MORAVIAN UNIVERSITY COLLEGE OLOMOUC

INTERNATIONAL DAY OF SCIENCE 2018

ECONOMICS, MANAGEMENT, INNOVATION

PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCE

12TH–13TH APRIL 2018
MORAVIAN UNIVERSITY COLLEGE OLOMOUC
OLOMOUC, CZECH REPUBLIC

MORAVIAN UNIVERSITY COLLEGE OLOMOUC

INTERNATIONAL DAY OF SCIENCE 2018

ECONOMICS, MANAGEMENT, INNOVATION

PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCE

MORAVIAN UNIVERSITY COLLEGE OLOMOUC
2018

SCIENTIFIC CONFERENCE BOARD

OVIDIU BORDEAN, Babes-Bolyai University, Cluj-Napoca, Romania

JAROSLAV BURIAN, Palacký University, Olomouc, CZ

PETR ČERMÁK, Moravian University College Olomouc, CZ

FRANTIŠEK DAŘENA, Mendel University in Brno, CZ

MILOSLAVA CHOVANCOVÁ, Tomas Bata University in Zlin, CZ

KATEŘINA IVANOVÁ, Palacký University, Olomouc, CZ

ZUZANA KAPSDORFEROVÁ, Slovak University of Agriculture in Nitra, Slovakia

RENATA KORSAKIENĖ, Vilnius Gediminas Technical University, Lithuania

BOHUMIL KRÁL, University of Economics, Prague, CZ

ANDREA SZIRMAI MADARASINE, Budapest Business School, Hungary

MICHAL MENŠÍK, Moravian University College Olomouc, Czech Republic

ŠÁRKA PAPADAKI, Tomas Bata University in Zlin, CZ

ADAM PAWLICZEK, Moravian University College Olomouc, CZ

MIROSLAV POKORNÝ, Moravian University College Olomouc, CZ

VIKTOR PORADA, University of Finance and Administration, Prague, CZ

RASTISLAV RAJNOHA, Pan-European University Bratislava, Slovakia

NADINE ROIJAKKERS, Open University of the Netherlands, Netherlands

JUDIT SÁGI, Budapest Business School, Hungary

EVA SIKOROVÁ, Moravian University College Olomouc, CZ

VLADIMÍR SMEJKAL, Moravian University College Olomouc, CZ

ANNA SOŁTYSIK-PIORUNKIEWICZ, University of Economics in Katowice, Poland

WLODZIMIERZ SROKA, The University of Dąbrowa Górnicza, Poland

SIMONA STERNAD ZABUKOVŠEK, University of Maribor, Slovenia

JARMILA ŠEBESTOVÁ, Silesian University, CZ

JAN ŠIROKÝ, VŠB – Technical University of Ostrava, CZ

LUBOŠ ŠTANCL, Moravian University College Olomouc, CZ

PEDRO TADEU, Polytechnic of Guarda, Portugal

POLONA TOMINC, University of Maribor, Slovenia

BLANKA VÍTOVÁ, Palacký University, Olomouc, CZ

ONDŘEJ VOJÁČEK, Czech Technical University in Prague, CZ

JARMILA ZIMMERMANNOVÁ, Moravian University College Olomouc, CZ

ORGANISATION BOARD

JARMILA ZIMMERMANNOVÁ (Head)

RADKA HUSAŘIKOVÁ

KATEŘINA VRANOVÁ

MICHAELA NOVÁKOVÁ

REVIEWERS

All papers were peer reviewed by two external reviewers and the Scientific Conference Board.

EDITOR

JARMILA ZIMMERMANNOVÁ

TECHNICAL EDITORS

RADKA HUSAŘIKOVÁ

KATEŘINA VRANOVÁ

MICHAELA NOVÁKOVÁ

The publisher assumes no responsibility for proofreading of the contributions and language check.

Moravian University College Olomouc, 2018

ISBN 978-80-7455-074-4

INTERNATIONAL DAY OF SCIENCE 2018

ECONOMICS, MANAGEMENT, INNOVATION

PROCEEDINGS OF THE INTERNATIONAL SCIENTIFIC CONFERENCE

12TH–13TH APRIL 2018
MORAVIAN UNIVERSITY COLLEGE OLOMOUC
OLOMOUC, CZECH REPUBLIC

CONTENT

FOREWORD 1

KEYNOTE SPEAKERS 2

ECONOMIC ANALYSIS OF HOUSEHOLDS - PROSUMERS
Jarmila Zimmermannová, Adam Pawliczek 3

EMPLOYING ADAPTIVE NEURO – FUZZY INTERFACE SYSTÉM MODEL (ANFIS) FOR PREDICTING THE „BRENT“OIL PRICES
Yulia Y. Finogenova, Denis V. Domaschenko, Edward E. Nikulin 10

EVENT STUDY ANALYSIS OF THE IMPACT OF NEWS ON THE VALUE OF CORPORATE REPUTATION: THE GAZPROM CASE
Irina Tkachenko, Irina Pervukhina 18

EVOLVING THE CORPORATE SECRETARY IN RUSSIAN ECONOMIC PRACTICE
Alla Vladimirovna Vavilina, Oksana Yur´evna Kirillova, Lidia Nikolaevna Levanova 25

EXAMINING OF THE LEADERSHIP STYLES ACCORDING TO EMPLOYEES SATISFACTION
Nikoleta Nagyová, Péter Karácsony, Norbert Gyurián 37

FINANCIAL HEALTH AND APPLICATION OF USING EVA INDICATORS IN THE PAPER INDUSTRY
Eva Sikorová, Zuzana Stefanovová, Vlasta Humlová 45

FUZZY MODELS PROPERTIES IN A FOREX TRADING SYSTEM CONTROL
Zdeňka Krišová, Miroslav Pokorný 57

GROUP EFFECTS AS A FACTOR OF CHANGING INDIVIDUAL BEHAVIOR IN WORKING GROUPS
Anna Romanovna Sardarian, Tatiana Vitalievna Komarova, Alla Vladimirovna Vavilina 67

HUMAN RESOURCES MANAGEMENT AND NEW PERSPECTIVES IN PROJECT MANAGEMENT - THE BASIS FOR DECISION - MAKING
Eva Hvizdová, Pavel Máchal 76

INTEGRATED MULTIDISCIPLINARY APPROACH FOR SAFETY &SECURITY MANAGEMENT: THE CASE STUDY OF PAPAL BASILICA AND SACRED CONVENT OF SAINT FRANCIS IN ASSISI, ITALY
Fabio Garzia 85

IOTA, ONE WAY TO AN INDEPENDENT PAYMENT SYSTEM
Jan Lavrinčík, Zdeňka Krišová, Jiří Pavelka 94

MEDIATION AND OTHER MEANS OF ALTERNATIVE DISPUTE RESOLUTION CONSUMER MATTERS
Blanka Vítová 101

MIGRATION INSTITUTION AS AN INNOVATIVE INSTITUTION OF DEVELOPMENT
Alla Vladimirovna Vavilina, Tatiana Viktorovna Cherevichko, Liubov Nikolaevna Orlova 109

MODELLING OF R&D FUNDING SOURCES IN RUSSIA
Anna Firsova, Maria Novoselova, Alla Vladimirovna Vavilina 117

MODIFICATION OF A TOOL FROM THE THEORY OF CONSTRAINTS FOR ECONOMIC PLANNING AND MANAGEMENT OF CONSTRUCTION PROJECT
Omair Ameir, Jakub Chlopecký 125

NATIONAL INNOVATION POLICY IN THE RUSSIAN FEDARATION: CONTENT, PRINCIPLES OF ITS DEVELOPMENT, SUCCESS OF IMPLEMENTATION
Alla Vladimirovna Vavilina, Tatyana Nikolaevna Yakubova, Igor Borisovich Kalashnikov.....137

ORGANIZATION OF CORPORATE INTERACTION IN RUSSIAN COMPANIES ON THE BASIS OF STAKEHOLDER THEORY
Oksana Yur´evna Kirillova, Olga Sergeevna Gorlova, Valeriya Aleksandrovna Kirillova 144

PLACE BRADING AS A FACTOR OF COMPETITIVE RECOVERY OF RUSSIA ON AN INTERNATIONAL TOURISM MARKET
Tatyana Nikolaevna Yakubova, Alla Vladimirovna Vavilina, Tatiana Vitalievna Komarova 153

SENSORY EVALUATION OF HONEY BY YOUNG CONSUMERS IN SLOVAKIA: PILOT TESTING
Peter Šedík, Renáta Benda Prokeinová, Elena Horská 159

STRATEGIC MANAGEMENT TOOLS IN THE SMALL AND MEDUIM SIZED ENTERPRISES: A LONG – TERM VIEW
Jarmila Šebestová.....167

THE DEVELOPMENT AND RELATIONS OF LABOUR PRODUCTIVITY IN V4 COUNTRIES
Eva Jílková, Veronika Říhová 174

THE FLOW PROCESSES OF THE CULTURAL INDUSTRIES – INTEGRATED INDICATORS
Nataliya Anatolyevna Malshina, Alexander Nikolaevich Bryntsev 181

THE FUZNET DEVELOPMENT SYSTEM
Petr Čermák, Jiří Martinů 191

THE MECHANISM FOR IMPLEMENTING THE MODEL OF THE INNOVATIVE DEVELOPMENT OF AN INDUSTRIAL ENTERPRISE
Elena Vetrova, Irina Gladysheva.....202

THE SECRET SAUCE: A REVIEW OF THE CHARACTERISTIC THAT DEFINE ENTREPRENEURS AND OWNER - MANAGERS
Nicholas Chandler, Judit Sági 209

THE STUDY DIRECTIONS OF DEVELOPMENT OF INDUSTRY ON THE BASIC OF R&D
Elena Vetrova, Liudmila Lapochkina 216

TRANSFORMATION OF RUSSIAN MASTER´S EDUCATION IN THE KNOWLEDGE ECONOMIC CONDITIONS
Alzhanat Suleimankadieva.....223

USAGE OF METHODS BETA CONVERGENCE AND SIGMA CONVERGENCE IN MEASURING REGIONAL DISPARITIES
Jan Široký, Martina Zemanová, Michal Krajiňák 231

FOREWORD

Dear participants of the conference “International Day of Science 2018, Economics, Management, Innovation“, it is indeed a great pleasure to welcome you to the campus of the Moravian University College Olomouc.

This is the second year MUCO organizes the international scientific conference in Olomouc. Scientists from the Czech Republic, Italy, the Netherlands, Hungary, Russia and the Slovak Republic will join the conference and share the results of their research. As many as 32 contributions including key speakers will be presented at the conference.

Furthermore, we can look forward to performances prepared by the key note speakers, i.e., prof. Eng. Fabio Garzia Ph.D. (Sapienza University of Rome, Italy), prof. Marcel G. Buijs (Rotterdam Business School, the Netherlands), assoc. prof. Ing. Lucie Sedmihradská, Ph.D. (University of Economics in Prague, the Czech Republic) and RNDr. Jaroslav Burian, Ph.D. (Palacký University in Olomouc, the Czech Republic). On the other hand, you are welcome to join our specialized sections thematically focused as follows: Human Resources Management, Management and CSR, Methods in Economy, Consumer Behaviour Issues and Economic Policy and Innovations.

I wish you all to enjoy the interesting presentations, the subsequent fruitful discussion and last but not least, the social networking.

I would like to also invite you to the next, 3rd international conference “International Day of Science 2019“, which will be held in Olomouc in April 2019.

On behalf of the scientific committee and the organisational team of the conference

Jarmila Zimmermannová
Vice-rector for Research and Development

KEYNOTE SPEAKERS

Lucie Sedmihradská is an Associate Professor at the Department of Public Finance, University of Economics in Prague. She teaches public finance and local government financial management courses. Her research focuses on budgeting and budget transparency at both central and local government levels, local government finance and inter-municipal cooperation. She participated at numerous domestic and international research projects in these areas as both the primary researcher and a research team member. She is the primary researcher in the Czech part of the Open Budget Survey since 2005. She has published approximately two dozen journal articles and book chapters and a monograph on municipal budgetary process. She is actively involved in civic activities and frequently lectures on local government budgets for both the civil society and political parties. She serves as local government council member since 2016.

Fabio Garzia is a professor specializing in security for the Engineering Master's Programme on Safety, Security and Civil Protection Engineering at SAPIENZA – University of Rome (Italy). He cooperates with universities in Italy as well as abroad within Master's and PhD programmes. He is an Adjunct Professor at Wessex Institute of Technology (UK) and also acts as a Member of European Academy of Sciences and Arts (Salzburg, Austria) which includes, among its members, about 30 Nobel Prizes. He is an author of about 120 scientific papers in international journals and international and national conferences. Professor Garzia is currently a Member of the Executive Committee of IEEE International Carnahan Conference on Security Technology. As a Member of Editorial Board, he participates in International Journal of Heritage Architecture, International Journal of Transport Development and Integration, and International Journal of Energy Production and Management, WIT Press.

Marcel G. Buijs has been working as a senior lecturer (online) marketing at the rotterdam university of applied sciences. from 2011 to 2013, he was a locationmanager of tio university of applied sciences rotterdam (hospitaly education). among his previous work experience before 2011 belong: marketing and human resources consultant, manager, trainer for siemens, kpn, orange, and interpolis in the netherlands. initially he studied pedagogics (bachelor), after that commercial economics (bachelor) and finally management sciences open university (msc). He has been working as a knvb trainer/coach 3 youth.

Jaroslav Burian graduated in applied geoinformatics in 2007. He received his ph.d. In cartography, geoinformatics and remote sensing in 2012. He has been working as an assistant professor focused on geoinformatics in human geography at the department of geoinformatics, faculty of science, Palacký University, since 2007. He teaches courses that focus on geoinformatics applied in public administration, spatial planning and human geography. His professional specialization is primarily on the issues of urban planning and modelling of the urban processes in gis. In last few years, he has taught as a guest at several universities in the Europe (e.g. University of Salzburg, west university of timisoara, ruhr university bochum, maria curie-skłodowska university in lublin and sofia university). As the author or co-author, he has more than 60 scientific and popular articles and has co-authored two atlases and four books. He is active member of Czech association for geoinformation and a member of the emi journal editorial board.

ECONOMIC ANALYSIS OF HOUSEHOLDS - PROSUMERS

Jarmila Zimmermannová, Adam Pawliczek
Moravian University College Olomouc
jarmila.zimmermannova@mvso.cz, adam.pawliczek@mvso.cz

Abstract:

Currently, the idea of households, which are simultaneously consumers and producers of electricity, is broadly discussed in public governments. Therefore the main goal of this paper is to present economic analysis of household - prosumer and to compare two scenarios – "off grid household" and "on grid household". Firstly, the literature overview and policy background connected with issue of prosumers will be presented. The methodological part will describe selected scenarios, data sources and economic indicators used in the analysis. The next chapter – results – will focus on comparison of selected scenarios and particular economic indicators of households - prosumers, divided on two possibilities - off grid and on grid household. Finally, the results will be discussed in connection with current scientific studies in the scope of international background.

Key words:

Renewable electricity; photovoltaics; prosumers; households; economic analysis.

JEL: H23, Q48

1 Introduction

The key conception material, focusing on households - prosumers issue is the National Action Plan for Smart Grids (NAP SG). Smart grids (SG) are defined as the electric networks that are able to effectively link the behaviour and actions of all users connected to them - producers, consumers, prosumers (consumers with their own production) - to ensure the economically efficient, sustainable energy systems operating with low losses and high reliability of supply and safety (MIT, 2015). Regarding the schedule of NAP SG implementation in the Czech Republic, the period up to 2019 can be characterized as a period of preparation, the next period 2020-2029 represents the gradual implementation of SG, and the period 2030 – 2040 should represent maximum economic efficiency at the required level of "intelligence" of the SG in accordance with the needs of the energy system and the existing technological level at that time (MIT, 2015).

As is mentioned in NAP SG, in connection with the development of renewable energy sources, the anticipated development of small sources, including combined heat and power production, the development of storage capacities and electro-mobility, increases demand on control systems, protection systems, measuring equipment, automation equipment and other elements of the power system.

An integral part of considerations on the integration of intelligent elements into electricity system of the Czech Republic is to ensure cyber security, privacy and information support provided to the client for his decision (MIT, 2015).

Regarding scientific studies focused on prosumer issues, there are only few studies in this field, since it represents new scientific topic. It is also interesting, that the most of these scientific studies are national case studies. For example Flaute et al. (2017) investigated the macroeconomic effects of the evolution of prosumer households in the future energy market in Germany, Olkkonen at al. (2017) examined micro-producers of energy as energy "prosumers"—hybrid producers and consumers—and as a challenge to the current logic of energy companies' stakeholder relations in Finland.

Zajaczkowska (2016) focused on the current state of the Polish energy sector related to the prosumer energy industry and described the future potential for the development of prosumer energy in Poland. Regarding Poland, Skorek – Osikowska et al. (2018) published the analysis based on real-time long-term measurements in a residential building located in Poland. The results show that the considered solution (micro-cogeneration prosumer systems based on the Stirling engine) can meet the electricity and heat demands of single-family houses throughout the year; however, heat storage system is required to optimize the operation of the device and extend the operation of the system to produce electricity. Depending on the local mechanisms, electricity storage may also be needed. The environmental effect of the considered system is positive, provided that renewable energy sources do not constitute an alternate solution.

Bellekom et al. (2016) explored the emerging rise of prosumers of electricity and its implications, in particular for grid management and electricity supply in the Netherlands.

Green and Staffell (2017) examine possible consequences of widespread home energy storage for the electricity market of the future, largely by using a model of the system in Great Britain. They consider self-interested strategies by users who have no commercial interaction with the power system beyond paying their electricity bill.

General simplified model of a factory - prosumer was created by Perkovic et al. (2018). The model represents multi-objective optimization for the minimization of the operating and the investment costs for a hypothetical factory acting as a prosumer on the electricity market.

In the Czech Republic, we can find mainly economic analyses of renewable energy sources implementation and its economic aspects, for example Ryvolová and Zemplinerová (2010) analysed costs connected with the growth of wind energy supply, Pawliczek (2011) described photovoltaic sector and its development. Průša et al. (2013) analysed consumer loss in photovoltaic power plants in the period 2010–2011 and Janda et al. (2014) focused on the total historical and future costs of supporting photovoltaic electricity generation in the Czech Republic. The model estimation of such costs is accompanied by a methodologically unified comparison with the costs of supporting other renewable energy resources. Zimmermannová and Jílková (2016) analysed the relationship between the increase of renewable electricity generation and the progress of public support for renewable electricity.

Analysis of current scientific studies focusing on prosumer issues reveals that there is a lack of models dealing simultaneously with economic and environmental issues, mainly in the area of sustainable energy development and reduction of greenhouse gas emissions. Moreover, a dynamic model is needed, since the economic entities have the ability to learn and optimize their behaviour continuously, depending on both external and internal changes in their environment. However, there is also a question of uncertainty, unexpected changes and disturbances in the economic system; therefore we need also methods based on language rules. The authors developed new agent model of household – prosumer and analysed the impact of public support in the area of solar electricity generation. This complex model is presented in the scientific study Zimmermannová et al., 2018.

The main goal of this paper is to present one of the key parts of the developed agent model - economic analysis of household - prosumer and to compare two scenarios – “off grid household” and “on grid household”.

2 Methods

2.1. Data

We have original dataset of daily production of electricity from photovoltaic power plant, installed in VSB-TU Ostrava, Faculty of Electrical Engineering and Computer Science; simultaneously we have also original dataset of daily electricity consumption in typical household, modelled also in VSB-TU Ostrava. Both original datasets are available for the authors within the project TH01020426 “System for

active management of decentralized energy units on local level", financed by the Technology Agency of the Czech Republic.

Then we use data from official statistical sources in the Czech Republic – Czech Statistical Office (CZSO, 2018) and Energy Regulatory Office (ERO, 2018).

2.2 Methodology

The following scenarios are defined:

Off grid household "ISLAND" – separate system with battery; the household is completely separate, not connected to the distribution network; the household uses photovoltaic panels as a source of electricity, the extra energy is stored in battery. In case of a lack of electricity, household takes electricity from alternative energy source - gasoline unit. The costs arise only on the household side, the AMM (Advanced Meter Management) system informs the household how much it has produced and how much electricity it has at a given time, including the prediction.

On grid household "PARTIAL ISLAND" - connected system with battery; the household is connected to the distribution network, firstly consumes electricity from own sources, then from the grid, production surpluses are supplied to the grid; the household uses photovoltaics as a source of energy, the extra energy is stored in batteries. In case of a lack of electricity, household takes electricity from the distribution network. Costs and revenues are generated on the household side and on the distribution side, the AMM (Advanced Meter Management) system informs the household how much it has produced and how much electricity is available at the given time and also ensures switching between the individual sources - solar panels, batteries and distribution network.

Regarding economic analysis, we use economic indicators connected with effectiveness of the solar energy projects - cash flow, discounted cash flow, cumulative cash flow, payback period; net present value (NPV); internal rate of return (IRR).

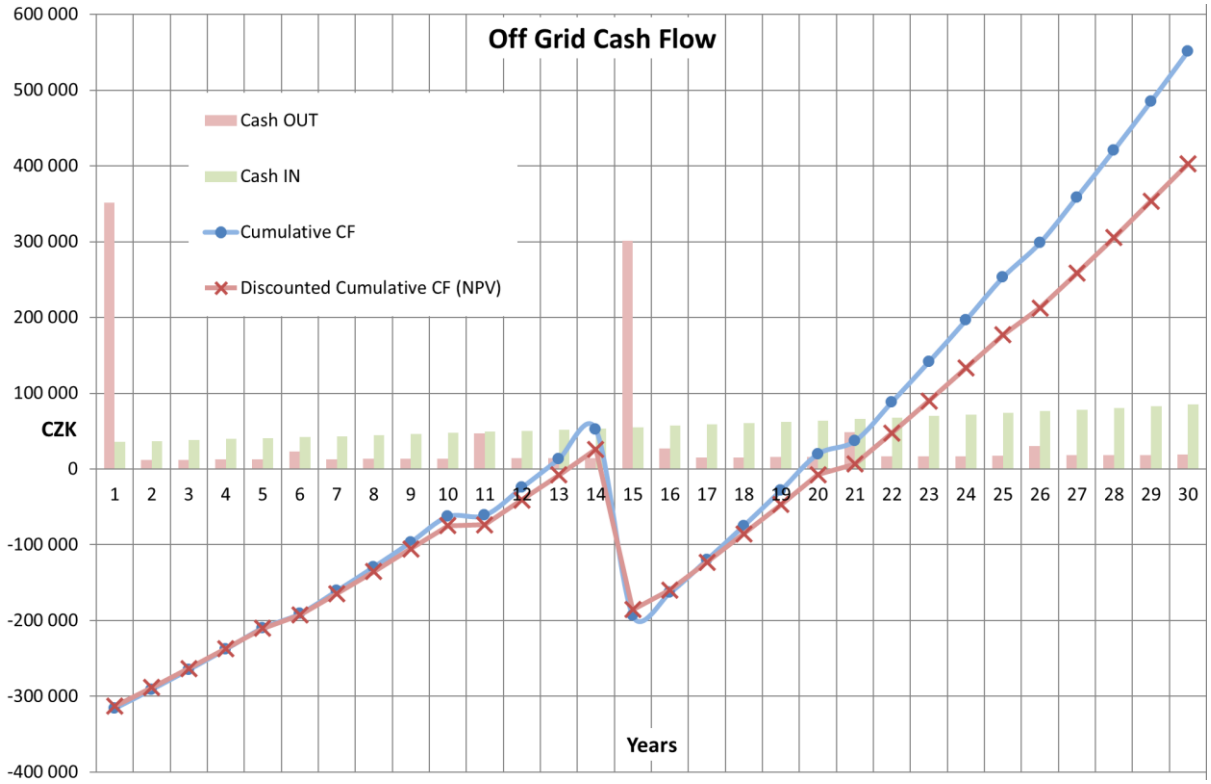
We will compare economic indicators of both scenarios "ISLAND" and "PARTIAL ISLAND". Both scenarios include the subsidy "New Green Savings" (NGS), regulated by the Ministry of the Environment of the Czech Republic. We use the highest level of this subsidy - 150.000 CZK (approx. 5868 EUR) for one solar electricity project.

3 Results

3.1. Off grid household "ISLAND"

Figure 1 shows us the economic aspects of the scenario "ISLAND", precisely cash flow, cumulative cash flow, discounted cumulative cash flow and payback period.

Figure 1: Scenario "ISLAND"



Source: Zimmermannova et al., 2018; own work

Within this "ISLAND" scenario, cumulative cash flow indicator as well as discounted cumulative cash flow indicator have increasing trend during the whole time of the solar electricity project (precisely 30 years), except the 15th year. In this year we can observe sharp decline, connected with the battery replacement, since the service lifetime of the battery is approximately 15 years. Therefore the household - prosumer should expect additional costs connected with new battery purchase and installation in 15th year of the project.

Figure 1 shows us, that in the scenario "ISLAND" including subsidy the payback period is represented by approximately 20 -21 years.

Table 1: Scenario "ISLAND" (in CZK) – including subsidy.

Year	1	5	10	15	20	25	30
Cash Flow	- 315 892	28 107	33 907	- 245 837	48 100	56 601	66 071
Cumul. CF	- 315 892	- 209 733	- 62 738	- 193 551	19 749	252 798	550 873
Disc. CF	- 312 764	26 743	30 695	- 211 752	39 420	44 135	49 020
NPV	- 312 764	- 210 282	- 74 826	- 185 501	- 7 485	177 257	402 533
IRR	---	-33,06%	-4,96%	---	-0,29%	3,73%	5,56%

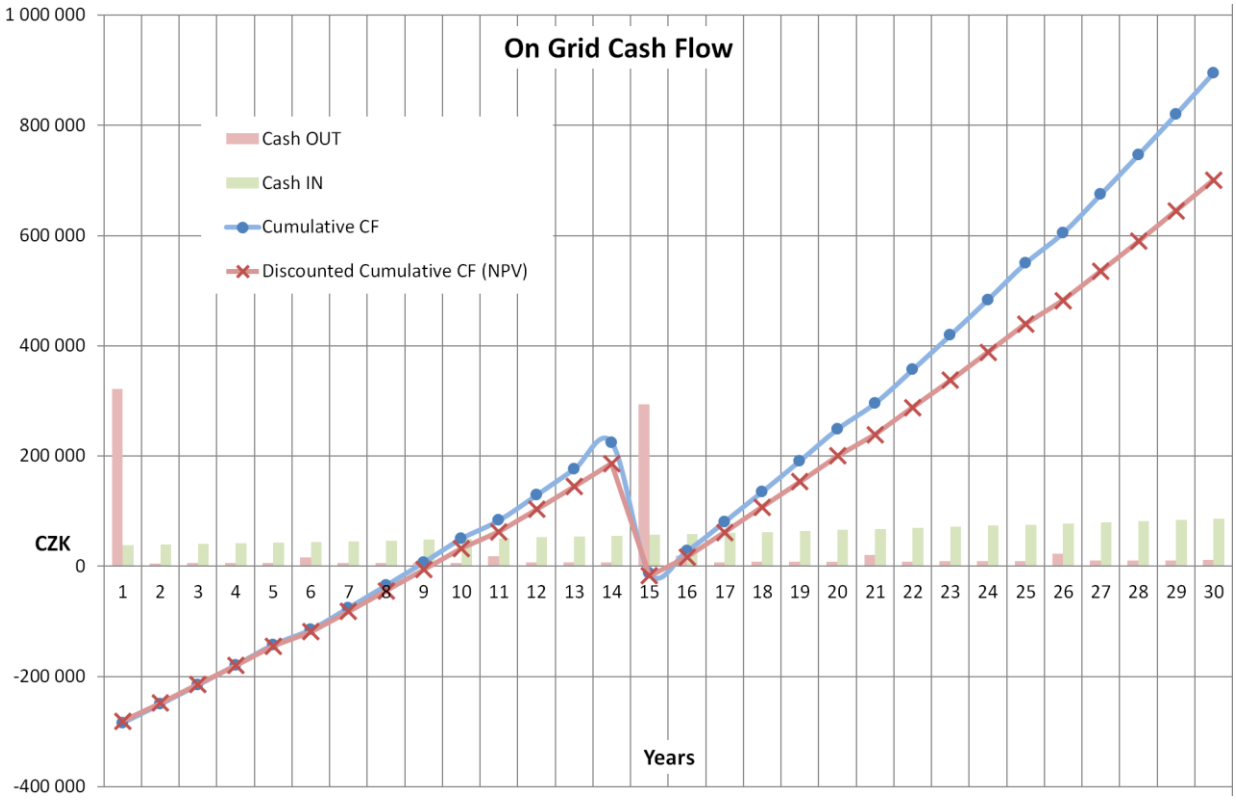
Source: authors

The subsidy causes lower investment costs at the beginning of the project, so NPV, cumulative CF and IRR are in positive values .

3.2 On grid household "PARTIAL ISLAND"

Figure 2 shows us the economic aspects of the scenario "PARTIAL ISLAND", precisely cash flow, cumulative cash flow, discounted cumulative cash flow and payback period.

Figure 2: Scenario "PARTIAL ISLAND"



Source: Zimmermannova et al., 2018; own work

We can observe the similar trends of cumulative and discounted cumulative cash flow as in case of "ISLAND" scenario, including the year of battery replacement. On the other hand, due to the possibility of electricity surplus selling to the grid and no need to invest to the alternative energy source - gasoline unit, the payback period looks much more interesting for possible investors.

Figure 2 demonstrates that in the scenario "PARTIAL ISLAND" including subsidy the payback period is represented by approximately 9 years, respectively 15 years, including purchase of new battery.

Table 2: Scenario "PARTIAL ISLAND" (in CZK) – including subsidy.

Year	1	5	10	15	20	25	30
Cash Flow	- 283 937	37 031	43 081	- 236 460	57 609	66 141	75 502
Cumul. CF	- 283 937	- 142 407	49 974	- 11 952	248 666	549 645	895 160
Disc. CF	- 281 125	35 234	39 001	- 203 674	47 213	51 575	56 017
NPV	- 281 125	- 144 484	32 886	- 16 866	200 712	439 815	701 000
IRR	---	-23,51%	2,21%	---	7,23%	9,35%	10,29%

Source: authors

The scenario "PARTIAL ISLAND" including subsidy shows positive values of NPV, cumulative CF and IRR in 10th year of the project. However, there are also visible high additional costs connected with replacement of the battery in 15th year of the project, which cause negative values of economic indicators in 15th year of the project. Finally, we can see positive values in 20th year of the project.

4 Discussion

Comparing our results with results of international scientific studies in the field of households – prosumers, it is obvious, that the main focus of the most of the studies is slightly different. For example

Flaute (Flaute et al., 2017) observes effects of households – prosumers on the macroeconomic indicators. The authors conclude that both the investments in power generating technologies and the higher income of households – prosumers due to self-produced electricity lead to higher consumption and stimulate economic growth. At the same time, the increase of prosumer households reduces emissions.

Olkkonen et al. (2017) clarify the role of the energy prosumer as a new type of stakeholder and connects prosumer relations to the notion of co-production. Thus, the article offers valuable information for energy companies when they update their business models to embrace prosumer relations and community involvement. Also Bellekom et al. (2016) focus on trends which affect current business models of DSOs and electricity production and supply companies. The latter are facing a loss of turnover which needs to be compensated by developing alternative business models. And DSOs have to deal with the new needs on the local grid which also require an adaptation of their business models. Developing business models in cooperation with local energy communities could be an attractive alternative to explore.

Scientific studies focusing on households – prosumers and their economic indicators are represented by Green and Staffell (2017) and Skorek-Osikowska et al. (2018). Green and Staffell (2017) have shown that, even with the unexpectedly low-cost Powerwall, and a pricing system that seems designed to encourage it, energy arbitrage cannot make consumer-based storage economic in Great Britain. The economic case for grid-scale storage is based on the wide variety of services that it can provide, but the complexity of the business models involved is a major obstacle to consumer-led deployment of energy storage. Until storage becomes very cheap (a fifth to a tenth of today's prices), or price swings grow extremely large to make arbitrage profitable, storage units will have to provide a number of separate services, typically to different buyers. Also Skorek-Osikowska et al. (2018) concluded that despite the environmental and economic effects, given a purchase price, without a support mechanism, prosumer systems have little chance of widespread implementation.

Based on the outputs of our research, we can say that our study presents similar results as Green and Staffell (2017) and Skorek-Osikowska et al. (2018); therefore our study represents an additional "brick to the wall" by describing the economic indicators of particular household – prosumer in the Czech Republic.

Dealing with the energy sector development, particular household – prosumer can represent also a stakeholder in the local energy grid and cooperate with energy companies – producers, distributors etc., so the results can be interesting for energy companies and local governments.

5 Conclusions

The main goal of this paper was to present economic analysis of household - prosumer and to compare two scenarios – "off grid household" and "on grid household".

It is obvious that both scenarios are different, including different assumptions and technical parameters; however we can observe basic economic indicators and their development during the duration of the project. The payback period in the scenario "ISLAND" including subsidy is represented by approximately 20 -21 years. We can see positive values of economic indicators at the end of 20th year of the project. Regarding the scenario "PARTIAL ISLAND" including subsidy, the payback period is represented by approximately 9 years, respectively 15 years, including purchase of new battery. We can see positive values of economic indicators in 10th year of the project, on the other hand replacement of the battery causes negative values of economic indicators in 15th year of the project.

We can say that the scenario "PARTIAL ISLAND" is more suitable for households, dealing with economic aspects of the project. However, in case that there is no connection of particular household to the grid, the scenario "ISLAND" is the only possible.

Regarding the following research, it would be useful to focus on spatial analysis of solar energy projects, since the intensity of sun can influence also economic parameters of particular projects.

6 Acknowledgements

Presented research was supported by the project TH01020426 “System for active management of decentralized energy units on local level”, financed by the Technology Agency of the Czech Republic.

7 Bibliography

[1] Bellekom, S., Arentsen, M., & Van Gorkum, K. (2016). Prosumption and the distribution and supply of electricity. *Energy, sustainability and society*, 6(1), 22. DOI 10.1186/s13705-016-0087-7

[2] Czech Statistical Office (CZSO). (2018). *Consumer prices*. Available online at: https://www.czso.cz/csu/czso/inflation_consumer_prices_ekon

[3] Energy Regulatory Office (ERO). (2018). *Feed-in tariffs for electricity generated from renewable energy sources*. Available online at: https://www.eru.cz/en/poze/cenova-rozhodnuti

[4] Flaute, M., Großman, A., Lutz, C., & Nieters, A. (2017). Macroeconomic Effects of Prosumer Households in Germany. *International Journal of Energy Economics and Policy,* 7(1), 146-155.

[5] Green, R., & Staffell, I. (2017). “Prosumage ” and the British electricity market. *Economics of Energy & Environmental Policy*, 6(1), 33–50. https://doi.org/10.5547/2160-5890.6.1.rgre

[6] Janda, K., Krška, Š. & Průša, J. (2014). Czech Photovoltaic Energy: Model Estimation of the Costs of its Support. *Politická ekonomie*; 62 (3) 323-346.

[7] MIT (Ministry of Industry and Trade of the Czech Republic). (2015). *National Action Plan for Smart Grids (NAP SG*). Available online at: www.mpo.cz

[8] MIT (Ministry of Industry and Trade). (2017). *Renewable energy sources in 2015; Results of the survey*. Available online at: https://www.mpo.cz/assets/cz/energetika/statistika/obnovitelne-zdroje-energie/2017/2/Obnovitelne-zdroje-energie2015.pdf

[9] Olkkonen, L., Korjonen-Kuusipuro, K., & Grönberg, I. (2017). Redefining a stakeholder relation: Finnish energy “prosumers” as co-producers. *Environmental Innovation and Societal Transitions*, 24, 57-66.

[10] Pawliczek, A. (2011). Czech Photovoltaic Business and Sustainable Development. *The International Conference Hradec Economic Days 2011*. Peer-Reviewed Conference Proceedings, Hradec Králové: Gaudeamus, 2011, 214-218, ISBN 978-80-7435-101-3.

[11] Perković, L., Mikulčić, H., & Duić, N. (2018). Multi-objective optimization of a simplified factory model acting as a prosumer on the electricity market. *Journal of Cleaner Production*, 167, 1438–1449. https://doi.org/10.1016/j.jclepro.2016.12.078

[12] Průša, J., Klimešová, A., & Janda, K. (2013). Consumer loss in Czech photovoltaic power plants in 2010–2011. *Energy Policy*; 63 (2013) 747–755.

[13] Ryvolová, I., & Zemplinerová, A. (2010). The Economics of Renewable Energy – Example of Wind Energy in the Czech Republic. *Politická ekonomie*; 58 (6) 323–346.

[14] Skorek-Osikowska, A., Remiorz, L., Bartela, Ł., & Kotowicz, J. (2017). Potential for the use of micro-cogeneration prosumer systems based on the Stirling engine with an example in the Polish market. *Energy*, 133, 46–61. https://doi.org/10.1016/j.energy.2017.05.066

[15] Zajaczkowska, M. (2016). Prospects for the development of prosumer energy in Poland. *Oeconomia Copernicana*, 7(3), 439-449.

[16] Zimmermannová, J., & Jílková, E. (2016). Do Economic Instruments in the Czech Republic Support Generation of Renewable Energy? *Economics Management Innovation*; 8 (2) 16-30.

[17] Zimmermannová, J., Pawliczek, A., Čermák, P. (2018). Public support of solar electricity and its impact on households – prosumers. *Organizacija*, 51 (1).

EMPLOYING AN ADAPTIVE NEURO-FUZZY INTERFACE SYSTEM MODEL (ANFIS) FOR "BRENT" OIL PRICES FORECASTING

Yulia Y. Finogenova
Plekhanov Russian University of Economics, Finance Department
jjfinogenova@gmail.com

Denis V. Domaschenko
Plekhanov Russian University of Economics, Finance Department, Research laboratory "Study of the monetary system and analysis of the financial markets"
dendv@rambler.ru

Edward E. Nikulin
Plekhanov Russian University of Economics, Finance Department, Research laboratory "Study of the monetary system and analysis of the financial markets"
edvardnikulin@gmail.com

Abstract:

One of the most prominent world price benchmarks is the "Brent" oil pricing and in the time of global economy its impact cannot be overestimated. However, when it comes to forecasting of "Brent" oil prices, it is not a straightforward thing to do (though a very important one), and to determine the cause-effect relations correctly is the essential matter in this case. To carry out causality analysis the authors apply adaptive-neuro fuzzy interface system for which the if-then rules serve as the basis and which offers good opportunities of defining the cause-effect relations. The results of modeling are not evident. Though the framework law states that the relationship of demand and supply affects the price, it is demonstrated that it is not the case of "Brent" oil pricing. The obtained results attest that the prices for precious metals (Palladium, Gold, Silver and Platinum) and commodity currencies exchange rates (USD/NOK, USD/AUD, USD/CAD and USD/ZAR) might both indicate and trigger the "Brent" price fluctuations. Moreover, according to the forecasting precision analysis carried out by the authors, the accuracy of the model reaches 62% on the day-to-day data.

Key words:

"Brent" oil prices, ANN, Fuzzy logic, ANFIS, Forecasting, Causality analysis

JEL: C53, C45, C12

1 Introduction: Overview of forecasting models

"Brent" serves as a major benchmark price for purchases of oil worldwide and it influences business operations on a global scale. However, when it comes to forecasting of "Brent" oil prices, it is not a trivial thing to do (though a very important one). Nowadays for the purposes of forecasting mathematical modeling is usually employed. Generally there are two types of mathematical models: structured and unstructured ones. The approach defined by structured models is based on the underlying economic studies and includes economic relations immediately, as a rule, by means of differential or difference

equations. By unstructured models we mean the all-purpose models the implementation of which does not influence their structure substantially. Each approach has its own benefits and drawbacks.

For instance, structured models provide a better comprehension of the internal processes of the modeling and make it possible to see how the variables are correlated. Such models deliver the most accurate results in terms of scenario analysis as well as in the cases of the simulated situation being confined to studying the defined fundamental basis. Put another way, the models function properly in the context of determined or low abstract problems. Nevertheless, if this approach is employed for forecasting, the chief concern will be a high risk of misspecification, that is to say, in case any of the basic rules is not in effect in a certain moment, parameters of the whole models will be inaccurate. Furthermore, according to (Crookes and De Wit, 2014), quite a lot of methodological mistakes might be caused by lack of qualification, and in their turn, methodological mistakes cause substantial misspecification in modeling.

To the contrary, unstructured models do not require accurate data to deliver appropriate results, so it is not necessary to describe the interrelations among all variables. This may lead to the risk of the model catching insignificant or noisy data for the analysis since it seeks to determine dependencies on its own. But at the same time, it allows studying unseen correlations and implicit fundamental changes. At present the models based on a vector autoregression (VAR) are the most popular ones.

The abovementioned models can be classified as linear, which might be a problem since the relationships between economic time series are non-linear. We employ models based on nonlinear autoregression (NAR) proposed in (Leontaritis, 1985) to handle this issue. To engage NAR models dynamic artificial neural networks are applied since they are non-linear as well and deliver higher-quality performance if they deal with noisy time series (Jiang and Song, 2011). For instance, in (Diaconescu, 2008) a model of a nonlinear autoregressive neural network with exogenous inputs (NARX) and ARIMA models were compared. According to the results of simulation, the root-mean-square error of the NARX model is lower than the error of the ARIMA model by an order of magnitude (NARX - 0.0004, ARIMA - 0.0061). In (Chaudhuri and Ghosh, 2016) the supremacy of the NARX model over generalised models of autoregressive conditional heteroscedasticity (GARCH, EGARCH) is demonstrated.

It should be mentioned as well that unstructured models deliver more accurate results of forecasting; to a certain degree it can be attributed to the fast-changing economic environment, which entails structured models' misspecification as well as to vigorous evolvement of this approach, ANN and boosting methods in particular.

The authors offer two hypotheses in respect of "Brent" oil pricing to be tested. The first one states that "Brent" oil prices are conditioned by the supply and demand. The second hypothesis assumes that the commodities traded on world exchanges influence the "Brent" oil prices' fluctuations. Since the hypotheses contradict each other, one of them will be confirmed and the other disproved, as basically oil prices ought to be determined by the demand and supply relation and influence the instruments of commodity markets.

Therefore, this study aims to define the variables that affect the "Brent" oil pricing in order to build a model for predicting the oil prices and test the model using historical information (back-testing).

2 Methods of formal determination of the causality between exogenous and endogenous variables

To define the causality between exogenous and endogenous variables formally the Granger causality test was contemplated. Prior to the time series in question being tested, it had been verified on the 200-time series with 100 observations generated at discretion (with expected value amounting to zero and standard deviation amounting to one). The authors divided 200-time series into two clusters: "cause" and "effect and consequently received 100 cause-effect pairs to be tested. The test parameters selected were as follows:

Max number of lags: 7

Alpha coefficient: 0.05

According to the test results, 40% of the pairs had a cause-effect relation, which cannot be correct. Therefore, the authors chose to employ a non-linear forecasting model to determine the cause-effect relations, supposing that in case the model delivered more accurate results in respect of forecasting for the pair and if it delivered less accurate results for the changed cause and effect in the pair, then the existence of cause-effect relationship would be confirmed in respect of the pair in question. The level of 10% in trend forecasting accuracy is established as the limit for the minimum change in the model's effectiveness. Moreover, as compared to forecasting based on endogenous time series alone, utilizing the exogenous time series ought to refine the forecasting accuracy. The above-referenced provisions agree with the Granger Causality theory (Granger, 1969).

