The good and the bad *Journal of Business Research* **59**(10-11) 1133-41 DOI: 10.1016/j.jbusres.2006.08.001

The change of disability policy to employment disabled persons: gaps in Latvia's practice

Zaiga Oborenko[1], Marga Zhivitere[2*], Maksym Bezpartochnyi[3]

[1]*Faculty of Economics and Social Development, Latvia University of Agriculture, 18 Svetes Street, Jelgava, Latvia*
[2]*Centre for Entrepreneurship Innovation and Regional Development (CEIRD), Ventspils University College, 101a Inženieru Street, LV-3601 Ventspils, Latvia*
[3]*Poltava University of Economics and Trade*

**Corresponding author's e-mail: marga.zivitere@isma.lv*

Abstract

During in the last ten years significant changes are observed in employment of Disabled persons: it is a changing paradigm for disability policy making from compensation towards to human rights. The aims focus on research that supports implementation of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) and the European Disability Strategy 2010- 2020. The surveys design to assess to the employment of persons with disabilities as well as to measure the level of implementation of disability inclusive practices and policies in the workplaces. The research carried out by analysing the situation in Latvia, as well as by compiling the statistical data, the opinions of experts and performed review of literature. despite state plans for measures to include people with disabilities in the labour market.The results show very slow improvement. It makes a vital gain for a better understanding the employer policies and practices that can improve opportunities for them. Through it is well appreciated that policies and practices cannot be altered as fast as one would like them to, nonetheless it is well worth to examine the bottleneck and practice challenges that are encountered while operationalizing ambitious policies. The results of the study lead to the conclusion that in Latvia the gap between policy and practice for the employment of disabled people is constantly decreasing.

Keywords: disability policy, employment disabled persons, human rights, Latvia, practice

1 Introduction

During in the last ten years significant changes are observed in employment of Disabled persons: it is a changing paradigm for disability policy making from compensation towards to human rights [1]. However that the disability employment gap – the difference in employment rates between disabled and non-disabled people – is a crucial indicator of disability equality, The Europe 2020 target for EU is 75% [2]. The number of employed persons with disabilities in Latvia is 40 450, or 4.5% of all employed (fig. 1).

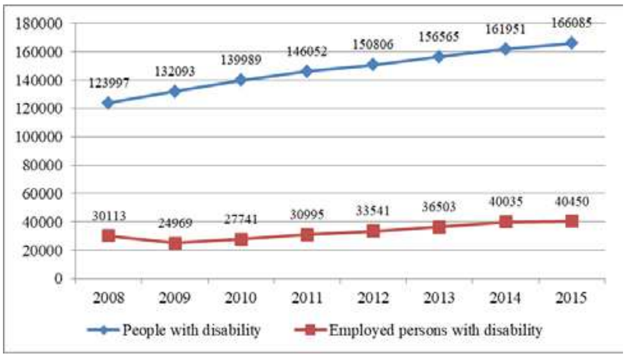


FIGURE 1 The number of people with disabilities and employed people with disabilities, 2008-2015 [3] *Source: The State Social Insurance Agency (VSAA)*

As the statistical data show, there is a problem of inadequate employment among people with disabilities and despite state plans and measures to include people with disabilities in the labour market, results show very slow improvement of employment of perslons with disability [4; 5].

Despite such an impressive array of policies, which undoubtedly demonstrates the novel intensions and realization on the part of State Social Insurance Agency and State Employment Agency regarding the approach to be embraced, studies and experiences on ground have brought out a degree of disconnect between policy and practice.

2 Methodoloy and methods

This study is heuristic. A survey scale develops within this framework in order to determine the perspectives of managers and employers with regard to the employment of disabled people. Several sources used for the creation of the survey form to use in order to collect data concerning the study.

3 Gaps in policy and practice

The recent adoption of the UNCRPD and with the hope that it will come into force near future such introspection gains enhanced importance. A closer scrutiny of the reasons for the disconnected between intentions, policies and progress made on ground towards mainstreaming disability, reveals that problems exist at multiple levels – with International Development Agencies, National Governments and NGOs including disability sector organizations. Similarly, there are challenges both at the structural as well as at the implementation level. Some of the practical issues have been discussed be: National Government in Latvia have adopted mainstreaming issues of disability within their policies however, at the same time they have set up parallel structures to implement separate disability programs instead of institutionalizing the same across all sectors. This has often led to confusion regarding mainstreaming, with various ministries not taking the ones of including people with disability within their programs.

4 Core principles associated with breaking the barriers to employment disabled people and making the changes

Discuss approaches for assessing and establishing work-capacity or disability, measures to improve labour market integration of persons with disabilities and the role of labour market institutions and other actors.

According to the respondents' answers on the questionnaire main barriers to employment of persons with disabilities, there were stated that the employers required support to overcome their worries and possible problems. The main help for employers would to come from vocational training and rehabilitation centres or from job coaches who follow up and support workers with disabilities [6].

5 Conclusions

The survey shows a considerable number of problems in economic, legal and social sectors, which influence the practice of employment of disabled people in Latvia.

The appropriate changes in labour legislation are needed in order to serve both the employer's and the employee's interests.

References

[1] *Cabinet of Ministers. United Nations Convention on Persons with Disabilities implementation guidelines 2014-2020* 2013 https://likumi.lv/ta/id/273969-par-ieklaujosas-nodarbinatibas-pamatnostadnem-2015-2020-gadam
[2] *ANED – Academic Network of European Disability Experts European comparative data on Europe 2020 & People with disabilities Final report* January 2017, p.7
[3] *European comparative data on Europe 2020 & People with disabilities* 2015 http://www.disability-europe.net/search?searchword=employment&searchphrase=all
[4] Ministry of Welfare of Latvia, Central Statistical Bureau of Latvia (CSP), The State Employment Agency (NVA)
[5] European Commission (Brussels, 15.11.2010 COM (2010) 636 final). European Disability Strategy 2010-2020: A Renewed Commitment to a Barrier-Free Europe (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions). Retrieved January 27, 2011 (p. 11), http://eur-lex.europa.eu.
[6] Information Systems Management institute. Study programme "Business administration" 2017 October

Youth labour behaviour problems of current importance

Natalia Nazarenko

Ptoukha Institute for Demography and Social Studies of the National Academy of Sciences of Ukraine

Corresponding e-mail: kyiv.natalinka@ukr.net

Abstract

The article considers the youth employment problems on labour market. The importance of youth ineffective employment substantially influence the motivation component of youth labour behavior. An important feature of the article is adaptation to the new conditions of labour market and bringing professional skills in line with the needs of the labour market.

Keywords: youth unemployment, labour market, youth labour behavior, motivation component

Under conditions of world globalization, the unemployment of young people has become a burning issue. In the last 10-12 years university graduates have often faced the need to solve employment problems by themselves after completing their education. The changes in the nature of labour market interaction are explained by the ineffectiveness of the system of graduates' employment, which, in turn, has led to the situation where 80% of graduates of Ukrainian educational institutions nowadays do not work according to their professional education, what is more, there is also a high level of unemployment among young people [1]. The researches of D. Bohynia, O. Hrynkevych, O. Hryshnova, L. Ilyich, Ye. Libanova, L. Lisohor, I. Kurylo, V. Onikiyenko are devoted to the theoretical and applied aspects of the problem of labour sphere and youth on the labour market. Most of the researchers note the structural changes in all spheres of society activity.

Youth unemployment in general and, in particular, youth ineffective employment substantially influence the motivation component of youth labour behavior; lead to the loss of motives to choosing and mastering profession, professional skills and their improvement; foster the refusal to work, which spurs social tension, increase criminal behavior etc.

Uncivilized market relations, problems of economic changes (decline of living standards, inflation, rise of unemployment, loss of prestige of socially important professions, increase of crime etc.) have substantial influence on labour behavior of young people [2]. This has led to the fact that professional activity in the sphere of material production ceased to be in the interests of employees, especially young people: the prestige of high quality professional labour has fallen; there has been a crisis of human values, and as a result, the attitude to profession and labour has changed. Nowadays the leading orientation among the youth is toward the work which gives the opportunity to earn substantial money with minimum physical and mental effort. Part of graduates is guided by different circumstances in choosing profession (prestige of profession, high salary), but to the least extent graduates take into account the real demand for the chosen profession on the labour market, even despite the fact that many young people fail to find a job according to their profession after graduation [3].

These tendencies partly coincide with world trends indicating the growth of demand for transprofessionals, the main characteristic of which is the ability to effectively train and retrain.

In the countries of the EU 28, the level of unemployment among the youth in 2015 was 20,3% (in 2001 – 17,7%), and general unemployment was 8,3%, as stated in the published report of the International Labour Organization (ILO) "Global Employment Trends for Youth 2015" [4]. 28 European countries managed to improve this index during 2013-2015, but in some countries it still gets past a 30% point (Spain, Greece, Italy, Cyprus, Romania, Portugal, Croatia) [5].

Conclusions

The analysis of global tendencies in the sphere of youth unemployment shows that intensive development of technologies, changes in labour organization and labour relations require constant adaptation to the new conditions of labour market and bringing professional skills in line with the needs of the labour market. To provide young people with better opportunities, competitive positions and to move to decent employment, it is required:

- to invest in high quality education and training which give young people skills, necessary to satisfy the demands of labour market;
- to guarantee social protection and package of services regardless of the kind of employment agreement; to create equal conditions for everyone: to secure the opportunity to work productively for every young determined person regardless of their sex, level of income and social and economic status;
- to increase the volume of investment in production and increase the inclusiveness of labour markets and society as a whole.

References

[1] *Riven zainiatosti Ukrainy u 2016 rotsi: Vybirkove obstezhennia* 2017 Kyiv: Derzh. tsentr zainiatosti Ministerstva sotsialnoi polityky Ukrainy https://www.dcz.gov.ua (in Ukrainian)

[2] Hrynkevych O S 2016 Vtorynna zainiatist studenskoi molodi v Ukraini u konteksti analizu yii osvitno-profesiinykh tsinnostei/ O.S. Hrynkevych *Naukovyi visnyk Khersonskoho universytetu* **2** 127-30 *(in Ukrainian)*

[3] 2014 *Perekhid na rynok pratsi molodi Ukrainy* [Ye. Libanova, L. Lisohor, O. Tsymbal, I. Marchenko, O. Yarosh] – Geneva: MOP p. 16 *(in Ukrainian)*

[4] *Global Employment Trends for Youth 2015: Scaling up investments in decent jobs for youth* 2015 International Labour Office – Geneva: ILO

[5] Unemployment_among_young_people 2016 Information portal of the International Labour Organization http://ec.europa.eu/eurostat/statistics-explained/index.php/ Being_young_in_Europe_today_-_labour_market_-_access_and_ participation#Unemployment_ among_young_people

Image of a tourist enterprise as a factor of competitiveness

Hanna Anikovich

BSPU, Minsk, Belarus

Abstract

One of the important aspects of the general perception and evaluation of a tourist enterprise is the impression it produces, that is, its corporate style (image).

Corporate style (CS) is a set of color, graphical, verbal, typographical, design constant elements that ensure visual and meaningful unity of goods (services), all information, outgoing from the firm, its internal and external design.

The process of image formation is always a goal-oriented process. In order for the process of image formation to be successful and effective, it is necessary; need effective management of it. All activities aimed at the formation of the company's image must be qualitatively and quantitatively determined.

Keywords: image, branding, corporate style, competitiveness

1 General

A positive image of the tourist company is created by the main activity of the enterprise and advertising and information work. Only a positive image increases the company's competitiveness, attracts consumers and partners, accelerates sales. The main rule of the company's "positive image": the firm should strive to ensure that its image in the minds of consumers matches as much as possible the image designed by the firm's specialists. The image of the company appears in the minds of consumers under the influence of various contacts with the firm: as a direct communication with employees, and acquaintance with advertising products or visiting exhibitions, presentations [1].

Another way to create public recognition is the use of well-known brands. Formulating adherence to the brand (creating a permanent clientele) is also a job to maintain a firm and sustainable image of the company.

Branding is the technology of creation and promotion of branded tourism services, the activity on the formation of long-term preferences for the tourist service, based on the increased impact on the selected segment of consumers of the trademark, trademark, advertising argumentation, materials and promotion activities, design and organization of places of sale of services, as well as other elements and shares in the field of advertising activities, united by a certain idea that distinguishes the services of the organization among rival Comrade, image it emphasizes the position and uniqueness. Thanks to branding, production becomes the embodiment of brand [2].

The main task of branding of a tourist organization is the formation and further development of positive, positive associations associated with its brand [3].

Creating your own brand is a complex process that requires a lot of time and effort, as well as huge financial investments, therefore in the tourism industry, where relatively small companies predominate, tourist organizations often use existing well-known brands to promote services on the market.

At the first stage of forming a corporate style, it is expedient to differentiate the main thing, create a certain image, on the second - to develop its new components, to produce certain media. When implementing the second stage, it is advisable to use the services of an advertising agency [4].

The central element of the firm's style of a tourist enterprise is a trademark. The trademark or service mark, like the hieroglyph of the ancient Egyptians or the symbolic symbol of the Sumerians, must carry not only a sufficient amount of information about the firm, but also contain laconic, encrypted in the characters message about the profile of the tourist enterprise, reflect its individual image.

The basic rule of "positive image of the firm": the firm should strive to ensure that its image in the minds of consumers as much as possible correspond to the image designed by the firm's specialists

The image of the company appears in the minds of consumers under the influence of various contacts with the firm: as a direct communication with employees, and acquaintance with advertising products or visiting exhibitions, presentations [5].

2 Conclusions

Thus, working with the image is a fairly painstaking and delicate work affecting many levels, processes and people in the organization, but in conditions of competition, this cannot be avoided. Only a positive image increases the company's competitiveness, attracts consumers and partners, accelerates sales. The image of the travel agency is mainly formed through public relations and advertising campaign.

References

[1] Aleshina I V 2011 *Corporate image* Marketing
[2] Durovich A P, Kopanev A S 2015 *Marketing in Tourism: Proc. allowance* Minsk: Economist
[3] Kotler F 2016 *Fundamentals of Marketing* Short course / Kotler Philip. - Moscow: Dialectics / Williams
[4] Pocheptsov G G 2013 *Image* M: Refl-beech
[5] Zverintsev A B 2012 *Formation of image. Communication management* St. Petersburg

Informational technologies in international financing of innovative activity

Dmitry Frolov*

State Higher Educational Institution "Vadym Hetman Kyiv, National Economic University", Ukraine, Kiev, 54/1, Peremohy Avenue

**Corresponding author's e-mail: 80505867591@rambler.ru*

Abstract

Currently, there is a tendency in Ukraine to reduce the number of innovative enterprises, which according to the State Statistics Service in 2015 amounted to 834 units versus 1715 units in 2013 [1; 2]. The low innovation activity of domestic enterprises is due to various reasons, among which the most important is the lack of domestic long-term investment resources. This causes the need to attract financial resources from the external sources in the innovative sphere, which are numerous international institutions for the financing of innovation activities.

Keywords: international institutions, financing, innovations, information technologies

International Innovation Finance Institutes can be divided into 4 large groups:

- transnational corporations;
- specialized international financial organizations;
- integration associations;
- governments of foreign countries.

In particular, specialized financial institutions that can finance innovative activities include: the World Bank (which includes the International Bank for Reconstruction and Development, the International Development Association, the International Center for Dispute Settlement, the Multilateral Investment Guarantee Agency), the IMF, the OECD, the GATT-WTO, European Bank for Reconstruction and Development and other regional banks.

Thus, financing of investment projects is carried out by many international institutions, which are an extensive system, with individual statutes, resources, functions, principles and objectives of innovation financing activities. Therefore, an in-depth study of global financial flows that go to innovation activities, international institutions for the financing of innovation, their legal status on the world stage, their participation in Ukraine, their structure, functions, principles and mechanisms of activity and rational borrowing of foreign experience in using modern tools for financing innovation activities, analysis and assessment of the possibilities of using effective mechanisms of attracting world financial resources to innovation activity in Ukraine is of paramount importance is important for the development of Ukraine's economy on an innovative basis.