The authors use "Brent" oil prices as an endogenous time series and the exogenous time series groups listed below:

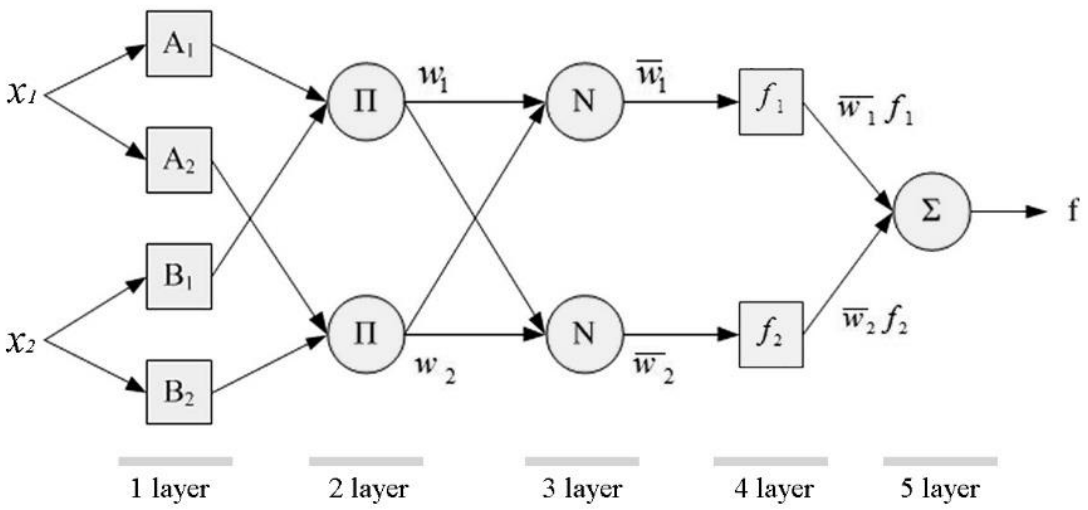
1. Precious metals prices: Platinum, Palladium, Silver and Gold;
2. Exchange rates of the commodity currencies: USD/NOK, USD/AUD, USD/CAD and USD/ZAR;
3. The relationship between supply and demand.

2.1 Forecasting model [1]

The authors have chosen adaptive neuro-fuzzy interface system (ANFIS) to carry out time series forecasting as it is predicated on the if-then logic rules and has ability to deal effectively with the problems requiring determining the cause-effect relations. ANFIS is an ANN based on Takagi-Sugeno fuzzy interface system (FIS). It comprises benefits of fuzzy logic and ANN. ANFIS was brought in by Jang J. S. R. in the work [Jang, 1991], and the author creates methods that are able to make a rule base and database of a fuzzy reference system out of people's knowledge and experience. The purpose of the model is to deal with the problem of the classical equation-based system dynamics modelling related to defects carried by the real systems [Jang, 1993]. The most curious thing is that as opposed to other ANN models, ANFIS renders statistically estimated fuzzy if-then rules that a human is able to observe and comprehend.

The architecture of ANFIS with inputs x1and x2 is presented in fig. 1.

Fig. 1: ANFIS architecture[2]



[1] Foot-note: chapter 2.1
[2] Jang J. S. R., 1991

The example of Takagi-Sugeno if-then rules are presented as follows:
IF x1 is A1 AND x2is B1 THEN f1= p1x1 + q1x2 + r1
IF x1 is A2 AND x2is B2 THEN f2 = p2x1 + q2x2 + r2
where
x1 and x2 are inputs;
A1,A2, B1 andB2 are the fuzzy sets;
f1 and f2 are the outputs within the fuzzy region by the fuzzy rules;
p1, p2, q1, q2, r1 and r2 are the coefficients, which are determined by the training of ANFIS.
ANFIS architecture is defined as follows:
1st layer: every node in the layer contains membership function for the term of the corresponded linguistic variable. This layer presents fuzzification procedure for original inputs values.
For instance:

$$O_i^1 = \mu_{A_i}(x_i)$$

2nd layer: every node in the layer gets membership functions from the previous layer and produces multiplication.

For instance:

$$O_i^2 = w_i = \mu_{A_i}(x_i) \cdot \mu_{B_i}(x_i)$$

3rd layer: every node in the layer normalises weights, obtained from the previous layer.
For instance:

$$O_i^3 = \overline{w}_i = \frac{w_i}{w_1 + w_2}$$

4th layer: every node in the layer calculates the following function:

$$O_i^4 = \overline{w}_i f_i = w_i(p_i x_1 + q_i x_2 + r_i)$$

5th layer: the layer contains the single node, which summarises all of the data, obtained from the previous layer.

$$O_i^5 = \sum_i \overline{w}_i f_i$$

For the training of ANFIS, we use a hybrid method, based on the error back propagation algorithm and the least squares method. The error back propagation algorithm configures the parameters of antecedent rules, i.e. membership functions. The method of least squares estimates the coefficients of the rule conclusions since they are related to the output of ANFIS linearly.

3 Paper results

To test the model, the authors use 230 daily observations for the period from 27.05.2016 to r 27.04.2016 in respect of trading days only (statistics source – Thomson Reuters).
The model is specified with the following parameters:

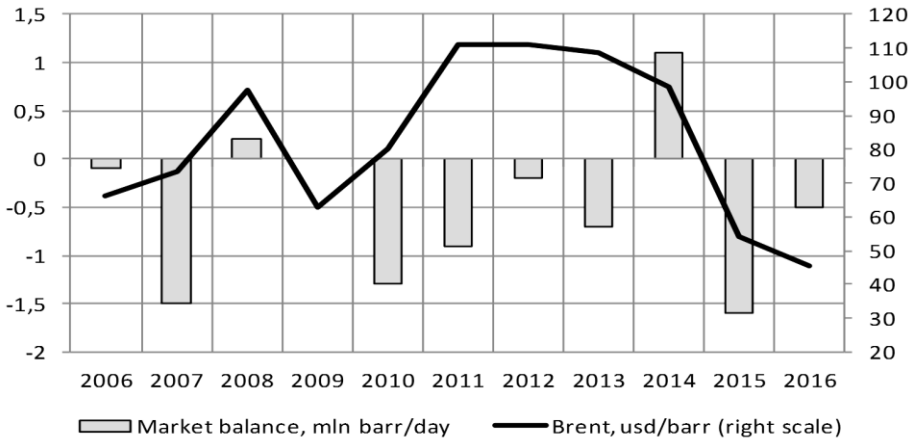
forecasting points number: 5;
maximum number of lags: 4;
clusters number: 4;
train window: 30.

The training set is to contain 30 observations, therefore the first 30 observations are going to be applied in the ANFIS initial training, whereas the other 200 observations are left for the back-testing.

The authors intend to study the cause-effect relations supply and demand for oil and “Brent” oil prices prior to forecasting in order to test the hypothesis assuming that “Brent” oil prices do not depend immediately on supply and demand, whereas they are in fact determined by prices for precious metals and exchange rates of commodity currencies.

The behaviour pattern of supply and demand relationship as compared to the “Brent” oil prices behaviour pattern charts are shown in the fig. 2.

Fig. 2: The supply and demand balance and the average annual prices of “Brent” oil[3]



As can be seen from fig. 2, there are no substantial cause-effect relations between supply and demand balance in the oil market and the “Brent” oil prices, which is proven by ANFIS (the difference in the trend forecasting accuracy between cause-effect and effect-cause pairs for the given time series are less than 5%, while the average accuracy does not exceed 53%).

Fig. 3 demonstrates that prices for precious metals exercise great influence on the “Brent” oil prices, and that is also proved by ANFIS which shows the difference between cause-effect and effect-cause pairs in the range between 11% and 18%.

Fig. 3: Precious metals and “Brent” oil prices (normalized data)[4]

[3] Authors calculations
[4] ibid

As is obvious from fig. 4, the currencies affect the “Brent” oil prices. It seems that the relation between currencies and “Brent” prices is stronger than influence of the precious metals; ANFIS shows the difference between cause-effect and effect-cause pairs in the range from 15% to 26%, also it shows that we gain mean performance improvement with exogenous time series about 4-5% (see the table). It is determined that the Norwegian Krone have the most significant impact on the “Brent” prices, using only these two-time series (Norwegian Krone – exogenously and “Brent” prices – endogenously), we get from 57% to 63% trend forecasting accuracy.

Fig. 4: Commodity currencies exchange rates and “Brent” oil price (normalized data)[5]

To evaluate the model forecasting performance more accurately, the authors simulate it 5 times for each point. Table 1 shows the results of the back-testing of the model which demonstrate that stable forecasts are obtained in respect of points 1, 2 and 3.

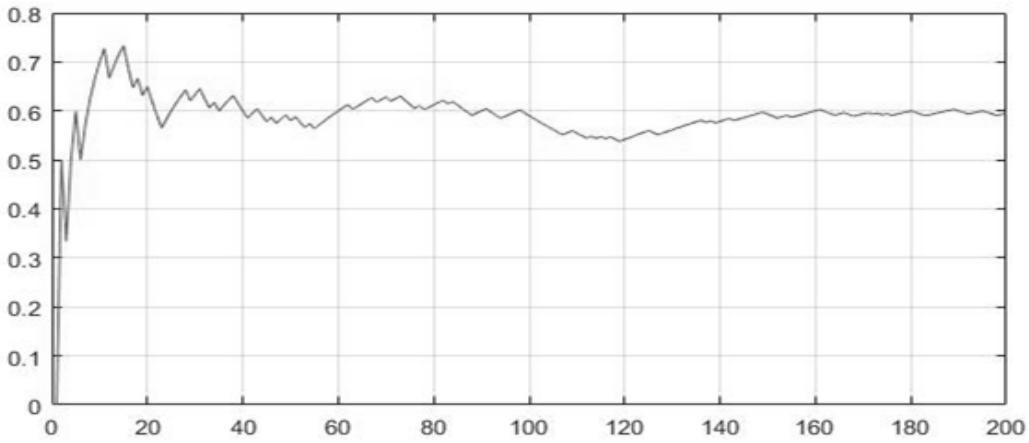
Tab. 1: Results of the back-test[6]

Forecasting point	1	2	3	4	5
Min trend forecasting accuracy	0.57	0.55	0.51	0.48	0.48
Mean trend forecasting accuracy	0.60	0.59	0.55	0.48	0.51
Max trend forecasting accuracy	0.62	0.61	0.58	0.51	0.54
Mean trend forecasting based on the “Brent” oil prices only	0.56	0.53	0.48	0.39	0.41

Fig. 5 represents dynamic of the trend forecasting accuracy of the model for “Brent” oil prices on the first predicted point.

[5] Authors calculations
[6] Ibid

Fig. 5: Average dynamic of the trend forecasting accuracy of the "Brent" oil prices[7]



It is noteworthy that the exactness of the trend forecasting deviates quite slightly from the end value, therefore the results of the modelling may be taken as valid.

4 Discussion

In terms of oil trade the fundamental demand and supply laws do not influence the price fluctuations. If we analyze the oil prices dynamics for the previous ten years (see fig. 2) and check it against the severe oscillations in fluctuations of the "Brent" oil prices, it becomes obvious that they do not depend on the demand and supply relationship, as the latter showed higher stability during the same period.

Such sizeable fluctuations of oil prices are caused by the nature of financial mechanisms of price formation in respect of commodities traded on world exchanges, which base on marginal position of the bidders. The market marginality creating the leverage effect enables them to open market positions that are far greater than the real security is, and that might disequilibrate the price far more than it would have been feasible should this option be omitted.

Nevertheless, the marginality of the market and derivatives allow manufacturers and oil end users to hedge market risks quite effectively. Hence, the price oscillations will still remain, so they should be considered as a matter of course. But the question left pending is the following: what are the factors that the oil prices depend on, if the classical laws are not in reliable in this case? To resolve this question the interdependency and synchronization of the dynamics (or cause-effect relationship) of several sectors of commodity and currency markets should be studied.

The authors come to a conclusion that basic laws do not exercise much influence on the market prices fluctuations (see fig. 2). However, in the long-term period it cannot be observed that the demand and supply relationship and oil prices depend on each other. More likely, the changes of oil prices repeat market prices dynamics, not vice versa, according to the modelling results (see fig. 3 and fig. 4).

Summing up, this paper seeks to study the interrelation between the prices for precious metals and commodity currencies and "Brent" oil prices. In order to determine such interrelation and forecast the "Brent" oil prices time series, the ANFIS model is employed.

The model was appraised with day-to-day data for the period 27.05.2016 – 27.04.2017 for 5-points prediction. The results demonstrated no apparent interrelation between supply and demand relationship and "Brent" oil prices, but disclosed a causal link between precious metals prices and "Brent" oil prices, along with one between commodity currencies and "Brent" oil prices. It is noteworthy that according to the

[7] Ibid

modelling results, Norwegian Krone exercises the greatest influence on “Brent” oil prices.

The mean forecasting accuracy in respect of the price oil trends is as follows: 60.0% for the first point, 59.0% for the second and 0.55% for the third one. Hence, the performance of the model is accurate in respect of forecasting the time series in question and therefore it may be applied to address other forecasting tasks.

5 Bibliographie

[1] Baumeister, C., & Kilian, L. (2015). Forecasting the real price of oil in a changing world: a forecast combination approach. Journal of Business & Economic Statistics, 33(3), p.338-351. DOI: 10.1080/07350015.2014.949342

[2] Chaudhuri, T.D. and Ghosh, I. (2016). Artificial Neural Network and Time Series Modeling Based Approach to Forecasting the Exchange Rate in a Multivariate Framework. Journal of Insurance and Financial Management, 1 (5), pp. 92-123

[3] Corrêa, J.M., Neto, A.C., Júnior, L.T., Franco, E.M.C. and Faria, A.E. (2016). Time series forecasting with the WARIMAX-GARCH method. Neurocomputing, 216, 5 December, pp. 805–815

[4] Diaconescu, E. (2008). The use of NARX neural networks to predict chaotic time series. Wseas transactions on computer research, 3(3), pp.182-191. Available at: URL http://www.wseas.us/e-library/transactions/research/2008/27-464.pdf [Accessed 2 April 2017].

[5] Jang, J. S. R. (1991, July). Fuzzy Modeling Using Generalized Neural Networks and Kalman Filter Algorithm. In AAAI Proceedings, Vol. 91, pp. 762-767. Available at: URL http://www.aaai.org/Papers/AAAI/1991/AAAI91-119.pdf [Accessed 10 March 2017].

[6] Jang, J. S. (1993). ANFIS: adaptive-network-based fuzzy inference system. IEEE transactions on systems, man, and cybernetics, 23(3), pp. 665-685. DOI: 10.1109/21.256541

[7] Jiang, C. and Song, F. (2011). Sunspot Forecasting by Using Chaotic Time-series Analysis and NARX Network. JCP, 6 (7), pp.1424-1429. DOI: 10.4304/jcp.6.7.1424-1429 ·

[8] Leontaritis, I. J., and Stephen A. Billings. (1985). «Input-output parametric models for non-linear systems part I: deterministic non-linear systems». International journal of control. 41 (2) pp.303-328. DOI: 10.1080/0020718508961130

[9] Lyneis, J. M. (2000). System dynamics for market forecasting and structural analysis. System Dynamics Review, 16(1), pp.3-25

[10] Rafieisakhaei, M., Barazandeh, B., Moosavi, A., Fekri, M., & Bastani, K. (2016). Supply and demand dynamics of the oil market: A system dynamics approach. In The 34rd International Conference of the System Dynamics Society.

[11] Sterman, J. D., Richardson, G. P., & Davidsen, P. (1988). Modeling the estimation of petroleum resources in the United States. Technological Forecasting and Social Change, 33(3), pp. 219-249 DOI: 10.1111/saje.12038

[12] Zhang, X. and Frey, R. (2015). Improving ARMA-GARCH forecasts for high frequency data with regime-switching ARMA-GARCH. Journal of Computational Analysis & Applications, 18(1) pp.727

EVENT STUDY ANALYSIS OF THE IMPACT OF NEWS ON THE VALUE OF CORPORATE REPUTATION: THE GAZPROM CASE

Irina Tkachenko, Irina Pervukhina
Ural State University of Economics,
Department of Corporate Economy and Business Management
tkachenko@usue.ru
ivp@usue.ru

Abstract:

The main objective of this work is to assess the effect of online news releases on firm's reputation and to determine how investors react to changes in the level of social responsibility information, with regard to «Gazprom», one of the largest public limited companies in the Russian market of oil and gas. The research uses an event study methodology. The novelty of the study is the focus on the capital market of a post-communist country, where the influence of CSR for investors' decisions is still poorly understood and underestimated. The initial sample covers 673 online news items announced from 1 January, 2015 to 31 August, 2017 and associated with «Gazprom» CSR. The empirical results show that news releases about «Gazprom» performance may have a strong impact on the company's stock prices. The obtained results confirm that investors take into account the information about changes in the level of CSR and respond positively to its growth and negatively to its decline.

Key words:

Corporate governance, corporate social responsibility, corporate reputation, event study, financial performance

JEL: G1, G34, G14

1. Introduction

The central idea in stakeholder theory [1] is that the success of an organization depends on the extent to which the organization is capable of managing its relationships with key groups, such as financers and shareholders, customers and employees, and even communities or societies.

Corporate social responsibility (CSR) and corporate reputation are becoming significant for different groups of stakeholders. Being socially responsible means attaining a number of advantages. On the one hand, CSR provides for a firm a chance to distinguish itself on the market [2]. High CSR standards have a positive impact on gaining competitive advantage through the strategy of differentiation and allow maintaining long term above-the-average results [3]. Moreover, social responsibility is connected with new market opportunities to create an additional corporate growth potential [4]. Another advantage is that CSR is treated as an important element of corporate reputation, [5, 6]. Reputation for social responsibility safeguards companies from stock declines [7]. Corporate reputation is viewed as an intangible asset [8, 9], as it is in fact a set of collective judgments of a firm, based on the assessments of its financial, social and environmental impacts [10].

Reputation takes time to build up, but it is easy damaged. Freeman's statement that corporations must be accountable for their social performance resulted in later research on the link between social responsibility and financial performance, namely, that changes in the level of CSR tend to be reflected in

the share price and, consequently, in the rate of return for investors. However, there is no consensus in these studies. While some authors find that corporate social responsibility and financial performance show a strong correlation, others find that there is an insignificant relationship between social responsiveness and economic performance [11]. Russian writers also made attempts to challenge this problem using event analysis methodology to assess the impact of events on stock prices in the Russian and international stock markets [12]. [13, 14, 15] include an investigation of the effect of the announcement of dividend payment on stock returns and [16] overviews the impact of mergers and acquisitions. Event analysis is also described as a tool used for measuring the value of the information about Russian public companies which is included in the analytical reports published by investment banks [17, 18].

Therefore, investors should treat the level of corporate social involvement as a predictor of their future financial results and pay attention to the information indicating changes in this area. The fact that investors pay attention to the information about the level of CSR also indicates that communicating this feature by companies may affect their market value.

In this paper we present the results of a firm-specific event study carried out to test the impact of news releases on the market value of «Gazprom», a Russian public joint stock company, market leader in the energy industry.

The method of event study is based on the assumption that every event which affects future financial results of the company is immediately reflected in the price of its shares, which mirrors the true value of a firm because it incorporates all relevant information [19].Thus, an event study is a statistical method to assess the impact of a specific event on the value of a firm [20, 21]. This method is gaining popularity in analyzing many situations, which can be firm-specific and economy-wide. The firm-specific events mainly involve a change in or a new implementation of company policy, for example, the announcement of a merger or a takeover, changes in management, football results of national clubs. Economy-wide events are often used in large sample event studies, which examine the effect of a particular event on relevant firms, for example, regulatory changes, natural and ecological disasters, or terrorist attacks. These events can be analyzed to see how they affect both gains and losses in company value as perceived by the market and to make better prediction in the future about whether a similar event will have a positive or negative impact.

The aim of our study is to assess the effect of online news releases on firm's reputation and to determine how investors react to changes in the level of social responsibility information, with regard to «Gazprom», one of the largest public limited companies in the Russian market of oil and gas. The research used an event study methodology. The novelty is the focus on the capital market of a post-communist country, where the influence of CSR for investors' decisions is still poorly understood and underestimated.

The remaining paper proceeds as follows. Section 2 describes the sample, data and methodology used in the research. Section 3 presents the research itself and its main results. Section 4 discusses the conclusions.

2. Methods

Event study methodology will be applied in this paper in order to measure the effects of different types of events on share prices of «Gasprom».

The initial sample covers 673 online news items released from 1 January, 2015 to 31 August, 2017 and associated with «Gazprom» CSR. The data are obtained from Regnum [22]. The data of daily stock prices over the studied period are taken from the site of the investment company Finam [23]

By using stock market reaction to the content of announcement, we managed to show that both positive and negative news affect the financial performance of the firm.

3. Results

The selection criteria for the inclusion of «Gazprom» in the study involve size of the company, industry representation, market capitalization and brand awareness. «Gazprom», a public joint stock company, is among Russia's top four oil producers. The company also owns major power-generating assets accounting for approximately 17 per cent of the total installed capacity of the national energy system. In addition, «Gazprom» ranks number one in the world in terms of thermal energy generation. «Gazprom» shares have been traded on the stock market since 1993. Its total assets are 252 billion USD (as of December 31, 2016) and its current market capitalization accounts for 59,775.64 USD (as of January 13, 2018)

In the new open market conditions the brand component of the total return has become an important part of «Gazprom» success due to market participants' sensitivity to how the company pursues the policy of CSR. Annually «Gazprom» supports various social projects contributing to culture, science and education development and promulgation of a healthy lifestyle.

The event study methodology relies on efficient market theory [19], which suggests that under the condition that information is publicly available, the current and expected financial performance of a firm impacts the price of publicly traded shares and, consequently, affects the firm's market value. There are a number of approaches to calculate the return on a given security. In our research we used the Capital Asset Pricing Model (CAMP), one of the common economic models, which relies on assumptions concerning investors' behavior. The CAMP describes the relationship between systematic risk and expected daily value-weighted returns for a particular firm and for the market for each event.

In accordance with a generic portfolio model approach, the key components of «Gazprom» portfolio are its products and corporate reputation, or goodwill. The return on the company's securities is taken as a return on «Gazprom» common stock traded on the Russian stock market. Return on company's core business is taken as gains on American Depositary Receipts (ADR) traded on the London stock exchange. In this case the assumption is that the Russian stock market investors are affected by information presentation about «Gazprom» activities, while the English stock market players are guided in their decision making only by objective financial indicators of the company performance.

For the studied period, rates of return on «Gazprom» shares traded on the Russian and London stock market, the RTS and FTSE – market indices – returns are calculated on the daily basis as follows

$$R_{adr} = \beta * \Delta R_FTSE \text{ and}$$

$$R_{adr_adj} = R_{adr} - \Delta R_{adr}$$

where R_{adr} is the current rate of return on ADR; β is the coefficient of linear regression between rates of return on «Gazprom» stock and FTSE returns; ΔR_{adr} is a rate of return on ADR caused by market fluctuations; ΔR_FTSE is FTSE return fluctuations; and R_{adr_adj} is an adjusted rate of return on ADR.

The next step is to measure the weighted value of corporate reputation in the total rate of return on «Gazprom» stock. Using the method proposed in [24], we analyze annual means of return on «Gazprom» shares traded on the Russian stock exchange and the rate of return on ADR. The values are taken from 0 to 1 with a 0.05 interval and a rate of return on goodwill is

$$R_{Gw} = (R_s - (1 - W_{Gw}) * R_{adr}) / W_{Gw}$$

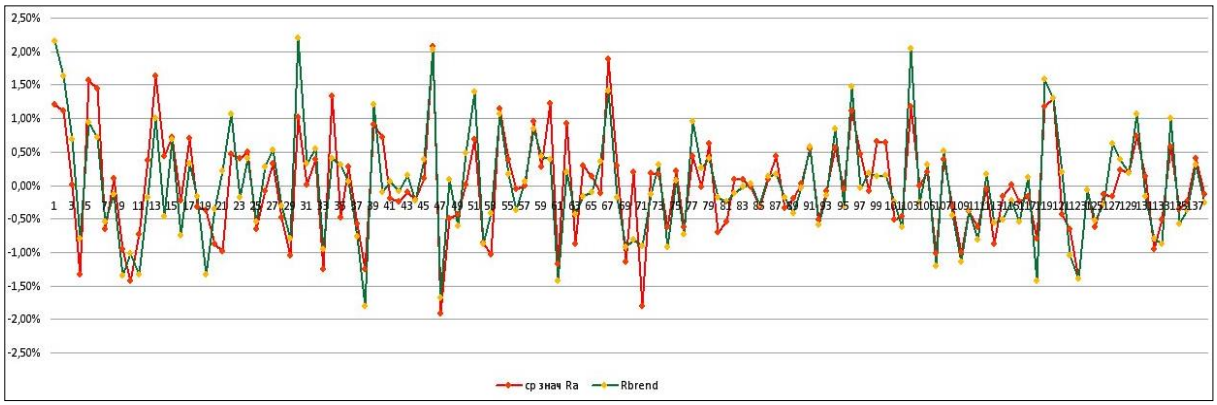
where R_s is the return on «Gasprom» shares traded on the Russian stock market; W_{Gw} is the weighted value of goodwill. Some numerical results are presented in Table 1. It is apparent for the data that returns on goodwill have positive values at 0.55.

Table 1. Dependence of return on goodwill on its weight in share portfolio[8]

W_{Gw}	R_{Gw}	Contribution of goodwill in rates of return on stock
0.4	-69.93	-50.03
0.45	-31.09	-22.24
0.5	-0.03	-0.02
0.55	**25.39**	**18.17**
0.6	46.58	33.32
0.65	64.50	46.14
…	…	…
1	139.78	100.00

Our next step is to compare fluctuations of «Gazprom» share prices with the plot of the company's returns on corporate reputation. For the study purposes the whole period from January 1, 2015 to August 31, 2017 is divided into 5 working days' intervals, total 137 segments. Figure 1 shows that the rate of return on «Gazprom» reputation strongly correlates with the rate of return on its shares.

Figure 1. Plot of returns on «Gazprom» shares and reputation



Then the study focuses on determining the impact of announced events on the value of corporate reputation. The initial sample covers 673 online news releases related to «Gazprom» CSR from January 1, 2015 to August 31, 2017. Approximately half of these events (371) are positive in content ('good' news), while 301 items are marked as 'bad news'. All announcements are divided into the following areas of CSR: environmental issues, ethical business behavior, relationships with customers, and community relations. Due to the complexity of the objective grouping of news related to business ethics and relationships with customers, they are united into one group - relationships with partners - and then broken down into two categories: relationships with internal partners (stakeholders) and relationships with external partners (stakeholders). The majority of the events (74 per cent) relate to «Gazprom» relationships with external partners; 18 per cent of the items inform about the company's relationships with internal or domestic partners. The share of news reporting on community relations is 7.5 per cent, while environmental news make up an insignificant 0.5%.

[8] Acknowledgement to Yuriy Shveitser (USUE MSc student) for making calculations

In terms of the impact of the events on corporate reputation and, consequently, on stock prices, relationships with both external and internal partners are equally significant - 70 per cent each. Community relations contribute 65 per cent.

As an example we will consider the impact of news releases on the company's business reputation in June 2015. In total, 11 events were announced, seven of them were marked as 'good news', and four - as 'bad' news. At the beginning of the first week of June (June 2 and June 4, 2015) two events increased «Gazprom» share prices: «Gazprom-Media» announced the launch of a new sport channel and «Gazprom» announced its intention to invest in the Iran-Armenia Pipeline construction. At the end of the first week (June 8, 2015) and the beginning of the second week (June 9, 20015) the news informing about the interaction of «Gazprom» with its Ukrainian business partners negatively affected the upward return trend, which could not be reversed by the positive event of June 10, 2015 when the five-a-side football club «Gazprom-Jugra» won the Russian Five-a-Side Football Championship. The yield growth of corporate goodwill during the third week was due to an important event: on June 18, 2015 it was announced that «Gazprom» would be involved in the Nord Stream – 2 Pipeline Project. At the end of that week, the news that «Gazprom» had significantly reduced investments in the gasification of Vologda Region caused a drop in «Gazprom» share prices during the next week. The downward trend was not improved by a 'good' event of June 24, 2015, when «Gazprom» management announced their plans to invest $70 million in Kyrgyzstan gasification.

4. Discussion and conclusions

The analysis of the entire set of news events allows us to make the following conclusions. In 70 per cent (471) of the total number of event, the nature of the news directly impacts the rate of return on corporate reputation: 'good' news increase and 'bad' news decrease the rate of return. From 137 segments of observations, 67 weeks were marked with growth of business reputation, 70 weeks - with its decline. Out of 137 examined segments, the changes in returns on shares and the value of goodwill strongly correlated, which might signify close relationship between these two indicators.

Since the main objective of the present work was to assess the effect of online news releases on firm's goodwill and to determine how investors react to changes in the level of social responsibility information, with regard to «Gazprom», this study highlights the empirical evidence of the effect of corporate reputation on the stock price and market capitalization. It also considers the contribution of a range of CSR dimensions and processes into a firm's business reputation value. The empirical results show that news releases about «Gazprom» performance may have a strong impact on the company's stock prices. The obtained results confirm that investors take into account the information about changes in the level of CSR and respond positively to its growth and negatively to its decline. In the studied sample, the growth of return on «Gazprom» stock resulted from announcements of environmental and social events. On the contrary, reported conflicts with partners and customers caused lower returns. Comparing the contribution of the firm's core business management and corporate reputation to an increase of return and growing market value, it can be observed that it is the core business that generates major returns on «Gazprom» stock, while the company brand is less profit-generating and more risky in terms of allocation of funds for brand management.

As it has been found out that the contribution of different aspects of CSR to corporate reputation is almost equal, it is, therefore, essential for the company's management to consider all dimensions and processes of CSR in order to build and maintain corporate reputation. Investors consider information about the social commitment of the companies as valuable, most probably because they regard it as a predictor of future economic performance.

Unlike other Russian research on event analysis mentioned in the Introduction, when the methodology is used to measure the effect of economic events on company's financial results, in this work we sought to examine the impact of an event on the firm's business reputation.

Another difference of our study from the previous works is that very few Russian researchers, who apply event analysis to CSR, classify the news events in terms of their occurrence as the outcome of

firm's relationships with external stakeholders and the so-called internal stakeholders. In this paper, in order to more accurately measure the impact of CSR on the change of the company's goodwill, all announcements were divided into the following areas of CSR: environmental issues, ethical business behavior, relationships with customers, and community relations. As a result, taking into account the nature of an event (positive vs negative) and its match or mismatch with the changes in share prices (growth vs fall) at each stage, as well as the announcement allocation by CSR areas, we were able to evaluate the impact of economic and non-economic events on «Gazprom» business reputation, and, as a consequence, on the company's market value.

In brief, the results of this study suggest that there is a financial incentive reflected in the stock prices for firms to be socially responsible while making decisions. Future studies might focus on applying event study as methodological tool in management research to support validity of statistical data.

5. Bibliography

[1] Freeman, R. E. (1994). «The Politics of Stakeholder Theory: Some Future Directions», *Business Ethics Quarterly,* 4(4), 409–421.

[2] Brammer, S. & Millington, A. I. (2008). «Does It Pay to Be Different? An Analysis of the Relationship between Corporate Social and Financial Performance», *Strategic Management Journal,* 29(12), 1325–1343. http://dx.doi.org/10.1002/smj.714

[3] Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free Press.

[4] Porter, M. E. & Kramer, M. R. (2011). «Creating Shared Value. How to Reinvent Capitalism — and Unleash a Wave of Innovation and Growth», *Harvard Business Review,* 89(1), 2–17.

[5] Brammer, S. & Pavelin, S. (2004). «Building a Good Reputation», E*uropean Management Journal,* 22(6). 704–713. http://dx.doi.org/10.1016/j.emj.2004.09.033

[6] Schnietz, K. E. & Epstein, M. J. (2005). «Exploring the Financial Value of Reputation for Corporate Responsibility during a Crisis», *Corporate Reputation Review,* 7(4), 327–345. http://dx.doi.org/10.1057/palgrave.crr.1540230

[7] Soppe, A. B. M., Schauten, M. B. J., Soppe, J. & Kaymak, U. (2011). «Corporate Social Responsibility Reputation (CSRR): Do Companies Comply to their Raised CSR Expectations?» *Corporate Reputation Review,* 14(4), 300–323. http://dx.doi.org/10.1057/crr.2011.21

[8] Brown, B. (1998). «Do Stock Market Investors Reward Companies with Reputations for Social Performance?» *Corporate Reputation Review,* 1(3), 271–280. http://dx.doi.org/10.1057/palgrave.crr.1540048

[9] Black, E. L., Carnes, T. A. & Richardson, V. J. (2000). «The Market Valuation of Corporate Reputation», *Corporate Reputation Review,* 3(1), 31–42. http://dx.doi.org/10.1057/palgrave.crr.1540097

[10] Feria-Domínguez, J. M., Jiménez-Rodríguez, E. & Fdez-Galiano, I. M. (2016). «Financial Perceptions on Oil Spill Disasters: Isolating Corporate Reputational Risk», *Sustainability,* 8, 1090; doi:10.3390/su8111090

[11] van Beurden, P. & Goessling, T. (2008). «The Worth of Values - A Literature Review on the Relation between Corporate Social and Financial Performance», *Journal of Business Ethics,* 82(2). 407-424. doi: 10.1007/s10551- 008-9894-x

[12] Malyshenko, K. (2017). *Event Analysis of the Stock Market* [*Sobytiyniy analiz fondovogo rynka*]. Vol. 2. Moscow: Rusience (in Russian).

[13] Teplova, T. (2008). «The Impact of Dividend Payment on Stock Market Valuation of Russian Companies: Empirical Event Studies on Russian and Foreign Trading Floors» [«Vliyanie dividendnykh vyplat na rynochnuiu otsenku rossiyskikh kompaniy: empiricheskoye issledovaliye metodom sobytiynogo analiza na rossiyskikh i zarubezhnykh torgovykh ploschadkakh], *Audit and Financial Analysis*, 2, 1-15 (in Russian).

[14] Berezinets I., Bulatova L., Il'ina Yu., & Smirnov M. (2015). «The Reaction of the Russian Stock Market on Dividend Payment Announcements: pirical Research» [«Reaktsiya rossiyskogo fondovogo rynka na obyavleniya o vyplate dividendov: empiricheskoe issledovanie»], *Vestnik Sankt-Peterburgskogo universiteta*, 8 (1), 44-90 (in Russian).
[15] Rogova E. & Berdnikova G. (2014). «Price Responses of the Russian stock market to Companies' Announcements of Dividend Payments» [«Tsenovaya reaktsiya rossiyskogo fondovogo rynka na obyavleniya kompaniy o dividendnykh vyplatakh»], *Russian Management Journal*, 12 (4), 3-28 (in Russian)..
[16] Chirkova E. (2011). «Market Responses to Announced Acquisitions of Private and Public Companies» [«Reaktsiya rynka na obyavleniye o priobretenii kompaniy otkrytogo i zakrytogo tipov»], *Corporate Finance,* 3 (19), 30–43 (in Russian).
[17] Pogozheva A. (2013). «Event analysis as a way of testing market efficiency» [«Sobytiyniy analiz kak sposob testirovaniya effektivnosti rynka»], *Russian Journal of Entrepreneurship*, 7 (229), 64-68 (in Russian).
[18] Pogozheva, A. (2013). «The Use of Event Studies for Assessing Information Significance of Analists' Recommendations for Russian Issuers» [«Ispol'zovanie sobytiynogo analiza dlya otsenki informatsionnoy znachimosti rekomendaciy analitikov po rossiyskim emitentam»], *Corporate Finance*, 2 (26), 32-45 (in Russian).
[19] Fama, E. F. (1970). «Efficient Capital Markets: A Review of Theory and Empirical Work», *Journal of Finance,* 25(2), 383– 417. http://dx.doi.org/10.2307/2325486
[20] MacKinlay, A. C. (1997). «Event Studies in Economics and Finance», *Journal of Economic Literature,* 35(1), 13-39. https://www.jstor.org/stable/2729691
[21] McWilliams, A. & Siegel, D. (1997). «Event Studies in Management Research: Theoretical and Empirical Issues», *Academy of Management Journal,* 40(3), 626-657. https://www.jstor.org/stable/257056
[22] Regnum https://regnum.ru/news/search/Газпром.html
[23] Finam http://www.finam.ru
[24] Shaipova, S. (2014). «An Innovative Method of Determining the Value of the Business Reputation of a Company» [«Innovatsionnaya metodika opredeleniya stoimosti delovoy reputatsii kompanii»], *Russian Journal of Entrepreneurship,* 15(22), 168-182 (in Russian).

EVOLVING THE CORPORATE SECRETARY IN RUSSIAN ECONOMIC PRACTICE

Vavilina, Alla Vladimirovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
vavilina_av@rudn.university, vavilinaalla@mail.ru

Kirillova, Oksana Yur'evna
Candidate in Economics, Associate Professor, Lead Researcher of Educational and Scientific Center "Management",
Plekhanov Russian University of Economics (REU),
117997, Stremyannyj pereulok.,36, Moscow, 117997, Russian Federation
Kirillova.OY@rea.ru

Levanova, Lidia Nikolaevna
Associate Professor, Department of Management and marketing, Faculty of Economics
Saratov State University
Astrakhanskaya str., 83, Saratov, 410012, Russian Federation,
levanovaln1@mail.ru

Abstract

The article examines the establishment of the corporate secretary in the corporate practice of Russian companies. Being complementary to the institution of corporate governance, this institution has being demonstrated high rates of development in Russia over the past 5 years. The authors analyze the dynamics of the functional development of this position in corporate governance systems in Russian and international companies, the list of corporate secretary's functions, the range of his/her interactions with other positions, personal and business characteristics that a specialist holding this position should have. As initial data for the analysis there was used the statistical data and the results of surveys of the professional community of corporate secretaries in Russia - NACS (National Association of Corporate Secretaries), as well as well-known professional associations in the field of corporate governance: RID (Russian Institute of Directors); NCSU (National Certification Center for Managers), NACD (National Association of Corporate Directors).
Based on the conducted research we came to conclusion that it is advisable to develop and introduce a corporate secretary position in corporate governance systems of companies; as well the result of the research has become a number of methodological guidelines related to activities of the corporate secretary in the system of interactions between corporate governance bodies, its role in the system of external and internal communications of the corporation with stakeholders, and control over interactions.

Key words

Corporate governance, corporate secretary, system of corporate governance, stakeholders, Board of Directors

JEL: M12, M21

1 Introduction

To have in a company the position of corporate secretary as a person with specific responsibilities for the system of corporate governance is considered to be a one of the western traditions.

The development of guarantees for the shareholders' rights, the improvement of company's management bodies effectiveness, the improvement of information policy and formation of corporate social responsibility are the primary goals of management in modern Russian corporations if they want to build corporate governance systems that meet the basic requirements of the best international corporate governance practices (CGBP). One of the leading positions for ensuring effective interactions in corporate governance systems in accordance with the provisions of its International Standards is assigned to the Corporate Secretary.

Unlike Russia, the institution of corporate secretaries has a long history in the West.

International practice has two similar institutions: the corporate secretary (in the US and Canada) and the company secretary (in the UK, Australia, Singapore, Hong Kong, Thailand).

Corporate secretaries are organically integrated into the corporate governance system and perform a number of important functions related to the regulation of corporate relations and occupy a sufficiently high position.

He is considered to be a senior corporate officer, who plays a key role in the administration of critical areas of corporate governance.

However, despite the advances in the formation of corporate governance systems in Russia and the success of the corporate secretaries' activities, in most Russian corporations both some shareholders and management underestimate the role of the corporate secretary's office. In most companies corporate secretaries are not independent from executive bodies, as a result of which they actually act as "servants of two masters", as they are in double subordination and, as consequence, forced to resolve contradictions of given orders, often dictated by different interests. The underestimation of the corporate secretary's role in the management system leads to a shortage of resources allocated to ensure its activities: both human and material, which prevented them from proper execution of his/her functions. This fact entails certain risks to the work of the corporate secretary, the elimination of which requires the search for solutions and tools that bring the rights and powers of his office into line with the role and function that must be formally assigned to him/her to ensure effective interactions between shareholders as the main stakeholders and directors as their representatives. Thus, the study of the role of the corporate secretary in the corporate governance system is of particular interest for the modern Russian corporate governance, which confirms the relevance of the topic chosen for publication

2 Literature review

The topics related to the work of the corporate secretary in the international scientific community are discussed mainly as an applied issue: the professionalization of corporate secretary's activities and the content of training programs at the bachelor's level (R. Müller,; V.S. de Oliveira, E. Chegan, 2015 [41]); participation of the executive secretariat in the implementation of social and environmental responsibility (S. Monteiro, Q.C. Cecatto, DDO Hardin, 2015 [40]); role of the corporate secretary in the organization of interaction of members of the board of directors (T. McNulty, A. Stewart, 2015 [39]); development of the corporate secretary's functions in terms of information disclosure (Zhou Kaiguo, Li Tao, Zhang Yan, 2009 [38]); the study of corporate social responsibility in terms of corporate secretaries (S.O. Idowu, 2009 [37]). Russian authors discuss the issues of efficiency if corporate secretary for Board of Directors (Belikov I.V., 2014, 2015 [7,8], the role of corporate secretary in non-public companies (Verbitsky V.K 2015-2016 [9,10], interaction of the corporate secretary with the internal control departments (Danilova SA, 2016 [13], peculiarities of the institute development in Great Britain (Merkulova O.V. 2014 [21], Russia (Osipenko O.V. 2015 [22], Semenov A.S. 2012, 2014,2015, 2016 [27,28,29,30],

and a number of others.

3 Situation analysis and research methods.

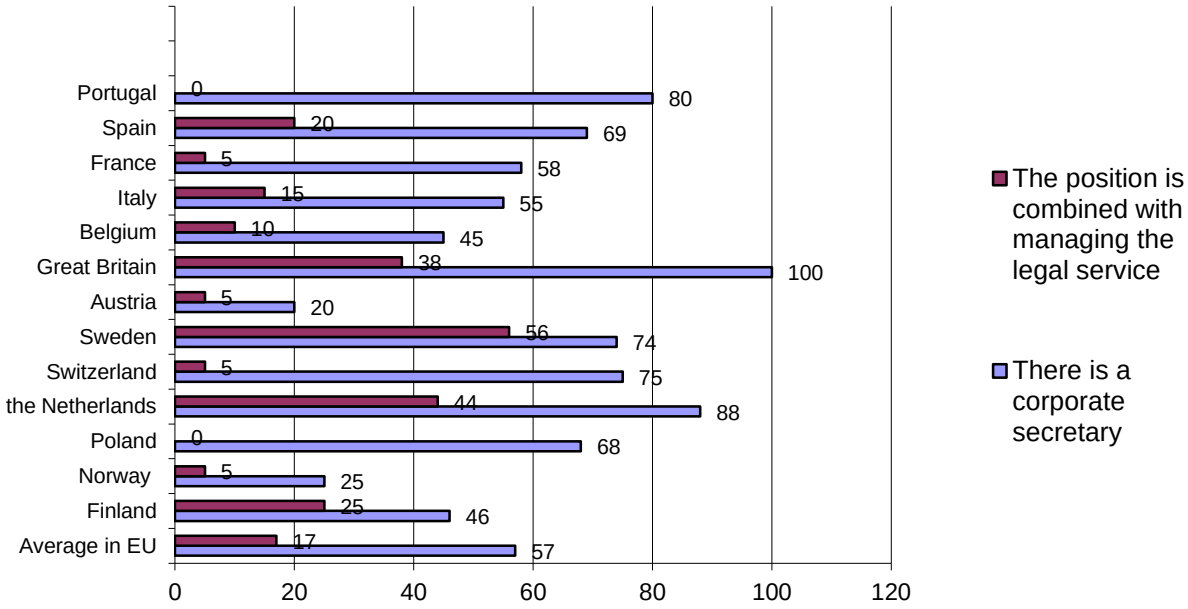
The methods of statistical, comparative, content analysis, generalization, analogy, interpretation of the expert surveys results, factor analysis, and groupings were used in the article.