The study of international financial flows that go for innovation activities, international institutions, where these financial resources are formed, and mechanisms for their attraction to Ukraine are doomed to use large amounts of information and factual data and information about the activities of international institutions that are located outside Ukraine.

Existing information technologies enable to perform complex tasks of searching the necessary information and simulate processes that 10-15 years ago were inaccessible to individual researchers and required the efforts of entire institutes. Information technologies allow ten times the time at each stage of the research to be reduced from the development of its plan to the testing and implementation of scientific results. Thanks to decision support systems, there is an opportunity for a deeper analysis of large data arrays with many variables. Also, network information technologies have greatly increased the speed of communication between all parties in economic relations. Thus, information technology is a determining factor in the study of the institutionalization of international financing of innovation.

Thanks to information technology, the amount of information available for use in the process of researching financial flows that provide innovative development of countries, increases in dozens or even hundreds of times. Moreover, ignoring the availability of such volumes of information and not using it for analysis and evaluation can make the results of scientific research inadequate and mitigate them.

In addition, in today's conditions of development of science, the results of the study require a widespread dissemination and discussion. In this regard, the potential of modern information technology is very large. They allow the use of international scientific metrics databases such as Scopus, Web of Science Core Collection (WoS), Index Copernicus, Google Scholar, etc., which are available to a wide range of readers from many countries around the world. But the use of all potential capabilities of modern information technology requires appropriate logistics.

The specificity of the study of international financial flows directed towards innovation activities, the formation of a system of institutions that can be involved in financing innovation activities at all its stages - from research and design work to innovation, necessitates the use of modern IT technologies at each stage of the scientific a study that covers both the collection and comprehensive analysis of modern sources of information and statistics, and the substantiation of conclusions and proposals.

References

[1] *Scientific and Innovative Activity of Ukraine: Statistical Collection 2017* State Statistics Service of Ukraine, Kyiv p. 85 *(in Ukrainian)*

Scientific and innovation activity in Ukraine: statistical collection 2014 State Statistics Service of Ukraine, Kyiv, p. 165 *(in Ukrainian)*

Coordination communication mechanisms of management

Zhanna Mikryukova*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: zannaabece@inbox.lv*

Abstract

Procedure the sustainable functioning of the organization is developed. On its basis is used to enable the management system to conduct managerial principles. Principles are made in terms of holding fundamental roles.

Keywords: strategy, results, change, means, performance, effectively

1 Introduction

Procedure the sustainable functioning of the organization is development. The organisation's basis is represented in its structural potential, with which help the organisation's main quality – the change – is made the ability to produce the change is the foundations of the resultative self-organisation. Changes are provided in terms of holding strategic goals. The goal occurs during the maintenance of a new specialized programs. There are need of performance means to support stability.

2 General

On its basis is developed to enable the management system to conduct fundamental changes [1]. The purpose of this research is to practically is to use performance criteria security program [2]. Subject of study are management mechanisms using coordinating communication foundation synthesis of trends in the development of the organization [3]. Proposed coordination and communication mechanisms determine the quality of the professional competence [4]. During the study the empirical material is being accumulated based not only accurate measurements but also the calculations [5]. The information helps in forming the effective structure of the organization. The control systems are used feedback mechanisms that provide stabilization target [6]. Such a control system is conducted in accordance to the algorithms of the maintenance management system. As grounds the concept of uniform management process is based on binding of objective regularities identified in the field of management [8].

3 Results

The degree of managerial skill is manifested at the level of binding of the trends of development of the organization. It expresses the ability of the control system to adapt to changes in the external environment and to provide for such specific effects. All of this helps not only to master codes of the effective management in the context environment and get experience, but also provide resultative management, being free to run fundamental changes. As a result, a transition from risk assessment to chance detection of a sustainable functioning is made.

References

[1] Ackoff R, Emery F 2008 *About purposeful systems* Moscow LIBROKOM 272 *(in Russian)*

[2] Кокинз Г 2007 *Управление результативностью. Как преодолеть разрыв между объявленной стратегией и реальными процессами* Москва: Альпина Брукс 325 с

[3] Пригожин А И 2007 *Дезорганизация: Причины, виды, преодоление* Москва: Альпина Бизнес Букс 402 с

[4] Mikrjukova Z 2017 Innovators in management: position of growth and decline of organization *The 15th International Conference Information Technologies and Management 2017, April 27-28, ISMA University, Riga, Latvia* p 200

[5] Пихлер Р 2017 *Управление продуктом в Scrum. Agile-методы для вашего бизнеса* Пер. с англ. Москва: Манн, Иванов и Фербер 240 с

[6] Шервуд Д 2017 *Системное мышление для руководителей: Практика решения бизнес-проблем* Москва: Альпина Паблишер 208 с

[7] 2017 *Менеджмент. Стратегии. HR Менеджмент. Стратегии. HR: Лучшее за 2017 год* Москва: Альпина Паблишер 103 с

Influence of technology of vision on mission of the organization

Akhror Iskandarov*, Angelina Kovaleva, Darya Peshkova

ISMA University, Riga, Latvia

**Corresponding author's e-mail: ahror0198@gmail,ru*

Abstract

The work explores the elements of goal-setting. In practice the impact of such items is low. Diagnostic approach is used.

Keywords: the time of evaluation, vista, result, deviation, influence, impact, effectiveness.

1 Introduction

The direction devoted to a research of technologies of vision [1, 2] is distinguished from current trends of business management. Now vision proves as an effective way of motivation of staff of the organization which can rally and unite activity of workers in one direction. In addition on the basis of technologies of vision the objective conclusions about the current position of the enterprise and about his future development become [3, 4]. Thereby it is possible to find the failures arising in activity of the organization, and leading to a stop of steady functioning of the organization [3].

2 General

The research of the nature of failures allows to reveal the essential deviations from a strategic objective occurring in activity of the enterprise [1, 4]. The basis of such deviations is represented by the violations connected with understanding of mission of the organization. As a result there comes the key moment of definition of strategic position of the enterprise which is shown in assessment of existential compatibility of two strategic categories: missions and visions [5].

However during such definition there are difficulties with fixing of the moment of approach and the prospects of manifestation of each of the listed categories. Opinion of researchers on this problem disperse as one of them consider vision as future state, and a mission as the present [6- 8] and, on the contrary, in other sources, vision is considered in the present, and a mission - in the future [1, 9].

In this regard at the disposal of managers of the enterprise there is a requirement available of the objective means allowing to carry out timely, the attached at the right time and to space, critical analysis of the violations found in strategic development of the organization. It is about identification of the reasons of incompatibility of vision and the mission of the organization.

3 Methodology

As object of the real research the situations leading to a compliance mismatch "Vision - a mission on all life cycle of the enterprise act". Detection of such mismatches gives the chance to formulate rules of the analysis of loss of steady functioning of the enterprise.

The research objective is devoted to development of the procedure providing monitoring of identification of inaccuracies of a task of missions of the organizations at any stages of development of the organization.

According to a goal the following tasks have been set:

- A research of approaches of the analysis of a mission of the organization from a position of prospects of vision (today or in the future).
- Diagnosis of the activities and the permanent monitoring of status of the organization
- Identification of main barriers contributing to rejection of organization development

References

[1] Крючков В Н 2015 Стратегическое видение: формирование новой парадигмы стратегического менеджмента *Эффективное антикризисное управление* **3**(90) 90-7
[2] Бейли Д *Как великие создатели преподносят свое видение* 2 с
[3] Нефедова И 2009 *Бизнес планирование. Шпаргалка.* Окей-книга 40 с
[4] Шамгунов Р Н 2011 Миссия и видение компании – можно ли придумать что-то новое? *Инновационный менеджмент* 05.12.2011. 10 с
[5] Камынин В А 2015 *Видение компании в контексте ее развития: компоненты и модель* 13 с
[6] Макрушина Н Н 2016 Роль миссии и видения организации *Инновационная наука* **11**(1) 108-11
[7] Плотников М Вб Пелепейченко Ю С 2014 Разработка и реализация стратегического видения в российских и зарубежных компаниях: сравнительный анализ *Вестник Вятского Государственного Гуманитарного Университета* Киров: **12** 6-12
[8] Томова А Б 2012 *Стратегическое видение как мотивационный ресурс компании Проблемы экономики и управления нефтегазовым комплексом* **3** 5-9
[9] Жемчугов А Мб Жемчугов М К 2011 *Стратегическое видение и стратегия предприятия Проблемы экономики и менеджмента* **1** 23-9

Methods of estimation of the demands to professionals in business management based on the Greiner's model

Viktorija Dangele* , Vsevolod Karaev, Timur Bazarbaev

ISMA University, Riga, Latvia

**Corresponding author's e-mail: vikadangale@mail.ru*

Abstract

The work is based on the Greiner's model. The analysis of our work shows pros and cons of this pressing problem. Our own model of solving the problem has been worked out and leads to the ability of predicting the life cycle stages in its development. The research concerns the methods of estimating the competence of management. At different stages of the life cycle of a business the level of competence is displayed by the ability of the managing body of the firm to decide in crisis situations.

The tools are the model which describes the typical signs of a stage and allows to suggest the ways to overcome the crisis situations.

Keywords: organisation, stages, crisis, changes, practice, knowledge, qualification

1 Introduction

Irrespective of the individual features of business organisations, their development passes 5 individual evolution stages which tend to change because of specific crises leading to revolutionary changes [1]. Any crisis reflects the necessity of making management more rational and demands the discovery of the factors which hinder the development of the changes [2]. If not revealed, the crisis problems are not solved which does not allow the business organization to develop.

The specificity of the Greiner's model includes the description of the stages before the changes. However, such descriptions being typical ones do not allow managers to work out the algotritm of the crisis fixation [3]. As a rule, the crisis is discussed after its appearance. The managament body of the business organization has to improve their personal knowledga or invite professionals. So either the managers' extra personal time is necessary or they have to share their powers with the invited professionals. Such a situation looks like a dilemma which does not have a rational simple criterion of the desired choice.

This dilemma tempts to agree with a halfmeasure: to hire a professional manager and at the same time to have the right to correct their activities at any stage of realization of their solutions. Any halfmeasure has a negative effect on the functioning of the business organization [4].

2 General

Purpose: to work out the procedure which allows to define the life cycle of the business organisation while overcoming the crisis stages in its development.

Tasks:
1. research of characteristic features of crisis points in L. Greiner's terminology;
2. selection of the factors which influence the development stages in L.Greiner's .model;
3. definition of the age of the business organization;
4. discovery of the drawbacks of the model;
5. research and correction of the drawbacks discovered;
6. working out the methods of overcoming difficult situations in the development of a business organization.

3 Conclusions

Results of the research are used to define the life cycle of the business organization which can both improve the professional competence of its managers and find out the situations in the business organization

4 Activities

At the end of the research it is necessary to sum up both the chapters and the whole course Project.

References

[1] Greiner L 1972 Evolution and revolution as organizations grow *Harvard Business Review* **50**(4) 37

[2] Кришталь Е А 2014 *Модель Ларри Грейнера* Экономические науки студент. – Санкт-Петербург: Санкт-Петербургский государственный экономический университет р.1-27

[3] Королева Е И, Сухоруков А М Модель жизненного цикла организации *Экономика и экономические науки* **3** р 27-33

[4] Кузьмин А М, Высоковская Е А 2016 Модель Грейнера *Методы менеджмента качества* **2**

Adaptation as the connecting link of dynamics and manageability

Daniil Bukas*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: Daniil.Bukas@inboz.lv*

Abstract

The approach is offered, the aim of which is to develope algorithms, designed to strengthen links between dynamic aspects of the organization and its management.

Keywords: dynamics, manageability, influence, hesitations, connection, impact

1 Introduction

Like any other aspect of our life, business organization is subject to a pernicious influence of a human factor. Lack of knowledge, understanding and unwillingness to accept the new lead to a harmful influence on the business environment, which, in turn, leads to the loss of control over the situation to this or that extend. Technological changes have important influence on the system station, and inability to adapt leads to the decrease of manageability, since the possibility to react to the full extent on the changes both in the external and in the internal environment of the organization. Loss of control does not contribute to timely and full-scale interference into the situation, which leads to even more negative consequence, connected with the expansion of the destructive influence both on the separate and on multiple structural elements of business organization.

2 General

Such influence leads to inability of adequate functioning of the system, which certainly results in decrease of organization growth rate and its functioning dynamics decrease. In its turn, excessive system activity, caused by the increase of dynamics of functioning of organization, may lead to loss of control over the situation at scale of basic (production) systems [1].

Under this approach there appears contradiction, shown in the fact that not only the influence of the opponents of the innovations leads to loss of manageability, but the excessive dynamics also does not contribute to the adequate functioning of the system.

Conflict resolution requires the settlement of special internal interrelations, arising in business-organizations [2]. So that, the objective prerequisites arise to be used as the connecting link of the adaptation algorithm.

3 Results

As the result, the created relations need adaptive efforts on synchronization of dynamic efforts of the management for the sake of organization manageability assurance under the opponency of the majority of its members.

The current research is oriented on the development of the procedure of increasing control over the intersystem changes along with the changes of the dynes of the organization.

In accordance with the stated goal, the following tasks were set forward:

- to classify dynamic aspects of the organization, including: rate of growth, rate of changes and rate of feedbacks;
- to disclose key factors of organization changes dynamics;
- to disclose benchmarks, supporting the consistency of the organization;
- to develop the methodology of increasing control over the system along with the change of its dynamics;
- to approbate the results of methodic within the frames of stability-oriented company.

The results of the research are focused on the coordination of the dynamic aspects of the organization and its managerial establishment.

References

[1] Bukas D 2017 Dilemma of dynamics and manageability in business-organizations *The 15th International Conference Information Technologies and Management 2017, April 27-28, ISMA University, Riga, Latvia, 173-4*

[2] Пригожин А И 2015 *Управленческие идеи: Вы какое положение на рынке хотите занять? Как для этого должна измениться Ваша организация?* Москва: ЛЕНАНД 480 с

Systematization of elements of a procedure, orientated towards measuring an enterprise's effectiveness

Natalija Kopitova*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: natalija.kopitova@gmail.com*

Abstract

The present research is dedicated to a construction of a model of a visionary view on a holacratic system. Such system is being developed on a basis of new management products aimed at assessing a current state of an enterprise and ensuring a continuous measurement of its performance.

Keywords: methodology, care, protection, system, environment, stability, algorithms

1 Procedure

The developed eight-step procedure leads to finding a complex CSGR indicator (see Fig.1).

The proposed indicator, called the coefficient of current sustainable growth, contains the following four parameters:

- current activity ratio (M_{WC});
- current liquidity ratio (K_{WC});
- transformative current asset coverage ratio (LQ_C);
- maneuverability of own working capital (K_{TCA}) [1].

Specifics of the procedure is that it is not a calculation of the coefficient, but a roadmap for assessing a current state.