As a source of information the paper uses statistical data and results of surveys conducted by the Russian Institute of Directors (RID); the National Association of Corporate Secretaries (NACS), the National Certification Center for Managers (NCSU), the materials of the IX Forum of Corporate Secretaries, as well as the publications of the professional edition on corporate governance "Joint Stock Company: Issues of Corporate Governance", and annual reports of Russian corporations.

Fig. 1 reflects the statistics on the institution of corporate secretary in European companies, which allows us to conclude that the profession of the corporate secretary in Europe is quite common and is present in 57% of EU public companies. At the same time, the UK is the only country where the position of corporate secretary is mandatory for joint-stock companies (Fig.1. [36, c.5)].

Russia has no such experience, since the business community learned about the corporate secretary only after the first national Code of Corporate Conduct was published in 2002. Over the past period the role of the corporate secretary for the highest level of management is getting more and more important. The reasons for the evolution of corporate secretariats in Russian business are: the growing influence of institutional investors, increasing the requirements of the society to the level of social responsibility of business, increasing pressure on the boards of directors and top management by shareholders and employees of enterprises, and tightening legislation.

Fig. 1. Statistics of application of the Institute of Corporate Secretary in European companies, 2011

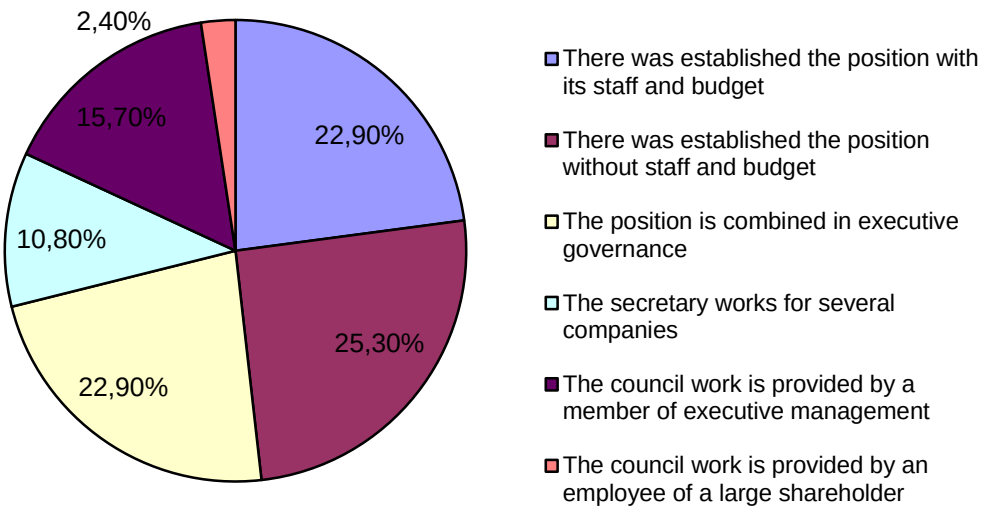


Since the beginning of the 2000s, Russian companies have differently understood the specifics of corporate secretary activities, and for some owners this functionality in the management system was a perfect exotic.

According to the surveys in 2012, only 23% of companies having in their structure corporate secretaries who are members of NACS (National Association of Corporate Secretaries) and participants in the IV International Forum of Corporate Secretaries (83 respondents), the position of a corporate secretary was established with separate staff and budget. In 41% of cases, the functions of the corporate

secretary were performed by members of the executive management, which contradicted the status of the corporate secretary, judging by the world practice of corporate governance. (Fig.2 [17, p.6])

Fig.2. Status of the Corporate Secretary, 2012



In recent years, in Russiathe position of the corporate secretary has becomewidely known, which is confirmed by a number of important documents aimed atthe formation and improvement ofthe institution of corporatesecretary activity [see 2,3, 4,5,]

As a result, in 2016, based on interviews with corporate secretaries (95 respondents) conducted by the Deloitte and Center for Corporate Governance and the National Association of Corporate Secretaries, as well as in accordance with the provisions on the corporate secretary of a number of companies selected at random, 43.2% of respondents called the ‘‘corporate secretary’’ as the position in the framework of which the functional of corporate interactions was implemented [30, p.67].

Based on the results of a survey conducted by the Russian Institute of Directors (RID) in 150 Russian companies, there is a positive trend in the evolution of the corporate secretary position (Table 1 [16, p.67]). The table shows the shares of the companies in which the position of the corporate secretary is established, or these functions are performed by the secretary of the board of directors.

Table 1. Presence of corporate secretary position in the company

	2014	2011	2010	2009	2008
Generally in sample	51%:	42%:	40%:	42%:	40%:
Listed Companies	56%:	46%:	52%:	55%:	49%:
State-owned companies	49%:	33%:	14%:	17%:	19%:

The results of the surveys show that these functions in Russian companies can be performed by: the head of the corporate-legal work department; head of the corporate governance department; director for corporate governance; head of corporate and legal projects; secretary of the Board of Directors [17, p.66]. However, the Moscow Stock Exchange required that this position in accordance with the Code of Corporate Governance should be called "corporate secretary".

In addition, it should be noted that the Code of Corporate Governance does not recommend the corporate secretary to combine his/her work as a corporate secretary with other functions in the company.

The corporate secretary is entrusted with serious functions in organizing corporate interaction, which requires:

1) certain personal qualities and professional competencies.
2) labour and financial resources, ensuring the appropriate functioning of the corporate secretariat.

With regard to professional requirements, within the Corporate Governance Code, it is recommended to appoint to the position of corporate secretary a person with a higher legal, economic or business background who has at least 2 years of experience in corporate governance or managerial work. Moreover, the corporate secretary must have an impeccable reputation.

Most of the current corporate secretaries have a sufficient work experience: 88% of them have worked for more than 5 years; 8% - 3-5 years; 4% - less than 3 years.

Nowadays, the majority of corporate secretaries are women, their share among survey respondents is 59% [30, p.66.].

As for age, the majority (64.3% of secretaries) are at the age of 25-40 years, and 34.5% - older than 40.

66 NACS secretaries were offered to choose 3 out of 5 proposed characteristics:

- organizational skills;
- communication skills;
- the ability to work with confidential information;
- creativity;
- efficiency.

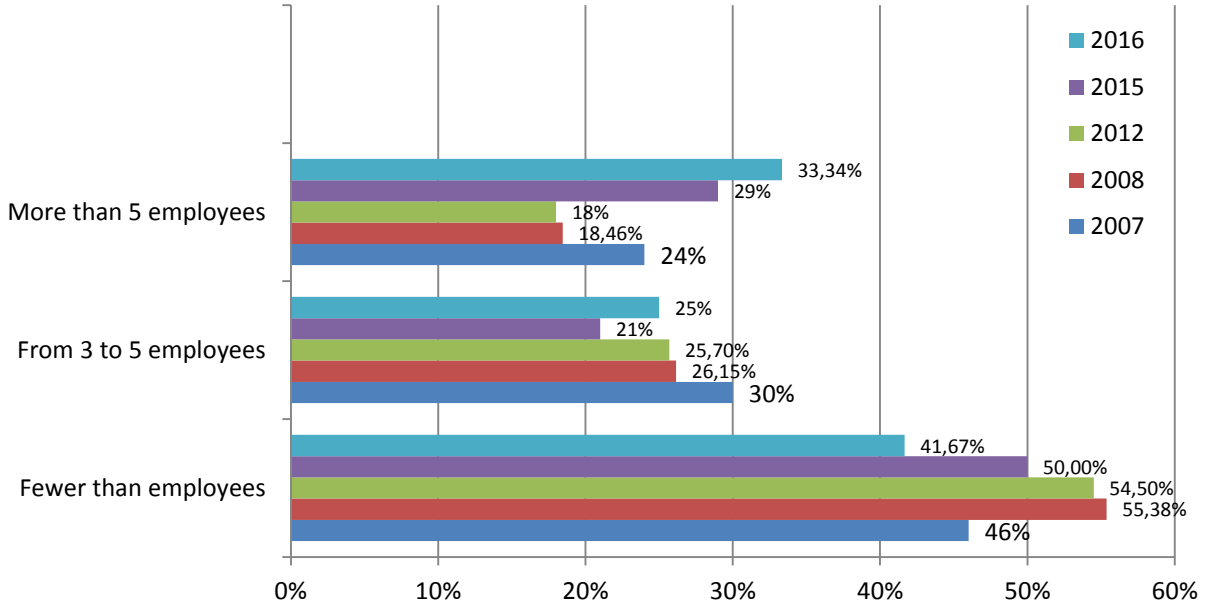
As a result, the survey revealed that the most essential qualities, according to the secretaries themselves, are organizational qualities, communication skills and efficiency.

A sufficiently large number of functions of the corporate secretary led to the development of the apparatus in the corporate governance system - the corporate secretariat. In accordance with the Corporate Governance Code (item 220), depending on the scope of the company operations, ownership structure of the capital, and the number of minority shareholders, the functions of the corporate secretary can be performed by one person - the corporate secretary - or a special structural unit headed by the corporate secretary. As a result, the company's corporate secretary began to allocate not only funds for remuneration (annual salary + bonus), but also to develop these companies' workforce.

Comparing the data for several years, one can observe the growth of the staff of the corporate secretariat (Fig.3 [17 p.6, 61, p. 69, 30 p.71.]). That is, the number of companies where the corporate secretary works without assistants, and in which his activities are limited solely to procedural matters, i.e. the preparation of documents for general meetings of shareholders and meetings of the board of directors, is declining. This dynamics demonstrates that domestic companies not only recognize that they need these employees, but also they are ready to vest them a wide range of powers.

In addition, it should be noted that in 30% of companies whose secretaries are members of the NACS, the boards of directors evaluates corporate secretaries' activity, which up to now, like the evaluation of the board's activities, has been exotic in Russian companies.

Fig. 3.The number of corporate secretary staff ,%.



Thus, as a result of the analysis, we can conclude that the institution of the corporate secretary with its functions, competencies, requirements for personal qualities, experience and education has already formed in the Russian business community. Russian companies have realized their need for this position in the corporate governance system and are determined to develop it. Despite the fact that employers often mix up the functions of the corporate secretary and corporate lawyer, there are no systems for assessing and remunerating corporate secretaries in most companies, one thing is certain: the need of Russian corporations for specialists with this qualification, performing the functions of organizing interaction and their control increases. This is due to the development of corporate governance in Russia and the desire to comply with the standards of international corporate governance practices.

4 Results and prospects.

Sound advisability of the wide introduction of the corporate secretary in corporate governance systems requires the development of methodological support for their activities.

In order to exchange experience, the Corporate Governance Code recommends the corporate secretary to maintain regular professional interaction with other corporate secretaries by participating in the professional association of corporate secretaries. For this purpose, the National Association of Corporate Secretaries (NACS) regularly conducts forums, webinars, conferences, Club meetings, and Professional Development Programs. To date, there has been a steady stream of people wishing to join the Association in order to get support and immerse themselves in a professional environment. In addition to clubs and master classes, various forms of experience exchange are actively being introduced, including expert support through the Internet resource, so that the members of the Association can get help, advice in the express mode. Moreover, experienced corporate secretaries, joining the Association, are happy to share their experience. NACS is going to place the library of such materials in Internet resources.

At first sight, based on the documents regulatingRussian companies' activity, the image of a corporate secretary is a sad combination of a secretary, notary officeand archivist. But in reality it is not true. A corporate secretary is a representative of top managementwith a wide range of powers and duties. Item 3.1. of the Corporate Governance Code indicates that effective corporate interaction with shareholders, coordination of the company's actions to protect the rights and interests of shareholders, and support for effective work of the board of directors are ensured by the corporate secretary [2].

Thus, the corporate secretary is an official who is called upon on a regular basis to maintain relations between shareholders, senior management and the board of directors, developing interaction within the corporate triangle. Thesecretary of the company acts as guarantor of compliance by the company's management of all procedural requirements that ensures the implementation of the legitimate rights and interests of shareholders.

The lack of such interaction leads to the fact that the joint-stock company gets involved into corporate conflicts and faces the need to pay fines, and its managers can be liable under administrative and criminal procedures, which entails a decrease in the capitalization of company. Therefore, the company secretary often acts asan adviser to the members of the board of directors and senior officials of the company on issues related to the requirements of regulatory bodies, listing rules and provisions oflegislation in the field of corporate governance. The importance of this position for the corporate governance system is emphasized by the fact that its functions relate to all blocks of corporate governance: shareholders' rights, management bodies, disclosure of information, social responsibility of the company, etc. In addition, the corporate secretary does a lot of work in the framework of compliance control.

In our opinion, all the functions of the corporate secretary reflected in the recommendations for the principles of corporate governance in the Corporate Governance Code can be classified according to the following criteria:

1. Organizational: doing preparatory work and conducting GMS (general meetings of shareholders); ensuring the work of the board of directors and its committees.
2. Information: ensuring the disclosure of information and storage of corporate documents; immediate notification of the Board of Directors about any breach of legislation, as well as internal standards of the company.
3. Corporate: ensuring interaction with shareholders and prevention of corporate conflicts; ensuring interaction with regulatory bodies, trade organizers, registering officers, other professional actors in securities market; contributing to the improvement of corporate governance.
4. Compliance control: implementing and monitoring procedures established by legislation and internal documents that guarantee the realization and protection of the rights and legitimate interests of shareholders; controlling over collegiate bodies activity; controlling over information disclosure; ensuring the improvement of corporate governance and corporate culture of the company.

All the functions of the corporate secretary can also be classified according to time reference. Based on this criterion we can single out two areas of corporate secretary's responsibility. The first concerns formalized activity and is related to a certain date (preparation for GMS or Board of Director's meetings, deadline of public information disclosure). The second is related to individual activity of the secretary: developing proposals for improving corporate governance practices in the company, preventing and resolving conflicts).

The corporate secretary often acts as a credited representative and adviser to the chairman of board of directors, the main shareholder, director and other key CEO of the company. He/she is a traditional mediator in resolving conflicts: administrative, with shareholders (minority shareholders), with foreign partners, with governmental and regulatory agencies. He is usually active in GR- and PR-events, represents the interests of the board of directors and executive management of the company in Russian and international public and professional organizations [19, c.41].

He is expected to be able to build trust-based and informal relations, establish a process of effective communications with top managers and professionals at different level, having various social status belonging to different national cultures.

The corporate secretary is a natural participant andinitiator of events aimed at introducing the procedures for evaluating the corporate governance in the company, the development of corporate culture with the formation of principles and values of the company. The corporate secretary contributes to the development and introducing into practice strategic documents such as vision, mission, goals, values, and Ethics Code.

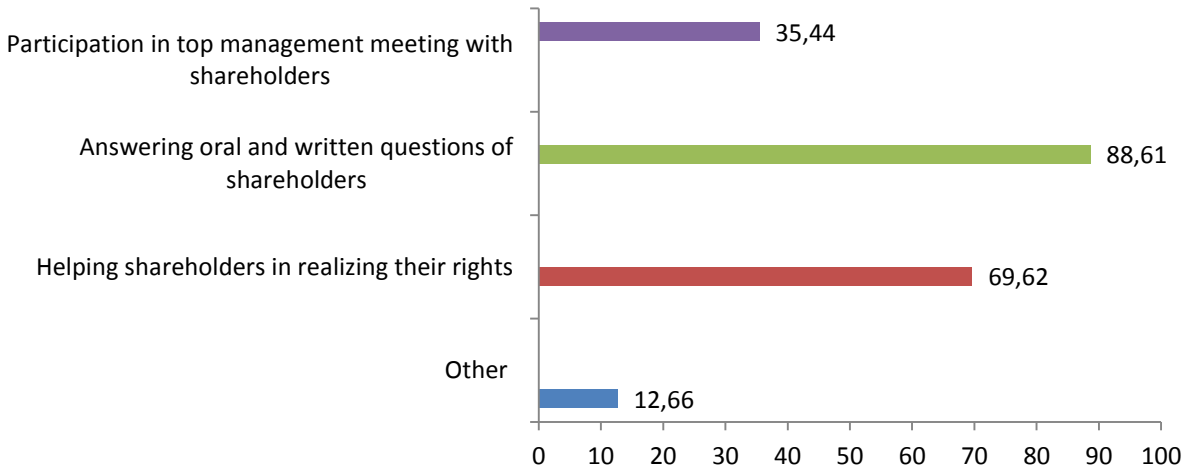
Thus, according to the survey of corporate secretaries (40 respondents) at the IX Forum of Corporate Secretaries, everyone answered that they fully or partially carry out all the functions of the corporate secretary mentioned in the Corporate Governance Code (Table 2) [18, p.65].

Table 2. - Corporate Secretary functions in Russian companies

Function	Fully in the secretary's responsibility	Partially in the secretary's responsibility	Not in the secretary's responsibility
Participation in the preparation and holding general meeting of shareholders	90	10	0
Ensuring the work of the board of directors and its committees	97.5	2.5	0
Participation in the implementation of the company's disclosure policy	75	20	5
Ensuring interaction with shareholders	75	20	5
Participation in the development of the company's corporate governance	82.5	17.5	0
Ensuring the interaction of the company with the regulator and professional players in the securities market	62.5	20	17.5

About 90% of the respondents are tasked with systematic counseling the board of directors members. As for the interaction of corporate secretaries with shareholders, the majority (88.61%) are involved in replying to oral and written questions of shareholders (Figure 4 [31, p.72]).

Fig.4. Key aspects of interaction with shareholders,%.



It should be noted that among companies that have a high corporate governance rating, there is a relative continuity of the functions performed by the corporate secretary. For example, PJSC "Sberbank", PJSC "Trans-Container", PJSC "ROSSETI", PJSC AK "ALROSA".

It is also worth mentioning that there is still no consensus within the Russian professional community regarding the limits of the competence of the corporate secretary. But specialists in corporate

governance on the basis of analysis of Russian and international practice identified three possible models of the corporate secretary:

- Secretary of the Board of Directors (mainly with administrative and technical functions);
- Director for Corporate Governance (carries out administrative functions, while organizing administrative and technical ones);
- The investment ombudsman of the corporation (designed to fulfill the role of an integrator in a business society).

  It should be noted that a number of corporate secretaries perform quite "non-standard" functions in companies:
- PJSC "ALROSA": ensuring the implementation of government directives; methodical guidance and coordination of the corporate secretaries activities of the group of companies;
- PJSC "Novolipetsk Steel": participation in the selection of candidates for the Board of Directors;
- PJSC "Polyus Zoloto": preparation of draft decisions for the Board of Directors;
- PJSC "Sberbank": participation in the procedure of liability insurance of members of management bodies and bank officials;
- PJSC "KAMAZ": building a corporate management system in the holding's subsidiaries, improving the management of the group, coordinating the work of the internal control and risk management system, managing the operation and developing the compliance system.

5 Conclusion

The advisability of evolution and introduction of the corporate secretary position in Russian companies of a corporation type is obvious. This is required by increasing influence of international investors, more pressure on the boards of directors and top managers on the part of shareholders and employees, and tightening norms of legislation. Based of the RID research, 51% of Russian companies have the position of a corporate secretary in their structure. The "portrait" of a Russian corporate secretary is as follows: the majority of corporate secretaries are women with a long enough work experience (their share among survey participants is 59%), education in 77% of cases meets the requirements of the Code of Corporate Governance: higher economic or legal (it is not uncommon for them to have two higher educations). In their own opinion, the most essential professional qualities in their work are organizational quality, communication skills and efficiency. Personal qualities - perseverance, independence, ability to win the trust of colleagues, stress resistance, ability to live in conditions of uncertainty and contradiction, the ability to obey several bosses and diplomacy.

Statistics data and the list of current problems indicate that the Russian Institute of Corporate Secretary has passed the stage of origin and demonstrates sustainable growth. This raises the problem of norms and regulations development in the sphere of corporate secretaries' activity, as well as the organizational structures improvement in the corporate governance system from the perspective of the emergence of a new coordinating center.

6 Acknowledgments.

This paper was financially supported by the Ministry of Education and Science of the Russian Federation on the program to improve the competitiveness of Peoples' Friendship University of Russia (RUDN University) among the world's leading research and education centers in the 2016-2020.

7 Bibliography:

[1] The Civil Code of the Russian Federation of November 30, 1994 No. 51-FZ (current version of 05/05/2014)

[2] Letter of the Bank of Russia of April 10, 2014 N 06-52 / 2463 [site]. URL: http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=162007&fld=134&dst=100009,0&rnd=0.6523617414273271#0 C.12. (date of access: 7/27/2017)
[3] Order of the Federal Agency for State Property Management (Rosimushchestvo) of March 27, 2014 N 94 "On approval of the Methodological recommendations on the organization of work of the corporate secretary in joint-stock companies partially owned by the government" dated September 19, 2017 - [Electronic resource]. Access mode: http://legalacts.ru/ (date of access: 10/16/2017
[4] "Regulations on the admission of securities to organized trades" (approved. by theBank of Russia on February 24, 2013 N 534-P) (as amended on June 19, 2017) (Registered in the Ministry of Justice of the Russian Federation on April 28, 2016 No. 41964)
[5] Instruction of the Federal Securities Commission of Russia of April 4, 2002 No. 421 / r "On recommendations for the application of the Code of Corporate Conduct" [site]. URL: http://base.garant.ru/12126459
[6] Instruction No. 3899-U of the Bank of Russia of December 16, 2015 "On Amendments to Bank of Russia Regulation No. 454-P of December 30, 2014 "On Disclosing Information by Securities Issuers ". [site]. URL: http://rid.ru/wp-content/uploads/2016/05/2015_И-РИД-2004-2014-итог.pdf (date of access 5.02.2017).
[7] Belikova, I.V. How to improve the effectiveness of the board of directors' work: recommendations to council members / I.V.Belikov // Joint-stock company: corporate governance issues. 2015. - № 4. - p.p. 68-80.
[8] Belikova, I.V. The Board of Directors - a key resource for the company's efficiency and sustainability / I.V.Belikov // Joint Stock Company: Corporate Governance Issues. – 2014. - №1.- p.p. 56-61.
[9] Verbitskiy, V.K. From ideal to real: what companies really need from corporate governance best practices. – Moscow: Alpina Publisher, 2015 - 216 p.p.
[10] Verbitskiy, V.K. Corporate governance in medium-sized Russian non-public companies: other corporate governance / V.K. Verbitsky // Joint Stock Company: Issues of Corporate Governance. – 2016. No.12. - p.p. 56-64.
[11] Volkov, O.Yu. Information technologies in corporate governance: implementation practice / O.Yu. Volkov // Joint Stock Company: Issues of Corporate Governance. – 2017. - p.p. 31-38.
[12] .CMPO did not disclose the "golden parachutes" of Oboronenergosbyt [site]. URL: Http://www.bfm.ru/news/215060 (date of access: 11/10/2016)
[13] Danilova, S.A. Corporate Secretary Interaction with Internal Audit Service: Sibur Practice/ S.A. Danilova // Joint Stock Company: Issues of Corporate Governance. – 2016. - № 6. P.p. 50-58.
[14] Dementieva, A.G. Corporative Governance: Textbook / A.G. Dementieva - Moscow Magistr INFRA-M, 2017.- 496 p. (MA Department)
[15] The study of corporate governance practices in Russia: a comparative analysis for 2004-2014. [site]. URL: http://rid.ru/wp-content/uploads/2016/05/2015_И-РИД-2004-2014-итог.pdf (date of access 5.02.2017).
[16] RID Research of corporate governance practices in Russia, 2008-2013 [site]. URL: http://rid.ru/wp-content/uploads/2016/05/2015_И-РИД-2004-2014-итог.pdf (date of access 5.02.2017).
[17] How the institute of corporate secretaries of Russian companies develops? (The material was prepared by the employees of the NACS) // Joint-Stock Company: Corporate Governance. – 2013. - p.p. 4-14
[18] How does the institution of the corporate secretary develop in Russian companies? The material was prepared by the staff of the NACS) // Joint-Stock Company: Issues of Corporate Governance. – 2015. No.12 - p.p. 64-69.
[19] Kuprienko, V.N. Notes of the Corporate Secretary / V.N. Kuprienko // Joint Stock Company: Issues of Corporate Governance. – 2017. No.7 p.p. 39 -48.
[20] Corporate Governance in Russia: Today and Tomorrow // Joint Stock Company: Issues of Corporate Governance. – 2016. No.8 – p.p.40-46

[21] Merkulova, O.V. Corporate Secretary in the UK / O.V. Merkulova // Joint Stock Company: Issues of Corporate Governance – 2014.- № 11. p.p. 49 -53.
[22] Osipenko, O.V. Corporate conflicts: new phenomena / O.V. Osipenko // Joint Stock Company: Issues of Corporate Governance. – 2015. - № 6. - p.p. 51-57.
[23] Panasenko, E. YU. Specific features of the corporate secretary development with independent directors / E.Yu. Panasenko // Joint Stock Company: Issues of Corporate Governance. - 2013.- №12. - p.p. 44-60.
[24] Rozanov, I. International approaches to improving the activities of the boards of directors / I.Rozanov // The securities market. -2014. №1. - p.p. 63-64.
[25] The material was prepared by the staff of the NACS) // Joint-Stock Company: Issues of Corporate Governance. – 2012. No.12. - p.p. 62-64.
[26] Savinov, S.V. Corporate culture: not for a sake of formality but for profit / S.V. Savinov // Joint Stock Company: Issues of Corporate Governance. – 2015. - №1.- p.p. 78-87.
[27] Semenov, A.S. Corporate secretary and evolution of corporate governance practices in the company / A.S. Semenov // Joint Stock Company: Issues of Corporate Governance. – 2013. - №11.- p.p. 4-9.
[28] Semenov, A.S. A new Code of Corporate Governance in Russia,/ A.S. Semenov // Joint Stock Company: Issues of Corporate Governance. – 2014. - №6 (121). - p.p. 55 – 60.
[29] Semenov, A.S., Shvyrkov, O.G. Trends in the institution of corporate secretaries development/ A.S. Semenov, O.G. Shvyrkov // Joint Stock Company: Issues of Corporate Governance. – 2016. No.9 - p.p. 65-74.
[30] Semenov, A.S. Instruments of the Corporate Secretary / A.C. Semenov // Joint Stock Company: Issues of Corporate Governance. – 2012. No.7 - p.p. 4-12
[31] Tepman, L.N. Corporate Governance: Textbook. A training manual for students studying in the areas of economics and management. – Moscow: UNITY-DANA, 2009.
[32] Haliullina, Zh.E. Institute of Corporate Secretary in PJSC "KAMAZ" / Zh.E. Haliullina, Zh.E. // Joint Stock Company: Issues of Corporate Governance. – 2016. No.1 - p.p. 48-51.
[33] Tsvetkov, O.Yu. NACS expands the corporate space / O.Yu. Tsvetkov // Joint Stock Company: Issues of Corporate Governance. - 2017.- №6. - p.p.6-9.
[34] Shvyrkov, O.G. Tendencies and problems in the work of the boards of directors in Russian and foreign companies / O.G. Shvyrkov // Joint Stock Company: Issues of Corporate Governance. - 2014. No.12. - p.p. 28-40.
[35] Shvyrkov, O.G. Corporate governance as a tool for increasing the investment attractiveness of companies / O.G. Shvyrkov // Joint Stock Company: Issues of Corporate Governance. – 2013. No.10 - p.p. 4-9
[36] Williamson, O.E. The Mechanism of Governance. New York: – Oxford University Press, 1996. p. 11.
[37] Idowu, S.O. Professionals' perspectives of corporate social responsibility/ S.O. Idowu. – 2009. – P. 49 -69. - [Electronic resource] - Access mode: http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=F6AhBOqilbtWgWxUMZu&page=5&doc=43&cacheurlFromRightClick=no (date of access: 12/15/2017
[38] Zhou, K.G. Proceedings of the 5th international symposium for corporate governance, books 1 and 2 / K.G. Zhou, ; T. Li, Y.Zhang. - 5th International Symposium for Corporate Governance. – 2009. - P. - [Electronic resource] - Access mode: http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=F6AhBOqilbtWgWxUMZu&page=5&doc=42&cacheurlFromRightClick=no (date of access: 12/15/2017

[39] McNulty, T. Developing the Governance Space: a Study of the Role and Potential of the Company Secretary in and around the Board of Directors / T. McNulty/ A. Stewart // Organization studies. – 2015. - Vol. 36. issue: 4. p.p. 513 -535. - [Electronic resource] - Access mode:
[40] Monteiro, C. The executive secretarial professional and environmental responsibility: the importance of the executive assistance / C. Monteiro, Q.C. Cecatto, D.DO. Gardin // Revista de gestao e secretariado-gesec. - MAY-AUG 2015. - Vol. 6. issue: 2. p.p. 134 -157.
[41] Muller, R / Executive secretariat professional profile in contemporary management environment: evidences from new workers in the labour market in the city of curitiba - Brazil, and corporate demands / V.S. de Oliveira, E. Cegan // Revista de gestao e secretariado-gesec. - SEP-DEC 2015. - Vol. 6. issue 3. p.p. 129 -151.

EXAMINING OF THE LEADERSHIP STYLES ACCORDING TO EMPLOYEE'S SATISFACTION

Nikoleta Nagyová, Péter Karácsony, Norbert Gyurián
J. Selye University, Faculty of Economics, Slovakia
nikoleta.nagyova@student.ujs.sk, karacsonyp@ujs.sk, gyuriann@ujs.sk

Abstract:

Leadership is a personal relationship in which one person leads, organizes and supervises other in the performance of organizational goals. Nowadays, the global business context is becoming more complex, complicated and changing more rapidly and dramatically than ever before, which presents leaders and employees with a multitude of challenges and opportunities. Leadership effectiveness is considered as one of the most vital parts in reaching the success of business in such a dynamic market competition. Organizations with poorly developed leadership have difficulties managing with the changes in the environment, they respond reactively and eventually, not being able to counteract the negative effects.
Leadership is progressively becoming the main focus for business alike and is the key issue facing modern organizations. Without effective leadership, the capability of a company to achieve a competitive advantage is far-fetched. This study is investigated the effect of leadership style on the organizational competitiveness. The leadership style of top management indicates their predisposition in managerial behaviors and actions, and is therefore an essential ingredient in the mix of factors that influence an organization's success (Changanti et al., 2002).

Key words:

Leadership, competitiveness, companies, management, organization

JEL: M12, M21

1 Introduction

Leadership and management are often considered practically equal concepts, which causing a lot of problems in the theory of management. Some authors are of the opinion that management is superior to leadership, and leadership is only one of the managerial roles, but most of the authors agree that leadership and management are interconnected and they complement each other in the organization, both leadership and management contribute to achieving organizational goals

A well balanced organization should have a mix of leaders and managers to succeed, and in fact what they really need is a few great leaders and many first-class managers [15].

Managers are the people to whom this management task is assigned, and it is generally thought that they achieve the desired goals through the key functions of planning and budgeting, organizing and staffing, problem solving and controlling. Leaders on the other hand set a direction, align people, motivate and inspire [13].

The “Leaders are individuals who establish direction for a working group of individuals and who gain commitment from this group of members to established direction and who then motivate members to achieve the direction’s outcomes” [8].

According to Northouse (2007) leadership as a process means that, as mentioned earlier, it is not a characteristic someone is born with, it is an interaction between leaders and their followers. The leaders influence and are influenced by their followers (a group). Leadership is available to everyone; it is not limited to the person in power. Today, leadership is extremely important for future prospects of modern

companies. Majority of authors in the field of management define leadership as one of the most important factors for determining organizational success [19;21].

The concept of leadership has been addressed by different theories. The great man theory of leadership was a popular 19th-century. This concept is based on the belief that great leaders are not made but born with unique characteristics [3].

While the Traits Approach took into account the personality of the leader, the Leadership Skills Approach takes into account the knowledge and abilities that the leader has. In the model proposed by Katz titled "Skills of an Effective Administrator" [12].

In 1939, a group of researchers led by psychologist Kurt Lewin set out to identify different styles of leadership. This early study was very influential and established three major leadership styles: authoritarian, democratic and laissez-fair leader [16]. Lewin and his colleagues examined the impact of different leadership styles on children's aggressive behavior. The focus was on how leaders influenced followers and directed group activities. Autocratic leaders make decisions them. They do not consult their followers, or involve them in the decision-making process. Democratic leaders take an active role in the decision making process but they involve others too. Despite the term "democratic" they don't necessarily put decisions to the vote. Laissez-faire leaders have very little involvement in decisions making themselves, pretty much leaving matters to their followers. This might be OK when the followers are capable and motivated but can create problems otherwise.

The rise of behaviorism to the dominant view in psychology guided leadership research during the 1940s and 1950s toward the study of leader behaviors. In 1945 the Ohio State University attempted to identify various dimensions of leader behavior. The researchers defining leadership as the behavior of an individual when directing the activities of a group towards goal. According to the findings of these studies, leaders exhibit two types of behaviors: people-oriented (consideration) and task oriented (initiating structure), to facilitate goal accomplishment [11].

Focus returned to the issue of leadership styles in the late 1950s and 1960s, as researchers began considering the effectiveness of various combinations of task-oriented and people-oriented behaviors. In this period the most important leadership model was Managerial Grid. "Grid" was originally developed by Robert Blake and Jane Mouton between 1958 and 1960 [4]. The late 1950s and early 1960s bore witness to the growth of a humanistic movement in psychology, which emphasized the personal growth and self-actualization needs of individuals. Definitive of this era was McGregor's (1960) popular Theory X and Theory Y models of leadership. In his book The Human Side of Enterprise, he talked about two theories called Theory X and Theory Y. McGregor identified an approach of creating an environment within which employees are motivated via authoritative, direction and control or integration and self-control [18].

Likert's system of management was an important contribution to the research and application of leadership theory and motivation. Like the foundational University of Michigan Studies, a continuum was developed from autocratic to participative [17].

According Tannenbaum and Schmidt (1958) the leader's actions to the degree of authority used by him and the amount of freedom available to his subordinates. The leader's actions described on the left characterize the manager who maintains a high degree of control, while those on the right describe a manager who delegates authority.

Situational leadership is built upon the contingency theory, and refined by Ken Blanchard in the 1980s. Leadership is composed of both a directive and supportive dimension. Hersey and Blanchard's (1969) situational leadership theory extended Blake and Mouton's managerial grid approach by incorporating the group's maturity level as a situational variable. Hersey and Blanchard developed four leadership quadrants (called quadrants 1 through 4): "telling," "selling," "participating," "delegating" [10].

Another situational approach to leadership is action-centered leadership, made famous by John Adair. Adair (1973) suggests that leaders need to be attentive to task needs, group needs and individual needs. However, the leader may need to vary the degree of emphasis given to each of the three components in response to the situation at any point in time [1].

Path-goal theory, originally developed by Evans (1970) was designed to identify a leader's most practiced style as a motivation to get subordinates to accomplish goals. The Path-goal theory is a leadership theory that advocates motivating subordinates through the accomplishment of goals. The Path-goal theory emphasizes relationships between the leader's style and the characteristics of the subordinates and work setting [9].

Vroom and Yetton (1973) developed what became known as the Vroom-Yetton Model. This model states that there is a variety of ways to make decisions and that a manager should choose the way that is most appropriate given the nature of the problem to be solved and the context in which the decision is to be made [20].

Until 1978, the focus of the mainstream literature was leadership at lower levels, which was amenable to small group and experimental methods and simplified variable models, while executive leadership and the more amorphous abilities to induce dramatic change were largely ignored. Burns (1978) describe two different words to make a distinction between "ordinary" and "extraordinary" leadership i.e. transactional and transformational leadership [6].

The new leadership theories focus on charismatic, transformational and visionary leadership. These theories emphasis the interpersonal processes between leader and followers [5]. A second recent approach to leadership examines the phenomenon through social network theory. Balkundi and Kilduff (2006) discussed the idea that a leader's cognitive representation of the patterns of relationships within various networks (e.g., ego, organizational, and inter-organizational) is the starting point for the way that the leader initiates and maintains social ties, which in turn influences their leadership effectiveness [2].

2 Methods

This study is about the analysis of the management style depending on employee satisfaction. In our research, we examined the management style of the companies (SMEs). After we established the proper background from the relevant literature we continued the research process with the selection of the target group and the method used for the project. To obtain our data, we chose a quantitative research form, more precisely questionnaire.

Our questions focus on the leadership style, organizational atmosphere, and their relationship to motivational tools. The questionnaire on workplace attitude was used to find whether there was a relationship between employee satisfaction, and leadership/performance in relation to the efficiency of the organization.

The questionnaire for examining workplace attitudes contained 28 questions. The questionnaire contained both closed and open questions as well as Likert-scale questions.

The participants received the questionnaire in form of paper. At some organizations for collecting data we selected the method of self-fulfilling questionnaire. This survey was carried out in August 2017. 250 questionnaires were successfully completed, which results will be analyzed in this study. The evaluation of the research, was analyzed by the IBM SPSS Statistics product family, for the statistical calculations we used the version 25 of SPSS software.

Applied statistical methods

Our research was supported by different statistical calculations. Basic, but more important information was provided us ***by frequency testing, averages and values.*** In addition to this method, we performed correlation calculations and cross-table analysis. ***Correlation*** is used to measure the strength of the linear relationship between two variables. The value of correlation minimum -1 and maximum 1. If the value of the correlation coefficient is 1, then the relationship between the two variables is perfectly straightforward. If it is 0, there is no connection between the two variables, they are independent If the value is -1, then the two variables are also perfectly consistent, but the relationship is inversely proportional. If the two variables are in normal dispersion, then only linear relationship can be imagined, if there is no linear relationship between them, they are independent of each other. Correlation means

mutual relationship. Correlation can be used to examine the tightness and the intensity of the relationship between the variables.

Crosstabs can be used to examine the relationship between two nonparametric (at least nominal) variables. The results are providing us information about the relationship between the two variables. Cross-table analysis also examines the correlation between two or more variables, and their combined frequency distribution.

With this analysis we try to find out whether two nominal or ordinal variables are related to each other. The Crosstabs method offers tests for independence, as well as associative and matching measurements for nominal and ordinal data. In addition, we can estimate the relative chance (risk) of an event, in case of a certain circumstance being present or missing.

3 Paper results

In the following part of the study we will present the main statistical calculations, which are needed to analyze the results. For our first calculation using the method of correlation, the following two variables were taken into consideration:

- is the employee aware of the goals of the organization,
- in what position do you work at the organization

The reason why we chose these two variables, is that the society our own assumptions include the idea that employees in senior positions are better informed, and they do not pay attention informing lower-level employees. Often this can be one of the biggest mistake in a leadership. The information flow extends to the everyday life of companies, and greatly influences efficiency of the organizations. Our assumption was examined in the following table:

Table 1: Position vs. Organization goals

		In what position do you work at the organization?	Is the employee aware of the goals of the organization?
In what position do you work at the organization?	Pearson Correlation	1	,129*
	Sig. (2-tailed)		,042
	Covariance	,135	,013
	N	250	250
Is the employee aware of the goals of the organization?	Pearson Correlation	,129*	1
	Sig. (2-tailed)	,042	
	Sum of Squares and Cross-products	3,200	18,400
	Covariance	,013	,074
	N	250	250

*. Correlation is significant at the 0.05 level (2-tailed).

Based on our correlation analysis, we can say that there is a weak connection between our two variables (our assumption is that ***the employees in higher positions are more informed than employees in lower positions)*** r=0.129. We can state that the position occupied in the workplace does not affect the level of knowledge and the flow of information. In that case, our assumption proved to be incorrect, but there is a relationship between the two variables, but not as a correlation. Because our previous assumption was incorrect, we were curious about the correctness of our next assumption, which is the following: ***which employee likes to work at his current workplace, is satisfied with the***

atmosphere at his workplace (so the organizational culture and leadership are positive). The validity or incorrectness of our assumption is examined by the following two variables:

- The employee likes to work at his workplace
- The employee is satisfied with the workplace atmosphere

Table 2: Likes to work at workplace vs. satisfaction

		The employee likes to work at his workplace	The employee is satisfied with the workplace atmosphere
The employee likes to work at his workplace	Pearson Correlation	1	-,852**
	Sig. (2-tailed)		,000
	Covariance	,540	-,652
	N	250	250
The employee is satisfied with the workplace atmosphere	Pearson Correlation	-,852**	1
	Sig. (2-tailed)	,000	
	Sum of Squares and Cross-products	-162,400	270,400
	Covariance	-,652	1,086
	N	250	250

**. Correlation is significant at the 0.01 level (2-tailed).

When examining the correlation of these two variables, the value of **-0.852** was obtained. From this we can conclude that there is a strong, negative relationship between the two variables. So, in this case, our assumption has been proven. There is a strong correlation between love towards the workplace and good workplace atmosphere. Furthermore, we have found that the two variables are significant at a significance level of 0.01.

Our next analysis includes the following two variables: the relationship with the manager and the satisfaction of the employee. In this case we use cross-table analysis

Table 3: The relationship with the manager and the satisfaction of the employee

		Satisfaction of the employee with leadership style					
.		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
The relationship with the manager	Poor	**18**	1	1	1	11	32
	Fair	1	1	1	2	10	15
	Average	0	18	0	1	1	20
	Good	0	0	19	27	30	76
	Excellent	2	0	18	27	**60**	107
Total		21	20	39	58	112	250

From the cross-table analysis (most peaking value), an employee who is satisfied with the leadership style is fully in a good relationship with his manager. In the other hand, an employee who is not happy with the leadership style usually does not have a good relationship with his manager.

Finally, we describe the complex level of satisfaction of all employees in the management style of their companies:

Table 4: The complex level of satisfaction of all employees in the management style of their companies

		Frequency	Percent
Valid	Strongly Disagree	15	6
	Disagree	21	8,4
	Average	42	16,8
	Agree	69	27,6
	Strongly Agree	103	41,2
	Total	250	100,0
Total		250	100,0

The data on the satisfaction of the management style were illustrated in the previous table. Based on this data, 41.2% of our respondents were fully satisfied with the company's leader, while 27.6% of them were mostly satisfied. From another point of view, 6% of the respondents are totally dissatisfied and 8.4% are usually dissatisfied with their leader. Summing up the results, the companies surveyed showed positive results, with most of the employees are satisfied with their leadership style. Taking into consideration the results of our management style question group, we can conclude that the managers of the companies surveyed use mostly the democratic leadership style. Among the motivational tools, the first three places (according to the application of the companies) were the training, the professional promotion opportunities and the team building events. Financial motivation occupied the fourth place, followed by verbal recognition. The following table illustrates the distribution of all motivational tools:

Table 5: Motivational tools

		Frequency	Percent
Valid	financial motivation	24	9,6
	benefits	21	8,4
	professional promotion opportunities	29	11,6
	challenging tasks	13	5,2
	continuous feedback	18	7,2
	training	29	11,6
	motivational competitions	17	6,8
	team building events	28	11,2
	freedom of working hands	15	6
	verbal praise	23	9,2
	care for the employees	17	6,8
	other	16	6,4
	Total	250	100,0
Total		250	100,0

4 Discussion

Summarizing our own results we can say that in case of our examined SMEs the position occupied in the workplace does not affect the level of information flow and knowledge. There is a strong connection between love towards workplace and good workplace atmosphere. An employee who is satisfied with the leadership style is fully in a good relationship with his manager. In contrast, an employee who is not satisfied with the leadership style usually does not have a good relationship with his manager. Based on our data on satisfaction with the management style, we found that 41.2% of our respondents were fully satisfied with the company's leader, while 27.6% were mostly satisfied. From another point of view, 6% of the respondents are totally dissatisfied and 8.4% are usually dissatisfied with their leader. Among the most common used motivational tools the first three places were training, professional promotion opportunities and team building events.