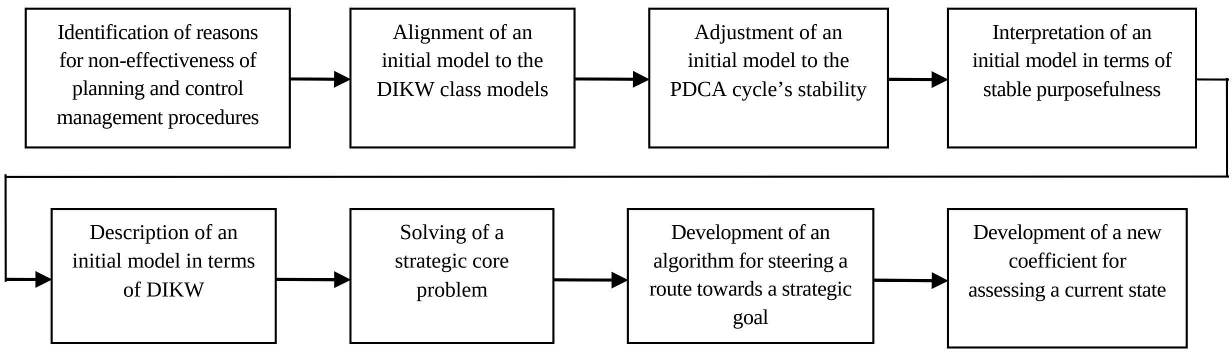


FIGURE 1 Development procedure of complex CSGR coefficient

2 Roadmap

Every roadmap requires passing certain landmarks. The research provides description of forty steps towards objective view of a strategic goal that is a concrete iteration to assess an enterprise's current state. A roadmap is an indispensable part of a management product that shows how this product should evolve in its applications [2-4]. As a result, the model of visionary view on a holarcratic system came down to a certain algorithm (see Fig.2).

The proposed algorithm is used to determine the readiness of assessment tools to conduct assessments and restorations of enterprise activity.

3 Results

In accordance with the developed model, objective tools have been obtained that allow to carry out a continuous measurement of enterprise activity's effectiveness at various stages of its life cycle, regardless of their duration. This promptly identifies reasons for enterprise falling into zones of unsustainable functioning and suggests measures to exit a malfunctioning state.

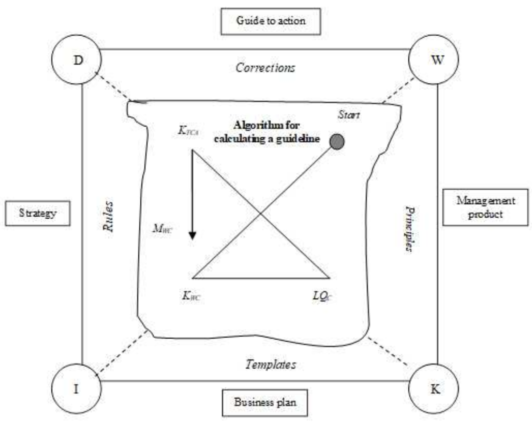


FIGURE 2 Modified model of a visionary view on a holacratic system

References

[1] Kopitova N 2017 Problem Integration of diverse planning and control means *The 15th International Conference Information Technologies and Management 2017, April 27-28, ISMA University, Riga, Latvia, p.193-5*

[2] Бикхофф Н, Бергер Р, Котлер Ф 2016 *Стратегический менеджмент по Котлеру: Лучшие приемы и методы* Москва: Альпина Паблишер 80 с

[3] Пихлер Р 2017 *Управление продуктом в Scrum. Agile-методы для вашего бизнеса* Пер. с англ. Москва: Манн, Иванов и Фербер 240 с

[4] Робертсон Б 2018 *Холакратия. Революционный подход в менеджменте* Москва: Эксмо 107 с

Detailed examination of a business project process

Abilkhan Amangeldiyev

ISMA University, Riga, Latvia

**Corresponding author's e-mail: ab080161@gmail.com*

Abstract

This article, investigates the means of effective business design. Their effectiveness is assessed through an organized examination. Drawbacks of expert opinions are revealed, and a program for restoring missed opportunities in business design is proposed, based on the developed procedure.

As a detailed description of the procedure, a thorough specification is used in order to effectively support the business project at any stage of its implementation.

Keywords: measures, stability, subject, specification, completeness, accuracy

1 Introduction

The need for detailed examination is determined through an appointment of expert analysis, rooted in the development of precise measures that aid in deriving an objective conclusion regarding the current state of the business project from the sustainability viewpoint. Thus, the expert conclusion in this regard should be developed on the foundation of a technology, which meets the required principals for construction of a sustainable management system. Therefore, the approach of B.Oleta [1] is used as the initial technology that facilitates detailing the examination process at the level of concrete steps, with the help of which it would be possible to address the future restoration and support of a sustainable business.

2 Problem formulation

Qualitative features of an expert, engaged in professional activities in the field of business design management, depend on his ability to identify the scope of research, as well as on his will to utilize the appropriate knowledge throughout the presentation process of a justified conclusion on the effectiveness of the business project. Distinct feature of such actions is the formulation of the projected conclusion, which is prepared for the certain time period under the conditions of numerous options and presence of several interested users [2].

In Table 1 displays a fragment of standardized stages of the procedure, stages of the program and methodology steps.

Presence of consolidated results allowed for the development of a document "Detailed Business Project Examination Plan" (DPE), which includes a description of 63 topics for cross-examination. This document is the primary tool in management of business project expertise development. Therefore, it should contain a written statement on what steps will be taken and what will be done during the development of a business project [3].

Furthermore, such statement should be carried in the form of an agreement between the consumer and the supplier. Additionally, all participants of the examination must fulfill what is stipulated in the agreement or request and receive permission to make changes to it. Primary purpose of DPE is limited to description of aspects of the examination and enables the official experts to use the established characteristics, that aid in reaching conclusions regarding on the essence of a business project. Moreover, DPE user must understand that only the properties defined in this document will be implemented.

TABLE 1 Fragment of detailed structure of the business project examination procedure

Examination steps		Procedure
Procedure stages	*Program examination phase*	*Sustainable business step*
1	2	3
Establish objective	Evaluation of business project content (BP) Research of the presented project Identification of all subjects	Identification of business core(N10) Formulation of an image of the market standing (N5) Identification of purchasing power of a consumer (N12)
Collection of initial data	Collection of data on subjects	Market segmentation (N1) Creation of an end consumer profile (N12)
…	…	…
15. Consolidation and affirmation of examination plan	Conclude a decision	Confirmation, that the product meets the requirements of clients (N23)

Verification of the accuracy and completion of the DPE must be executed prior the commencement of the examination. In order to carry out such authentication, joint review of this document directly by users of their representatives has to be organized. DPE contains a full description of what is required to make a conclusion regarding the current state of the business project. Hence, the conclusion incorporates a thorough description, oriented directly at the users of the business project.

3 Conclusions

The developed procedure for structuring expert actions permits for supplementation of the existing methods of business project development with new approaches. As a result, the overall quality of a business project and means of evaluation become guidelines for operations. On the basis of the proposed procedure, detailed specification has been developed, with the help of which objective conclusions are made in regards to the current state of the finished business project and presence of drawbacks. In conclusion, through consideration of identified drawbacks, a program for the restoration of missed opportunities in business design is then initiated.

References

[1] Олет Б 2015 *Путеводитель предпринимателя. 24 конкретных шага от запуска до стабильного бизнеса* Москва: Манн, Иванов и Фербер 336 с

[2] Amangeldiyev A 2017. Problem Management and Business-projects Analysis *The 15th International Conference Information Technologies and Management 2017, April 27-28, ISMA University, Riga, Latvia, 191-2*

[3] Trompenaars F, Coebergh P H 2014 *100+ Management Models. How to understand and apply the world's most powerful business tool* Oxford: Infinite Ideas Limited 577 p

Mechanisms of full-scale protection of the organization

Dina Kelsina* , Azir Mamedrzaev

ISMA University, Riga, Latvia

**Corresponding author's e-mail: d.kelsina@gmail.lv*

Abstract

The present work is devoted to the research of problems of business protection from a position of means for ensuring of security at various levels of the organization. The objective means that allow to identify the reasons for the destruction of the organization and to create a system of countermeasures act as such tools.

Keywords: strategy, system, problem, methodology, expertise, recommendations

1 Introduction

Introduction of new management facilities and the organization cause changes in strategic development of the enterprise. At the same time any such change is the expensive procedure, and any erroneous intervention causes serious losses. In this regard at the disposal of the organization have to be the means of assessment of current state which aren't allowing to interfere in a stable process. The object of the research is expert activity within the framework of which it would be possible to recommend to managers of the enterprise to choose their concrete technology for protection of business.