5 Bibliography

[1] Adair, J.E. (1973): "Action Centred Leadership". McGraw-Hill, London.

[2] Balkundi, P., Kilduff, M. (2006): The ties that lead: A social network approach to leadership. The Leadership Quarterly, 17(4). pp. 419-439.

[3] Bass, B. M. (1994): Transformational leadership and team and organizational decision making. In B. Bass and B. Avolio (Eds.). Improving organizational effectiveness through transformational leadership. California: Sage Publishers

[4] Blake, R., Mouton, J. S., Barnes, B. L., Greiner, E. L. (1964): “Breakthrough in Organization Development,” Harvard Business Review, 42 (6), pp. 133-155.

[5] Boal, K. B., Hooijberg, R. (2000): Strategic leadership research. The Leadership Quarterly, 11(4), pp. 515–549.

[6] Burns, J. (1978): Leadership. New York: Harper and Row, USA

[7] Chaganti, R., Cook, R. G., Smeltz, W. J. (2002): Effect of styles, strategies and systems on the growth of small businesses. Journal of Developmental Entrepreneurship, 7(2).pp. 45-52.

[8] Conger, J.A, (1992): "Reflections on Leadership and Spirit", Conference on Leadership and Spirit, Boston, pp. 5-20.

[9] Evans, M. G. (1970): "The effects of supervisory behavior on the path-goal relationship". Organizational Behavior and Human Performance. 5. pp. 277–298.

[10] Hersey, P., Blanchard, K. (1969): Great ideas revisited: Revisiting the lifecycle theory of leadership. Training & Development, 50(1), pp. 42-48.

[11] Judge, T. A., Piccolo, R. F., Ilies, R. (2004): The Forgotten Ones? The Validity of Consideration and Initiating Structure in Leadership Research. Journal of Applied Psychology, 89(1), pp. 36–51.

[12] Katz, R.L. (1991): Skills of an effective administer. Business classic fifteen key concepts for managerial success. Harvard Business Review.

[13] Kotter, J. P. (1991): A Force for Change: How Leadership Differs from Management? Harvard Business Review. pp. 54-63.

[14] Kotter, J. P., (2001): “What leaders really do?“ Harvard Business Review, 79.(11) pp. 85-96.

[15] Kotterman, J., (2006): “Leadership vs. Management: What’s the difference?” Journal for Quality & Participation, 29(2), pp.13-17.

[16] Lewin, K., Lippitt, R., White, R. K. (1939): Patterns of aggressive behavior in experimentally created “social climates.” Journal of Social Psychology, 10(2), pp. 269–299.

[17] Likert, R. (1961): New patterns of management. McGraw-Hill. USA

[18] McGregor, D. (1960): “The Human Side of Enterprise”, McGraw-Hill, USA

[19] Northouse, P. G. (2007): Leadership Theory and Practice. London: Sage Publications.

[20] Vroom, V.H., Yetton, P.W. (1973): Leadership and decision-making. Pittsburgh, Pennsylvania: University of Pittsburgh Press.

[21] Yukl, G., (1999): An Evaluative Essay on Current Conceptions of Effective Leadership. European Journal of Work and Organizational Psychology, 8(1), pp. 33–48.

FINANCIAL HEALTH AND APPLICATION OF USING EVA INDICATORS IN THE PAPER INDUSTRY

Eva Sikorová[1] / Zuzana Stefanovová/ Vlasta Humlová
[1]Moravian University College Olomouc, Department of Business Economics
eva.sikorova@mvso.cz
zuzana.stefanovova@mvso.cz
vlasta.humlova@mvso.cz

Abstract:

The article determines the importance of financial analysis, financial health, individual financial indicators and their performance, but also points to the ways of their research and measurement. The article also addresses the use of economic value added in business management. It also applies the indicators of liquidity, profitability, activity and stability in the years 2012 to 2016, including the performance of the CZ-NACE 21 branch in the graphs and the IN95 index, in specific conditions of the business entity. The financial analysis is based on an economic assessment of a business entity based on accounting statements. Regular analysis is beneficial for large, medium and small business entities, as it can outline early on in the areas of business, especially financial problems. At the same time, the importance of financial analysis in terms of anticipated development in the near and far future can not be overlooked.
The aim of the article is to affort the deficiencies of individual models and existed future solutions by the help of the including of knowledge for foreign colleagues and moving for ahead from of the stages with multiple discriminatory analyzes to other levels, such as neural networks, fuzzy models, and other models of intercompany comparison.

Key words:

Financial indicators, financial health, EVA indicator, small and medium enterprises, CZ-NACE financial statement, Du Pont diagram

JEL: H3, M2, L2

1 Introduction

When evaluating the performance of an enterprise, it has a key place to measure financial returns. To analyze financial health or financial distress, methods of financial analysis are used to identify weaknesses that could cause small or larger problems in the future, and to determine its strengths.
In fact, two basic approaches to financial analysis can be distinguished. An approach that is geared to the needs of external users of accounting information is referred to as the "Anglo-Saxon". This approach is most commonly used in the Czech Republic. Another approach, which is very little used in the Czech Republic, is to focus on intercompany comparisons of the economic performance of enterprises. This method is mainly used in France to assess the creditworthiness of businesses.
All businesses try to survive and achieve the best economic results, ie to maximize the difference between their revenues and costs. If there is an unfavorable development of cash flows in a business, its very existence may be jeopardized.

In this context, we deal with **three key hypotheses**:

H1 In the period under review, the company under investigation achieved a positive economic performance and reached a significant position in the inter-company comparison with its main competitors.

H2 The company creates business value for its owner in the form of economic added value.

H3 The company has the presumption of maintaining its market position, to increase its market position.

According to Synek, the process of financial health and performance analysis is a total of 6 steps. They are:

- calculation of the indicators for the monitored enterprise,
- comparison of indicators with industry averages (comparative analysis),
- evaluation of indicators over time (trend analysis evaluating,
- the interrelationship between indicators (for example, a pyramid set of indicators),
- evaluation of other indicators (eg MVA, EVA),
- proposal for measures (the analysis reveals the weak and strong points of the company's economy and serves as a basis for financial management and planning, or for forecasting).

The sources of information for external and internal analysis are primarily financial accounting statements (balance sheet and profit and loss account, or cash flow statement). According to Mrkvička and Kolář, the financial statements are generally reclassified as a rule for the easier identification of entries into individual indicators.Asset items in the balance sheet are liquidated, from the most liquid items (cash) to the least liquid (fixed assets). On the liabilities side, they are aligned similarly.

2 Methods

The article used basic research methods, such as the method of analysis, synthesis, comparison and the method of abstraction. It is also widely used theoretical scientific method of deduction. The method allows the deduction proceeded from general findings, conclusions and assertions to the courts special, unique events and so deduce necessary conclusions.

Within financial analysis, there are a number of methods that can be applied. Růčková, when choosing methods of financial analysis, it is necessary to ensure their adequacy in terms of efficiency, cost and reliability. There are two approaches to the evaluation of economic processes: fundamental analysis and technical analysis. Reese in Financial Analysis understands technical analysis as a sum of specific methodological tools based mainly on mathematical procedures, while fundamental analysis is based on the knowledge of the interrelationships between economic and non-economic processes. The resulting evaluation of economic processes is then realized by a combination of both approaches. The financial analysis uses in principle two groups of methods - elementary methods (analyzes of absolute indicators, differential flow means, proportional indicators of parallel and pyramidal analysis of ratios) and higher methods (mathematical and statistical methods and non-statistical methods).

However, according to Kislingerové, when evaluating the performance of an enterprise, we do not, in most situations, be able to quantify the indicators of the company being analyzed, but it is necessary to compare the situation and the development in some way with the environment in which the enterprise is located. The option is several and the appropriate choice of procedure always depends on the purpose of the analysis. The most common procedures include business comparison with industry-wide development defined by standard production classification (NACE). However, we can only state on what individual criteria the development of a business differs from the sector and that the undertaking under examination is generally better or worse than the sector according to a certain criterion. If we want to get information on the status of an enterprise in terms of multiple criteria at the same time, it is appropriate to apply the chosen intercompany benchmarking method.

In fact, several intercompany benchmarking methods can be used. Since each of them has its exits and disadvantages, the chosen method must suit both the selection of the companies in the group and

the choice of the criteria to be compared. In the practical analysis of the intercompany comparison, a simple scoring method is used.

Conversely, vertical analysis, a percentage or structural analysis, consists of expressing individual items of financial statements as a percentage of one chosen base as 100%. For analysis of the balance sheet, the total amount of assets (liabilities) is selected as the basis, for the analysis of the profit and loss statement the total amount of the total income. If the structure is then calculated over a number of consecutive periods, it is obvious to what movements it occurs in the setting of the asset base or the capital structure.The financial statements show the absolute values of each item. To analyze the interrelationships and the relationships between the indicators, these absolute values are given in mutual relations. The analysis of financial statements using ratios is generally used and universal. In the case of a parallel arrangement, all indicators have the same meaning and are arranged only according to the basic content consistency of the phenomenon described. In the parallel set of indicators that belong to the so-called traditional indicators used to measure the financial performance of enterprises, the following basic groups of indicators can be found: liquidity, profitability, activity, indebtedness and financial stability, cash flow and capital market indicators.

The Pyramid Decomposition summarizes briefly and clearly several features of the financial health of the company as determined by analyzing ratios, and at the same time it makes it possible to determine the interrelationship between the liquidity, the financial structure and the profitability of the company. The most well-known method of using pyramid ratios is the so-called Du Pont diagram, which depicts the return on equity (ROE) of the profit margin, the turnover of total assets and the ratio of total assets to equity.

3 Paper results

The essence of the complex characteristics of the company's financial health
The essence of financial analysis is not only to assess the financial situation from the point of view of past and current development, but especially of the future development, based on complex characteristics, concentrated in a single coefficient or index. Existing models can be divided into two groups.
(a) **creditworthy models** that respond to the question of whether an enterprise is good or bad. These models include Balance Analysis I, II, III, Tomas model, Kralick Quicktest and Argentino model, b) **bankruptcy models** that answer to the question of whether an enterprise is defrauding over time. They are based on real data, including the Altman model, the IN95 Index of Trust, the Taffler model. Both sets of models are based on the assumption that there are some developmental differences in the enterprise a few years before bankruptcy, which is typical for businesses at risk of bankruptcy.In the practical analysis of the company, the models applicable in the Czech Republic are used (Douch's analysis II and the IN95 Index of Trust). Another criterion for selecting models is the ability to fill them with sufficient data to be objectively interpreted.
It is a set of 17 indicators, four sub-indicators (stability, activity, profitability and liquidity) and one overall indicator. These indicators have a different weight in the overall rating according to this model. The biggest weight has the indicators of profitability, the lowest weight on the contrary activity indicators. The model can also be used where information needs to be quick but relevant.Increasing value means an improving state in an enterprise. Value > 1 is considered good, the value in the range of 0.5 - 1 is the result in the gray zone. For these companies, it is not possible to clearly determine its further developments in terms of finance. The value of <0.5 may mean a deteriorating financial situation for the company because it is difficult for it to obtain additional sources of funding.
The "IN95" credibility index respects Czech specific conditions, and therefore good predictive value can be expected. Another indisputable advantage is the fact that it respects the conditions of each sector through V1 - V6 weights.

Formula: *Credibility Index "IN95"*

$$IN = V1 * x1 + V2 * x2 + V3 * x3 + V4 * x4 + V5 * x5 - V6 * x6 \qquad (F\ 1)$$

where x1 = total assets / foreign sources; x2 = earnings before interest and taxes (EBIT) / interest expense; x3 = earnings before interest and taxes (EBIT) / total assets; x4 = total returns / assets; x5 = current assets / (short-term liabilities + short-term bank loans) and x6 = overdue liabilities / income.

The overall index, for example, for the paper and printing industry is (after including weights):

$$IN = 0.23\,x1 + 0.11\,x2 + 6.07\,x3 + 0.44\,x4 + 0.10\,x5 - 16.99\,x6 \qquad (F\ 2)$$

If the index value is greater than 2, the business has good financial health. An index value of between 1 and 2 is an enterprise for which the financial position can not be uniquely determined and an index value less than 1 indicates an enterprise in financial distress.

Modern methods of evaluating company performance

According to the authors of Mařík and Maříková, unlike traditional indicators, which mainly rely on the information of the financial statements and do not take into account the time value of money and risk, the concept of so-called opportunistic costs is introduced into performance measurement and it is working with the operating profit.These value criteria include, in particular, EVA, CF Return on Investment (RO ROI), Net Asset Value (RONA), and CF Gross Assets Profitability (CROGA). Their practical use is constantly expanding.

EVA - Economic Value Added

The purpose of the indicator is to determine the so-called economic profit, which is the difference between the revenues and the economic costs, ie the costs which, in addition to the accounting costs, include the so-called opportunity costs (or the cost of missed opportunities). If EVA is positive, it means that the company's revenues covered the investors' (owners' and creditors') rewards for the risk incurred, and a new value was created. The value of the economic value added ***is based on this calculation:***

EVA = NOPAT - C × WACC / Economic added value

NOPAT (Net Operating Profit after Taxes) represents the net operating or operating profit after tax, respectively profit from operating activities of the enterprise. It can not be identified with the operating result of operations under Czech law, as it may also include part of the financial result.In the calculation, the profit or loss from the ordinary activity or operating result can be taken as the basis for adjusting the items to ensure consistency between NOPAT and C. Another option is to come out of revenues and adjust them to items that constitute operational activities. All three ways must lead to the same result.

NOPAT = EBIT × (1 - t)

where t - corporate tax rate and EBIT - profit before deducting interest and taxes.

C is tied-up capital that serves the operating activities of an enterprise, ie the assets needed for the core business. Operational activity (or operational) is a business activity that serves the basic business purpose. Non-operating (non-operating) activities include, for example, investing temporarily free money in securities or trading in loose land at a manufacturing enterprise. It is always necessary to maintain the link between the operational (operational) assets and the result of the operating (operating) business.

WACC (Weighted Average Cost of Capital) is the weighted average cost of capital. It is an economic variable representing the average price (expressed in interest rate) that an enterprise must pay for the use of its own capital. Weights are the shares of the individual components in the capital structure of the enterprise. Basic components include equity (equity, equity), bonds, and other long-term foreign resources. It is recommended that the weighting of individual components be used to express market values, but in the Czech Republic it is not possible, except for exceptions. Therefore, the basis of accounting is primarily the value of each component of capital.

$$WACC = rd * (1 – t) * CK / C + re * VK \qquad (F\ 3)$$

Where rd - the opportunity expense of the paid-up foreign capital, or the cost of the foreign capital, the re-opportunity cost of the equity or the capital costs, CK - the value of the paid-in foreign capital (bank loans and bonds), VK - equity value, C- total long- capital (C = CK + VK), t - rate of income tax.

According to Kislingerové, the performance of the indicator shows that performance growth is**:**

- the growth of NOPAT's operating performance with a constant volume of invested capital C,
- streamlining the asset portfolio may lead to a reduction in activities whose operating performance does not cover the return required by investors.

Use of economic value added in business management:

- As a financial analysis tool for measuring performance. The site also has the so-called relative indicators of economic added value, which include:
- as a tool for *financial analysis to measure performance.* Here are also the so-called relative value added economic indicators, such as the Value Spread, which can be calculated as EVA and net working capital (C). This indicator is the decisive variable for measuring the return on capital adjusted for risk. It is also suitable for intercompany comparison.
- as new methods for valuing a business or an investment project,
- as a tool for managing and motivating staff when employees are interested in maximizing EVA with a bonus. The bonus is usually linked to the total EVA of the unit, the EVA increment and additional individual parameters or the subjective evaluation of the indicators.

Reporting - a modern method of evaluating business performance

The task of reporting, as one of the most important parts of controlling, is to create a relatively complex system of indicators and information that should evaluate the development of the business as a whole and in individual sub-sections. Reports and reports should be organized according to the needs of their users in such a way as to provide the necessary information to facilitate decision making.

Reports and reports should have the required structure, they should not be too many or too little detailed, they should be intelligible and clear and evaluate only measurable variables. Reporting should be an effective tool for management, planning and decision making. Sectoral analysis is part of financial analysis applications dealing with investment activities on capital markets. In particular, analysts look at the characteristics of each sector and focus on the prognosis of their development in the future. Future and industry perspectives have a direct impact on the future development of a particular business that is doing business in the industry. When identifying the characteristics of the sector, it is necessary to focus especially on:

- specific features of the industry**,**
- the sensitivity of the sector to business development,
- the state regulation of the sector,
- the sectoral structure type a
- the prognosis of its further development.

Single share method

The simple share method is based on the principles of multi-criteria decision making. The goal is to get a ranking of businesses based on the evaluation of multiple criteria. For these purposes, it is advisable to compile a matrix where the individual lines are listed in the rows, the decision points and their values in the columns. The character of the metrics reflects whether higher values of the pointer (+1) or lower (-1) are favorable **(**Table 1: Decision matrix)

Table 1: Decision matrix

Object (podnik)	Criterion (eg pointer)				
	X_1	X_2	X_3	…	X_m
1					
2					
3					
…					
…					
n					
Weights	P_1	P_2	P_3	…	P_m
Character of indicators	+1	+1	-1		+1

Source: own elaboration, 2018 and KISLINGEROVÁ, E. a kol. *Finanční analýza: krok za krokem.* 1. vyd. Praha: C. H. Beck, 2005, str. 67. ISBN 80-7179-321-3.

The method uses the average value of each indicator (arithmetic mean) divided by the value of each indicator in the matrix (if the value of the indicator is considered positive) or the value of the relevant indicator divided by this mean value (if the decrease of the indicator value is considered positive). Companies are then sorted by each pointer so that the company with the best value of the relevant pointer gets the order n, the next best then n-1, the last order 1.
The advantage of this method is that it takes into account how companies differ in each indicator.

Douch's analysis, which includes the weighted average of stability, liquidity, activity and profitability indicators, and then the overall indicator again, is the weighted average of the total indicators for the group of the above indicators. The Douch's analysis, also referred to as ***Bilancial Analysis II, is a contextual example of a joint stock company in the paper industry shown in the following table in a list of 5 consecutive periods (ie 2012-2016*) - Table 2: Balance Model II. in the research company.**

Design of the Douch analysis indicator II.
Stability indicators:
S (1) = equity capital / fixed asset
S (2) = (equity / fixed assets) * 2
S (3) = equity / foreign capital
S (4) = total assets / (5 * short-term foreign sources)
S (5) = total assets / (15 * stocks)
The overall stability coefficient is the weighted average of all stability coefficients:
S = (2 * S1 + S2 + S3 + 2 * S5) / 7

Liquidity indicators
L (1) = (2 * financial assets) / short-term foreign sources
L (2) = ((financial assets + receivables) / short-term foreign debt
L (3) = (current assets / short-term foreign debt
L (4) = (working capital / total liabilities) * 3,33
The overall liquidity ratio is the weighted average of all liquidity ratios:
L = (5 * L1 + 8 * L2 + 2 * L3 + L4) / 16

Activity indicators:
A (1) = (total sales / 2) / total liabilities
A (2) = (total sales / 4) / equity
A (3) = (4 * added value) / total sales
We will determine the overall indicator as activity weights as a weighted average:
A = (A1 + A2 + A3) / 3

Profitability indicators:
R (1) = (10 * EAT) / value added
R (2) = (8 * EAT) / equity
R (3) = (20 * EAT) / total liabilities
R (4) = (40 * EAT) / (sales + outputs)
R (5) = (1.33 * operational HV) / (operational + financial + extraordinary HV)
The overall indicator is again determined as a weighted average for the group of profitability indicators:
R = (3 * R1 + 7 * R2 + 4 * R3 + 2 * R4 + R5) / 17
Overall Indicator for Balance Analysis II .:
Total indicator C = (2 * S + 4 * L + 1 * A + 5 * R) / 12

Table 2: Balance Model II. in the surveyed company

Year	2012	2013	2014	2015	2016
A. Stability					
Stability overall: S	**0,79**	**0,85**	**0,90**	**1,09**	**1,07**
B. Liquidity					
Liquidity overall: L	**0,33**	**0,30**	**0,52**	**1,51**	**1,25**
C. Activity					
Activity overall: A	**0,82**	**0,79**	**0,72**	**0,69**	**0,62**
D. Profitable					
Profitable overall: R	**2,08**	**2,51**	**1,98**	**1,56**	**1,18**

Analysis results						
Coefficient	**A description of the coefficient**	**Year**				
		2012	2013	2014	2015	2016
S	Stability	0,79	0,85	0,90	1,09	1,07
L	Liquidity	0,33	0,30	0,52	1,51	1,25
A	Activity	0,82	0,79	0,72	0,69	0,62
R	Profitable	2,08	2,51	1,98	1,56	1,18
Final result: C		**1,18**	**1,35**	**1,21**	**1,39**	**1,14**

Source: own elaboration, 2018

Therefore, in all years (2012-2016), the overall result (result of individual analyzes) is greater than 1.00 and ranges from 1.39 to 1.14.

Another part of the paper is devoted to the results of the IN95 index of the research company again between 2012 and 2016 (in the table 3: **Credibility Index "IN95" research company)**

Credibility Index "IN95"

IN = V1 x1 + V2 x2 + V3 x3 + V4 x4 + V5 x5 - V6 x6

where x1 = total assets / foreign sources; x2 = earnings before interest and taxes (EBIT) / interest expense; x3 = earnings before interest and taxes (EBIT) / total assets; x4 = total returns / assets; x5 = current assets / (short-term liabilities + short-term bank loans) and x6 = overdue liabilities / income.

Table 3: Credibility Index "IN95" research company

Weight for Credibility Index

ONACE	Name	11	V2	V3	V4	V5	V6
DDE	Paper and printing industry	,23	,11	,07	,44	,10	,99

Index		Values in individual years in thousands of CZK				
Year		2012	2013	2014	2015	2016
V1*X1	X1=CA/CZ	0,409	0,451	0,464	0,498	0,506
V2*X2	X2=EBIT/interest	1,123	1,951	1,644	0,841	0,690
V3*X3	X3=EBIT/CA	0,872	1,049	0,797	0,676	0,455
V4*X4	X4=revenue/CA	0,607	0,568	0,515	0,500	0,477
V5*X5	X5=OA/(KZ+KBÚ)	0,080	0,076	0,117	0,283	0,272
V6*X6	X6=ZPL/revenue	0,172	0,094	0,185	0,026	0,051
IN95		**3,26**	**4,19**	**3,72**	**2,82**	**2,45**

Indicator	Line of the revised report	Indicator values in individual years in thousands of CZK				
		2012	2013	2014	2015	2016
CA	R1	1 781 089	1 984 168	2 325 848	2 484 698	2 670 147
CZ	R13	1 001 616	1 011 248	1 153 954	1 148 637	1 214 125
EBIT	V18 + V27	255 992	342 954	305 578	276 801	200 167
Interest ex	V18	25 083	19 337	20 443	36 189	31 894
Revenue	V22	2 455 391	2 559 766	2 721 852	2 820 815	2 896 527
OA	R2	717 606	722 823	803 825	906 044	988 346
KrCZ	R14	893 226	953 889	687 553	319 645	362 782
Liabilities after due date	Annual reports 2012-2016	24 835	14 111	29 631	4 390	8 641

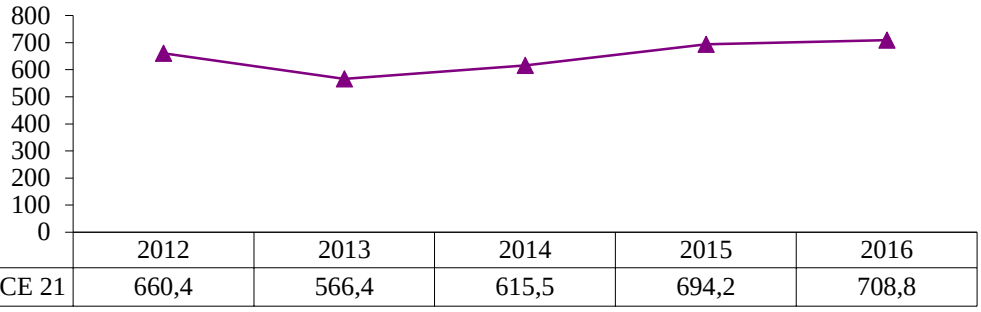
Source: own elaboration, 2018

Decreasing profits and other performance indicators suggest that some financial problems might emerge in the future. If the trend of declining profit continued (with an average annual decline of 20%), the firm would lose up to 5-8 years. A similar forecast has also emerged from models of prediction of financial distress - although the figures have been in all prosperity years, but with a declining trend (***Credibility Index "IN95" research company in Table 3, from 3,26 in 2012 to 2,45 in 2016).*** Very sensitive are the results presented ***in Table 2: Balance Model II. in the surveyed company (indicators of liquidity, profitability, activity and stability in the years 2012 to 2016), including the performance of the CZ-NACE 21 branch in the graphs*** (Chart 1: Labor productivity from accounting value added at current prices in 2012 2016 (CZK thousand / employee), Chart 2: Book value added at current prices in 2012 - 2016 (in CZK million), Chart 3: Year-on-year change in economic value added in the years 2013 - 2016 in absolute terms (in CZK billions)

In this connection, reference should be made to the methodology of financial analysis of industry and construction and its using. The Financial Analysis of Industry and Construction deals in detail with

the financial results of industrial and construction companies and follows up on their brief evaluation in "Analysis of the Development of the Czech Economy and Industries in the Field of the Ministry of Industry and Trade. Financial analysis maintains the same methodological approach, focusing in particular on assessing the development of economic added value and the impact of its year-on-year development on the following: sectoral structures, institutional sectors and value-creation with a breakdown into four categories of enterprises. The source of the risk-free rate has changed for the sake of clarity. The source of data for financial analysis is P 3-04 CSO report (c, d) and the Res / MPO / P3-04 sectoral statement.

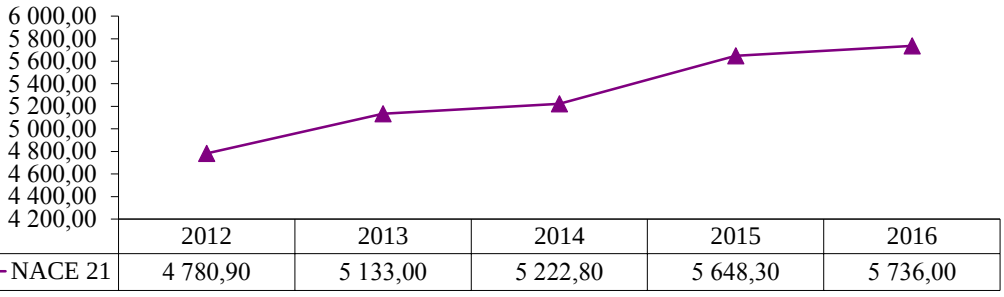
Chart 1: Labor productivity from accounting value added at current prices in 2012 2016 (CZK thousand / employee)



	2012	2013	2014	2015	2016
NACE 21	660,4	566,4	615,5	694,2	708,8

Source: own elabration, MPO. Panorama of the manufacturing industry and related services from 2012-2016. Url : http://www.mpo.cz/hledani.html?lid=1&searchtext=panorama

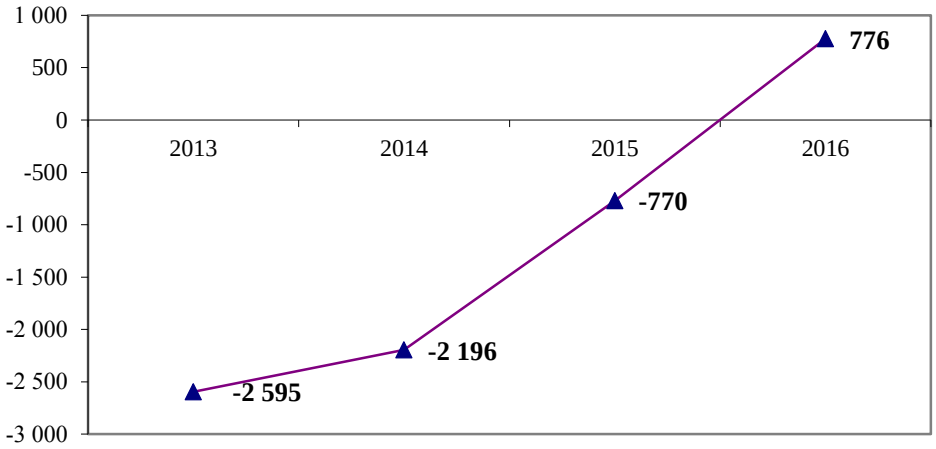
Chart 2: Book value added at current prices in 2012 - 2016 (in CZK million)



	2012	2013	2014	2015	2016
NACE 21	4 780,90	5 133,00	5 222,80	5 648,30	5 736,00

Source: own elabration, MPO. Panorama of the manufacturing industry and related services from 2012-2016. Url : http://www.mpo.cz/hledani.html?lid=1&searchtext=panorama

Chart 3: Year-on-year change in economic value added in the years 2013 - 2016 in absolute terms (in CZK billions)



Source: own elabration, MPO. Panorama of the manufacturing industry and related services from 2012-2016. Url : http://www.mpo.cz/hledani.html?lid=1&searchtext=panorama

In theoretical discussions, there are new findings in favor of or against the application of the EVA concept and other criteria based on the value of the company in the context of ongoing changes in accounting and tax legislation or in the financial market conditions in the Czech Republic. It is not possible to clearly identify which performance measurement indicators are more accurate. However, the EVA indicator, that is no means the only correct criterion for assessing the performance of an enterprise and the quality of its management. Similarly to other methods of financial analysis, it is particularly important to simplify the view of the whole economy. Table 4 prezentes economic added value of the research company in 2014-2016.

Table 4: Economic added value of the research company in 2014-2016

Total volume of capital (own and foreign) – C	**2014**	**2015**	**2016**
Average capital:	1 838 113	1 990	2 177 385
Net Operating Profit after Tax - NOPAT			
Sales on sales	2 553 462	2 654 858	2 706 316
Transport costs	-109 193	-136 701	-136 701
Other billing-reducing items	-42 379	-31 942	-29 105
Net Sales Income	**2 401 890**	**2 486 215**	**2 540 510**
Change in finished product status rozpracovanosti	16 180	15 657	27 636
Rentable output	**2 418 070**	**2 501 872**	**2 568 146**
Material costs	-1 379 903	-1 366 647	-1 474 732
Gross Profit	**1 038 167**	**1 135 225**	**1 093 414**
EBIT	**418 046**	**408 101**	**320 556**
NOPAT	**300 996**	**288 158**	**238 865**
Economic added value	**172 830**	**164 485**	**100**
Value range = EVA / C	**9,40%**	**8,26%**	**4,61%**

Source: own elaboration, 2018

4 Discussion

The company in the surveyed range of 2012-2016 shows a balanced capital structure with a propensity for equity. Currently, he has no problems with the payment of his obligations to suppliers, creditors, employees and the state. However, decreasing profits and other performance indicators suggest that some financial problems might emerge in the future. If the trend of declining profit continued (with an average annual decline of 20%), the firm would lose up to 5-8 years. A similar forecast has also emerged from models of prediction of financial distress - although the figures have been in all prosperity years, but with a declining trend (Credibility Index "IN95" research company in Table 3, from 3,26 in 2012 to 2,45 in 2016). Very sensitive are the results presented in Table 2: Balance Model II. in the surveyed company (indicators of liquidity, profitability, activity and stability in the years 2012 to 2016), including the performance of the CZ-NACE 21 branch in the graphs.

The Financial Analysis of Industry and Construction deals in detail with the financial results of industrial and construction companies and follows up on their brief evaluation in "Analysis of the Development of the Czech Economy and Industries in the Field of the Ministry of Industry and Trade. Financial analysis maintains the same methodological approach, focusing in particular on assessing the development of economic added value and the impact of its year-on-year development on the following: sectoral structures, institutional sectors and value-creation with a breakdown into four categories of enterprises. The source of the risk-free rate has changed for the sake of clarity. The source of data for financial analysis is P 3-04 CSO report (c, d) and the Res / MPO / P3-04 sectoral statement. The data set contains only economically active entities, 2408 organizations in the industry, and 283 enterprises in the construction sector. In the future, it is also recommended that businesses have the opportunity to verify their financial position within the respective industry and thus enable them to take appropriate measures to rationalize their business and shape the corporate strategy for the future.

Year-on-year, the EVA increased by CZK 4.9 billion. This increase was due both to improved value for money and positive investment development (VC). Effective value development depends on return on equity (ROE), which caused an increase in EVA of CZK 24.4 billion. On the other hand, the value of the risk (re) risk was negative for EVA. The development of all EBIT breakdowns in the ROE breakdown has contributed positively to EVA (excluding EBIT / Revenue, which caused an EVA decrease of CZK 15.8 billion). Significant negative impact is evident in the VK / A indicator, which caused the EVA to decrease by CZK 5.9 billion. Other indicators in this area had little positive or negative effects on EVA value development.

Building on the level of development and knowledge in the field of comprehensive business performance assessment methods, future solutions are possible to include knowledge of foreign colleagues and move from a stage characterized by multiple discriminatory analysis to other levels, such as neural networks, fuzzy models, and other intercompany benchmarking models.

5 Bibliography

[1] DUUS, H..J., BJERRE M., 2015. Qualitative value profiling: a reassessment. In: 11. th International Scientific Conference on Economic and Social Development – Building Resilient Society. Zagreb: VADEA.s. 292-301.

[2] GUPTA, P.D., GUHA, S. and KRISHNASWAMI, S.S., 2013. Firm Growth and its Determinants. Journal of Innovation and Entrepreneurship, 06, vol. 2, no. 1, pp. 1-14 ProQuest Central. DOI http://dx.doi.org/10.1186/2192-5372-2-15.

[3] HENDL, J. 2005. Qualitative research: basic methods and applications. Ed.. 1. Prague: Portál ISBN 80-7367-040-2.

[4] KALÍNSKÁ, E. 2010. International trade in the 21st century. 1. ed. Prague: Grada,. ISBN 978-80-247-3396-8.

[5] KISLINGEROVÁ, E., 2001. Business valuation. 2 st ed. Praha: C. H. Beck, pp. 67. ISBN 80-7179-529-1.

[6] KISLINGEROVÁ, E., HNILICA, J. 2005. Financial analysis stop by stop. Praha: C. H. Beck, pp. 67. ISBN 80-7179-321-3.
[7] REES, B. Financial Analysis, 1995, 1st ed. London, New York, Toronto: Prentice-Hall,ISBN 0-13-288283-3.
[8] POKORNÝ, M et al., 2014. Uncoventional methods of solving economic and managerialn tasks. 1st ed. Olomouc. UP Olomouc, pp.294. ISBN 978-80-244-4218-1.
[9] Růčková, P. 2005. Financial analysis. 1st ed. Karviná: OPF SLU Karviná, ISBN 80-7248-pp. 299-8.
[10] SIKOROVÁ, E., MĚŘVOVÁ, M., NOVOTNÝ, J., 2016. Profit analysis comparison in business and non-profit organizations in terms of accounting, finance, tax. Przegląd Nauk StoSowaNych Nr 10, 1. vydání Opole: Politechnika Opolska, pp. 21-42, ISSN 2353-8899.
[11] Sikorová, E., Meixnerová, L., 2017. Intercompany comparison of selected financial indicators of the small and medium enterprises. : Hradec Economic Days. Hradec Králové, Vol. 7(1), ISSN 2464-6059. ISBN 978-80-7435-664-3, pp.. 620 – 628.
[12] Sikorová, E., Meixnerová, L., 2017. Basic Characteristics of Czech Business Entities in the Context of National and International Accounting. Journal of International Studies, 10(3), 120-133. doi:10.14254/2071-8330.2017/10-3/9.
[13] VIRGLEROVA, Z., DOBEŠ, K. and VOJTOVIČ, S., 2016. The Perception of the State's Influence on its Business Environment in the SMEs from Czech Republic. Administratie Si Management Public, no. 26, pp. 78-96 ProQuest Central. ISSN 15839583.

FUZZY MODELS PROPERTIES IN A FOREX TRADING SYSTEM CONTROL

Zdeňka Krišová, Miroslav Pokorný
Moravian University College Olomouc, Department of Compuer Science and Applied Mathematics, Czech Republic
zdenka.krisova@mvso.cz, miroslav.pokony@mvso.cz

Abstract:

FOREX system is a global platform for the exchange trading of currency pairs. Successful trading depends on well-informed traders and their experience and forecasting of the situation. The paper is devoted to the computer representation of decision-making tasks, which the trader solves operatively. Computer models of decision makers' mental models are formalized by fuzzy logic models. Depending on the nature of the task, structures and model parameters can be appropriately modified. Variants of fuzzy models that are part of the FORSUP decision module are analyzed in terms of their structures and properties.

Key words:

FOREX, trading system, expert system, uncertainty, fuzzy sets, fuzzy-logic.

JEL: C52, C53, D53

1 Introduction

The FOREX system is a worldwide trading platform for currency exchanges [1]. Successful trading depends on the good information of the traders, their experience and the estimation of the situation.
The financial market reflects the overall economic situation of advanced market economies, the status of individual sectors and economic entities. The dynamics of today's world, the constant changes and the events that economic operators must react to can have a significant impact on capital markets. A typical feature of society as a system is the complexity of its structures and the strong uncertainty of its behavior, conditioned by the inclusion of the human factor. And this very important feature of the social system strongly affects the financial market, its participants and their behavior when making deals.

If we want to describe a properly functioning information system for managing and managing business with exact computer algorithms, we need accurate and complete data. For the financial market, however, there is a typical lack of accurate measured data and accurate information about its behavior. When creating an information system for trading on the stock exchange, it is useful to use non-monetary (non-numerical) methods in addition to non-immaterial methods (mathematical and logical procedures). The Unconventional methods can work with uncertainty and include procedures that enable them to formalize and use efficiently. The core of these structures are non-numeric rule-based language models, using (natural) uncertainty of input variables to improve the quality of output variables drawn. Uncertainty can be formalized using fuzzy sets, decision making is then performed using fuzzy logic algorithms. These procedures currently used in the economy [9].[10], [11], [12], in decision-making and management of companies [13], [14], in investment decisions [15], [16], in finance [17], [18], in the management of decision making tasks [19], [20].

The aim of this paper is to show different types of fuzzy models to support decision makers that are designed by an expert in the form of IF-THEN rules. These models work with the numeric or verbal values of their variables or their combinations and draw conclusions in the form of output variables. The

output variables can be either numeric values or lists of rated variants of possible business events according to the nature of the task being solved.

In the framework of participation in the solution of the OP PIK project Application: Information System for the Management and Administration of Forex Trades (TESCOSW) [2], the FORSUP (FOREX SUPPort) program is developed at the Ministry of Foreign Affairs, whose modules are designed for the computer solution of the decision- dealing with trading [3].

The FORSUPP system is divided into two parts, the first of which is designed for off-line trading plan preparation and the other is intended for on-line schedule updates during trading.

The off-line portion predicts the magnitude and trend of currency pair rates and draws recommendations for trading, including current macroeconomic developments, financial developments and the impact of foreign exchange interventions. The off-line regime also assesses the riskiness of prospective clients in terms of business, legislation, sanctions and transparency of their activities. The on-line part responds operationally to the development of trading conditions based on the analysis of the sapphire chart dynamics. The trading recommendation is derived from the parameters of the candles and the characteristics of the currency pair curves.

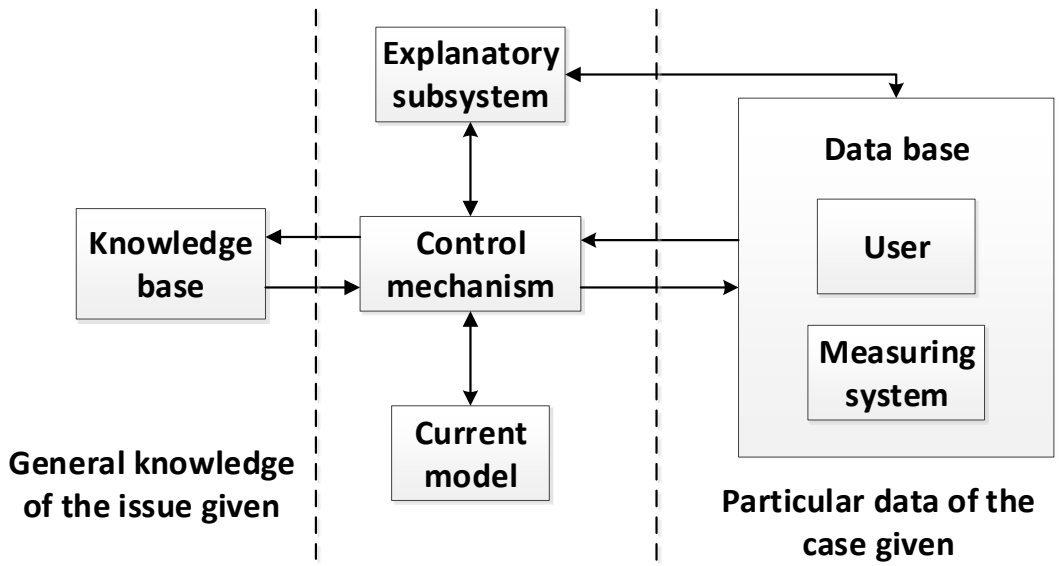
The FORSUPP system contains mathematical computational data preparation blocks and fuzzy logic decision blocks. Fuzzy-logic decision blocks use the structure and function of expert systems. They are means of multi-criteria decision making as tools of the science of artificial intelligence. Formalizing the meaning of word terms is done using fuzzy sets, decision making is done using fuzzy logic algorithms [4].

2 Methods

2.1 Fuzzy-logic based expert system

The Expert System is a multi-criteria decision making tool, based on Artificial Intelligence Approaches [4]. The principle is a computer representation of mental models of experienced experts.

Figure 1: Structure of expert system



The mentality model of the expert decision is engineered in the form of a language model, which consists of an IF-THEN set of conditional decision rules. If the quality of the human expert decision-making is conditioned by the effective processing of the vagueness of the verbal expressions, two basic problems need to be addressed: how to formalize the vagueness of the meaning of natural language words, and how to manipulate this vagueness with the algorithm.

The first problem is solved in the module used using fuzzy set theory approaches. The second problem is then solved linguistic approaches of multi-valued fuzzy logic.

The general language model of the decision-making problem is stored in the knowledge base (Figure 1). The general model is updated by inserting data for a specific case from the block of the current model. The input data can be represented by data from the measuring system or provided verbally by the user (database block). The specific case is evaluated by the fuzzy logic control algorithm and the result of the solution (decision) is provided to the user. The explanatory mechanism then provides information about the knowledge (active rules) that have been used to solve the particular case.

2.2 Types of fuzzy-logic models structure and parameters

Fuzzy models are designed for computer formalization of mental models of experienced experts. Therefore, they must be able to process information in a linguistic form and effectively use their uncertainties - vagueness. The structures and parameters of the regular fuzzy models can be modified according to the nature of the problem solved. The structure of the model must use words in a natural language model parameters must be able to express their degree of uncertainty. The same applies to the form of its input and output variables. As well as expert mental models must be able to process fuzzy models and input the numerical (digital) and to provide, where necessary numerical information output. The output information may again be either uncertain (word) or sharp (numeric).

2.3 Fuzzy sets formalization of vagueness (uncertainty)

Fuzzy models used to formalize the vagueness of the meaning of words approaches fuzzy set mathematics [4]. Fuzzy sets are generalizations of sets of common ones. It differs from the definition of the element's membership in a set.

In the case of ordinary sets, the element *x* in the set *A* either belongs absolutely or does not belong. The degree of affinity of an element in a set is defined by a relation

$$\mu_A(x) = 0$$

if element *x* in set *A* is not and

$$\mu_A(x) = 1$$

if element *x* in set *A* belongs.

Fuzzy sets introduce a new concept, namely the partial assignment of the element *x* to the fuzzy set *A*. If you can not determine with certainty whether *x* belongs to A, then a degree of membership of a real number

$$\mu_A(x) \in (0,1)$$

the size $\mu_A(x)$ expresses the degree of membership of *x* to *A.*

Membership function assigns all elements *x* of universe X their degree of belonging to the fuzzy set as a real number from a closed interval <0,1>.

The sharp (ordinary) fuzzy set of numbers 7-9 knows uncertainty competence elements and a membership function according to Figure 2. Even the sharp number 5 can then be represented by a fuzzy set that contains only one element ($x = 5$) of degree 1 (Figure 3).

Figure 2: Ordinary set – crisp interval <7, 9>

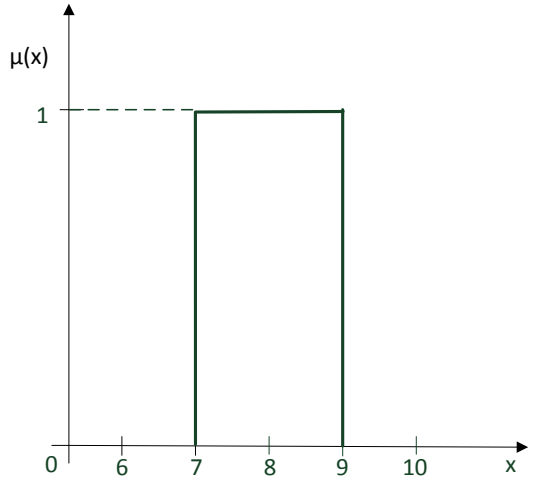
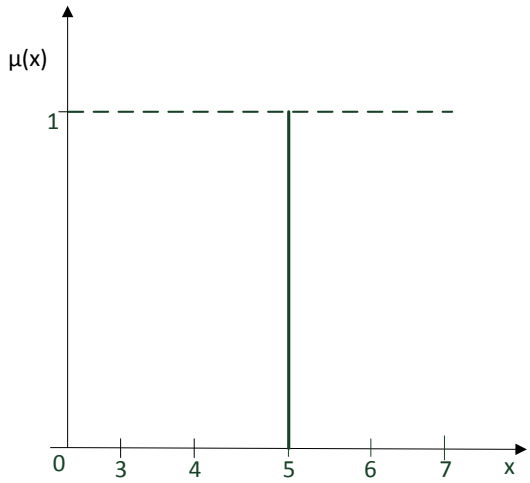


Figure 3: Fuzzy set – crisp number „5“



In contrast indefinite number ("about 5") can be represented as a fuzzy number, i.e. fuzzy set of triangular membership functions, which comprises one element (fifth gear), the degree of membership value of 1 and the other of indeterminate (fuzzy) range <4.5; 5.5> with a degree of membership from 0 to 1 (Figure 4). Linguistic meaning of the word, e.g. SMALL then we can formalize fuzzy sets with trapezoidal membership functions (Figure 5). Values (7-9) values we consider to be clearly SMALL, values from fuzzy intervals <of 6,7> and <7,8> are considered to be SMALL only partially depending on their degree of membership.

Figure 4: Fuzzy set – fuzzy number „ABOUT 5“

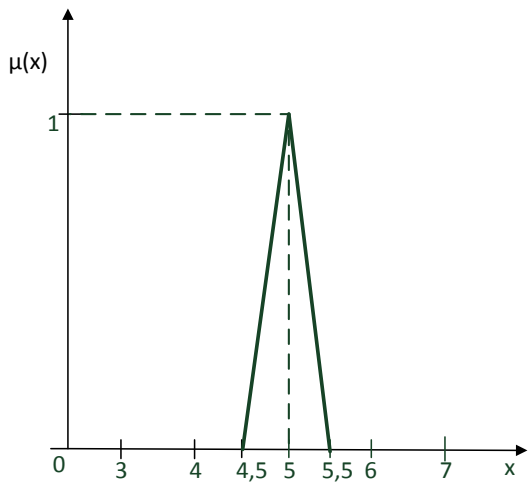
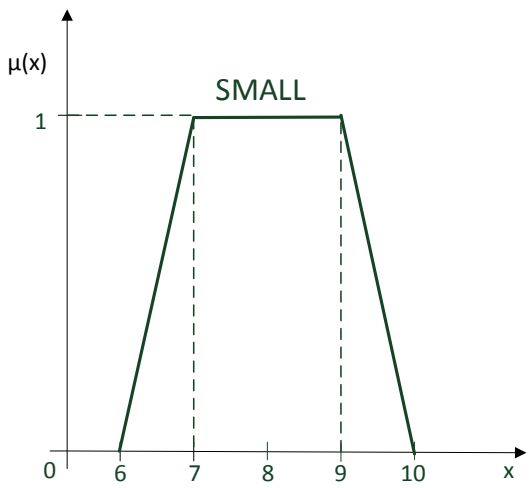


Figure 5:Fuzzy set – fuzzy interval <7, 9>



Using fuzzy sets (resp. their membership functions) so we can formalize generally as sharp (numerical) values so vague (vague, fuzzy) values. Their membership functions (Figure 2 and Figure 5), differ only in their parameters.

2.4 Case studies of fuzzy models types

The nature of fuzzy models allows to define the output variable either in the form of a real number or in the form of evaluated variants of possible decisions.

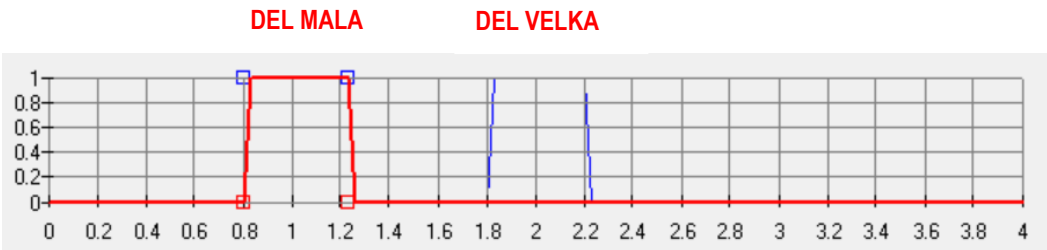
Input variables of fuzzy model quantities can be sharp (numeric), indefinite (linguistic, verbal) or combined. The output variables can then be in the form of a fuzzy set or a sharp number.

A FORSUPP decision support subsystem (FORexSUPPort) has been designed as part of the FOREX solution, which includes 12 sub-lingual fuzzy regulatory models [3]. These models use these options.

2.4.1 Values of Input/output variables are of numerical crisp type (FASV_num)

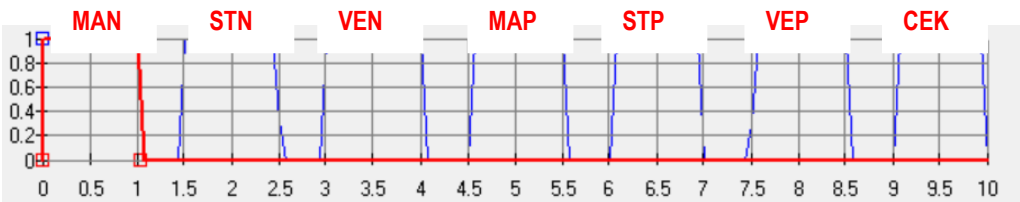
The decision model is mathematical and has the character of an ordinary multidimensional table. The values of input and output variables are common numbers, the model does not work with uncertainty and therefore gives a clear sharp decisions. In FORSUPP, an example of the FASV_num is an example of how to derive activity from candle parameters [5]. All its input variables (BAR – color candles, TEL – length of candle body, DEK – the length of the candle's wick, SMK – direction of the candle's wick and TRE – trend direction of the candle) are encoded with sharp numbers (e.g. DEL MALA = 1, DEL VELKA = 2) - see Figure 6.

Figure 6: Discrete type of two-values input variable



The output variable AKC – action can acquire the language values formalized by the usual fuzzy sets MAN – small purchase, STN – medium purchase, VEN – great purchase, MAP –small sales, STP – medium sales, VEP – great sales, CEK – wait - Figure 7.

Figure 7: Discrete type of multi-values output recommendation

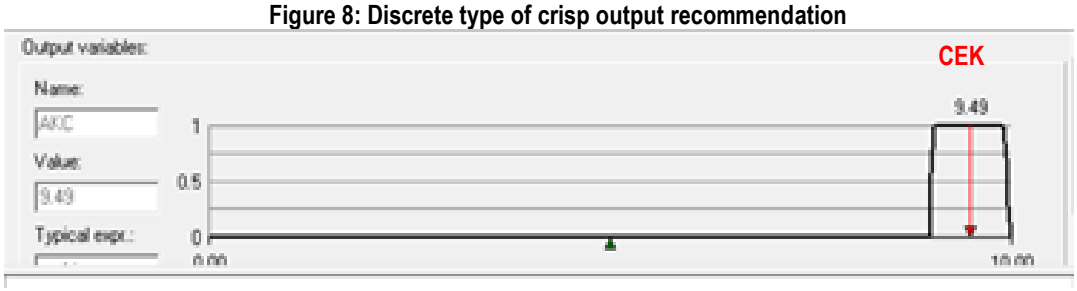


The sharp rule of the model has, for example, the shape [3].

IF (BAR = 1) and (*TEL* = 2) and (*DEK* = 2) and (SMK = 1) and (TRE = 3) THEN (AKC = CEK)

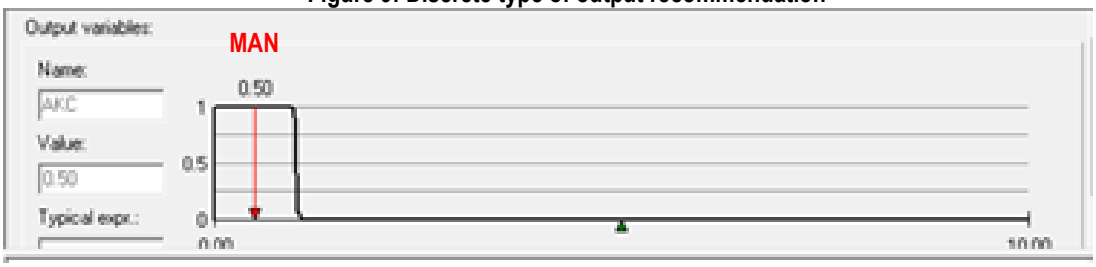
Entering the input values BAR = 1, TEL = 2, DEK = 2, SMK = 1 and TRE = 3 leads to unambiguous (sharp) recommendation AKC = CEK - see Figure 8.

Figure 8: Discrete type of crisp output recommendation



Another entry of input values that differ only by changing the variable from TEL = 2 to TEL = 1 leads to a single action recommendation AKC = MAN – see Figure 9.

Figure 9: Discrete type of output recommendation

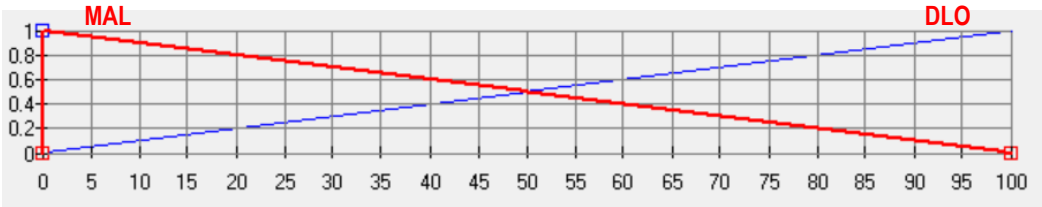


Fuzzy model FASV_num does not work with uncertainty, both recommendations are absolutely sure, categorical, do not offer the user the discretion of any other possible action. Such recommendations are primitive and limit user action.

2.4.2 Values of Input/output variables are of combine crisp and linguistic type (FASV_comb)

In FORSUPP system is an example of a combined version of the FASV_comb [3]. Its input variables BAR, SMK, and TRE are again of sharp numerical values - see Figure 6, but the language values of the TEL and DEK variables are defined as indefinite - fuzzy sets with triangular attributes – Figure 10.

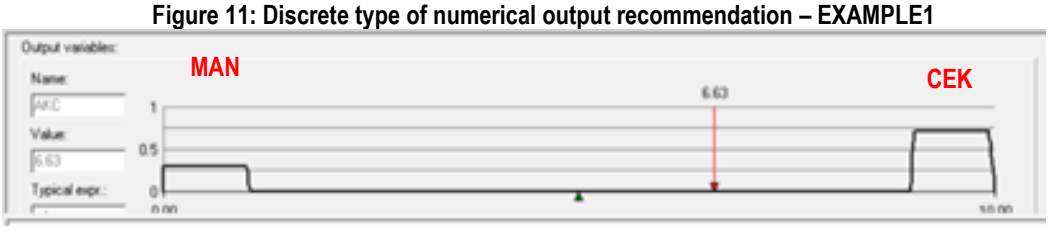
Figure 10: Fuzzy linguistic type of input values TEL



IF (BAR = ZEL) and (*TEL is MAL*) and (*DEK is DLO*) and (SMK=DOL) and (TRE = DOL) THEN (AKC = VEN)

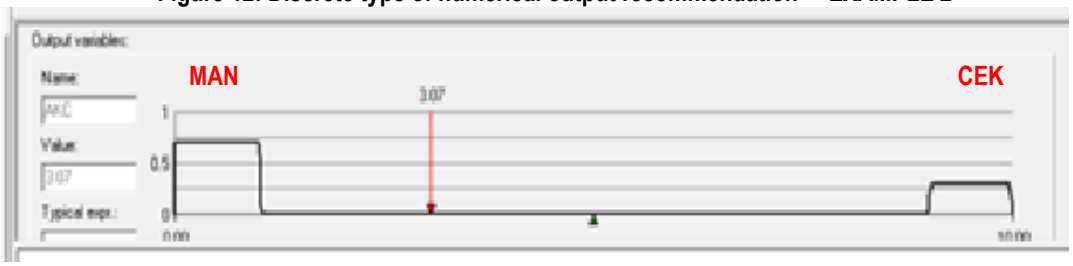
Entering the input values according to EXAMPLE 1, a BAR = 1, TEL with MAL (70) of DEK with DLO (100) SMK = 1 and TRE = 12 leads although again recommendations AKC with the CEK, but not with a unit (absolute) certainty, only with a confidence level of 0.73. The model allows the user to consider further action MAN, but with less certainty of 0.17 (Figure 11). Such output recommendations are varied and at the same time valued, richer than in Chap. 2.4.1

Figure 11: Discrete type of numerical output recommendation – EXAMPLE1



The mere resizing uncertain input variables TEL (30) and DEL (100) leads back to the uncertain, but again to a varied recommendation - Figure 12.

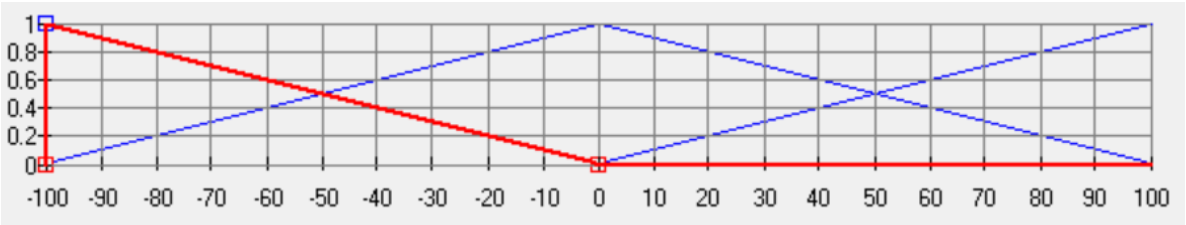
Figure 12: Discrete type of numerical output recommendation – EXAMPLE 2



2.4.3 Values of model variables are of linguistic type I (FKOR)

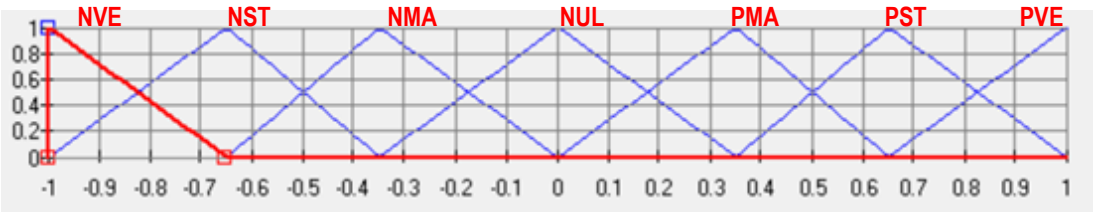
For example, in the FORSUPP system, the FKOR [3] - fuzzy model determines the magnitude of the correction factor. Input variables of the model MAV - Indicator macroeconomic developments, FNV - indicator of financial development and VPS - The political situation in the country, have their values defined as triangular fuzzy numbers - Figure 13.

Figure 13: Fuzzy linguistic type of model variables values



The output variable KOR - The correction factor of the predicted development course - has fuzzy language values NVE - Negative large, NST - Negative mean, NMA - Negative small, NUL - Approximately zero, PMA - Positive small, PST- Positive Medium , PVE - Positive Big - Figure 14.

Figure 14: Fuzzy linguistic type of output recommendation

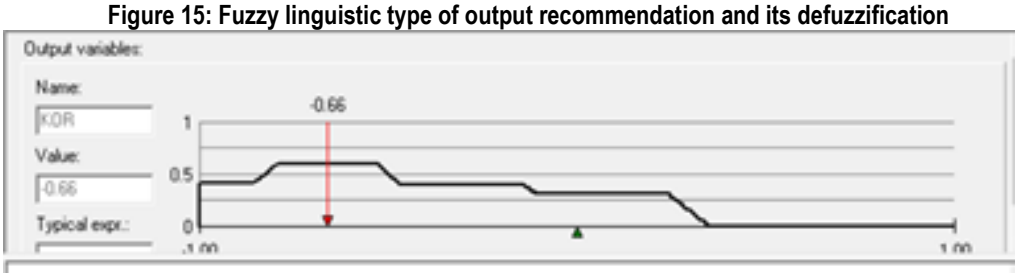


Example rule model [3]

IF (MAV is STB) and (FNV is STB) and (VPS is SPN) THEN (KOR is NST).

The output takes the form of recommendations output membership functions of the fuzzy sets - Figure 15. In the simulation example, it follows that the recommended value is in the area (KOR is NST). However, we need a numeric value that is equal to the after defuzzification KOR = -0.66.

Figure 15: Fuzzy linguistic type of output recommendation and its defuzzification

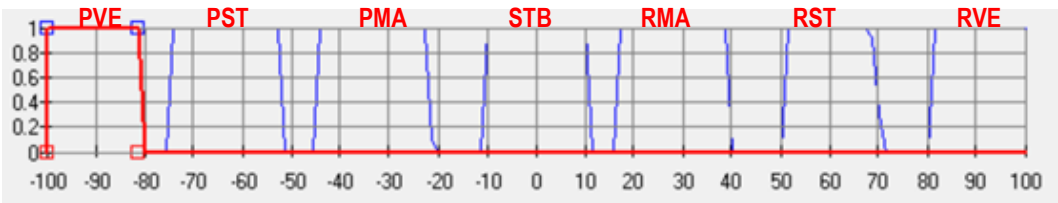


2.4.4 Values of model variables are of linguistic type l2 (FMAV_diag)

In the FORSUP system, an example of the FMAV_diag model for determining the trend of macroeconomic development is the example. Input variables are INM - Purchasing Manager Estimates, VMN - Unemployment Rate, SPP - Rather Decline and LRD - Real GDP Development with Defined Fuzzy Language Values.

Output variable MAV - Macroeconomic trend indicator - has PVE language values - large drop, PST - moderate drop, PMA - small drop, STB - stable state, RMA - small growth, RST - growth medium and RVE - growth big.

Figure 16: Discrete type of numerical multi-values output recommendation

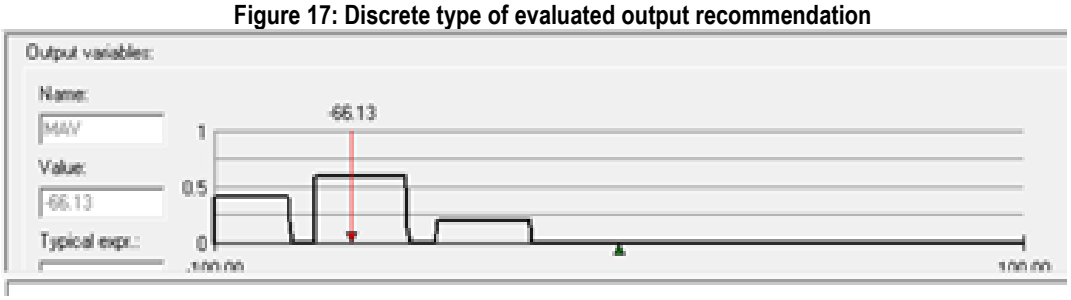


Example rule model [3] has a shape

IF (INM is SPP) and (VNM is SPR) and (VRH is STB) THEN (MAV is PST)

In the simulation example, the model provides the user with a varied recommendation in the form of evaluated development types - Figure 17.

Figure 17: Discrete type of evaluated output recommendation



Priority has PST - medium decrease (0.66), other considerations (with lower possibilities) are PVE - decrease large (0.43) and PMA - low drop (0.24). The user reviews the recommendation and decides on the definitive type.

3 Discussion

Fuzzy models are part of the expert modules that support the decision of FOREX traders when trading currency pairs. Based on current data and information on the state of the market derive the best recommendations commercial activities and also evaluates the risk business partner. Unlike presented solution, published Forex trading support systems [6], [7] do not include the riskiness of business clients in their decision-making tasks.

Fuzzy models are designed by an expert in the form of a set of IF-THEN rules. They work with the numeric or verbal values of their variables, or their combinations. The uncertainty of the word expressions is formalized by fuzzy set mathematical methods, the input algorithms work on the principles of multi-valued fuzzy logic. Special types of fuzzy models can work without using the uncertainty of the processed information as an ordinary multi-criteria decision table.

Input variables of fuzzy models are numeric. The output variables can be solved by the nature of the job, either numeric values or lists of assessed variants of possible business ventures.

The decision-making part of FORSUPP for FOREX includes fuzzy models of all types. The case studies presented in the report represent the structures and parameters of the models that characterize the individual types. Synthesis of models, simulation of their properties and graphical presentation of the results is done in LFLC (Linguistic Fuzzy Logic Controller) [8].

At the current stage of development of the fuzzy-logic expert systems is prepared their application software. In the next stage, the programme modules will be implemented and tested under real trading conditions.

4 Bibliography

[1] *Základy obchodování na FOREXu*, [online]. [cit. 2017-12-27]. Dostupné z: https://www.fxglobal.com/ebook/

[2] *Informační systém pro řízení a správu obchodů v prostředí Forexu*. OP PIK Aplikace. MVŠO. Studie. TESCOSW, a.s. Olomouc. 2016 (in Czech)

[3] Pokorný, M.,, Zimmermannová, J.,, Závodný-Pospíšil, J., Lavrinčík, J., Krišová, Z., Čermák, P., Martinů, J., Mošová, V., Říhová, V. *Informační systém pro řízení a správu obchodů v prostředí Forexu*. Olomouc: MVŠO Olomouc, 2017 (in Czech)

[4] Novák, V., Perfilieva,I.,Dvorak, A. Insight into *Fuzzy Modeling*. WILEY. 2016. ISBN: 978-1-119-19318-0

[5] Pokorný, M. a kol. *Informační systém pro řízení a správu obchodů v prostředí Forexu*. OP PIK Aplikace. Olomouc: MVŠO Olomouc, 2016 (in Czech)

[6] Barbosa R.P., Belo O. *Multi-Agent Forex Trading System*. In: Hăkansson A., Hartung R., Nguyen N.T. (eds) Agent and Multi-agent Technology for Internet and Enterprise Systems. Studies in Computational Intelligence, vol 289. Springer, Berlin, Heidelberg

[7] Dymova, L.,Sevastjanov, P.Kaczmarek, K. *A Forex trading expert system based on a new approach To the rule-base evidential reasoning*. Expert Systems with Applications. Elsevier.Vol.51, 1 June 2016,

[8] Dvořák A., Habiballa H., Novák V., Pavliska, V., *The concept of LFLC 2000 - its specificity, realization and power of applications*, COMPUT IND 51. 2003. ISSN:0360-8352.

[9] SHIH-MING L., KUO-LUNG L., SUSHIL G. *Economic Decision Making Using Fuzzy* Numbers. 2010 Dostupné z: http://www.pomsmeetings.org/ConfProceedings/002/POMS_CD/Browse%20This%20CD/PAPERS/002-0634.pdf

[10] ZOPOUNIDIS, C., PARDALOS, A., BAOURAKIS, G.. *Fuzzy sets in management, economics, and marketing*. River Edge, N.J.: World Scientific, c2001, xiii, 269 p. ISBN 98-102-4753-2.

[11] PAZZI, J., TOHMÉ, F. A Fuzzy characterization of uncertainty in financial crises. *In Fuzzy Economic Review,* 2005, vol. X, issue 2, s. 61-70. ISSN 1136-0593.

[12] BEZDĚK, V. Using fuzzy logic in business In *SIM 2013 – Challenges and inovation in management and leadership*. Rumunsko: Temešvár, 2013.

[13] JAMALI, A., TAVAKKOLI, M., New Method to Evaluate Financial Performance of Companies by Fuzzy Logic: Case Sudy Drug Industry of Iran, Asia Pacific. In *Journal of Finance and Nankiny.* Research vol 4, No 4., 2010. pp 15-24.

[14] MARČEK, M. PANČIKOVA, L., MARČEK, D. *Ekonometria a soft computing.*`Žilina: EDIS – vydavateľstvo ŽU, 2008. ISBN 978-80-8070-746-0.

[15] EKSI, I., CAKIR, V., BUYUKKONUKLU, B., OZCALICI, M. Prediction of Firm Value with Financial Structure Items: An Implementation on Metal Industry.In *Fourth International Conference FAM.* 2011. S. 65-72. ISSN 1314-460X.

[16] JAMSHIDI, M., REUTER, M., ANDINA, D., JAMSHIDI J. S. Real investment valuation model for very large industrial real investments. In *Soft Computing with Industrial Applications.* 2004, roč. 17, s. 379-384. ISBN 1-889335-23-1.

[17] BOJADZIEV, G,. BOJADZIEV, M.. Fuzzy Logic for Business. *In Finance, and Management.* 2nd Edition. Singapore: World Scientific Publishing Co. Pte. Ltd., 2007. 232 s. ISBN 13978-981-270-649-2.

[18] DAVIDOVÁ, O. Diagnostikování stavu objektu s využitím fuzzy logiky. *Automa: Časopis pro automatizační techniku.* 2001. Dostupné z: <http://www.odbornecasopisy.cz/download/au110152.pdf>. ISSN 1210-9592.

[19] FLAHATI, A, MIRZAEIAN, R. The Economic Analysis and Evaluation of the Investment projects with special References to the fuzzy Approach. *In Life Science Journal – Acta.* 2012, roč. 9, č. 3, s. 2691-2695. ISSN 1097-8135.

[20] KREMLÁČEK, P. *Možnosti využití fuzzy logiky ve firmách*. Brno, 2009. Diplomová práce. VUT v Brně, Fakulta Podnikatelská, Ústav Managementu. Vedoucí práce doc. Ing. Petr Dostál, CSc. Dostupné z: <http://www.vutbr.cz/www_base/zav_prace_soubor_verejne.php?file_id=14962>

GROUP EFFECTS AS A FACTOR OF CHANGING INDIVIDUAL BEHAVIOR IN WORKING GROUPS

Sardarian, Anna Romanovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
sardaryan_ar@rudn.university , anna_al_edu@mail.ru

Komarova, Tatiana Vitalievna
Assistant Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
komarova_tv@rudn.university

Vavilina, Alla Vladimirovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
vavilina_av@rudn.university, vavilinaalla@mail.ru

Abstract.

The article analyzes the main group effects in working groups (social facilitation, the M.Ringelmann effect, the effect of conformism, "we" effect, etc.). The article contains the findings of the authors' questionnaire-based survey of students at the Economics Department of Peoples' Friendship University of Russia (RUDN University) concerning their behavior change in working groups including the manifestation of group effects. In the course of the survey it was revealed that becoming a member of a group, half of the respondents more effectively solve the tasks, become more active, confident and ready to adopt the role of a leader. Only a few of respondents indicated that they can not work at all in the group, start making mistakes while working in a team, become irritable and prone to conflicts. Among the most important factors, which, in the opinion of the respondents, most often hampered their group to be more effective, the respondents named: lack of group cohesion, poor communication, transferring group members' responsibility to others. Less than one third of respondents admitted their conformal behavior and stated that the opinion of the group strongly influences their personal opinion and that in case of group pressure they will agree with the group's opinion.

Key words:

Group, behavior, individual, management, social facilitation, conformism in a group, "we" effect, social loafing effect

JEL: M12, M21, M54

1 Introduction

In recent decades, from the 1980-1990s, the approach to teamwork became topical in management, and team management has become a popular area in corporate consulting and management practices of the world's largest companies. Working in a team is beneficial for the company, as it leads to the reduction in time, decrease in labor costs, increase in labor productivity; faster results are achieved in the search for non-standard solutions to a problem; motivation for work activity is increased; interpersonal and intergroup conflicts are reduced. It is believed that in team workers are more productive while their job satisfaction increases. The effective team is characterized by the achievement of high rate of both the production assignments completion, and the conservation of human resources, the democratic atmosphere, joint participation in decision-making, the close and friendly attitude of the group members to each other, open and constructive solution to conflicts, free and open expression of ideas, distribution of leadership between team members. The effectiveness of the group is significantly influenced by the personality of the group members (individual qualification, skills, abilities, etc.), peculiarities of the organization in which the group undertakes its activities (leadership style, corporate culture), as well as certain processes occurring in groups called group effects). Thus, the study of the individuals' behavior in groups, the study of behavioral change under the influence of certain group processes - group effects, is of particular interest to modern management, which confirms the relevance of the topic chosen for publication.

2 Literature review.

To date, a certain body of knowledge has been formed in the scientific literature (sociological, managerial, psychological), reflecting certain aspects of the individual's behavior in a group. The characteristics of individual behavior in groups were studied by such scientists as Belbin M. [1], Lyutens F. [2], Mehddaks R. [3], Oksinojd K. [4], Robbinz S. [5], Thompson L. [6] J. J. George G. Jones [7], Slocum John W, Hellriegel D. [8], Denison, D. R.[9], Glaveegeo R.[10] Laurie J. Mullins[11], Newstrom John W.[12] Among the Russian authors who study the behavior of individuals in groups, we can distinguish: Balashov A. [13], Shapiro S.A. [14], Litvinyuk A. [15], Kartashova L.V., Nikonova T.V., Solomanidina T.O. [16], Reznik S.D. [17]. Group effects are discussed in the papers by the following scholars: M. Ringelmann[19], S.Asch [21], I. Janis [22].

3 Research Methods.

This publication uses the methods of analysis, study, generalization, sociological survey (in particular questionnaire-based survey), factor analysis, and groupings.

The objectives of the paper are: to determine key group effects occurring in the group, examine main causes of their occurrence, reveal specific features of individual's behavior in a group as exemplified by students groups.

During the survey of student groups there were studied the effects of facilitation and conformity, and identified the specificity of their manifestation among the youth.

The sources on which the provisions and conclusions of this article are based are academic works by foreign and domestic specialists, as well as the authors' original research of more than 450 students at the Management Department, the Economics Faculty, the International RUDN University [18] conducted in 2017. Thus, the survey was conducted using a specially developed questionnaire "Changing behavior in a group", containing 9 key questions whether respondents: 1) consider their group effective; 2) work more effectively in a group or prefer individual work; 3) consider their behavior in the group changing greatly and how; 4) are influenced by the opinion prevailing in the group, etc.

4 Results and Discussion

4.1. Types of group effects.

Group aspects of an individual in organization has been addressed since the beginning of the past century, however, despite the conducted group studies, Western management for quite a perceptible time ignored the existence of groups in the organization and viewed the organization as a set of individuals. The ideologist of scientific management F.Taylor completely excluded the working group from his consideration and believed that the groups had a negative impact on the production process and work efficiency, called for the destruction of groups and gave the workers only individual tasks. The recognition of the role of groups by scientific management begins in the 1930s and 1940s after conducting of the Hawthorne Experiments by the Western Electric Company. The experiments revealed (and then it was recognized) that a group is an important factor of organizational effectiveness. Nowadays groups are considered the basic unit of the production process and a factor of labor productivity. A group is a relatively distinct unit of a small number of individuals (usually not more than ten), who have regular contact and frequent interaction and act together for a sufficiently long period of time.

Working in groups, including effective ones, entails a number of serious difficulties that manifest themselves in so-called group effects - the mechanisms of the group functioning, through which the group processes are carried out and the effectiveness of groups is achieved. So, it is obvious that when an individual joins the group, he/she most often changes the behavior compared with the one demonstrated alone or in the course of interpersonal communication "face to face".

One of the interesting effects necessary for studying by practicing managers is the effect of "social laziness" (or so-called social loafing, the Ringelmann effect). According to this effect, as the number of members in the group increases, the average individual's contribution to the group work decreases. Thus, M. Ringelmann [19] proved that if the productivity of one person is 100%, then the two together will, on average, raise the weight, which is not twice as much, but only 93% of the total weight lifted by two separately working people. "The coefficient of efficiency" of a member of a group of three people will be equal to 86%, and of eight people - only 51%, etc. Social loafing can be explained by the presence of individual responsibility, the size of the group, friendly relations, etc. (table 1) For example, this effect can be observed in large groups where the "dilution of responsibility" occurs: the larger the number of the group members, the less the contribution of each participant to the final action [20].

Table 1- Key causes of the "social loafing" effect

Causes of effect	Manifestation
Presence of individual responsibility for the results of their work.	the lower the responsibility, the higher social loafing.
Group cohesion and friendly relations	Social loafing is lower if its members compete with each other.
Group size	The larger the number of the group, the higher social loafing.
cross-cultural differences	Members of collectivist culture demonstrate less social loafing that those who belong to individualistic culture.
Gender differences	Women are is less inclined to social loafing than men.

Source: compiled by the authors

Another group effect is the effect of "social facilitation", it is when in the presence of people holding high position, the individual's motivation for solving the problem increases. However, the effect of presence can also influence the individual's motivation negatively (then we can speak about the negative manifestation of this effect - the effect of social inhibition). The intensity of this behavior of individuals in

groups can depend on many factors: the degree of significance of the people present, the individual characteristics of the individual, the preparedness of the individual for solving the task posed, and so on.

The effect of the "pendulum" is manifested in the group by the cyclic alternation of the group emotional states of the group members. So, if any events that occurs in the group are positive for the members of the group, then the group demonstrates an emotional uplift, and vice versa (the events in the production life having a negative meaning for the majority of the group members lead to a decline in the general mood).

"We" effect becomes evident in sense of belonging to a particular group of people. Thus, on the basis of common goals, tasks and joint activity, the members of the group come to an understanding of the group as a certain part of their individual's life; the relations of unity and integrity of the group are built. "We" effect turns out to be more significant psychological mechanism of the group functioning. Thus, the hyperbolized sense of "we" can lead the group to reassessing their capabilities and merits, to being separated from other groups, to "group favoritism" (tendencies in any case to favor members of their group as opposed to members of another group). The insufficient sense of "we" leads to the lack of unity in the group and, as a result, the lack of coherence in the group's activities and a decrease in its effectiveness.

One of the most interesting group effects is rightly considered the conformism effect, to the study of which S.Asch devoted a long time [21]. This effect can be witnessed in group pressure on the individual opinion, subordination to the opinion of the group. Base on a series of experiments, S. Asch proved that more than one-third of people demonstrate conformal behavior. The degree of conformism is determined by the following factors: the degree of individual's competence, the type of personality, the group structure, the level of team cohesion, the presence of individuals in the group that are authoritative for the individual, the degree of personal relations among the members of the group, etc.

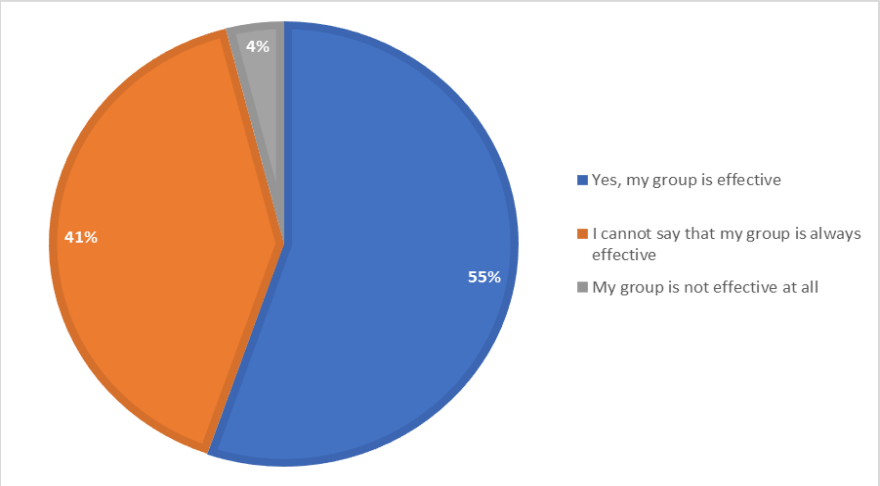
The effect of groupthink is a way of thinking acquired by people in a situation when the search for consensus in a group becomes more important than the most correct decision. In the event that group members face the threat of disagreements and conflicts, they try to avoid them, find a solution that suits everyone, even if this decision is unreasonable and ineffective. The discovery of this phenomenon and the term "groupthink", belongs to the American psychologist I. Janis [22].

4.2 The research of individual's behavior in a group

In order to identify the degree of individual's work effectiveness in team, the authors of the paper in December 2017 conducted a study among 450 students at the Economics Department of RUDN University, which hosts students from more than 150 countries of the world.

Replying to the question "Do you consider your group effective (where the members of the group support each other, where they quickly and efficiently solve the tasks set, where a atmosphere is benevolent), 55% of the respondents gave a positive response, 41% answered that they can not say the group was always effective. And only 4% of respondents answered that they consider their training group completely ineffective (Fig. 1)

Figure 1- Do you consider your group effective?



Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017

When asked whether the respondents consider their behavior to be very different when they are in the group, the respondents answered that it changes "very much" (7.7% of the men and 1.3% of the women) and does not "change at all" (22.5% of men and 21.7% of women) (Table. 2.).

Table 2- Changes in the individual behavior in the group (gender-disaggregated), (%)

Degree of behavior change	men	women
Behavior change in group (%)		
Changes Very Much	7.7	1.3
Changes Enough	16.5	12.5
Changes a Little	53.3	64.5
Does not Change	22.5.	21.7

Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017

According to the results obtained, it was revealed that 56.6% of respondents behave differently in the group, 50.6% more effectively solve their tasks, 35% 7 become more active, confident and ready to take the lead. 4% of the students answered that they can not work at all in the group, 8.8% in group forms of work begin to make mistakes and 11.7% become irritable and conflicting (tab. 3.).

Table 3 - Changes in Individual Behavior in teamwork

Evident Changes in Behavior	Percentage of Respondents
I become more active, confident and take a lead	35.7
I solve the problems more effectively	50.6
I become less confident	10.8
I suddenly start making mistakes	8.8
I become irritable and prone to conflicts	11.7
I shift responsibility to other group members	8.8
I behave according to the situation, each time in a different way	56.6
I take responsibilities and do other members' work	21.3
I cannot work in a group at all	4
My behavior does not change	28.5

Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017

Among the most important factors that prevent the group from being more effective students named: lack of group cohesion (59.1%), poor communication (58%), group members shifting responsibility to others (46.5%). Conflicts (14.2%) and toxic socio-psychological climate in the group (21.8%) became less evident and, therefore, the least manifested factors in the group (tab. 4).

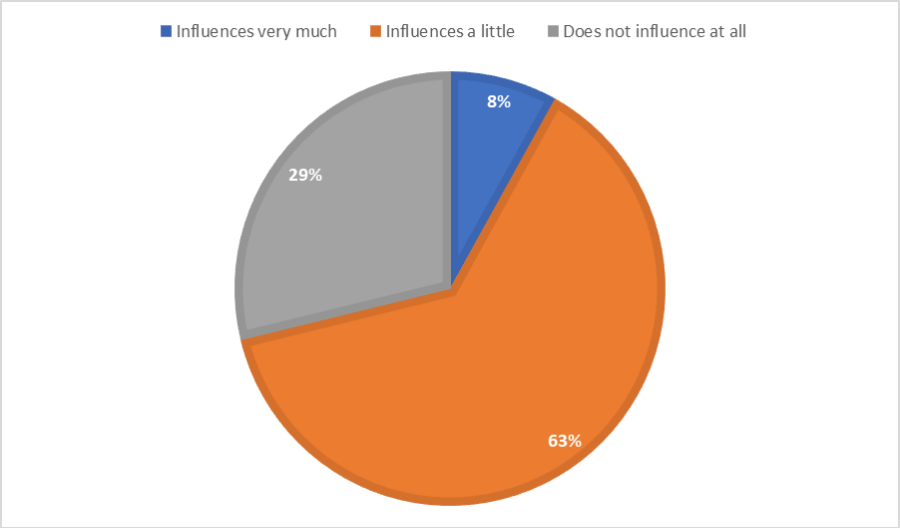
Table 4- Factors that do not prevent the group from being effective

Factors	Percentage of Respondents
Too many group members who want to be a leader	41.3
cross-cultural differences	31.7
Inefficient leadership	35.5
Inadequate openness and goodwill in the group	51
Group members who shit responsibility to other members	46.5
inability to listen to each member's opinions, bad communications	58
Lack of group cohesion.	59.1
Toxic social-psychological climate in the group	21.8
Constant conflicts	14.2

Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017.

8% of respondents said that group opinion badly influences their own opinion, 29% said that group opinion does not influence their own opinion at all. The rest (63%) answered that the opinion of the group affects their personal opinion insignificantly (Fig. 2).