2 Methodological grounds

As a subject of research, effective mechanisms of organization protection are used. The purpose of this research comes to development of the procedure providing the protection of business at any stages of it's life cycle. In accordance with the goal the following main objectives are solved:

- to classify mechanisms of business protection;
- to carry out the description of traditional examination of protective mechanisms;
- to reveal the problem of use of traditional approaches;
- to formulate new statement of the problem solution

The tasks listed above were the basic for execution of the examination, allowing to develop a complex of recommendation for the use of effective mechanisms of business protection in each specific case.

3 Recommendations

Examination of business protection mechanisms is focused on finding of mechanisms for an integrated assessment of all types of ensuring the sustainable business operation [1]. At the same time it is necessary to concentrate attention to the following circumstances:

- expansion of the horizon of vision [2, 3];
- search for new technologies that can considerably change the market, the alignment of forces in branches and its economic indicators [4];
- assessment of the situation both from within and outside the branch;
- clarification and verification of the functionality of the techniques and business models that are used by the enterprise;
- definition of potential factors that may become a source of new opportunities [5];
- an assessment of the opportunities and availability of resources for implementation of entry into the market with a new product, or for entry into the new market;
- development of the plan of strategic development to achieve the ultimate potential benefit.

Thus, conditions for stage-by-stage performance of obligations and realization of the conceptual ideas in life are created, building the stable business, and. with the exception of any uncertainty.

References

[1] Нив Г 2007 *Организация как система: Принципы построения устойчивого бизнеса Эдвардса Деминга* Москва: Альпина Бизнес Букс 370 с

[2] Fred R David 2015 *Strategic Management Concepts and Cases A Competitive Advantage Approach* 15th Edition, by Fred R. David and Forest R. David, published by Pearson Education

[3] Крючков В Н 2015 Стратегическое видение: формирование новой парадигмы стратегического менеджмента *Эффективное антикризисное управление* **3**(90)

[4] Trompenaars F, Coebergh P H 2014 *100+ Management Models. How to understand and apply the world's most powerful business tool* Oxford: Infinite Ideas Limited 577 p

[5] Kelsina Dina 2017 Assessment of multiple actor loylity *The 15th International Conference Information Technologies and Management 2017, April 27-28, ISMA University, Riga, Latvia, p 183-4*

Specificity of value estimation of multifunctional enterprises

Rostislav Kopitov* , Alina Merentsova, Jelena Miltuze, Natalja Novikova, Sherzod Sultanmahmudov, Volodymyr Oleshko, Alena Tugarina

ISMA University, Riga, Latvia

**Corresponding author's e-mail: rostislavs.kopitovs@isma.lv*

Abstract

Faced with the problem of reducing the value of the firm, a system of related settings is suggested as a means of linking the strategy to the financial goals of specialized units. Such a system is a mechanism for converting the value goal into specific operational objectives.

Keywords: efficiency, integer, private, hierarchy, abilities, parameters, consistency

1 Introduction

The study of full activity allows to determine its effectiveness in the long term [1-3]. Systematic measurement of key parameters of value forms an idea of the development of the enterprise as a whole [4, 5]. Ideology of the value protects the interests of shareholders and guides managers to preserve the value of the organization in a competitive industry, taking into account market needs [6-7]. Passion for the whole is a loss of the private, the essence of which is expressed in the infringement of the interests of certain participants who are interested in the development of the organization. In this regard, there is the problem of multifunctionality, which extends to the background of the specialization of individual unit.

The core of the study is the examination of the formed areas of activity. The point is that cost, as an indicator of the corporate goal, when distributed by structural components, must meet the conditions of inter-level balancing. Otherwise, incorrect conclusions are given about the state of the activities of individual units.

2 Formulation of the problem

To overcome this discrepancy, algorithms of value control are required to be set up to identify hidden advantages in the work of the specialized units of the organization. This is an analysis of the main directions of the transport enterprise, which represent the second level of the organization's hierarchy of capabilities [7]. This approach changes the attitude to the value characterizing the fourth level of the hierarchy and establishes its use as a mechanism for decomposition into components that are described using five sets of related parameters

Implementation of the approach requires the solution of the following tasks:

1. Carry out an audit of the organization's capabilities, distributed across five levels (tasks, specialization, functionality, multifunctionality, growth)
2. Define a set of parameters for each level of the hierarchy;
3. Select time intervals for the evaluation of each set of parameters;
4. Provide an understanding of the factors, the impact on each parameter, and the methods of their control;
5. establish the limitations and disadvantages resulting from the evaluation of each parameter;
6. Express each parameter at the expense of cost;
7. describe each direction, short-term controlled, in terms of strategic alignment of objectives, taking into account reasonable assets;
8. Carry out a full-scale assessment of the enterprise as a whole and in each direction.

3 Conclusions

Thus, having established controlled parameters for each level of the organizational structure, it was possible to solve the main task of managing the organization, reduced to transforming the overall goal into more specific strategic and operational goals. As a result, it was possible to reconsider the position of the division, initially recognized as unprofitable.

References

[1] Барнард Ч 2012 *Функции руководителя: власть, стимулы и ценности в организации* Москва, Челябинск: Социум, ИРИСЭН 333 с

[2] Fred R David 2015 *Strategic Management Concepts and Cases A Competitive Advantage Approach* 15th Edition, by Fred R. David and Forest R. David, published by Pearson Education

[3] Grant R M 2006 Strategic planning in turbulent enviroment Evidence from oil majors *Strategic Management Journal* **24** 491-517

[4] КапланР С, Нортон Д П 2010 *Награда за блестящую реализацию стратегии* Москва: ЗАО «Олимп-Бизнес» 368 с

[5] Kelly N 2013 *How to Measure Social Media: A Step-by-Step Guide to Developing and Assessing Social Media ROI* Boston, Pearson Education

[6] Copeland T, Dolgoff A 2006 Expectations-Based Management *Journal of Applied Corporate Finance* **18**(2) 82-97 DOI: 10.111/j.1745-66622, 2006.00089.x

[7] Kopitov R 2009 Enhancing business reliability: improving value-based management by measuring investment attractiveness *Proceedings of the 9th International Conference "Reliability and Statistics in Transportation and Communication" (RelStat'09), 21–24 October 2009, Riga, Latvia, p. 211-221. ISBN 978-9984-818-21-4 Transport and Telecommunication Institute, Lomonosova 1, LV-1019, Riga, Latvia*

Parallax in the process of paragenesis of management products

Stanislav Miscenko*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: miscenko.stanislav@gmail.com*

Abstract

The fundamental idea developed by the author in this research is the determination of parallax in the search for management products. The idea is very daring, but not quite promising in the future. This work is based on the researches in the field of creating strategies employed for a modular product designing.

Keywords: module, strategy, technology, market, organization, construct, process, components, architecture, deviation, adjustment

1 Introduction

The author of the study pays great attention to the process of creating a strategic product on the basis of interaction of technologies of the markets and organizations put forward the idea of possibility of creating the designing modular management product [1, 5, 9]. There emphasized the necessity to take into account the different competitive conditions of market relations, which in turn stimulate the use of adequate strategies [2, 3].

The author is convinced that the initialization of parallax and paragenesis of new interactions between management products is a very promising direction in trend management.

2 General

To create a modular architecture of the product, it is necessary to separate the process of technology development and the process of the product development. It should be considered that the creation of a modular product of management leads to a better understanding of the company functioning. The distinctive feature of the modular construction of the product can be better comprehended via designing the new products [6]. The author underlines the obvious parallels, while trying to find management products, relying on traditions in creating a strategic product [4].

Traditional product design consists of the following stages [4]:

1. market research,
2. identification of the competitive product properties,
3. identification of the group of consumers who are interested in these product characteristics,
4. methods for determining the cost and functional properties of the "optimal product",
5. creation of optimal competition of the product based on the proposed tasks.

The modular architecture of the product should contain not only the range of available components, but also those components that are likely to appear as a result of the development of technology and the introduction of components with improved functional properties [4].

The modular construction of the management products can lead to lower costs of design, manufacture, distribution and service of management products. It is also necessary to note that there recently appeared the so-called "virtual" or "modular" organizations in the dynamic commodity markets. All these achievements in the development of traditional products, according to the author's opinion, are applicable in the search for management products and their creation [4, 5, 7].

3 Conclusions

The topicality of this research is determined by the importance of studying the internal principles underlying the development of management products [8]. As well, it is necessary to pay attention to the fact that this type of research is rather a view into the future than the reality. Nevertheless, the author hopes that these researches will become the determining factor in the process of formation of innovation economy considering the creation of management products as an innovative factor. It should be expected that the idea based on the discussed hypothesis will get its "wave of gravity" and will gradually become the part of the surrounding reality. The author is convinced that the products of management, created on the principle of parallax, will become unsurpassed [10, 11]. And, according to the author, the most important thing is the right choice of "points" of support to minimize losses in determining the angle of deviation in the process of developing new management products.

It is also important to add that the comprehension of creating and managing the strategic knowledge takes the central position in the process of coordinating the new interaction types between technologies, markets and organizations while creating management products [4, 12].

References

[1] Maslennikov M M 1968 *Methodological value of comparison in scientific research* Voronezh: Publishing House of Voronezh State University *(in Russian)*

[2] Prigozhin A 2007 *Disorganization: Causes, types, overcoming* Moscow: Alpina Business Books

[3] Kondakov I 1975 *A logical Glossary & Reference Book.* Moscow: Science *(in Russian)*

[4] Sanchez R 2010 *Strategic product creation: managing new interactions of technology, markets and organizations* "Strategy", School of Business, Open University of the United Kingdom:

Textbook: points 8-15

[5] Kochanowski V P 1999 *Philosophy and Methodology of Science* Rostov-on-Don: "Phoenix" *(in Russian)*

[6] Sanchez R 1995 Strategic Flexibility in Product Competition *Strategic Management Journal* **16**(Summer special issue) 135 - 59

[7] Samojlenko E S 2010 *Problems of Comparisons in Psychological Research* Moscow: Russian Academy of Sciences, Institute of Psychology, pp.7-8 *(in Russian)*

[8] Мартынов А В 2003 *Philosophy of life* Saint-Petersburg: YUR.V.AN

[9] Novikov A M, Novikov D A 2007 *Methodology* Moscow: SINTEG

[10] Chip Heath, dan Heath 2013 *How to Make Better Choices in Life and Work* New York: Crown Business

[11] Miscenko S 2014 Modality of Managing the Generation of Resultant Ideas: Multidimensional Organization Structure *The 12 International Scientific Conference "Information Technologies and Management" 2014 April 16-17.Riga, Latvia*

[12] Ignatyev A V, Maksimov M M 2000 *Investigation of control systems*: *Textbook for universities* M.: YUNITI-DANA

Algorithms for calculation of discounting rates during various life cycles of an organization

Gleb Akimov* , Abilkhan Amangeldiyev, Olga Kamforina, Irina Kazina, Rostislav Kopitov, Roman Zaharov

ISMA University, Riga, Latvia

**Corresponding author's e-mail: glezz@inbox.lv*

Abstract

Incorporation of effective business organization principles requires the use of adequate evaluation tools. The cost management methodology is the best strategy to support the governance over a firm's sustainable operations. Implementation and success of set strategic goals, depend on management's ability to recognize hidden roles in the structure of the apparatus. In practice realization of organization's full potential occurs in accordance with the accepted norms of capitalization.

Keywords: compatibility, factors, symptoms, discounting, context, care, vacancy, potential

1 Introduction

Cost management approaches, are applicable even now, and are an effective means of ensuring the stable function of the organization [1, 2]. Models of the investment project and operational enterprise permit for conduct of an objective assessment of the company's activity in both the medium and long term perspectives. [3-5] Comparison of the two models is aimed at revealing methodological incompatibility related to cash flow. However, the calculation of discount rates and capitalization coefficients, result in inaccuracies, which manifest during the life cycle changes of an organization. The actual problem is convoluted due to the increased influence of the external factors on the organization's management system and its resulting feedback.

Therefore, it is imperative to perfect the methodological tool for bilateral comparison of key aspects of the external environment and the prognostics of the management system's feedback. Primary scope of the research is focused on algorithms of localization of the organization's current position towards the strategic future.

2 Algorithm prerequisites

The dynamics of strategic objectives and targets are investigated from the standpoint of changing financial worth of the enterprise, the description of which requires special introduction of three sets of constraints:

1. Preservation of organization's values
2. Presence of a competitive industry
3. Guidance for a loyal client

During constraints formulation, particular attention is paid towards investigating the context of the discounting process, based upon reduction framework. As a result, the discounted amount, which presents the difference between the future and the current expenses of the enterprise, is understood to be the unusual cost of capital, which in our understanding is considered to be the organization's safety margin and a measure of stability. The existence of the safety margin, gives organizations the maneuverability to readily respond to the external environment in terms of the size of its potential, which is equivalent to a force capable of destroying the control system. Therefore, discounting rate calculation algorithms, shouldn't account for the invested company capital, instead should concentrate on identifying possible "gaps" in the organizational structure, that result in deviations from the desired outcome.

3 Interpretation

The proposed algorithm is calibrated towards the so-called "care for the organization as a whole", which is displayed through the management team's ability to identify the hidden potential within the organizational structure.

In Fig. 1 three strategic areas are outlined, which describe the approximate values of the algorithm's main branches.

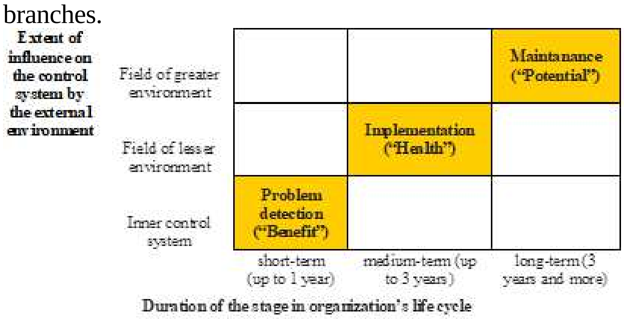


FIGURE 1 Strategic scheme for calibration of algorithms responsible for discounting rates calculation

The first area represents the current state of the enterprise, where the problem detection of the control system occurs within the short-term. The discount rate is examined from the standpoint of "effective freezing of funds" in the organization. Hence, special attention is paid towards the symptoms of the team's professionalism. Such symptoms describe the team's competency in terms of "managing the change in capital, whilst taking into account the long-term development plans of the organization".

Further, the means of realizing organization's potential is explored in the context of two aspects.

In this regard, first of all, vacancies of the organizational structure, which are under attacks of the lesser environment forces in the medium-term, are determined. The implementation area illustrated in the fig.1 above characterizes the transitional period of the enterprise development.

Secondly, forces are identified, which allow organizations to overcome the influence of the greater environment in the long-term. The means to overcome is based on the accompaniment and guidance of the management system, responsible for the sustainable operation of the enterprise.

4 Conclusions

Calibration and adjustment of algorithms into key factors and symptoms of its development, provide managers of the company with concrete means to assess the degree of influence, the external environment has on the development of the organization. Upon their framework, management team's level of readiness is determined, as to whether they can implement their plans as well as, if necessary, carry out corrective actions to restore the normal functions.

References

[1] Kopitov R, Zaharov R 2010 Mechanisms of fundamental changes in the interval uncertainty removal process in the context of organizational structure management *Proceedings of the 10th International Conference "Reliability and Statistics in Transportation and Communication" (RelStat'10), 20–23 October 2010, Riga, Latvia, p. 268-277. ISBN 978-9984-818-34-4 Transport and Telecommunication Institute, Lomonosova 1, LV-1019, Riga, Latvia*

[2] Akimov G 2017 Diagnostics of management technologies in the context business organizations *The 15th International conference information technologies and management 2017, April 27-28, ISMA University, Riga, Latvia*, p 173-4

[3] Казина И, Копытов Р 2010 Механизмы решения рамочных конфликтов при переходе на новые информационные системы *Research and technology – step into the future.* **5**(3) c 81

[4] Amangeldiyev A 2017 Problem Management and Business-projects Analysis *The 15th International conference information technologies and management 2017, April 27-28, ISMA University, Riga, Latvia,* p 191-2

[5] Kamforina O 2017 Classification of factors that affect loss of sustainability in organization *The 15th International conference information technologies and management 2017, April 27-28, ISMA University, Riga, Latvia, p 187-9*

Cluster organisation resource features of auditing

Margarita Zybina*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: dmbplus@gmail.com*

Abstract

The most important feature of the cluster management team's professionality results in the principle of "supplementing the general activity to its fullest". By determining the order of executing functions of cluster's potential participants, they are being divided by their type of activity.