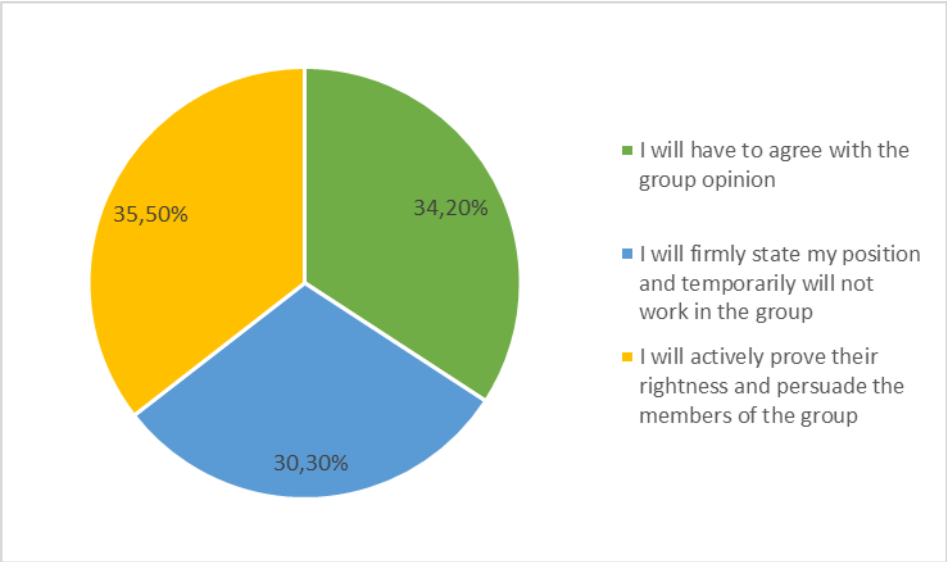
Figure 2- How much does the opinion of the group affect your personal opinion?



Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017

Answering the question "If the majority of the group members make a decision that you strongly disagree", the respondents said that they will have to agree with the opinion of the group (34.2%), they will firmly state their position and temporarily will not work in the group (30.3 %) and will actively prove their rightness and persuade the members of the group (35.5%). Thus, respondents almost evenly split (fig. 3.)

Figure 3- ‘‘What would you do if the majority of the members of the group make a decision that you strongly disagree with"?



Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University students conducted in December 2017

The majority of the respondents answered that they can work quite well in the group and also can work individually (men 64% and 65.9% women). Individual work is preferred by 13.5% of men and 12.5% of women. And more than 20% of respondents like to work not alone; 4.).

Table 4- Group work preferences

	men	women
Group work preferences, %		
No, I always prefer to work individually	*13.5*	*12.5*
I can work quite well in a group, and also I can work individually	*64*	*65.9*
Yes, I like working in a group more than alone	*22.5*	*21.6*

Source: compiled by the authors based on the findings of the questionnaire "Behavioral change in the group" of RUDN University conducted students in December 2017

5 Conclusion

The goals set for the author's research (to determine the main group effects occurring in the group, as well as to investigate the specific behavior of individuals in the group as exemplified by students groups) were achieved. As research into the behavior of new generations of workers (generation of the Millennium, the digital generation) is becoming more and more topical today, it is interesting to study the behavioral aspects in the group of young people. It seems that the research data will later acquire a larger scale and become more systematized.

The results obtained during this research can help the leaders of modern companies form working groups and teams, especially those consisting of the younger generation, as well as for further scientific and practical research on the problems of individuals' behavior in groups.

6 Acknowledgment:

This paper was financially supported by the Ministry of Education and Science of the Russian Federation on the program to improve the competitiveness of Peoples' Friendship University of Russia (RUDN University) among the world's leading research and education centers in the 2016-2020.

The authors are grateful to the students at the Management Department, the Economics Faculty, RUDN University, for their active participation in the survey, the results of which were included in the article.

The publication was prepared with the support of the «RUDN University Program 5-100».

7 Bibliography:

[1] Belbin R. M. Komandy menedzherov. - Moscow Hippo, 2009
[2] Lyutens F. Organizatsionnoe povedenie. - Moscow INFRA-M, 1999.
[3] Mehddaks R. Uspeshnaya komanda. Kak ee sozdat', motivirovat' i razvivat' – M.: Al'pina Biznes Buks, 2008
[4] Oksinojd K.EH. Organizatsionnoe povedenie. - Moscow KnoRus, 2009
[5] Robbinz S.P. Osnovy organizatsionnogo povedeniya. - Moscow Vil'yams, 2006
[6] Tompson L. Sozdanie komandy / Per. s angl. - Moscow Vershina, 2009
[7] George J., Jones G. Understanding and Managing Organizational Behavior (5th Edition), 2007
[8] Slocum John W, Hellriegel D. Principles of Organizational Behavior. - Cengage Learning, 2009
[9] Denison, D.R. Corporate culture and organizational effectiveness. New York: John Wiley & Sons, 1990
[10] Glaveegeo R. Organizational Buying Behavior, 2010
[11] Laurie J. Mullins. Management and Organization behavior. London: Pitman Publishing, 1996
[12] Newstrom John W. Organizational Behavior: Human Behavior at Work, 2006
[13] Balashov A. Teoriya organizatsii i organizatsionnoe povedenie. Uchebnoe posobie. - Moscow INFRA-M, 1999. – 2015.
[14] SHapiro S.A. Organizatsionnoe povedenie. - Moscow Kno-Rus. – 2016.

[15] Litvinyuk A.A. Organizatsionnoe povedenie. - Moscow YUrajt. – 2013.
[16] Kartashova L.V., Nikonova T.V., Solomanidina T.O. Organizatsionnoe povedenie. - Moscow INFRA-M, 2008.
[17] Reznik S.D. Organizatsionnoe povedenie. Uchebnik. - Moscow INFRA-M, 1999. – 2016.
[18] RUND University [electronic resource]. Access mode: http://www.ng.ru/education/2016-04-12/8_job.html
[19] Ringelmann, Maximilien, Les Machines Agricoles (Paris: Hachette, 1888–1898)
[20] Sardarian A. Fenomen sotsial'noj leni // Upravlenie personalom. issue 15) - 2011.- s.53-59
[21] Comstock G. A., Scharrer E. Asch // The Psychology of Media and Politics. - Academic Press, 2005. - P. 46-49, 19. – 316 p.
[22] Janis, Irving L. (1959). Personality and persuasibility. New Haven: Yale Univers

HUMAN RESOURCES MANAGEMENT AND NEW PERSPECTIVES IN PROJECT MANAGEMENT – THE BASIS FOR DECISION – MAKING

Eva, Hvizdová – Pavel, Máchal
Mendel University in Brno, Department of Project Management
eva.hvizdova@mendelu.cz, pavel.machal@mendelu.cz

Abstract:

Project management is one of the fundamental elements of organization management. Many experts consider the management of projects the most important activity of the future. Western management considers the knowledge of project management as an integral part of the skills of managers and ordinary workers. The project oriented organization requires the adaption of the HRM system to create a viable design that acknowledges projects and project orientation. The paper deals with the development of human resources as a new perspective of project management. It also specifies its impact on decision making.

Key words:

New perspectives, human resources, competency, theory, decision - making

JEL: D9

1 Introduction

Human Resource Management (HRM) is the most important functional in all organizations. It contributes to the success of the organization and creates competitive advantage for the organization. The way HRM practices and policies take shape also affects the employee's experiences of work and the employment relationship. HRM is therefore important in any organization. The project-oriented company is no different in this regard. The implementation of project management in an organization can be considered as a change which touches different identity dimensions of the organization [19]. A central dimension to be changed is "Human resources", as personnel require new competences and skills. Thus every time a new project or program is started, the HR configuration of the organization must change. This might create pressure. It certainly impacts the work organization, and creates the need for new processes like assigning personnel onto projects, dispersement from projects, and processes for linking projects assignments to careers [18]. Project management is a tool for implementing a modern management method called *Management by Objectives* (MBO). According to Kerzner [7], project management has recently begun to shift attention from technical to behavioral competencies, and issues of so-called management of the situation attracts more and more attention. The process of integration and interpersonal relations has been even more important about the growth of the size of project teams. Project managers now need to be able to communicate with several different functions and departments. In the scientific field, there are also very interesting studies beginning to emerge towards identification and research on behavioral competencies of participation in the specification of organizational knowledge. These competencies could contribute to the creation of organizational innovations in project management. In addition to specific competencies (knowledge of marketing, product development, business planning, decision making, etc.), developed economies are beginning to talk about the need for emotional intelligence as part of behavioral competencies. The Western World considers the knowledge of project management as the standard knowledge that every executive needs to have. The use of project

management is a proven practice (*best practice*) that successful organizations use to ensure good competition. If our organizations want to succeed in the global global market, even the European market, they must learn how to use project management well [8]. The aim of this paper is to highlight the new perspectives of project management and their impact on decision – making.

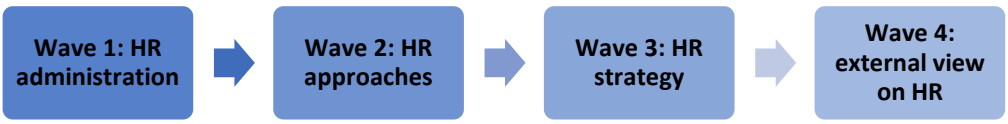
2 Methods

The methods characterize the theoretical framework of the contribution. We summarize, analyze and compare important theoretical approaches. In this regard, we are trying to create a discussion that would help develop the subject in specific conditions. The main criterion of selection of sources was the database of available authors which is linked to the modern concept of project management. In this regard we use the scientific work of authors Huemann and Windsor. These authors describe a primary concept of implementation of HRM into project management discipline. In the scientific work, we use the method of analysis (analysis of available resources), synthesis (a combination of opinion procedures), induction (formulations of opinions) and comparison (comparing authors' views with our approach). The theoretical framework introduces and describes the theory opinions which explains the importance of development this scientific theme.

3 Paper results

Many experts consider project management the most important "control" activity of the future [13]. Particularly, in today's rapidly changing market environment it is becoming more and more important and its good implementation can bring each organization a significant competitive advantage. This is the principal reason why there can be an ever-increasing emphasis observed in this case. Project management is the process of implementation of the amendments [4]. Ideal project organization has a special management culture, which is expressed in the strength of its employees and teamwork. These attributes are associated with a permanent process of organizational change, customer orientation and networking of clients linked to the close communication of project teams. The project organization will always require special competencies and skills to support successful project collaboration. HRM policies, practices, and processes need to be promoted because we can only talk about the creation of a project organization [5]. Ulrich, Younger, Brockbank and Ulrich [20] work with the term "human resource development waves" (see Figure 1). Recently, the HRM profession has gone through three general development waves, with the fourth wave coming right now. All the waves run over a similar curve with phases of rise, learning, growth and then stability.

Figure 1: Waves of HRM development



Source: Ulrich, Younger, Brockbank and Ulrich, 2014

Wave 1 put emphasis on administrative work related to human resources management, where HR staff focused on working conditions, staffing and compliance with the Labor Code. HR was primarily something that could be called "administrative and transactional services." The roles of HR in the wave 1 were carried out by people who have produced excellent administrative work. The efficiency of the HR

Unit in Wave 1 consisted in achieving higher performance with less resources, and its credibility was based on the flawless administration of individual transactions.

Wave 2 put an emphasis on creating innovative approaches to managing human resources in terms of obtaining, rewarding and motivating employees, educating them, communicating with them, etc. For example, General Electric executives realized that their future well-being was deeply influenced by how quickly and reliably is the company able to educate its successors at all levels of leadership, and to support the international growth of individual business units. This led to the establishment of the Crotonville Training Center (currently, the Jack Welch Leadership Center), an extensive campus of next generation key executives and CEOs. The efficiency of HR in Wave 2 was based on innovation and HR integration. Its credibility was derived from the ability to adopt state-of-the-art HR practices.

Wave 3 focused on integrating individual and integrated HR approaches with the company's success through strategic HR management. Mastering the strategic nature of HR work has forced the change of HR department and the advancement of its staff capabilities. Effectiveness of Human Resources Management in Wave 3 requires a direct line between corporate strategy and HR steps. The credibility of HR is based on the presence of its staff at a round table where discussions about a future strategy are taking place. In the company's strategy, HR personnel is entrusted with the task of assessing and adapting the structure of employees, corporate culture and management style to the needs of the strategy. To meet strategic goals, during this wave HR staff redefines strategies in human resource into management priorities.

Wave 4 uses HR approaches in response to external business conditions. This wave represents a modern approach to HR techniques. The external view on HR goes further and, in addition to its strategy, coordinates its work with the business context of company and interested project teams. It is necessary to realize that the three previous waves describe the personnel work which has to be carefully carried out - personnel administration must be flawless, HR approaches must be innovative and integrated. HR needs to transform strategic goals into individual steps. At the same time, it is important to realize that future HR staff (i.e. project team members) do not rely only on these three waves, but they search outside their organizations for their customers, investors and communities when defining the success of human resources management. Wave 4 assumes implementation of the new concept of project management decision making.

3.1 HRM and new perspectives in project management

Human Resources Management (HR) represent a specific activity within an organization that deals with the management of human capital, i.e. management of employees as a whole [2]. They differ from management by providing managers with "tools" that can directly and indirectly drive growth and sustain productivity. Project management is not a routine activity, so it is clear that, unlike standard management, we should pay more attention to human resource management. The basic prerequisites for the functioning of any company (organization, enterprise, firm, project team) are essential resources - material, financial and human. However, the most important of these are human resources, which the other two sources put into motion and determine their use.

Human resources are primarily people with their knowledge, experience, skills and abilities that they bring to the organization in which they work. They represent a human potential that affects the value of an organization and its results much more than its technological and material equipment or the state of finances. According to Drucker [4], we agree with the view that current pressures on organizations require a broader, more complex and more strategic view on human resources. It is necessary to look at the people in long-term perspective and more like potential wealth than the cost item. Traditional project manager declares that human resources are not essential, but this statement is not right. Even in our environment we can meet this opinion. However, if a project manager does not pay sufficient attention to motivation and inspiration to his team, he can not expect effective results. Current management of human resources is characterized by a new management approach. Several foreign and local authors are

concerned with the concepts of human resources management, most frequently characterized by the following common features [10]:

- A strategic approach to personnel work and to all personnel functions: long-term perspective and considering the long-term results of the decisions made.
- Orientation on external factors of formation and functioning of the organization's workforce: interest in population development, external economic conditions, labor market, value orientation of people, and environment.
- Personnel work ceases to be a matter of HR and becomes a part of everyday work of all executives.
- There is a close link between staffing and the organization's strategies and plans.
- Personnel management becomes the backbone of organization management, a central management role.
- Emphasis on human resource development: all employees from managers must be aware of the current conditions it is necessary to constantly develop the professional competencies and personal characteristics of all employees, which predispose the organization to modern methods of work, the creation of flexible working teams, rapid response to the environment and increasing adaptability.

Knowledge about HRM is produced by researchers and theorists who, through publishing their work in books and journals, construct knowledge in particular ways and in so doing frame the way HRM debates take shape in the academic and practitioner literatures. In most of the extant literature HRM is framed primarily in terms of large, stable organisations, while other organisational types, such as, those relying on projects as the principle form of work design, are marginalised in discussions about what HRM is and how it should be practiced [5]. People are also a unique attribute in subjective object relationships, i.e. the ability of self-determination. It's the potential to manage oneself. In other words, the ability of people to act in their roles purposefully, reasonably, and independently. The main components of self-management are self-control (the ability to manifest emotions in an appropriate way), discipline (the ability to control one's own emotions to achieve the goal), endurance (the power not to achieve the goal) and, above all, the ability to realize the entire cycle of controlling the process. To understand and anticipate human behavior, we need to deal with limited rationality. These limitations are not even the least obvious. We can not even know what they are in advance [8,6].

3.2 New attitude to decision – making in project management

Every project starts with a decision. Leaders typically have a bias for action so they like making decisions, and often do so with a strong sense of certainty that inspires those around them. According to the PMBOK guide [15], the project is defined as a *"temporary effort spent on creating a unique product, service, or output"*. Project management processes are divided into five main process groups. These include: **Initiating process group** - these processes define a new project or project phase of an already existing project. **Planning process group -** these processes define the scope of the project, set the objectives and activities of the project that are needed to achieve its goal. **Executing process group** - during these processes, the work set out in the project plan is done, so that the given specifics of the project are respected. **Monitoring and Controlling process group** - these processes require monitoring, reviewing, and directing progress and project performance. The processes set out the requirements for changes
and their implementation. **Closing process group** - through these processes, the project activities are finalized, respectively to the formal ending of the project or its phase.

In project management we make decisions on a daily basis. Most are relatively unimportant; some are critical and will cause the project to be successful or to fail. The classical approach to making decisions in management is a very rational set of steps: **Identify the problem** – recognize there is a problem, define

the goals, and gather the information needed to make a rational decision. **Generate all possible solutions** – brainstorm all solutions, preferably in a group. Don't filter anything even remotely reasonable at this point. **Generate objective criteria** – generate the measurement criteria to assess the possible solutions for feasibility and reasonableness. Begin taking into account criteria for measuring the success or failure of the decision. **Select the best option** – using the filtering criteria, make a decision on the best possible solution. **Implement the solution** – put into place the preferred solution. **Monitor the results** – track and monitor the outcome of the implemented solution and the results that ensue. This may take some time for long-term outcomes to become apparent. Did the proposed solution work or should another solution be implemented?

Decision making is critical to being successful as a project manager. It is something we do on a daily basis as we juggle schedule, resources, risks, quality, and other factors. The academic world has taught for many years that decision making should be rational, looking at all possible facts and logically arriving at the best solution. But modern research in physiology has shown us how the brain really arrives at decisions, and it is not as logical as we would like to think. The more we understand how our brains arrive at conclusions, the better our ability to make more rational decisions. However, there is virtually no support in real-life management studies for the utility of the rational model. There are a lot of assumptions that must be made in practice [12]:

- The problem is clear and unambiguous.
- We have identified the real problem and not just a symptom of the problém.
- Managers have perfect information.
- Objectives are known and agreed to by everyone.
- The alternatives and their consequences are known or predictable.
- Managers are rational, systematic, and logical.
- Managers work in the best interests of their organizations.
- Ethical decisions do not arise in the decision-making proces.
- Time and resources are not a consideration.
- Decisions will be implemented willingly and supported by all stakeholders.

But in real approach to project management we can see:

- Decision makers rarely have access to perfect information.
- Opinions often outnumber facts.
- Decision makers are influenced by other people who have a strong interest in a particular outcome.
- Decision makers are limited in their ability to comprehend vast amounts of information.
- The data may be so poorly presented that a decision is not obvious.
- Decision makers seldom can accurately forecast future consequences.
- Emotions, fatigue, attitudes, and motives can interfere to prevent rational decision making.
- Culture and ethical values influence the decision-making process.

The rational approach works much better in the field of science, where there is time to gather sufficient data before making a decision and to take a logical approach to arriving at a decision. As project managers, we often must make decisions under time pressure and with inadequate data of questionable accuracy. In this environment we base decisions mostly on our own experience and the experience of people we trust well enough to ask their opinion. There exists certain conditions for consensus decision – making [21]: **Common Goal:** Everyone needs to share a common goal and commit to achieving the desired outcome**.** Invest time in defining this shared goal to avoid conflict later on. **Commitment to Reach Consensus:** Each individual needs to share their opinion, listen, and remain open to new ideas or

directions. Whilst value is placed on individual ideas, the overall success of the group is more important. **Active Listening:** Listen to the opinions of others carefully and without interruption. **Trust and Openness:** The group must trust that no-one will manipulate the process for their own agenda. Creating a team environment based on companionship, collaboration, respectful discussion, and a proactive attitude is critical. **Clear Process:** Establish and follow common guidelines. **Participation:** The process will only work if those involved are engaged, share their opinions, and work together to find a solution. **Good Facilitation:** Depending on the size of the group, you may wish to appoint a facilitator to run the meeting. In a general sense, a decision is a position, opinion, or judgment reached after consideration. It is a cognitive phenomenon and the outcome of a complex process of deliberation, which includes an assessment of potential consequences and uncertainties. Decision involves thinking, judgment, and deliberate action to assign irrevocable allocation of resources with the purpose of achieving a desired objective. Basic elements of a decision process include information seeking, ascription of meaning (interpretation), applying decision criteria, and subsequent implementation action. A modern, integrative approach to human resource management was presented by William Ouchi [17]. In his work, he compared the differences between the management approach and their influence on different cultures in the United States and Japan. Typical elements of American society have been marked by the letter A, typical elements of the Japanese society by the letter J. The synthesis of these two cultures and approaches to the management reached the Z theory. The author compared several basic parameters. These were mainly: work, decision making, responsibility, promotion, career, control and access to employees. From American society, he emphasized individual responsibility. In Japanese style, the influence of collective decision-making. As important, he considered the length of the relationship between employer and employee. While in US culture workers are ready to fluctuate, and migrate for work according to market needs, in Japanese culture, an employee often comes up with the idea of a lifetime employer. The most important and unifying element of the Z theory is the union of team consensus with individual decision making. Moreover, the integral role of project management decision - making is emphasized by the fact that managers must anticipate the effects of the external environment in which the organization is located and in which it operates. Project managers would not be able to perform their tasks and be successful in the full sense if they did not understand or even ignored many stimuli from the outside environment.

4 Discussion - competency management as primary determinant of decision making

The most productive organizations make good decisions quickly and execute them efficiently. As noted earlier, our findings reveal that decisions improve with the right culture, people, and process. We see that consistently high-performing organizations empower their people to make the best possible decisions, have a formal decision making process, and tie it all together by embedding support for good decision making into their culture. Strategy, information, and risk management are important factors in their success, but there are many more issues under the culture-people-process umbrella that both directly and indirectly affect good decision making [16].

By trying to identification the decision – making in project management we must work with term competencies. **Competence** is a term used in various meanings, but it usually indicates *the scope of a certain activity, authority and duty.* The synonyms to the word of competence are ability, capacity, skill, efficiency. However, in defining this concept in a psychological context, it is a cluster of specific attributes and patterns of behavior. To further definition an abbreviation KSAO (Knowledge, Skills, Abilities, Other Characteristics) can be used. It refers to a set of specific knowledge, skills, abilities, and other characteristics that are required for successful performance in the role and are sufficient whether necessary for the achievement of certain objectives. Competence is understood as a **socio-economic character**, ability to perform certain functions and achieve specific performance yet. The competencies also serve as input measure of individual behavior in its adoption in the organization. They contain the following basic **components**: personality traits and perception of oneself; the motives of knowledge, skills, abilities, and especially the ability to effectively apply all of these components.

Competencies also have their own structure. They consist of both intelligence, talent, abilities, but also values, attitudes and motives. Further, there are skills, knowledge, know-how and the resulting form of behavior included. The fact that competencies are manifested in behavior gives us the opportunity to describe and measure them [9]. Nowadays, the term "competence" is used in two different meanings. The first expresses the power, authority, scope (usually some granted authority or belonging to any authority). On the other hand, the second meaning expresses the ability to perform an activity, to be able to perform it, to be qualified in the relevant area, to have the necessary knowledge and skills. The difference between these meanings lies in the fact that the first emphasizes something that is given to a person from the outside. On the other hand, the second significance emphasizes the inner quality of man that results from his development at that moment. This quality is more or less independent of the outside world and gives it some performance. Armstrong [1] refers to competence-based management as a human resource management system that combines individual HR processes into a complex system in which individual human functions are integrated with a set of required competencies, respectively with a model of professional competence. A specific competency model, unlike the above, identifies those competencies that are a prerequisite for the desired performance of a given employee at a specific position. In case of strategic objectives of the company that require the involvement of all company employees, the so-called central competencies models are used. These models are applied to each employee to streamline their performance. They include, e.g. competencies focused on teamwork, customer orientation, or process improvement at all levels of the organization.

Many organizations have developed competency systems to define what they believe are the key competencies needed to achieve success. These systems contain generic (generic) behavioral abilities. Describe how people should behave in their roles, and for each role they contain professional or functional abilities. Define what people should know and know to do their job well.

Plamínek and Fišer [14] state that a system of corporate ideas is necessary for competencies. In an organization, the basic decision-making criterion is the vision, goals, tasks - just the ideas that make the organization alive. For ideas to really bind the company and to be used by everybody in everyday work, they must be defined above all. Then two important things must become: they must be realized and made available to people. If a company has a project management competence, it can accept project managers whose level and range of work abilities, skills and other characteristics fit into this concept. Furthermore, it also can precisely identify the employees and the degree of difficulty they have to deal with.

Competency based management is a progressive approach to business management that is based on the mutual synergy of "hard" management factors (structure and strategy) and "soft" aspects (competencies of workers). If this approach is appropriately implemented within the project management system, it can be very beneficial to the organization and its human resources. Competency management is considered to be the basis for decision-making in project management.

Based on the goals that lead businesses to compile and use competency models, competence models can be divided into three basic types. When defining *a generic competence model,* emphasis is placed on creating generally applicable and proven competencies that reflect the requirements necessary in each organization regardless of the job position being performed. In this case, it is most often a model of key competencies, including leadership, communicativeness, creativity, or effective teamwork. Such a generally valid model is the first step of the enterprise to successfully implement a competence approach in the context of people management. Its disadvantage lies primarily in its frequent focus on a very wide group of company employees. This reduces the effectiveness of this model.

A specific competency model, unlike the above, identifies those competencies that are a prerequisite for the desired performance of a given employee at a specific position. In case of strategic objectives of the company that require the involvement of all company employees, the so-called central competencies models are used. These models are applied to each employee to streamline their performance. They include, e.g. competencies focused on teamwork, customer orientation, or process improvement at all levels of the organization.

We would like to emphasize that competent management is a very important part of the project management perspective. P. F. Drucker – as a result of his orientation on people and their values, and his ability to project trends in the form of their social consequences – pointed out that former ideas of an employee loyalty and their application had already ceased to be valid. He saw that knowledge is transferable and that its application is not limited to narrow specialization in one particular company or one sector. At this place, we can talk about knowledge workers in project management. They appreciate their knowledge and skills, their recognition and respect, as well as their work (and perhaps even more). They expect to be well-rewarded for their work, but they also have a much greater degree of recognition and discipline. Drucker was convinced that people are currently more important for the success of an organization than ever, because it gives them more power [4].

5 Bibliography

[1] Armstrong, M. (2007). *Řízení lidských zdrojů: nejnovější trendy a postupy*. Praha: Grada Publishing. ISBN 978-80-247-1407-3.

[2] Dessler, G. (2012). *Human Resource Management*. Pearson Education: USA. ISBN 0273766023.

[3] Drucker, P. (2006). *Innovation and Entrepreneurship*. Harper Business: New York. ISBN 978-01-3379-807-4.

[4] Drucker, P. (2008). *Management podle Druckera. Odkaz zakladatele moderního managementu.* Management Press: Praha. ISBN 978-80-7261-181-2.

[5] Hueamnn, M., Keegan, A. a Turner, J. R. (2007). Human resource management in the project – oriented company: A review. *International Journal of Project Management*, 25 (2007), 315 – 323. ISSN 0263-7863.

[6] Kahneman, D. (2007). *Myšlení rychlé a pomalé*. Jan Melvin Publishing. ISBN 978-80-87270-42-

[7] Kerzner, H. (2013). *Project management: a systems approach to planning, scheduling, and controlling*. Eleventh edition. Hoboken, New Jersey: John Wiley. ISBN 978-111-8415-856.

[8] Máchal, P. – Ondrouchová, M. – Hvizdová, E. (2017). *Nové perspektivy v projektovém managementu.* Brno: Vydavatelství Mendelovy univerzity v Brně. ISBN 978-80-7509-504-6.

[9] Medzihorský, Š. (2004). *Kompetence v managementu.* Available on: <http://modernirizeni.ihned.cz/c1-14608830-kompetence-v-managementu>.

[10] Měrtslová, L. (2014). *Řízení lidských zdrojů a lidského kapitálu firmy.* Akademické nakladatelství CERM, s.r.o.: Brno. ISBN 978-80-7204-907-3.

[11] Mikuláštík, M. (2015). *Manažerská psychologie.* Grada Publishing: Praha. ISBN 978-80-247-4221-2.

[12] Parth, F. R. (2013). *Critical decision-making skills for project managers*. Paper presented at PMI® Global Congress 2013 - EMEA, Istanbul, Turkey. Newtown Square, PA: Project Management Institute.

[13] Pinto, J. K. (2013). *Project Management*. Prentice Hall: USA. ISBN 978-013-6065-616.

[14] Plamínek, J. a Fišer, R. (2005). *Řízení podle kompetencí.* Praha: Grada Publishing. ISBN 80-247-1074-9.

[15] PMI (2013). *A guide to the project management body of knowledge (PMBOK® guide)*. 5th ed. Newtown Square: Project management institute, 2013, 589 s. ISBN 978-1-935589-67-9.

[16] PMI (2015). *Capturing the value of project management*. Available on: <http://training.procept.com/library/pmi-decisionmaking-en.pdf>.

[17] Robbins, S.P. a DeCenzo, D.A. 2005. *Fundamentals of Human Resources Management*. USA: Willey, ISBN 978-04-716-5680-7.

[18] Stulgiene, A. (2010). *HRM in project – oriented organization: Theoretical Aspects.* Available on: <https://konference.fbm.vutbr.cz/workshop/papers/papers2010/stulgiene.pdf>.

[19] Turner, R.J. et al. (2010). *Perspectives on Projects*. New York: Routlege.

[20] Ulrich, D. et al. (2014). *Nová éra řízení lidských zdrojů. Šest kompetencí pro HR budoucnosti.* Praha: Grada Publishing.ISBN 978-80-247-5090-3.

[21] Windsor, G. (2017). *How to use Consensus Decision Making for Project Management.* Available on: <https://www.brightwork.com/blog/use-consensus-decision-making-project-management#.WloYNKjibIU>.

INTEGRATED MULTIDISCIPLINARY APPROACH FOR SAFETY & SECURITY MANAGEMENT: THE CASE STUDY OF PAPAL BASILICA AND SACRED CONVENT OF SAINT FRANCIS IN ASSISI, ITALY

Fabio Garzia
Safety & Security Engineering Group – DICMA, SAPIENZA – University of Rome, Italy
Wessex Institute of Technology, Southampton, UK
European Academy of Sciences and Arts, Salzburg, Austria
Foundation for the Basilica of Saint Francis in Assisi, Assisi, Italy
fabio.garzia@uniroma1.it

Abstract:

The purpose of this paper is to illustrate an integrated multidisciplinary approach for safety and security management. It is based on a general Integrated Multidisciplinary Model for Safety and Security Management (IMMSSM) supported by an Integrated Technological System Framework (ITSF) that can be based on Internet of Things (IoT) / Internet of Everything (IoE). It can be adopted in most situations and has already produced interesting results, both from a theoretical and practical point of view, in safety & security management, and even from a cost/benefit point of view, in different existing organizations which have started to adopt the IMMSM and have started to modify their already existing technological systems to support it through the above mentioned ITSF. In particular, the case study of the Papal Basilica and Sacred Convent of Saint Francis in Assisi in Italy is shown.

Key words:

Safety management, security management, Internet of Things, Internet of Everything, IoE/IoT integrated system.

JEL: L63, L86, M15

1 Introduction

Safety and Security management (SSM) represents a vital and powerful tool for the prevention of incidental events (fires, floods, hurricanes, earthquakes, etc.) and/or voluntary attacks (vandalism, thefts, espionage, terrorism, etc.) against people and tangible and intangible resources as well as for their protection when incidental events and/or voluntary attacks take place in any sort of organization.

It is also very important to mitigate an incidental event (safety) and/or a voluntary attack (security) during the initial phase and during the subsequent phases, using fundamentals tools represented by emergency management, business/service continuity and disaster recovery.

Because of the constant growth of new hazards and threats, SSM requires constant updating using more and more powerful and flexible tools which have to be integrated using a proper multidisciplinary approach, considering also economical aspects from the cost / benefit point of view.

Integrated technological systems [1 – 5] represent resourceful elements of generating responses which can aid SSM in an effective way, even from budgets optimization point of view.

For this reason, it is necessary to exploit an integrated multidisciplinary approach for safety and security management which joins together modelization [6, 7] and a suitable Integrated Technological System Framework (ITSF) that can be based on Internet of Things (IoT) / Internet of Everything (IoE),

considering also the big data aspect [8 -12] which represents the purpose of this paper, showing also the case study of the Papal Basilica and Sacred Convent of Saint Francis in Assisi, Italy.

2 Integrated multidisciplinary approach for safety & security management

The considerend approach joins together modelization and a suitable Integrated Technological System Framework (ITSF) that can be based on Internet of Things (IoT) / Internet of Everything (IoE).

In the following, a proper general model and a general ITSF capable of supporting are shown.

2.1 The general model for safety and security management

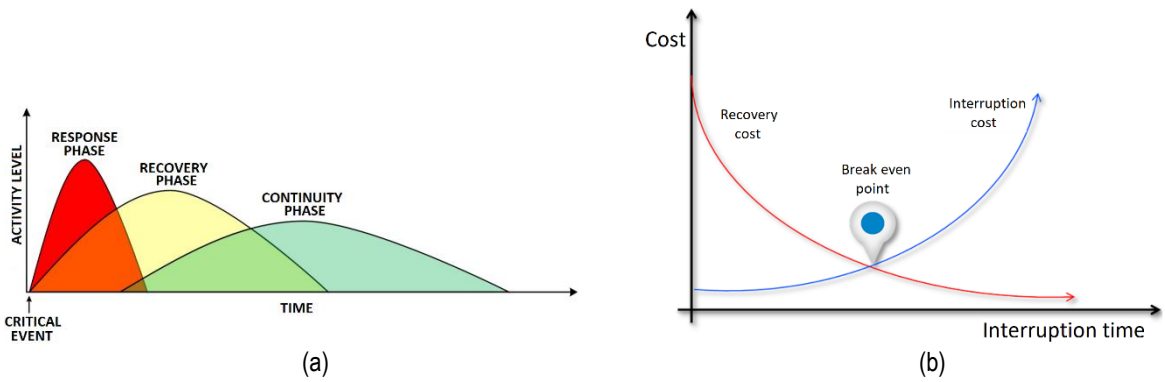
Since safety and security deal with risks, it is fundamental to provide a general description of it for our purposes. Risk R can therefore be defined as the probability P of a quantifiable damage, injury, liability, loss, or any kind of undesired occurrence (briefly designated as damage D which depends on the considered situation) that is generated by external or internal vulnerabilities. The risk R can therefore be defined as:

$$R = f(P, D) \qquad (1)$$

where f (*) is a proper function which depends on the considered situation, P represents the probability of the risk, variable between 0 and 1, and D represents the damage which can be defined according to a selected reference range, as a function of the considered organization. The damage D is supposed to be variable between 0 and 10 in the considered context, without any loss of generality and to preserve a general approach.

The proposed integrated multidisciplinary model for safety and security management (IMMSSM) joins all the elements necessary to deal with risks such as risk analysis, impact analysis, risk mitigation and residual risk management such as emergency management (EM), business/service continuity (BSC), and disaster management (DM), considering the associated operative tools (OTs), as shown in the following. When a critical event takes place despite of all the prevention countermeasures necessary to reduce its probability and the protection countermeasures necessary to reduce its damage, a plenty of activities must be done to manage the critical event and to return to the initial condition, if possible. All the necessary activities can be divided into 3 main phases represented by response phase, recovery phase and continuity phase according to the kind of actions and activities that are necessary. The level of these activities varies according to the considered phase both from intensity point of view and from the time duration point of view. The response phase represents the activities that must be done immediately to face the critical event, avoiding greater damages. The recovery phase represents the activities that must be done, even overlapped to the previous phase, to start to recover from the critical event. The continuity phase represents the activities that must be done, even overlapped to the previous phases, to restore the initial condition, before than the critical event. This situation is illustrated in Fig. 1a.

Figure 2: (a) Activity level as a funtion of the time of the different activities necessary to manage a critical event. (b) Costs as a funtion of interruprtion time [7].



Any critical event can generate a partial or total interruption of the functionality of a considered organization. From this point of view, it is possible to reduce the interruption time using proper prevention and protection countermeasures and proper activities to manage the residual risk, illustrated in the following. If a reduced interruption time is needed, due to the requirements of the considered organization, a noticeable investment is necessary to set up all the necessary countermeasures. The recovery cost decreases with the tolerable interruption time since less efforts are needed. This situation is illustrated in Fig. 1b. On the other side, the interruption cost growths with the time, according to a behaviour that depends of the considered organization. The crossing point between the recovery cost curve and the interruption cost curve lets individuate the break-even point which represents the balance point between the cost necessary to recover the situation and the cost due to the interruption, individuating the optimal interruption time and the optimal investment necessary.

Operative tools (OTs) are represented by all the elements that can be used for SSM, properly integrated and supported from a ITSF. They can be divided into countermeasures (CM) [1– 5, 13], security & safety policies and procedures (PR), and human factor and resources (HF). Countermeasures are represented by physical/logical technology (physical: intrusion detection, access control, video surveillance, fire detection, dangerous gas detection etc.; logical: intrusion detection systems, anti-viruses, etc.) and physical/logical barriers (physical: fences, armoured doors, armoured glasses, fire extinguisher etc.; logical: firewalls, etc.). Human factor and resources are fundamental to obtain the best performance by personnel and people, training them and using a proper psychodynamic/ epigenetic - evaluation/improving [14]. It is also very important to evaluate human error for an efficient SSM using the most proper method according to the considered situation [15].

Risk analysis [16 – 17] represents an essential tool to evaluate the threats concerning an organization and it can be divided into distinct groups, represented by: qualitative, semi-quantitative, quantitative, and mixed including human factor.

Once individuated and measured all the risks of the considered organization, it is necessary to evaluate the impact that those risks can produce over the organization itself, identifying all the essential elements which must be kept operative to ensure that the organization could work. From this point of view, it is important to contemplate three important parameters represented by: MTD (Maximum Tolerable Downtime), RTO (Recovery Time Objective), RPO (Recovery Point Objective) which provide a quantitative evaluation concerning the above elements that is necessary to achieve a precise impact analysis.

Risk mitigation is done by means of all the necessary OTs to reduce the probability of each risk (prevention activities) and/or damage of each risk (protection activities). There are four main strategies for risk mitigation, represented by: risk acceptance (the risk is accepted since the mitigation activity is too expensive with respect to the damage produced by the risk), risk avoidance (any risk is reduced at the minimum level without any care to of costs), risk limitation (that is the most common strategy since it reduces the exposition considering only a sub-set of actions. It joins risk acceptance and risk avoidance), risk transference (the risk is transferred to third parties available at accepting it).

Residual risk management can be made using emergency management, service/business continuity and disaster management that can and must be strongly integrated to avoid malfunctioning of residual risk management.

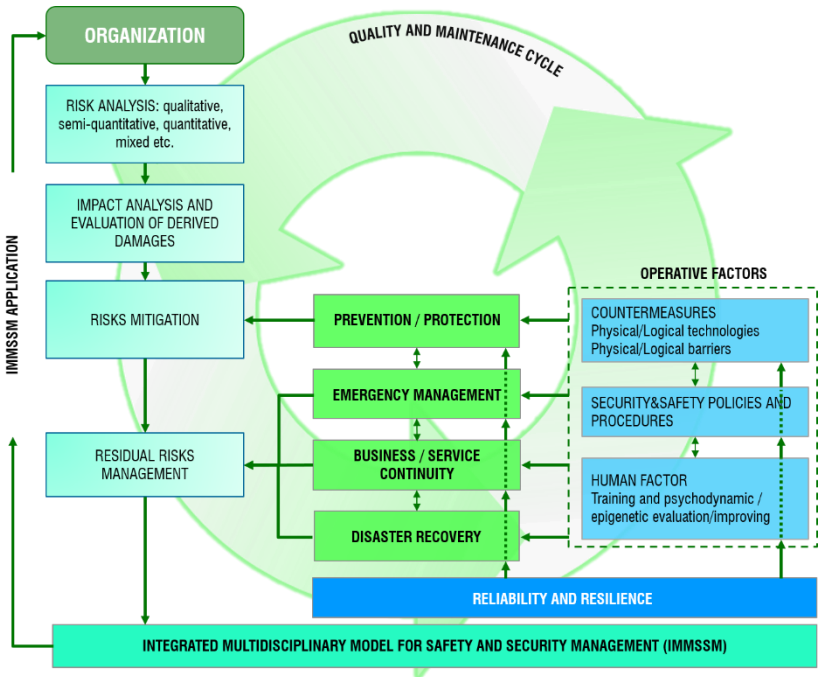
Emergency management is extremely important to manage critical situations according to what is planned in the safety and security procedures and policies, using OTs in a proper way. In fact, it is important to work in a very well-organized and accurate way as soon as the emergency takes place otherwise it could be no more possible to recover the original conditions and the consequences could be more hazardous.

Business and service continuity concentrate about what is required to recover regarding functionalities, processes and activities which are considered critical for the exact operativity of the considered organization. They can be divided into the typical phases of plan, do, check, improve.

Disaster recovery is represented by the technological, management and logistic elements necessary to recover the operativity of an organization, focusing mainly on system, data, infrastructure even if this represent a quite limited approach since disaster can be produced from a plenty of motives.

From what illustrated above, not only the above elements of residual risk management must be strongly connected but also all the elements of SSM, including OTs, must be connected to attain resourceful results. For this reason, a suitable integrated multidisciplinary model for safety and security management (IMMSSM) has been studied [6, 7]. It represents a general model valid for most organizations and its scheme is shown in Fig. 2.

Figure 2: Scheme of the Integrated Multidisciplinary model for Safety and Security Management (IMMSSM) [6, 7]

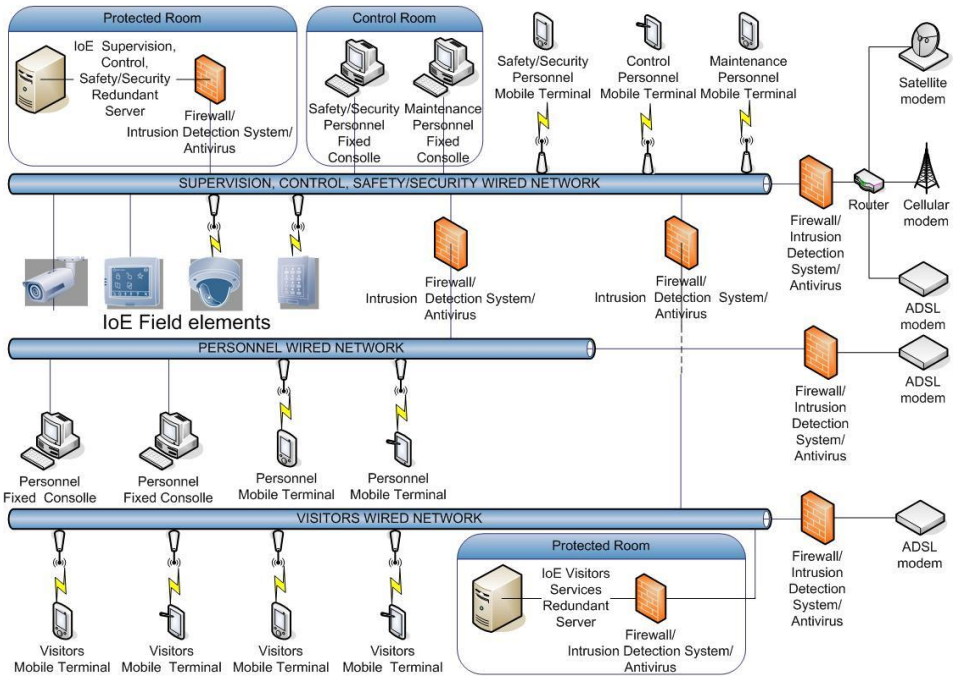


An appropriate Integrated Technological System Framework (ITSF), aided by a proper optimization procedure for the use of OTs from the cost/benefit point of view, can reduce the general risk of the organization at minimum cost, thus assuring the finest employment of the IMMSSM at lowest rate with respect to the wanted objectives. All the elements of the IMMSSM mutually interact. This means that if there is a variation in one of them, such as a new threat to face, the related variation of risk analysis generates an inevitable tuning in all the other elements. It is also necessary to consider other essential elements represented by reliability and resilience for OTs, emergency management, business /service continuity and disaster recovery, as shown in Fig.2. The IMMSSM requests an Integrated Technological System Framework (ITSF) for its support and for the implementation of all the policies and procedures, due to the mixture of features, analyses and measures which must be considered in normal and critical situations. The IMMSSM and the related supporting ITSF must also consider analysis, planning and management of the maintenance and quality, as well as the initial realization cost and annual cost. To create a suitable IMMSSM, it is essential to evaluate the use of OTs from a cost/benefit point of view, considering not only the cost of initial execution but also the annual costs. From this point of view, the great advantages deriving by the integrability of OTs in the above IMMSSM and related ITSF have been demonstrated [7].

2.2 The integrated technological system framework based on IoT/IoE

A suitable and fitting Integrated Technological System Framework based on Internet of Everything (IoE-ITSF) is strongly recommended to support the IMMSSM. In this way, it is possible to warrant all the objects of the IMMSSM to be integrated in a flexible and modular way, to translate, at any time, any necessary tuning of the IMMSSM into a quick and inexpensive adjustment of the associated IoE-ITSF. This goal can be realised using integrated systems [1– 5] and innovative technologies such as Internet of Everything (IoE) where people, things (mobile terminals, devices, actuators, smart sensors, wearable devices, etc.), data/information/knowledge and procedures are suitably associated to accomplish the required targets [8- 12]. The IoE-ITSF is characterized by a high modularity which allows for the integration, at any time and in flexible way, of any type of element which needs to be incorporated in the IoE system. Its general scheme is shown in Fig. 3.

Figure 3: Scheme of the Integrated Technological System Framework based on Internet of Everything (IoE-ITSF) to support the IMMSSM [6, 7].



The proposed IoE-ITSF is planned to be a widespread framework useful for the most organizations where external visitors can also be present. For this reason, the networks used to provide supervision, control and safety/security services, internal personnel services and visitor's services are appropriately separated from the physical and logical points of view for security reason [13]. The IoE-ITSF can interconnect all the 'IoE objects', generating a proper signalling to the operators (personnel in the control room, security personnel, safety personnel, maintenance personnel, Police, Fire Brigades, Civil Protection, Medical staff, etc.), in real time, via any sort of communication channel, when any dangerous or risky situation happens [13]. Due to its nature, the IoE-ITSF deals with a massive amount of data and, for this reason, it uses proper big data and data analytics techniques to guarantee always its best performances [9]. The IoE-ITSF illustrated before has demonstrated to be a powerful tool to ensure a high flexibility for OTs that can be supported and integrated, with a reduced cost, by the IoE-ITSF itself, guaranteeing considerable cost reductions thanks to the integration capability of the system with respect to the OTs [6, 7]. This is the reason for which the IoE-ITSF has shown itself to be extremely useful not only for IMMSSM but also for its optimal implementation, from the cost/benefit point of view, thanks to its positive influence on OTs. For this cause, some existing organizations have started an implementation

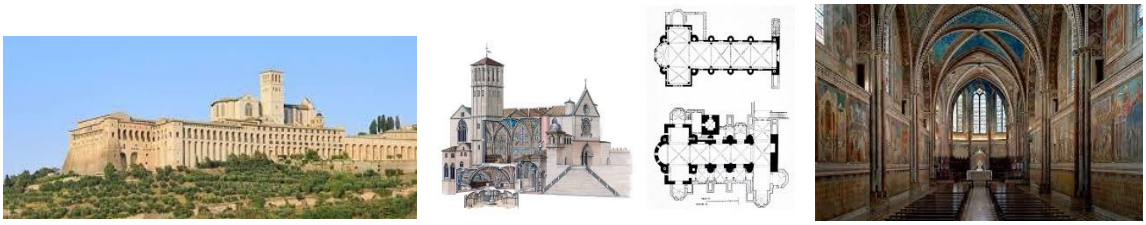
program of IMMSSM and of the related IoE-ITSF, modifying, gradually, their already existing integrated systems [1-5].

3 The case study of the Papal Basilica and Sacred Convent of Saint Francis in Assisi

The Papal Basilica and the Sacred Convent of Saint Francis in Assisi in Italy represent an exceptional cultural heritage site where the mortal remains of Saint Francis are housed since 1230 A.D.

Each year, millions of pilgrims and visitors from all over the world visit this site each which, from 2000 A.D., together with other Franciscan sites in the surrounding and the entire Assisi town, have been appointed as World Heritage by UNESCO. The Papal Basilica, where unique frescoes by Giotto and other famous painters are present, is composed by three layered assemblies: the tomb or crypt of Saint Francis, located at the lower level; the lower Basilica, whose altar is just above the tomb of Saint Francis; the upper Basilica, located above the lower Basilica. Inside the Sacred Convent there is a museum, a library and sufficient space for hosting spiritual and cultural activities. Inimitable and composite cultural heritage sites, such as the considered one, necessitate a noteworthy effort to guarantee security and safety of visitors. Along with such needs are cultural heritage preservation and protection as well as accessibility for visitors, with reference to visitors with disabilities, and for personnel normally present for site management, including the Friar's community. From this point of view, it is necessary to consider other important aspects such as energy management, maintenance management and a plenty of other aspects that must be managed in a well-organized way, by means of a suitable proper integrated technological system. These goals can be reached using the above integrated multidisciplinary approach properly adapted for the considered site.

Figure 4: (a) Panoramic view of the Papal Basilica and the Sacred Convent of Saint Francis in Assisi. (b) Schematic section view of the Basilica. (c) View of the interior of the upper Basilica where the Giotto's frescoes are visible.

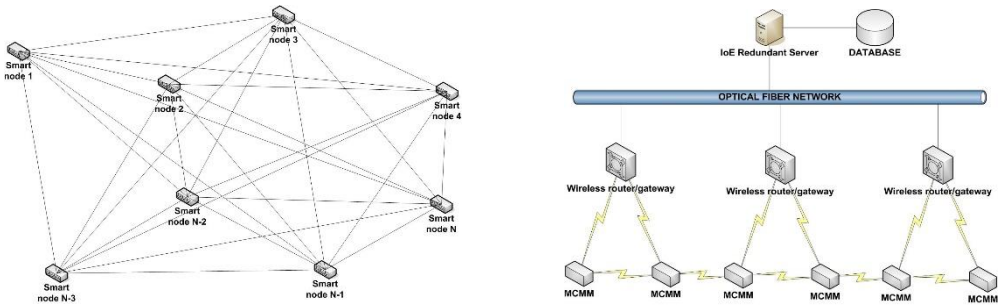


(a) (b) (c)

3.1 Development of the model, design of the IoE-ITSF system and first results obtained

Different actions have been carried out and are still going on both sequentially and in parallel, as a function of the available resources, always considering the final goal. Thus, a set of preliminary and essential series of multi-disciplinary activities formulated as set up of the IMMSSM and subsystems of the IoE system are considered [18]. Due to multi-disciplinary work that have been done and that is going on, an international group started working locally and remotely.

Figure 5: (a) Architecture of the IoE system backbone network. (b) Architecture of the microclimate monitoring system [18]



(a) (b)

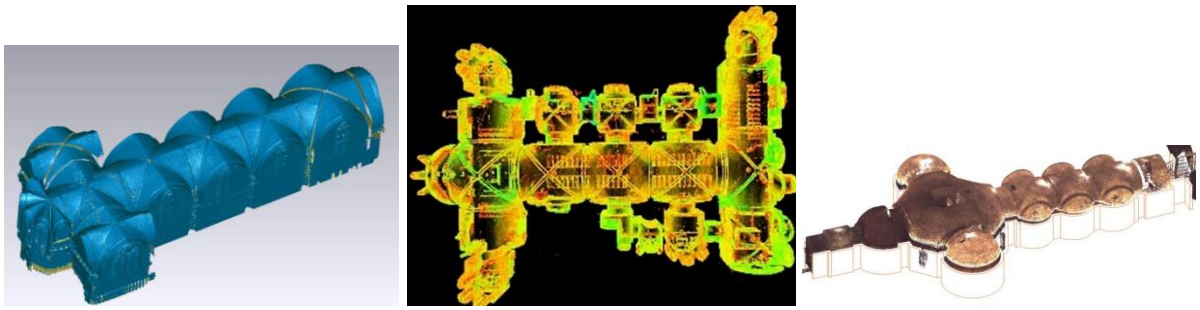
First of all, the introductory activities required to set up the IMMSSM have started, included the other actions necessary to study and design the Site Management System (SMS), for the specific site, based on IoE (SMS-IoE), as well as a new communication network which is vital to ensure that all the information needed for the strategic IoE services could be supported with the required level of security, safety, reliability and resilience, granting the required confidentiality, availability and integrity. From this point of view, a proper Genetic Algorithm (GA) based technique has been studied and tested to design the connections between the different IoE Field Elements and the different smart nodes that compose the network (Fig. 5a) to guarantee a decrease of final costs and an elevated level of reliability and resilience of the system itself, considering the typical artefacts and restrictions of an inimitable cultural heritage site such as the considered one.

Due to the need of acquiring all the necessary information to be shared locally and remotely, a proper laser scanning activity of the Papal Basilica and of the Tomb (Figures 6) has been done. This is aimed at obtaining a 3D model of it that is going to be rendered into a Building Information Modelling (BIM) and to utilize a flexible tool for all the needed activities, including safety and security management [19]. This action is essential due to the presence of strong architectural restrictions, which involves taking care in the installation of wires and devices.

At the same time, a proper study and analysis regarding human factor was done and it is still on-going. It regards the psychological aspects of the ordinary signalling and all the IoE services provided both to visitors and to personnel normally present for site management, including the Friar's community. It is aimed at improving the value and the effectiveness of the IoE services themselves and of those inside the site. These activities require the use of suitable tools for opinion mining of social networks to collect feedback from visitors on perceived safety/security versus real safety/security [14].

Another parallel activity is related to an experimental microclimate monitoring system (MMS) of the Papal Basilica, based on apt microclimate monitoring modules (MCMM), has been studied and realized and its architecture is shown in Fig. 5b. The MMS are aimed at controlling the microclimate parameters to avoid of reaching critical conditions which could trigger harmful processes of the unique frescos of the Basilica.

Figure 6: (a) Meshing upper Basilica. (b) Point cloud of lower Basilica. (c) Tomb point cloud represented in Revit environment [18].



(a) (b) (c)

Other activities are dedicated to new and suitable IoT/IoE services for the considered site (such as people counting subsystem), including Augmented Reality (AR) and Virtual Reality (VR) intended at improving the visiting experience of the visitors; biometric solutions for the considered site, with particular care to the privacy aspects; fluid dynamic analysis of the interior of the site to improve the quality of air with regards to people wellness and pictures preservation plus further activities related to the energy management/optimization/preservation and renewable energy; cybersecurity aspects of the IoE system; Big Data, security analytics for Big Data infrastructure, machine learning techniques for the site etc., with the purposes of attainment, step by step and with the contribute of all the people and subjects that are working on it, the desired goals.

4 Conclusions

In this work an integrated multidisciplinary approach for safety and security management which joins together modelization and a suitable Integrated Technological System Framework (ITSF) that can be based on Internet of Things (IoT) / Internet of Everything (IoE), has been illustrated.

The IoE-ITSF has demonstrated to be a powerful tool to ensure a high flexibility for OTs that can be supported and integrated, with a reduced cost, by the IoE-ITSF itself, guaranteeing considerable cost reductions thanks. For this reason, some existing organizations have started an implementation program of IMMSSM and of the related IoE-ITSF, modifying, gradually, their already existing integrated systems. The case study of the Papal Basilica and Sacred Convent of Saint Francis in Assisi in Italy, which represents and always-going-on project that is opened to future solutions and contribution by anybody, with the intention of improving constantly the services which can be provided, is demonstrating, until now, the same advantages using the approach illustrated in the paper.

5 Bibliography

[1] Garzia, F., Sammarco, E. &, Cusani, R., The integrated security system of the Vatican City State", *International Journal of Safety & Security Engineering*, 1(1), pp. 1-17, 2011.

[2] Contardi, G., Garzia, F. & Cusani, R., The integrated security system of the Senate of the Italian Republic, *International Journal of Safety & Security Engineering*, 1(3), pp. 219- 246, 2011.

[3] Garzia, F. & Cusani, R., The integrated safety / security / communication system of the Gran Sasso mountain in Italy, *International Journal of Safety & Security Engineering,* 2(1), pp. 13-39, 2012.

[4] Garzia, F. & Cusani, R., The safety/security/communication wireless LAN of the underground Gran Sasso mountain national laboratories of the Italian Institute of Nuclear Physics, *International Journal of Safety & Security Engineering,* 2(3), pp. 209-226, 2012.

[5] Garzia, F., Sammarco, E. & Cusani, R., Vehicle/people access control system for security management in ports, *International Journal of Safety & Security Engineering*, 2(4), pp. 351-367, 2012.

[6] Garzia, F. "An Integrated Multidisciplinary Model for Security Management – Optimized Implementation Technique and Related Supporting Technological System Framework", *Proc. of IEEE International Carnahan Conference on Security Technology*, Orlando (USA), pp. 107-114, 2016.

[7] Garzia, F., Lombardi, M., "Safety and security management through an integrated multidisciplinary model and related integrated technological framework", *SAFE 2017 – WIT Transactions on The Built Environment*, Vol. 174, pp. 285-296, 2017.

[8] Di Martino, B., Li, K. C., Yang, L., T., Esposito, A., Internet of Everything: Algorithms, Methodologies, Technologies and Perspectives (Internet of Things), *Springer*, 2017.

[9] Kleppmann, M., Designing Data-Intensive Applications, *O'Reilly Media*, 2017.

[10] Garzia, F., Papi, L., An Internet of Everything based integrated security system for smart archaeological areas, *Proc. of IEEE International Carnahan Conference on Security Technology*, Orlando (USA), pp. 64-71, 2016.

[11] Garzia, F. & Sant'Andrea, L., The Internet of Everything Based Integrated Security System of World War I Commemorative Museum of Fogliano Redipuglia in Italy", *Proc. of IEEE International Carnahan Conference on Security Technology*, Orlando (USA), pp. 56-63, 2016.
[12] Garzia, F., "The Internet of Everything based integrated system for security/safety/general management/visitors' services for the Quintili's Villas area of the Ancient Appia way in Rome, Italy", *SAFE 2017 – WIT Transactions on The Built Environment, Vol 174, pp.261-272, 2017.*
[13] Garzia, F., Handbook of Communication Security, *WIT Press*, 2013.
[14] Borghini, F., Garzia, F., Borghini, A. & Borghini, G., The Psychology of Security, Emergency and Risk, *WIT Press*, 2016.
[15] Spurgin, A. J., Human Reliability Assessment – Theory and Practice, *CRC Press*, 2009.
[16] Guarascio, M., Lombardi, M., Rossi, G. & Sciarra, G., Risk analysis and acceptability criteria, *WIT Transactions on the Built Environment*, 94, pp.131-138, 2007.
[17] Norman, T., L., Risk Analysis and Security Countermeasure Selection, *CRC Press*, 2010.
[18] Gambetti, M., Garzia, F., Baiocchi, V., Vargas Bonilla, F. J., Borghini, F., Ciarlariello, D., Chakaveh, S., Costantino, D., Culla, A., Cusani, R., Ferrer, M. A., Fusetti, S., Kodl, J., Livatino, S., Lombardi, M., Marsella, S., Peng, J., Smejkal, V., Ramalingam, S., Ramasamy, M., Sacerdoti, S., Sdringola, A., Thirupati, D., Faundez Zanuy, M., "The Internet of Everything System for the Papal Basilica and Sacred Convent of Saint Francis in Assisi, Italy*", Proceedings of WEF (World Engineering Forum) - Safeguarding Humankind's Heritage, The Great Challenge for Engineers*, Rome (Italy), 2017.
[19] Garzia, F., Lombardi, M., "The role of BIM for Safety and Security management", *Int. J. Sus. Dev. Plann*., Vol. 13, No. 1, pp. 49-61, 2018.

IOTA, ONE WAY TO AN INDEPENDENT PAYMENT SYSTEM

Jan Lavrinčík, Zdeňka Krišová, Jiří Pavelka
Moravian University College, Olomouc
Jan.lavrincik@mvso.cz, zdenka.krisova@mvso.cz, pavelka.investments@gmail.com

Abstrakt:

This article discusses the technological and investment potential of the third-generation cryptocurrency called IOTa. It explains what to imagine under the crypt of IOTa and under the term Internet of things (IoT - hence the name of the cryptocurrency). This concept, which is closely related to the crypt, represents its potential. The article also deals with the technological shortcomings of cryptocurrency based on the raw Blockchain, and points out how to address these systemic difficulties with the DAG-Directed Acyclic Graph (DAG), whose IOTa architecture is used.

Key words:

IOTa, cryptocurrency, Bitcoin, DAG - directed acyclic graph, IoT - Internet of things, Tangle.

JEL: G11, G15

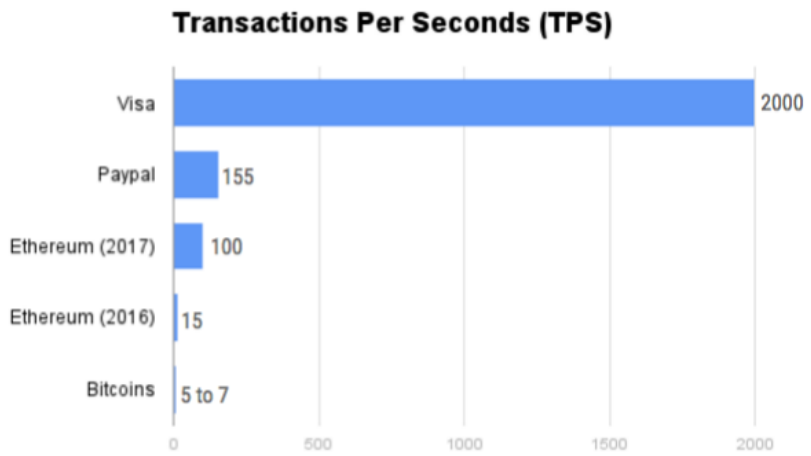
1 Introduction: Blockchain issues

In order to fully imagine the potential of IOTs, it is necessary first to focus on the shortcomings of the current cryptocurrency; especially the pitfalls of their blockchain structure. For comparison, we use Bitcoin's oldest cryptocurrency [1]. For the contribution, we chose the exploratory research plan and a descriptive research plan.

1.1 IOTa - Scalability

Bitcoin network takes 10 minutes to confirm the transaction. Which is a big problem in terms of cryptography, since the ideological aim of cryptocurrency is to achieve the cheapest, fastest and sometimes anonymous transactions [2], [3]. Therefore, if it needs to make an immediate and cheap payment, bitcoin fails. Another problem associated with bitcoin scalability is the number of transactions the bit hole network can handle per second [4]. Bitcoin is not able to perform more than 7 transactions per second, which is enormously insufficient in today's size and load of the whole blockchain (Figure 1) [5]. In order to substantiate our claims, we provide a list of Bitcoin unconfirmed transactions and a list of unconfirmed transactions [6].

Figure 1: Transaction Per Seconds (TPS).



1.2 Fees

Blockchain is a very complex structure, both mathematically and technologically. Therefore, we resort to the following, simplified model for explanation. Within the Bitcoin network, we find two counterparts; users and miners. As a Bitcoin user, you are allowed to make transactions for a so-called fee [7]. This fee is shared between miners whose role in the system is not only to exploit the cryptomimeter, but also to keep the entire accounting book (bitcoin ledger) and to validate (validate) individual transactions. Just for these tasks, miners are rewarded from a fee that is charged to you as a user. Due to the ever increasing number of transactions, the transaction fee is also traced, which currently exceeds $ 1. Bitcoin thus becomes an economically unacceptable alternative for performing micro transactions [8].

1.3 Energy demand

The times when it was possible to exploit the BTC on a regular CPU are long gone. The reason for this is the increasing demand for mining. From the beginning, the BTC block 50 was rewarded. After every 210,000 blocks, the reward is always down by half (ie 25, then 12.5 etc ...) (Figure 2). Miners are trying to compensate for this difficulty with increasingly sophisticated mining techniques and a number of mining equipment [9]. Such an approach, however, has the effect of increasing the consumption of electricity [10]. To help readers dive into the issue, we would like to point out that the current consumption of the entire bituminous network per year corresponds to the year-round consumption of countries such as Denmark or Ireland. This consumption is 29TWh [11].

However, the most alarming figure is the unstoppable increase in energy consumption. In the last month it has risen by 20% and has been keeping this rate of escalation for six months [12].

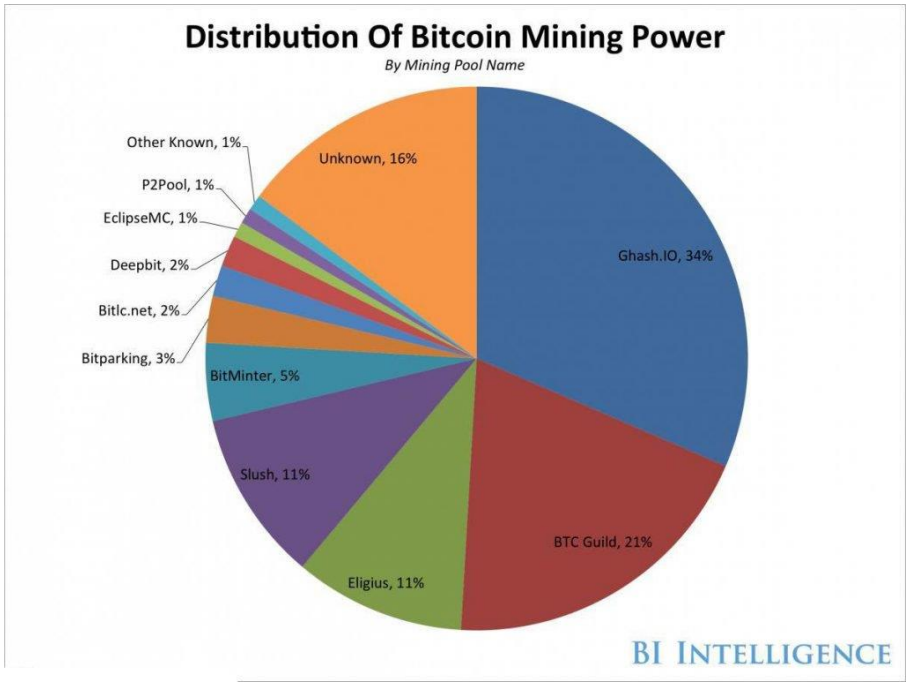
Figure 2. Estimated drop in rewards per extracted block

1.4 Centralized decentralized currency

Bitcoin is considered a decentralized currency by its community. As a decentralized currency, therefore, the community is presented and perceived. This status quo, however, is not an inviolable dogma because there are risks that indirectly prove that the bitterness decentralization is relative. The first fact that threatens the bitcoin decentralization is, for example, the imbalance of the ownership structure of the BTC [13]. Of the total number of less than 30 million addresses, only 730,000 users own more than 1 BTC and only 180,000 addresses hold more than 10 BTC. What is most striking is the fact that only 1,600 addresses have a balance of more than 1000 BTC, and the sum of these bills amounts to less than 6.5 million BTC, which is almost half of the available BTC and one third of all bitcoins that will be extracted [14]. Percentage of this means that 0.0054% of the network owns 40% of all BTC extracted (Figure 3). Such ownership distribution permits the manipulation of the exchange rate, and thus to break the idea of a non-inflationary, stable and decentralized currency [15].

Another inconceivable risk is the clumping of miners in the tv. pools (pools) that arose because of the increasing difficulty of drilling bitcoin [16]. The bit hole network security is directly dependent on the computing power of the entire network. At a time when a pool would reach 51% of the entire network's performance, it would be able to double the costs. This means that it would be possible to rewrite, delete or impersonate foreign transactions on the network. This fact causes the blockchain to be vulnerable in the case of a quantum computer attack (they do not yet exist) [17].

Figure 3. Percentage pooling of pools.

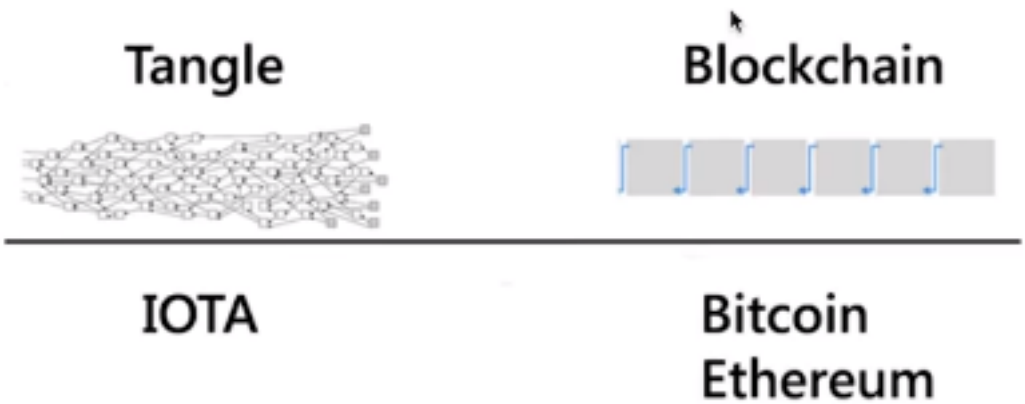


1.5 IOTa

Even though the bitcoin community is trying to solve the scalability problem and reduce transaction fees, so far has not been able to come up with the ultimate solution. Therefore, the article also offers a look at the cryptocurrency which solves the shortcomings associated with the blockchain. Cryptocurrency IOTa is a distributed blockchain-like book whose architecture uses BlockDAG (Directed Acyclic Graph) technology. This architecture modified for IOTa is also called Tangle (DAG and Tangle can interchange with each other, it is the same system) [18].

Due to the complexity of DAG, we will describe its behaviour in a simplified way and rather we will devote ourselves to the technological benefits that have solved the blockchain problems. DAG can be understood as a hierarchy of nodes that are unidirectional linked to one another; with no node coming out of the previous one - there are no cycles in this system. Virtually bitcoin can be considered as a specific type of DAG since it is a one-way block system linearly arranged in series, so there is no cycle found. The tangle is more general (Figure 4) [19].

Figure 4. Structure DAG (left) and blockchain (right).



DAG is a system that can increase performance by validating transactions. With the growth of the community and the whole system, it becomes safer and faster. Because the more nodes in the network are created, the faster it is to confirm the existence of another node; other transactions. This principle results from the DAG architecture where each user who executes a transaction must validate two other transactions. It is not possible to review the DAG and blockchain contrast, with DAG being more efficient with increasing size. While the speed of confirmation of blockchain transactions, as we have described, is declining with the growing community. Tangle has achieved excellence in scalability. Another community that IOT is welcome is the fact that all transactions are completely free of charge [20]. The reason is already mentioned to confirm transactions by the users themselves. Which is possible only because IOTa is a so-called pre-drawn currency, so it is not like bitcoin. And consequently, because the currency is overstated and transactions are validated and retained by individual users, there is no need for miners in the network. For transaction confirmation, users are rewarded with a zero fee. Due to the algorithms that IOTa uses, the entire network is immune to quantum attack and double spending [21].

1.6 Risks associated with IOTa ownership

We see a considerable risk in the current approach of the creators to IOT. The team of developers that IOT has developed has decided to temporarily centralize the project. As a reason, the size of the network has not yet been sufficiently developed to resist hacking attacks [8]. This fact discourages many speculators and investors who could potentially include IOTs in their portfolio, as they are aware of possible manipulation by developers who are currently firmly indicating the IOT course and have full control over all funds and the book [12].

2 Discussion

Cryptocurrency are interesting young alternative investment vehicle and in compliance with the above mentioned and described strategies may offer significant appreciation of 10% per month and more. There is a lot of technological potential at Iota, especially with emerging tokens.
Yes, it is a young and relatively risky investment, one of the tools can be diversification, where in investments in the more projects. Another tool may be a combination of selection into multiple types cryptocurrency - Bitcoin, Bitcoin Gold, Ethereum, DogeCoin, DashCoin, Litecoin, etc.

3 Result - Internet of Things

The Internet of Things is defined as a place through which modern devices can be controlled even remotely via the Internet. For a better understanding, you can imagine a smart household where all the different devices communicate with each other. Imagine forgetting to lock the door or leave the heater on and leave the house. Motion sensors then send all the other devices a signal that they have not registered motion for a long time, and that you may not be at home, so another device decides to lock the door. While the third device tells you by SMS that the door was locked automatically. This is how the Internet of Things works. The estimated market value of the Internet of Things is estimated at more than a quarter of a trillion of US dollars by 2020 [16]. Because IOTa does not read any fees, it may dream of doing micro-transactions, even Nano transactions. This feature is more than appealing to large corporations. Due to non-existent charges, it is easier for an instrument to demand an exact amount for the counterparty, as the counterparty does not need to consider charges that may be even more variable. This would allow IoT facilities to simplify and accelerate the payment processes that would take place between them.

4 Bibliography

[1] " How It Works: Internet of Things " 12 January 2018. [Online]. Available: https://www.youtube.com/watch?v=QSIPNhOiMoE.

[2] " How to Buy IOTA " 14 January 2018. [Online]. Available: https://github.com/IISourcell/IOTA_demo/blob/master/How%20to%20Buy%20IOTA.ipynb.

[3] " Smaller Pools Are Diversifying the Bitcoin Mining Industry " 14 January 2018. [Online]. Available: https://news.bitcoin.com/pools-diversifying-bitcoin-mining/.

[4] "About us," 5 December 2017. [Online]. Available: https://bitcoinfoundation.org/about/.

[5] "Bitcoinminning: What is the Bitcoin Mining Block Reward?," 10 January 2018. [Online]. Available: https://www.bitcoinmining.com/what-is-the-bitcoin-block-reward/.

[6] "IOTA: The New generation of cryptocurrency," 1 January 2018. [Online]. Available: https://iota.org/.

[7] Abu Bakar, N. and Rosbi,S. (2017) High Volatility Detection Method Using Statistical Process Control for Cryptocurrency Exchange Rate: A Case Study of Bitcoin,The International Journal of Engineering and Science, Vol. 6(11), pp. 39-48 2.Abu Bakar, N. and Rosbi, S. (2017) Robust Statistical Normality Transformation method with OutlierConsideration in Bitcoin Exchange Rate Analysis, International Journal of Advances in Scientific Research and Engineering, Vol.3 (9), pp. 80-91.

[8] B. W. Christian Beer, "Bitcoin –The Promise and Limits of Private Innovation in Monetary and Payment Systems," 28 January 2015. [Online]. Available: https://www.researchgate.net/publication/271473884.

[9] Foscht, T., Maloles, C., Swoboda, B. and Chia, S.L. (2010), Debit and credit card usage and satisfaction: who uses which and why –evidence from Austria, International Journal of Bank Marketing, Vol. 28 (2), pp. 150-165.

[10] Identification of non-equilibrium growth for Bitcoin Exchange rate: Mathematical derivation method in Islamic Financial Engineering. Available from: https://www.researchgate.net/publication/322129094_Identification_of_non-equilibrium_growth_for_Bitcoin_Exchange_rate_Mathematical_derivation_method_in_Islamic_Financial_Engineering [accessed Feb 02 2018].

[11] Identification of non-equilibrium growth for Bitcoin Exchange rate: Mathematical derivation method in Islamic Financial Engineering. Available from: https://www.researchgate.net/publication/322129094_Identification_of_non-equilibrium_growth_for_Bitcoin_Exchange_rate_Mathematical_derivation_method_in_Islamic_Financial_Engineering [accessed Feb 02 2018].

[12] L. L.-T. R. J. M. Macdonald, "TheBlockchain: A Comparison of Platforms and Their Uses Beyond Bitcoin," 3 February 2017. [Online]. Available: https://www.researchgate.net/publication/313249614.

[13] M. Hammami,"Bitcoin and Blockchain mechanism," 3 March 2017. [Online]. Available: https://www.researchgate.net/publication/315766868.

[14] M. Kubát,"Virtual currency bitcoin in the scope of money definition and store of value," ScienceDirect-Procedia Economics and Finance, pp. 409-416, 2015.

[15] Reynolds, P. and Irwin, A.S.M. (2017) Tracking digital footprints: anonymity within the bitcoin system, Journal of Money LaunderingControl, Vol. 20 (2), pp.172-189.

[16] S. Balaji,"On Bitcoin, India's Government And Tech Companies Find Common Ground,"21 June 2017. [Online]. Available: https://www.forbes.com/sites/sindhujabalaji/2017/06/21/bitcoin-india-regulation/#353844e87e4a.

[17] S. Modgil,"Indian Government Mulling Legalising Bitcoin Cryptocurrency In India," 26 June 2017. [Online]. Available: https://inc42.com/buzz/bitcoin-cryptocurrency-india-government/.

[18] S. Nakamoto, "“Bitcoin: A Peer-to-Peer Electronic Cash System”,2009, Available: www.bitcoin.org.

[19] Scope for Bitcoins in India. Available from: https://www.researchgate.net/publication/321780780_Scope_for_Bitcoins_in_India [accessed Feb 01 2018].
[20] Simser, J. (2015) Bitcoin and modern alchemy: in code we trust, Journal of Financial Crime, Vol. 22(2), pp.156-169.
[21] V. P. D. K. Sanjana Panicker,"An Overview of Blockchain Architecture and it's Applications," International Journal of Innovative Research in Science, Engineering and Technology , Vol. 5, Issue 11,pp. 1111-1125, Novemb

MEDIATION AND OTHER MEANS OF ALTERNATIVE DISPUTE RESOLUTION IN CONSUMER MATTERS

Blanka Vítová
Palacký University, Faculty of Law
blanka.vitova@upol.cz

Abstract:

The article analyses vice and virtues of different means of alternative dispute resolution (namely mediation), its advantages and disadvantages in the consumer disputes and compares it to the other methods of alternative dispute resolution. Although there is considerable commonality among the techniques of negotiation and dispute facilitation that are frequently to be found in all these systems, the structure and architecture of individual methods differs between each of them.

Key words:

Mediation, alternative dispute resolution, ADR, consumer.

JEL: K12, D18

1 Introduction and methods

Consumer protection regulation is a specific area, which is influenced by the law of the European Union. Community legislation is a specific set of rules that is neither international law nor national law, still the consumer protection requirements must be taken into account in defining and implementing various Union policies and activities. It comprises the treaties, secondary law, and the case law of the Court of Justice of the European Union, which in its judgments offers a binding interpretation of the Community law and, in certain cases, on this basis directly formulates prescriptive provisions, while the European Union's consumer legislation is mainly composed of directives originally approved by the Council.

The Treaty on the Functioning of the European Union (Art. 169) provides that the EU is to contribute to the attainment of a high level of consumer protection, namely by protecting the health, safety and economic interests of consumers, as well as by promoting their right to information, education and to organise themselves in order to safeguard their interests. The EU and its internal market should provide consumers with added value in the form of better quality, greater variety, reasonable pricing and high safety standards for goods and services.

The regulation of consumer protection covers a number of different themes – this leads to its large fragmentation. Separate provisions apply, for example, to the regulation of the composition and quality of products or services, consumer contracts (including, for example, doorstep selling or the conclusion of distance contracts), consumer credits, electronic commerce, etc. This is obviously detrimental to competitiveness, growth and job creation within the internal market of the EU. The procedural part of the consumer dispute resolution is covered also by other set of laws (procedural acts, arbitration act, act on consumer protection etc.).

The European consumer protection regulation in general covers wide range of legal acts (regulations, directives, national law measures etc.). That means that most of the consumers´ rights are protected by these sets of law. However, it is the enforceability of the consumers' rights which is the major problem. It is clear that most consumer disputes, by their nature, are characterised by a disproportion between the economic value at stake and the cost of its judicial settlement. The difficulties that court procedures involve may thus discourage consumers from exercising their rights in practice. On the other hand there are

alternative mechanisms for the out-of-court settlement of consumer disputes that have had good results, both for consumers and entrepreneurs, mainly due to the fact that they reduce the cost of settling consumer disputes and the duration of the procedure and lead to the settling of a dispute through the active intervention of an impartial third party, who proposes or imposes a solution. Thus ensuring access to efficient, fast, simple and low-cost means of resolving both domestic and cross-border disputes which arise from consumer contracts benefits consumers and boosts their confidence in the economy.
The article is the result of a scientific research[9] which does not limit itself only to a logical summary and settlement of known information. The author of the article uses mainly the quantitative research methods, the partial methods used for the legal research and interpretation of the legal provisions in the article applicable to the targeted problems are grammar, logical, exact, sociologic, systematic and comparative methods. The research also assumes usage of a scientific method of final analysis and abstraction method by which the essential matters are separated from the unnecessary. The author also uses the opposite method – i.e. synthesis.

2 Alternative dispute resolution in general

The alternative dispute resolution (ADR) procedures are highly diverse all over the European Union[10]. It can take the form of procedures where the parties are brought together with the aim of facilitating an amicable solution, or procedures where the ADR body proposes or imposes a concrete solution (or a combination of several such procedures).
There is no unified definition of the ADR systems[11]. At present, there are several different means of consumer dispute solution recognised by the Czech legal system – civil court proceedings, conciliation and mediation[12]; numerous other forms of ADR can be identified as well – arbitration, adjudication, early neutral evaluation, med arb, expert examination, ombudsmen etc.[13]. Each of them has its strong and weak points; some of them are known and used more than the others for various reasons.
There is a big need for better understanding of the many different types of mechanisms and processes (including the activities of public authorities) for alternative dispute settlement. Although there is considerable commonality among the techniques of negotiation and dispute facilitation that are regularly to be found in all these systems, the structure and architecture of individual methods differs between each of them. One of the common features is that the parties to a dispute must be consumer and entrepreneur[14] who must be fully informed about their rights and the consequences of their choices when choosing an ADR procedure – the ADR bodies shall inform consumers and entrepreneurs of their rights before they agree to or follow a proposed solution.
The most known (and used) method is the civil court proceedings. The problem with this means of the consumer dispute resolution is that it is very expensive and time consuming for the consumer. This feature does not follow the basic rule of ADR which shall be free of charge, attractive and inexpensive for

[9] The work of this author was supported by GAČR, grant no. 17-03490S „Mediation in Consumer Disputes“.
[10] See BENÖHR, I. In HODGES, CH., BENÖHR, I., CREUZFELD-BANDA, N. Consumer ADR in Europe. Civil Justice Systems. Oxford: Hart Publishing, 2012, p. 5.
[11] Holá points out that the term „alternative“ refers to the possibility of choice. HOLÁ, L. *K pojmu konciliace v řešení spotřebitelských sporů*. Obchodněprávní revue 2/2017.; HORÁČEK, T. Mimosoudní řešení spotřebitelských sporů v ČR. In Soukromé právo, 2017, no. 7–8, p. 2.
[12] Arbitration as one of the means of consumer ADR was banned by Act. No. 258/2016 Coll.
[13] See HODGES, Ch., TULIBACKA, M. Civil justice in England and Wales – beyond the courts. Mapping out the non-judicial civil justice mechanisms. Retrieved from https://www.law.ox.ac.uk/sites/files/oxlaw/civil_justice_in_england_and_wales_-_beyond_courts._mapping_out_non-judicial_civil_justice_mechanisms.pdf.
[14] The term “consumer” covers all natural persons who act outside their trade, business, craft or profession [if the contract is concluded for purposes partly within and partly outside the person’s trade (so called dual purpose contracts) and the trade purpose is not to be predominant in the overall context of the supply, the person should also be considered as a consumer as well]. The second party to the dispute – the entrepreneur – means any natural or legal person (Including any person acting in his name or on his behalf), who is acting for purposes relating to his trade, business, craft or profession.

consumers (costs should not exceed a nominal fee). Many of the claims in the consumer disputes are so called small claims (claims for defective goods of low value) and the consumer does not want to spend money nor time for the court proceedings for goods that did not cost him that much money and be forced to expect an unpredictable judgement. Arbitration is faster than litigation but puts very strict requirements on the personal qualities of arbitrators and the cost benefit in the consumer disputes in very low. Conciliation is – according to the current Czech law – just another way of proceedings by a governmental body, this body assess the standpoints of both parties, evaluates them, and then comes to their own opinion which they present to the disputing parties. Unlike in civil proceedings and arbitration, in conciliation the other party (the entrepreneur) is obliged to give their standpoint on the issue but is not obliged to accept the result of the conciliation. Mediation is usually faster than litigation, saves money and the good name of the mediating parties[15] and respects equality between parties to the dispute, on the other hand the mediation may not fulfil the characteristics of ADR which shall basically allow the parties to submit their information and evidence without being physically present.

One of the crucial features of all ARD methods is the transparency[16] and independence of the ADR bodies, the person/s in charge of ADR should be independent of all possible influences which might have an interest in the outcome of the dispute and should have no conflict of interest which could impede them from reaching independent solution.

3 Problematic aspects of consumer dispute resolution

Alternative dispute resolution methods offer a simple, efficient, fast and low-cost out-of-court solution to disputes between consumers and entrepreneurs. However, these methods are not yet sufficiently and consistently developed in the Czech Republic[17]. It is regrettable that, despite the existence of the Directive 2013/11/EU on alternative dispute resolution for consumer disputes, alternative methods of dispute resolution have not been correctly established and do not run satisfactorily. Consumers and entrepreneurs are still not aware of the existing out-of-court redress mechanisms, with only a small percentage of citizens knowing how to file a complaint within the alternative system of dispute settlement. In the Czech Republic there is currently no comprehensive and unified system of alternative dispute resolution of consumer disputes, which would cover all targeted areas. Most of the consumers use the possibility of suing the entrepreneur in the court proceedings (litigation), vast majority of the disputes however end up unresolved because the consumers are not willing to invest their money and time into civil proceedings with unpredictable result. Many consumers are not aware of the fact that the agreement between them and the entrepreneur to submit complaints to an ADR entity does not deprive the consumers of their right to bring an action before the courts for the settlement of the dispute.

There have been several governmental attempts to develop a functioning dispute resolution system, none of them however led to a satisfactory result. The Alternative dispute resolution Pilot Project run by the Ministry of Industry and Trade in 2008 was not a big success mainly due to the fact that these alternative methods of dispute resolution (including the conciliation) were optional for the parties to the dispute[18]. On the other hand, there are specific sectors where alternative mechanisms for settling disputes work quite efficiently (e.g. financial services, electronic communications[19], postal/delivery services and energy).

---

[15] See POKORNÁ, D. Koncept společenské odpovědnosti: obsah, podstata, rozsah. 1. vyd. Olomouc: Univerzita Palackého v Olomouci. 2012.

[16] See art. II of Commission Recommendation of 30 March 1998 on the principles applicable to the bodies responsible for out-of-court settlement of consumer disputes, 98/257/EC. Official Journal L 115, 17/04/1998 P. 0031 – 0034. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:31998H0257&from=CS.