Keywords: environment, impact, coordination, symptoms, reaction, advantage

1 Introduction

Market challenges that impact the cluster's management team (CMT) oblige it to search for strong competitive advantages. Besides, the traditional methods of search are tended towards the explanation of industry differences in terms of profitability. Generally, the task is to define the market factors that influence the profit. However, the existing differences between companies by indicators of activity cannot be explained by the market effects [1].

In this regard, CMT must apply a resourceful approach in the context of cluster organisations, based on which completely different factors are being determined. [2]. Factors characterising CMT's activities are related to them, allowing not only to react to the external changes, but also to outrun them, thus impacting the external environment. Eventually, the methods of determining the competitive advantages based on the fundamental resources and capabilities become the main source of differences between the potential of organisation and profit. Thereby, the resourceful approach appears to be an important supplement to the organisational mission, based on the market positioning, in terms of open systems appearing to be the most powerful means to explain the differences that exist in securing of resources. CMT's role is the most important, when choosing and coordinating the resources.

2 Cluster policy tools in the field of auditing resources

Realisation of CMT's cluster policy in the context of resource research results in monitoring the resource symptoms that allow to track their impact on the external environment. Besides, the competitive advantage is being secured by a timely reaction to the external impacts.

Understanding the key factors of the external impacts, CMT tracks the possibilities and threats, resulting from the external environment. Moreover, CMT has managerial tools in its possession that allow it to timely react to their external appearance. It is being achieved with special, only CMT-specific, capabilities that allow to gain insight of strengths and weaknesses of resources involved in the cluster. In other words, a stable competitive advantage is being achieved by the defined symptoms, knowing of which allows CMT to influence the external environment by correctly positioning the allocated resources.

3 CMT's programme of actions in adapting the cluster's initiatives

CMT uses the theory of resources in order ot define the factors and symptoms allowing to find the connection between the resources and profitability, and value. In this regard, CMT understands the resource as a special way of industrial activity, distinguishing components. Such as equipment, skills, acquired patents, recognised brands, etc. It is being referred to the market attractiveness, where the resources are being invested into. It should be marked that such resources may be unproductive, since their functional role is determined to the realisation of only a part of the end-product.

Resources that have been expressed in the material value characterise the order of functions. Given the unproductive nature, the amount of functions does not give a full insight into functioning of the company, but reflects a certain sequence of types of activity. It is important to add that it is hard to move the productive assets, and they are not subject to forgery, composing the basis for competitive advantage. Therefore, it is required to restore full activity on a full processing level that characterises a steady functioning of the cluster.

References

[1] Adner R, Helfat C E 2003 Corporate effects and dynamic managerial capabilities *Strategic Management Journal* **24** 1011-25

[2] Grant R 2002 *Contemporary Strategy Analysis* 4th ed., Blackwell, Oxford

[3] Zybina M 2017 Algorithm for assessing the external environment of medical cluster *16th International conference. Open Learning & Distance Education, January 25-26, ISMA, Riga, Latvia*

Superb Organizations object in general

Marina Bruk, Rostislavs Kopitovs*

ISMA University, Riga, Latvia

**Corresponding author's e-mail: rostislavs.kopitovs@isma.lv*

Abstract

Problem of implementing a unified strategy on an entire distance of its achievement is being consistently solved. Deviations from a strategic goal are fixed on a basis of developed algorithms included in a management product, and effective recommendations on exiting unsustainable conditions are offered. Effectiveness of an organization is viewed from the point of materialization of its organizational structure in accordance with a research of a capitalization of goal-creating opportunities.

Keywords: technique, care, protection, system, environment, sustainability, algorithms

1 Introduction

Superiority of organizations in general is achieved due to an existence of a specially developed methodology of decision-making that is applied in the context of changes of the external in relation to a well-adjusted management system of the surroundings/an environment. The essence of such organizations is defined by a formula containing the following content: "protection of the caring for organization" At the same time, a care function is assigned to an organizational structure, at the disposal of which must be previously prepared two special sets of protective gear. The spreading of these is performed throughout the whole development life-cycle of an organization. On the basis of the first of the sets the entire management process is serviced, and in accordance with the second set, the ensuring of full management activity is carried out. The integrity of a process manifested in preparation of resultative planning norms of its individual components, and a completeness of activity observed during measurement of an effective control mean, are linked on the basis of common algorithms for monitoring an organizational structure's performance. Inability to perform condition occurs in cases of loss of sustainability, in which a structure is unable to take care of organization's development, since it does not possess the necessary means of protection at a certain point in time. In this connection, the object of the research are algorithms for monitoring structure's sustainable functioning, which, in addition to the traditional customary assessment means, contain a full set of effective guidelines for action.

2 General

As a methodological start of the proposed approach, a four-level contour is used, the bases of which constitute four strategic elements (see Fig.1).

Specificity of the proposed contour is manifested in two aspects:

- in determining a current state of an organization;
- in case of a loss of sustainability, in restoration of its activity.

Present possibilities are researched in space-time coordinates which describe nine interconnected contours (see Fig.2).

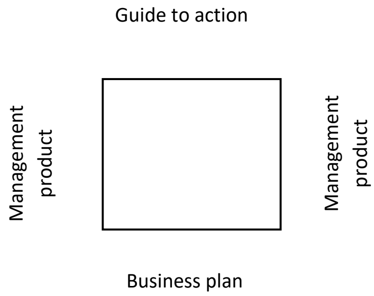


FIGURE 1 Initial contour

Determining boundaries of distant environment			Zone of sustainable functioning (60-100%)
Determining boundaries of close environment		Zone of sustainable functioning (30-60%)	
Development of management system	Zone of sustainable functioning (potential: 0-30%)		
	Short-term perspective	Medium-term perspective	Long-term perspective

FIGURE 2 Interconnected grids of full-scale development of an organization

Sustainable functioning of an organization is conditionally characterized by three zones. In such zones, synchronization of knowledge that is used while planning horizon is being formed, with skills that are expressed in understanding of environment's boundaries, is conducted. Development of an organization occurs as an uncertainty is being removed, identified by its structure in the course of improving monitoring algorithms. The effect of such identification is an ability of an organizational structure team to prevent destruction of a management system and team readiness to protect an organization from external influence directed by forces of a higher order. In fact, it is about health of an organizational structure of an enterprise. A transition to a new level of sustainable functioning is carried out when vacancies are discovered and a potential of an organization is revealed. The fact of transition is confirmed by an increase in resultativeness norms and efficiency means. The history of such increase testifies not only to an improvement of a functional support of an organization's structure, but also characterizes its opportunities for adaptation, training and self-knowledge. The change in the mean of efficiency over time demonstrates growth of an enterprise value, to a greater extend caused by capitalization of its organizational structure [1].

3 Conclusions

The present approach is used in creation and maintenance of metasystems [2] under conditions of adaptation and training. Within the framework of the announced section of this conference, fourteen directions that form a notion of the management perspectives, among which a special role belongs to the immutability of management laws and principles of an organization.

References

[1] Copeland T, Dolgoff A 2006 Expectations-Based Management *Journal of Applied Corporate Finance* **18**(2) 82-97 DOI: 10.111/j.1745-66622,2006.00089.x

[2] Косяков А, Свит У, Сеймур Дж, Бимер С 2014 *Системная инжененрия. Принципы и практика.* Москва: ДМК Пресб 624 с