[17] HORÁČEK, T. Mimosoudní řešení spotřebitelských sporů v ČR. In Soukromé právo, 2017, no. 7–8, p. 4.

[18] Ministerstvo průmyslu a obchodu ČR. Hodnocení pilotní fáze projektu pro mimosoudní řešení spotřebitelských sporů ze dne 5. 5. 2010. Retrieved from https://www.mpo.cz/cz/ochrana-spotrebitele/mimosoudni-reseni-spotrebitelskych-sporu-adr/mimosoudni-reseni-spotrebitelskych-sporu-adr--42173/.

[19] See NĚMEČKOVÁ, Š. Mimosoudní řešení spotřebitelských sporů u Českého telekomunikačního úřadu. In Soukromé právo, 2017, no. 7–8, p. 22–31.

One of the means of the alternative resolution in the Czech Republic – arbitration – is governed by Act no. 216/1994 Coll. on Arbitration Proceedings and Enforcement of Arbitral Awards. Arbitration proceedings was not primarily intended to resolve the consumer disputes, mainly due to the weaker position of the consumer, the practice shows that arbitration is rather used as a traditional form of dispute resolution in the commercial area. This arbitration procedure is relatively faster than the court proceedings, but rather expensive for a single consumer. It has also been repeatedly criticized by the Czech Supreme Court or the Constitutional Court due to the unfair trade practices and unfair terms concluded with the consumers.[20] One of the biggest argument contrary to the possibility of solving the consumer issues by arbitrators was the lack of absence of possible conflict of interest, the arbitrators did not disclose the circumstances that might have an effect on their independence and impartiality or gave rise to a conflict of interest with one of the parties (the entrepreneur) to the dispute they were asked to resolve (they had financial interests in the outcome of the ADR procedure, direct business relationship with the entrepreneur, etc.). This method of alternative dispute resolution in consumer matters has gradually evolved in the Czech legal system. By Act no. 19/2012 Coll. specific requirements have been imposed – the arbitration clause between the consumer and the entrepreneur in written form, the requirement to register an arbitrator in the list of arbitrators run by the Ministry of Justice, etc. Although this method of resolving consumer disputes was often faster than the court proceedings, it cannot be ignored that it was very often criticized, namely because of the financial demands on consumers, unfair terms in consumer contracts and unfair commercial practices. In 2016, in connection with the adoption of the Consumer Credit Act, the possibility of negotiating an arbitration clause in the consumer contracts was banned. According to the legislative documents available to monitor the entire legislative process, the legislator's reason for this radical solution was that "the arbitration proceeding was strongly influenced by the predatory practices linked to consumer defaults, while bearing the burden of paying significant costs."[21]

Mediation is another method of dispute resolution (in the Czech Republic governed generally by Act no. 202/2012 Coll. on Mediation). Mediation is a process whereby two or more parties to a dispute attempt by themselves, on a voluntary basis, to reach an amicable agreement on the settlement of their dispute with the assistance of a mediator. This process may be in general initiated by the parties or suggested or ordered by a court or prescribed by the law. It is a voluntary process in the sense that the parties themselves are in charge of the process, may organise it as they wish and terminate it at any time. Mediator is an impartial third person who is asked to conduct mediation in an effective, impartial and competent way, regardless of the denomination or profession of that third person. It is possible for the parties (or for one of them with the explicit consent of the others) to request that the content of a written agreement resulting from mediation be made enforceable. The content of such an agreement shall be made enforceable unless either the content of that agreement is contrary to the law or the law does not provide for its enforceability (the mediation contractual clause should not hamper access to justice, in particular on the part of the weaker party, thus mediation agreement may be binding only with the explicit agreement of the parties involved).

Last but not least method of ADR in the Czech Republic is the conciliation. This method has been recently implemented into amendment of Czech Act no. 634/1992 Coll. on consumer protection. Under this Act, the consumer has the right to out-of-court settlement of a consumer dispute arising out of a contract of sale or a service contract, with the exception of contracts concluded in the field of healthcare services provided to patients by healthcare professionals for the purpose of providing healthcare, in the field of services of general interest of a non-economic nature, and concluded with public providers of further or higher education. This regulation appoints the Czech Trade Inspection (and several other governmental

[20] See VÍTOVÁ, B. Zákon o ochraně spotřebitele. Komentář. Praha: Wolters Kluwer ČR, 2016.; VÍTOVÁ, B. Nepřiměřená ujednání ve spotřebitelských smlouvách po rekodifikaci soukromého práva. 2. vyd. Praha: Wolters Kluwer ČR, 2014.

[21] Vládní závěrečná zpráva z hodnocení dopadu regulace (RIA). Retrieved from https://www.psp.cz/sqw/text/orig2.sqw?idd=112848.

bodies[22]) to lead the conciliation with the results mentioned above. Many experts assumed that the Czech legislator would use the existing system of mediation as a template for the future alternative dispute resolution. However, the legislator chose a different way and by adopting the above mentioned amendment side-tracked mediation from the effective method of alternative dispute resolution and left out the existing mediators from becoming the conciliators. The explanatory memorandum to the amendment explains that the consumers are not aware of the possibility of choosing mediation as a means of alternative dispute resolution. The legislator however forgot that the conciliation by the Czech Trade Inspection is an unknown topic to most of the consumers as well. In addition, the Czech Trade Inspection is a governmental body primarily appointed to check and sanction the entrepreneurs, not to provide the parties to a dispute with independent opinion (although it constituted a separated department of ADR which deals with the consumer-entrepreneur conciliation).

From the above mentioned features of the various ADR methods we can tract several problematic aspects in consumer disputes, such as which means of the dispute settlement are the best for the consumer (i.e. are there any types of cases when it is more efficient for a consumer to sue the entrepreneur in civil proceedings rather than apply for mediation/conciliation and vice versa)? Is mediation suitable for consumer dispute resolution and if so, is it efficient to establish a mandatory mediation between the consumer and the entrepreneur before they start a lawsuit? In what way is the mediation procedure different from other means of dispute settlement (concerning the rights and duties of the mediating parties, legal requirements on the mediator, legal requirements on the final agreement and its enforceability, cost benefits of mediation)?

4 Mediation in consumer disputes

The disparities in the alternative dispute resolution coverage, quality and awareness in the Czech Republic constitute a barrier to the efficient access to justice and are among the reasons why many consumers abstain from fighting for their rights and why they lack confidence that potential disputes with entrepreneurs can be resolved in an easy[23], fast and inexpensive way. The consumers should be encouraged to use the special alternative means of dispute resolution which is accessible, swift, effective and cheap and apt to enable the establishment and maintenance of quality and trust-based commercial, economic, social and neighbourhood relations and to contribute to a high level of consumer protection in a 'win-win' situation, with benefits for both sides as compared to current judicial practice.

Mediation – as a mean of dispute resolution – can bring certain benefits to both parties – the speed, cost savings and equality between parties to the dispute (mediation usually "weakens" the economic and legal superiority of the entrepreneurs). According to the EU Court of Justice the national legislation of EU member state may even prescribe recourse to a mediation procedure as a condition for the admissibility of legal proceedings relating to the consumer disputes, to the extent that such a requirement does not prevent the parties from exercising their right of access to the judicial system[24]. On the other hand, the mediation in consumer disputes is a relatively new means of dispute resolution, in many cases specific application of the rules is unclear and the consumers may not enforce their rights as they could.

---

[22] The subject of out-of-court settlement of consumer disputes is the financial arbitrator in the field of financial services (within the scope of the legal regulation regulating the financial arbitration – Act. no. 229/2002 Coll., on Financial Arbitrator), in the area of electronic communications and postal services it is the Czech Telecommunication Office (within the scope stipulated by the legislation regulating electronic communications and postal services, e.g. Act. no. 127/2005, Coll., on Electronic Communications), in the field of electricity, gas and heating, it is the Energy Regulatory Office within the scope of the legislation regulating the electricity, gas and heating industry (Act. no. 458/2000 Coll., on Business Conditions and Performance of State Administration in Energy Industries).

[23] Fialová discusses one of the problematic aspects of the ADR directive (2013/11/EU) transposition, because although the Czech legislator constituted a possibility for the consumer to file a complaint in an on-line application, he also constituted an excessive obligation to confirm the complaint by a consumer´s written letter. FIALOVÁ, J. Poznatky z praxe mimosoudního řešení spotřebitelských sporů v působnosti ČOI. In Soukromé právo, 2017, no. 7–8, p. 15.

[24] Judgment of the Court (First Chamber) of 14 June 2017, Livio Menini and Maria Antonia Rampanelli v. Banco Popolare – Società Cooperativa. Case C-75/16.

Mediation is used in certain types of civil disputes, such as disputes arising from the family law. There is very little experience with the mediation in the consumer disputes. This is partly caused by the fact that the consumers (nor entrepreneurs) are not aware of the fact that they can choose to settle the dispute by mediation. They don't know their rights and duties during the mediation procedure, or are distrustful of the possible enforceability of the mediation agreement[25].

The consumer disputes are characterised by high level of stress both for the consumer and the entrepreneur. Most of the means of dispute resolution are connected to a mandated decision which means that one of the parties loses. Mediation on the other hand is typical for its psychological lead which makes the parties to settle their dispute by agreement without the feeling that one of the parties gives up their claims (it is a win-win situation).

The mediator (according to the Czech law) does not have any decision-making or sanctioning powers. Unlike the conciliator, the mediator tries – according to their technical and communication skills – to bring the parties to the agreement through a compromise, which means that one party in fact surrenders their claim[26]. The final agreement is however acceptable to both of them.

Compared to conciliation and arbitration, the conciliator is an independent third party who is to assess all the problematic issues between the parties, evaluates them, and then comes to their own standpoint which they present to the disputing parties. Contrary to the arbitration, there are not such strict requirements on the form of the agreement and the person of the mediator which may on the other hand form a specific problem in the consumer disputes. In many cases the mediator leads the parties to a solution acceptable to both parties, yet forbidden by the cogent (mandatory) rules of consumer law regulation[27]. Majority of the mediators are not lawyers by their occupation and do not know the nuances of the Czech consumer law. Yet it is essential for the success of any alternative dispute resolution method in consumer matters that the ADR body possess the necessary knowledge, expertise[28], including a good understanding of the consumer law[29], the opposite may cause possible liability for damage[30]. The question at stake is whether the persons acting as an impartial ADR body should have just a general basic knowledge of law but or a detailed knowledge of consumer law in order to understand the legal implications of the dispute[31].

One of the advantages of mediation is that the final agreement is the result of the free will of both parties[32] (the solution imposed can be binding on the parties only if they were informed of its binding nature and accepted this fact), not given by a superior judge, arbitrator or litigator (the mediating parties often agree upon a solution which may seem disadvantageous to the impartial third party, still the mediating parties are satisfied with the result because it is their will to end up the dispute in this way). Mediation may

---

[25] Mediation should not be regarded only as a weaker alternative to judicial proceedings. The national legislation of each EU member state should ensure that the parties to a written agreement resulting from mediation can have the content of their agreement made enforceable (however it should be possible for a EU member state to refuse to make an agreement enforceable if the content is contrary to its law, or if its law does not provide for the enforceability, e.g. in cases where the obligation specified in the agreement was by its nature unenforceable).

[26] GRYGAR, J. Zákon o mediaci a související předpisy s komentářem a vzory. Podle stavu k 1. 1. 2014. Praha: Leges, 2014, p. 13.

[27] GRYGAR, J. Zákon o mediaci a související předpisy s komentářem a vzory. Podle stavu k 1. 1. 2014. Praha: Leges, 2014, p. 21.

[28] See art. 3.1 of the European Code of Conduct for Mediators. Retrieved from http://ec.europa.eu/civiljustice/adr/adr_ec_code_conduct_en.pdf

[29] See art. I of Commission Recommendation of 30 March 1998 on the principles applicable to the bodies responsible for out-of-court settlement of consumer disputes, 98/257/EC. Official Journal L 115, 17/04/1998 P. 0031 – 0034. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:31998H0257&from=CS.

[30] See MELZER, F. Škoda způsobená informací nebo radou. In Bulletin advokacie, 2017. Retrieved from http://www.bulletin-advokacie.cz/skoda-zpusobena-informaci-nebo-radou?browser=mobi.

[31] HOLÁ, L. Mediace v teorii a praxi. Praha: Grada Publishing, p. 60.; PLAMÍNEK, J. Mediace. Nejúčinnější lék na konflikty. Praha: Grada Publishing, p. 86–89.

[32] DOLEŽALOVÁ, M., HÁJKOVÁ, Š., POTOČKOVÁ, D., ŠTANDERA, J. Zákon o mediaci. Komentář. 1. Vydání. Praha: C. H. Beck, 2013, p. 10.

be advantageous for the entrepreneurs as well because – except for the reasons stated above – it eliminates the risk of medialisation and putting the good name of the company at stake.
In addition, there is an increasing importance of online commerce and in particular cross-border contracts[33], thus a properly functioning alternative dispute resolution system for consumer disputes is necessary in order to achieve the consumers´ confidence in the functioning market. Such development should build on existing alternative dispute resolution procedures in the Czech Republic and respect their legal traditions.
Most of the alternative methods of dispute settlement are regulated on a voluntary basis. Many of the Czech entrepreneurs however are not willing to fulfil their obligations and will not take part in any alternative means of dispute settlement. They also rely on the fact that most consumers will not sue them because of the small claims and high costs of potential court proceedings[34]. Thus proper legislative measures could facilitate the implementation of alternative methods of consumer dispute resolution and encourage natural and legal persons to use it more often, especially in relation to cross-border disputes, bearing in mind that judicial procedures for resolving such disputes are more complex, expensive and lengthy.

5 Conclusions

Effective and efficient justice systems are fundamental and belong to one of the main objectives of the EU-policy (not only) in the field of civil justice. The principle of access to justice is of fundamental importance to the economic stability and proper functioning of the competitive internal market.
Consumer dispute solving is an important part of the consumer protection, most of the consumers give up the dispute solving due to the above mentioned reasons (disproportion between the economic value of the goods or services and the cost of its judicial settlement, the difficulties that court procedures involve etc.).
There are several alternative dispute resolution systems functioning in the Czech Republic at present (all of them are regulated by different legal provisions), one of the main obstacles to their use is the lack of even development of such systems and little knowledge of the potential results. It is very difficult for the consumers to orientate themselves in the big quantity of legal acts and understand their rights and duties in the specific procedures. The current situation in the Czech legal system leads rather to a disorientation of a consumer than to help him to redress their claims. It is the responsibility shared by the public authorities, information and advisory networks, regulators and consumer groups, which all should conduct awareness-raising campaigns and pilot projects on alternative methods of dispute resolution.
Mediation in general and mediation in consumer disputes is a relatively new method of dispute resolution in the Czech Republic. The number of mediation cases in consumer disputes is very low and it demonstrates certain differences from the mediation used in other fields of law (e.g. in family law). Most of the consumers are not aware of the fact that they have certain rights, nor know the possible ways to enforce them. They are not willing to invest further money and time into unpredictable result of the dispute in court proceedings. It is thus crucial to raise consumer awareness of the existence and benefits of alternative methods of dispute resolution prior to the initiation of a consumer dispute at court.
Although mediation could be seen as a means to improve the efficiency of the justice system (especially before courts where there is a substantial backlog of cases pending) and to reduce the obstacles that lengthy and costly judicial procedures create for citizens and businesses, one must bear in mind that there are several problematic aspects that could make mediation unsuitable for the consumer law. On the other hand mediation could definitely contribute to the improvement of relationship between the consumers and entrepreneurs because unlike in the judicial proceedings there is no 'winning' or 'losing' party.

[33] NOVOTNÁ, M. Mimosoudní řešení spotřebitelských přeshraničních sporů. In Soukromé právo, 2017, no. 7–8, p. 19–21.
[34] Večl points out that the the success of conciliation is notably lower in higher-value claims. VEČL, T. Mimosoudní řešení spotřebitelských sporů u České obchodní inspekce. In Soukromé právo, 2017, no. 7–8, p. 13.

The development of ADR procedures should on one hand build upon the existing ADR procedures in the Czech Republic and respect their legal traditions and specific features, on the other hand we must not forget about the specific features of the consumer law which may hinder some of the advantages of some of the ADR systems used within the Czech law.

6 Bibliography

[1] BENÖHR, I. In HODGES, CH., BENÖHR, I., CREUZFELD-BANDA, N. Consumer ADR in Europe. Civil Justice Systems. Oxford: Hart Publishing, 2012.

[2] DOLEŽALOVÁ, M., HÁJKOVÁ, Š., POTOČKOVÁ, D., ŠTANDERA, J. Zákon o mediaci. Komentář. 1. Vydání. Praha: C. H. Beck, 2013.

[3] FIALOVÁ, J. Poznatky z praxe mimosoudního řešení spotřebitelských sporů v působnosti ČOI. In Soukromé právo, 2017, no. 7–8, p. 14–16.

[4] GRYGAR, J. Zákon o mediaci a související předpisy s komentářem a vzory. Podle stavu k 1.1.2014. Praha: Leges, 2014.

[5] HODGES, Ch., TULIBACKA, M. Civil justice in England and Wales – beyond the courts. Mapping out the non-judicial civil justice mechanisms. Retrieved from https://www.law.ox.ac.uk/sites/files/oxlaw/civil_justice_in_england_and_wales_-_beyond_courts._mapping_out_non-judicial_civil_justice_mechanisms.pdf.

[6] HOLÁ, L. K pojmu konciliace v řešení spotřebitelských sporů. Obchodněprávní revue 2/2017.

[7] HOLÁ, L. Mediace v teorii a praxi. Praha: Grada Publishing.

[8] HORÁČEK, T. Mimosoudní řešení spotřebitelských sporů v ČR. In Soukromé právo, 2017, no. 7–8, p. 2–6.

[9] MELZER, F. Škoda způsobená informací nebo radou. In Bulletin advokacie, 2017. Retrieved from http://www.bulletin-advokacie.cz/skoda-zpusobena-informaci-nebo-radou?browser=mobi.

[10] NĚMEČKOVÁ, Š. Mimosoudní řešení spotřebitelských sporů u Českého telekomunikačního úřadu. In Soukromé právo, 2017, no. 7–8, p. 22–31.

[11] NOVOTNÁ, M. Mimosoudní řešení spotřebitelských přeshraničních sporů. In Soukromé právo, 2017, no. 7–8, p. 19–21.

[12] PLAMÍNEK, J. Mediace. Nejúčinnější lék na konflikty. Praha: Grada Publishing.

[13] POKORNÁ, D. Koncept společenské odpovědnosti: obsah, podstata, rozsah. 1. vyd. Olomouc: Univerzita Palackého v Olomouci. 2012.

[14] VEČL, T. Mimosoudní řešení spotřebitelských sporů u České obchodní inspekce. In Soukromé právo, 2017, no. 7–8, p. 11–13.

[15] VÍTOVÁ, B. Nepřiměřená ujednání ve spotřebitelských smlouvách po rekodifikaci soukromého práva. 2. vyd. Praha: Wolters Kluwer ČR, 2014.

[16] VÍTOVÁ, B. Zákon o ochraně spotřebitele. Komentář. Praha: Wolters Kluwer ČR, 2016.

MIGRATION INSTITUTION AS AN INNOVATIVE INSTITUTION OF DEVELOPMENT

Vavilina, Alla Vladimirovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
vavilina_av@rudn.university, vavilinaalla@mail.ru

Cherevichko, Tatiana Viktorovna
Doctor of Economics, Full Professor, Director of SSU Institute of History and International Relations, Saratov State University
Saratov, Astrakhanskaya str., 83, 410012, Russian Federation
Cherevichko@inbox.ru

Orlova, Liubov Nikolaevna
Doctor of science (economic), professor, Specialized Department of Federal Antimonopoly Service of the Russia, Plekhanov Russian University of Economics, (REU)
Stremyanny lane. 36, Moscow, 117997, Russian Federation
Orlova.LN@rea.ru

Abstract:

The present article is devoted to the analysis of the role and meaning of migration processes as an opportunity to realise innovation transformations of economic processes. The authors consider migration within the context of global economic changes.
The research studies the migration system from two fundamental points - innovation and institutionalism. Authors prove that as a specific institution of relations migration is a system of accumulation and transmission of information both in time and space. At the same time, migration system is a specific institution of relations. As being advantages for migration development as an institution of innovative development, the authors highlight such advantages as consistency, stability, predictability; strong position on national levels; large-scale; implementation of transformational management. From a practical perspective, the authors suggest scientific and research and practical measures on the development of migration processes in terms of migration flow regulations, modernisation of existing institutions and establishment of new ones.
The main objective of the presented research is to justify the fact that migration can now be regarded as a specific development institution that ensures an innovative transformation of the economic processes in the Russian Federation's economy through allocating mainly intellectual resources.

Key words:

Migration, migration institution, processes and forms of migration, transformation, focus on innovation, modernisation, development institutions.

JEL: J61, J48

1 Introduction

Global economy takes a path of innovation development ever more actively. In addition, the human factor becomes the main source of economic growth. People, to be more specific, their knowledge, skills, initiative and focus on innovation are connected with economic development and modernisation processes. Together with the whole world, Russia stands at the threshold of renovations. In response to the challenges of modern times, the long-term priority for today's Russia is an investment in a person. It will strengthen the national economy and turn the social sphere into the 'impulse for modernisation'. Migration of labour recourses is an innovative institution of development as it provides the connection between the geographically-distributed resources and the workforce. It also contributes to the satisfaction of population needs as well as improvement of quality and level of life.

2 Materials and methods

As scientific tools in conducting this research, the authors have chosen such scientific general and special methods as the method of systematic and statistical analysis, methods of induction and deduction.

Informational background of the research is based on the materials provided by the Federal Government Statistical Service of the Russian Federation, publications in trustworthy Russian and foreign periodicals; scientific and research and project developments of scientific units of Plekhanov Russian University of Economics and RUDN University.

The theoretical background of the research is based on the modern theories of institutionalism (D. North, 1997), transformation of economic processes (K. Polanyi, 2004), innovations of economic systems (L. Orlova, 2016), allocations and usage of labour resources (A. Kolganov, A. Buzgalin, 2005; A. Asaliev, 2012, 2013) and others.

According to K. Polanyi (K. Polanyi, 2004), national economy seems to be an institutionally executed process. "Process" means the analysis from the perspective of motion that describes the location or act of assumption. Without any indications on social conditions that determine the motives of individuals, it is difficult to say what exactly back up the connection and mutual repetition of translocations. Interrelated elements of natural and human environments would not form anything integral, or there wouldn't be a structural unity that could play a role in the society or possess its own history. Here we can distinguish an extremely importance of the institutional aspect of economic management. Institutionalism of economic process gives it an internal unity and stability, creates a structure that acquires a particular structure in society and changes the place of the economic process in this society by attaching great importance to the history and focusing on values, motives and policy.

Innovations have become an integral peculiarity of economic systems development and the basis of innovation transformation. Thus, innovation is a reflection of modernisation process. The innovation of economic systems development allows providing required growth ratio together with stability level. It is necessary to arrange the process of innovation development provision of economic systems considering such principles as complexity, multiple-level system, harmonisation of interests of various economic units (L. Orlova, 2016).

Despite the extensive use of such categories as transformation and modernisation in scientific and practical spheres, there is no a uniform understanding of these notions. According to the transformation theory, its object is the consistency of social and economic structural changes that appear in technological and institutional transformations (A. Martynov, 2010). The direct source of modernisation is technological changes that lead to the institutional transformations. Technological and institutional transformations are impossible without technological innovations, innovations in human capital and institutional innovations. Such an explanation of a modernisation process allows considering modernisation as a part of innovation transformation that provides the development and operation of such an element of reproduction structure of the national economy as a knowledge-based economy. Specifically this segment of the economy - knowledge-based economy is responsible for the creation

and concentration of innovation transformation potential of the social and economic system that includes institutional innovations as well.

Transformation changes are common for migration system as a part of the social and economic system. Migration system from the perspective of innovation is a system of accumulation and transmission of information both in time and space. Besides, migration system is a specific institution of relations. Considering migration system in institutional context, it is worth to pay attention to the structure of the institutional environment. Traditionally, institutional environment is considered to be a system of formal and informal institutions (D. North, 1997). The first group represents the legislation of this or that country. Informal institutions - customs, moral standards, rules of behaviour, etc. Reorganisation of migration institutions is one of the occurrences of innovation.

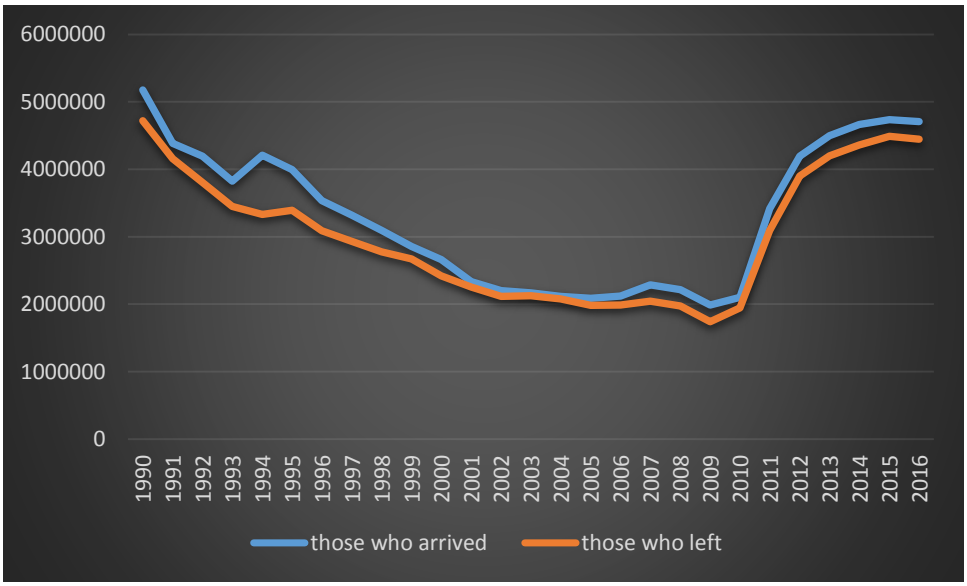
Regarding transformation and modernisation, it is necessary to remember about the most significant trend of the modern economy - globalisation of all economic processes that are also crucial for modern migration. “In terms of globalisation, a rapid development of information technologies, a certain position of a country in the global community allows it to reproduce and generate modernisation impulses as a source of development and improvement of the population quality of life” (I. Semenenko, 2010).

The issues of the labour migration can be considered from the point of view of resource allocation that means the system of distribution and translocation of resources in economic space. Migration processes as an allocation of real and potential labour resources can be illustrated by the factual data on labour migration in the Russian Federation.

It must be noted that the objective of this research is to examine migration processes in the Russian Federation without comparison with migration processes occurring in other countries, including the EU countries. This is due to the peculiarities of migration processes in the Russian Federation, namely: an increase in the scale of permanent migration; increased activity within the internal relocation of citizens.

Fig. 1 shows data that characterise the dynamics of the total migration of population in Russian economy as of from 1990 to 2016.

Fig. 1. Dynamics of total migration of population in the Russian Federation



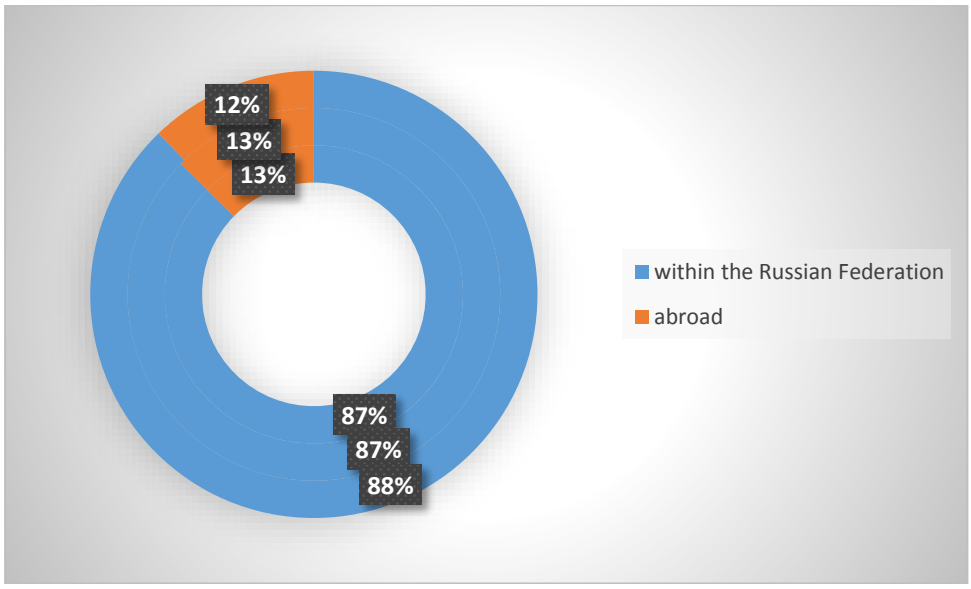
Source: materials provided by the Federal Government Statistical Service https://www.gks.ru

(blue line – those who arrived; orange line – those who left)

Commenting Fig. 1 we can underline a decrease in the intensity of migration processes during the crisis period (for example, the crisis of the Russian economy in 1998, the global financial crisis in 2008) and the increase in migration flows during periods of economic growth.

In Fig. 2 and 3 there is the structure of arriving and leaving people in terms of migration processes. The inner circles show the data for 2014, middle circles - 2015 and outer circles - 2016.

Fig. 2. Structure of those who arrived at the result of migration

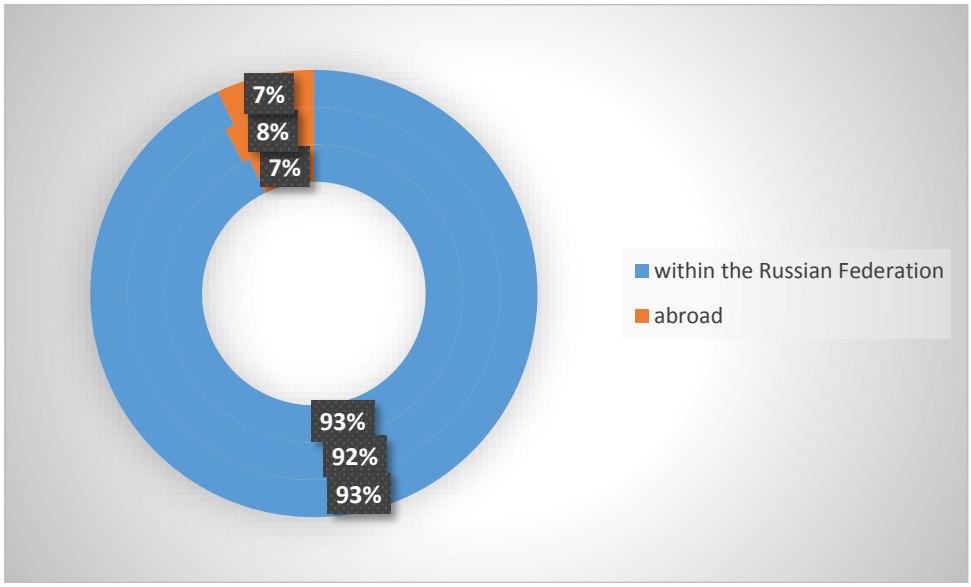


Source: materials provided by the Federal Government Statistical Service https://www.gks.ru

(blue – within the Russian Federation; orange – abroad)

This data shows that the most migration processes take place within the Russian Federation. It means that allocation of labor resources has, in general, local character while translocations are floating and seasonal caused by urbanization.

Fig. 3. Structure of those who left at the result of migration



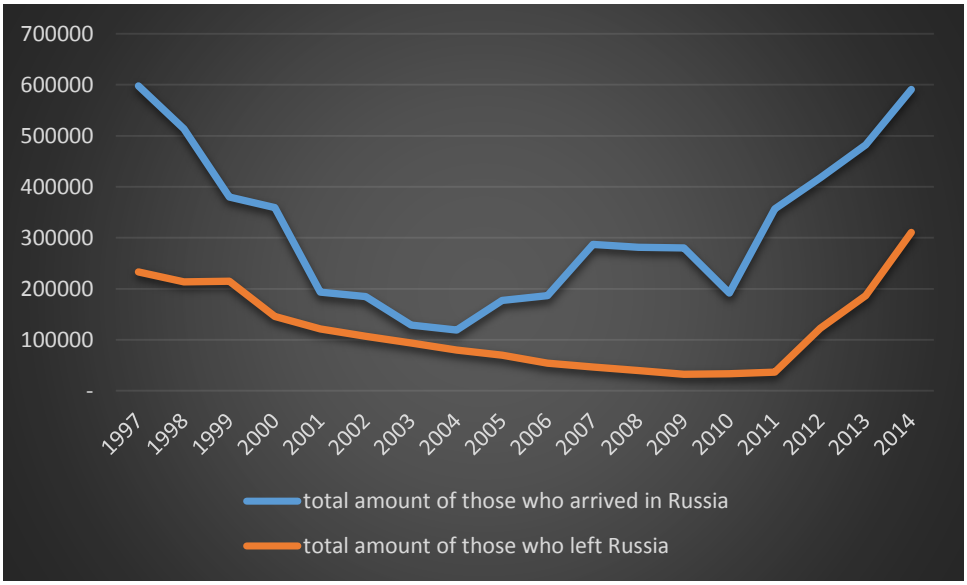
Source: materials provided by the Federal Government Statistical Service https://www.gks.ru

(blue – within the Russian Federation; orange – abroad)

Among the specific features of migration in the Russian Federation can also be named the following: the largest number of displaced people are employable; the majority on the basis of gender gradually became women; the number of citizens who entered the Russian Federation significantly exceeded the number of those who left it; the number of internally displaced people and refugees has significantly increased; the main reason for the displacement within the country was the search for jobs.

In Fig. 4 there is data on international migration that characterises the significant increase of arrivals in the Russian Federation over the number of people who have left it. According to Rosstat, the major movement of the workforce is closely connected with the translocation of labour resources between the CIS countries.

Fig. 4. International migration



Source: materials provided by the Federal Government Statistical Service https://www.gks.ru

(blue line – total amount of those who arrived in Russia; orange line – total amount of those who left Russia)

It should be marked that the number of Russian people leaving the country for non-CIS countries has shrunk. The most intensive outward migration flow is directed ti Germany, Israel and Finland. The principal exporters of labor for Russian economy are Ukraine, Moldavia, China and the Customs Union member states. As for employment field, for foreign citizens the most sought-after industries are construction and manufacturing.

The level of resources allocation depends on the level of economy and society development, and it is an indicator of economic coordination between units and levels of the economy (A. Kolganov, A. Buzgalin, 2005). Migration provides the connection between geographically-distributed resources and the labour force, helps with satisfying of population needs in getting a job, accommodation, means of living, social and professional mobility, changes of social status and other characteristics of living conditions of the population (A. Asaliev, 2012, 2013).

3 Results and discussion

3.1 Transformation of labour activity of population.

Dramatic shift that takes place in the process of economic globalisation is indicative of changes, which affect human existence, especially his/her labour activity. The most visible changes are:

- the technological and economic transformation that provides changes in the complex of interrelated technical, institutional and managerial innovations; This process, first of all, appears in development of technologies in order to influence information (in the sphere of new generation technologies);
- establishment of global information space builds a new system of industrial relations (production via virtual space) that reflects the inclusiveness effect of all economic processes by new technologies;
- qualitative change of economic configuration of the world; According to several forecasts, by 2020 Asia preceded by China will produce more than 40% of the global GDP; besides, China's GNP will reach $ 20 trillion; the USA will be on the second place - $ 13 trillion. (D. Sorokin, 2001);
- the tragedy of "joint" global resources. Considering migration, a "joint" limited global resource is labour - lack (shortage) of highly-qualified experts.

However, the peculiar feature of all changes mentioned above is not only their large-scale and complexity but also their focus on innovation. These peculiarities are demonstrated in the sphere of labour and migration. Thus, for example, changes in characteristics of labour technologies create new forms of employment that in its turn intermediate new forms of migration. Informational support of society, the increase in the share of the service sector as well as the increase in the role of multinational companies in global economy reduce the necessity of physical movement of experts. The modern world is characterised by the proliferation of the distance employment that is based on the usage of diverse information systems and the Internet together with network technology mechanism that contributed to the development of three types of network structures: 1) corporate network structure that is functioning within structural units of an organisation; 2) intercompany network structure that is an alternative to the market as an exchange institution; 3) network structures of telecommuters. The work through telecommunications is 'virtual' migration, which is a reflection of global innovation changes.

3.2 Migration as a development institution

New forms of employment and migration in global economy determine the necessity of their institutional distinctness. Systematic interrelation of recent changes stipulates the occurrence of new integral effect, which excludes the isolated appearance of each change. So, according to our opinion, there is a particular hypothetical relation: complex global changes of economic conditions of microsystem 'require' significant complex and qualitative changes both in labour sector and the sector of migration relations. Global labour space should face the 'linkage' of migration processes with innovation transformations.

The migration institution plays a vital role in the development of global labour space. The labour if the primary resource that can travel in global space via three channels:

- enterprises can choose their location in different countries all over the world in order to find labour resources considering expenses, skills and social conditions;
- enterprises can attract highly-qualified employees from different parts of the world regardless of their location by offering a high salary and appropriate labour conditions;
- people themselves can enter any labour market wherever they are due to various migration reasons.

The migrants' labour can be used in any country with vacant workplaces. However, there is one peculiar feature - the labour force migration itself is limited in global space by national institutions of migration.

Nowadays not only governments participate in the organisation of migration (labour) flows, but also non-governmental structures – several private firms and individuals that take part in the entrepreneurial activity. Thus, today, depending on the institutions engaged in labour migration, the export countries are divided into the following categories:

- countries where public institutions are involved in the organisation of external labour migration;
- countries where private institutions are involved in the external migration processes;

- countries where both public and private institutions are involved in the organisation of labour migration.

The variety of tasks, organisational forms and directions of migration institutions make it more challenging to develop and implement general, unified standards that regulate migration processes.

That is why to solve migration problems, especially issues of migration flows regulation, it is necessary to modernise existing or create new institutions that will possess global prospects and authority to make decisions of supranational nature as well as enforce them. The emergence of new, especially supranational migration institutions is determined by institutional innovations, and we can consider these institutions as development institutions.

It is worth pointing out that despite the widespread implementation of development institution category in the formation of state policies in different countries, there is no any generally accepted definition. Following Yu. Kindzarksy (Yu. Kindzersky, 2010), there is also no any common criterion of distinguishing of development institutions from the number of any other institutions. Also, there are no generally accepted methods of efficiency assessment of these institutions in solving problems that are triggers for their development.

Due to our opinion, migration development institution is an innovative type of migration institutions. The most significant reason for the creation of supranational migration institutions of development is ineffectiveness and inflexibility of traditional tools of migration policy in various countries.

Migration institutions of development can be classified according to their specialisation or focus area. There are universal and specialised institutions. The performance of the first group is not focused on the solution of one task. Universal migration institutions of development include supranational migration institutions. The formation of universal supranational migration institution of development reflects the active behavioural strategy of all economic units, labour institutions' transformation in order to include national labour force into the global economic space.

4 Implications and Conclusion.

Migration in and of itself has quite a positive effect on the development of society; by and large, it performs important functions that are expressed in:

• balanced redistribution of the labour force;
• overcoming significant differences in citizens' standard of living;
• cross-fertilization of cultures; overcoming the demographic crisis.

The performance of specialised development institutions is generally focused on the solution of separate tasks. It should be noted that the existence of institutions' specialisation does not mean that they do not influence the solution of different tasks. Thus, for instance, the performance of immigration institutions of development definitely influences universal migration institutions. There are the key advantages of the development of a migration institution:

- consistency, stability, predictability;
- stable position on national levels;
- large-scale;
- implementation of transformational management.

It is not a coincidence that transformational management is one of the advantages of migration institution of development. We consider it to be the management of the complicated process of change that affects the formation of the global labour market and a focus on innovation in migration relations.
Besides, taking into account that universal migration institution of development is established by the state to solve large-scale problems of migration processes regulation, formation of general global migration policy, it is reasonable to use the system of qualitative and quantitative indicators that characterise the influence of institution operating results on the changes of key indicators of countries' development.

5 References

[1] North, D. Institutions, institutional change and economic performance/translation from English A.N. Nesterenko; foreword and scientific editing B.Z. Milnera. - M.: The foundation of an economic book "Nachala" 1997. - 180 p.

[2] Polanyi, K. Economy as an institutionally formed process // Western economic sociology: chrestomathy of modern classics/arranging and scientific editing V.V. Radaev; translation M.S. Dobryakova and others. M.: ROSSPEN, 2004. – P. 82-104.

[3] Orlova, L. Basic principles and approaches to management of the sustainable and innovative development of economic systems // Management in Russia and in abroad, 2016. - № 3. - P. 3-9.

[4] Kolganov, A.I., Buzgalin A.V. Economic comparativistics. M.: INFRA - M, 2005. - p.746

[5] Asaliev, A. M,. Shubenkova, E.V. Topical issues of labour usage // Issues of economic structuring. - 2012. - No. 3 - P. 10-15.

[6] Asaliev, A.M. Vukovich, G.G., Valkovich, O.N. Social partnership. Saarbrücken: LAP LAMBERT, 2013. - 284 p.

[7] Medvedev, D. Realisation of national projects: new objectives // Social and economic development of Russia: new edges (international conference materials). M., 2008. – P. 10.

[8] Martynov, A. Modernisation and transformation // Society and Economy, 2010, No. 6 - P.9

[9] Semenenko, I. Modernisation, authoritarianism and democracy // Global economy and international relations. 2010. No.11. – P.100.

[10] Sorokin, D. Challenges of the modern era and Russia's strategic response // Issues of the Economy. 2001. No.11. – P. 35

[11] Kindzersky, Yu. Development institutions: formation principles and problems // Society and economy. 2010. No.7-8. – P.57-58

MODELLING OF R&D FUNDING SOURCES IN RUSSIA

Anna Firsova
Saratov State University, Faculty of Economy
a.firsova@rambler.ru

Maria Novoselova
Saratov State University, Faculty of Economy
mariya_nov@mail.ru

Alla Vavilina
Peoples' Friendship University of Russia (RUDN), Faculty of Economy
vavilinaalla@mail.ru

Abstract:

The success of innovation as one of the main conditions for economic development is largely determined by the methods of financial support and investments. The most important part of the strategy of innovative development of the economy today is the development of mechanisms for financing innovative activities. The analysis were identified the structure of R&D expenses by source of funds. The support measures and the France and Japan experience were studied. Analysis of modern forms and methods of financing Russian innovative enterprises reveals a structural disproportion between sources of financing innovations. The goal of the article is to analyse the structure of innovation financing using the method of comparative studies and to substantiate the need and directions to attract large and accessible resources from the money and financial markets. The ways of development of sources of financing innovative activity and indirect measures of monetary stimulation are determined to increase the interest of commercial banks in lending to innovations through the development of syndicated loan facilities and debt financial instruments.

Key words:

Research and development, funding, innovative activity

JEL: O3

1 Introduction: Expenditure on R&D as a Driver of Economic Growth

Innovations in the XXI century are becoming a strategic driver of economic growth, the level of development determines the effectiveness, competitiveness of the economy and national security.

The goal of the article is to analyse the structure of R&D financing in developed countries and to substantiate the need and directions to attract large and accessible resources from the money and financial markets for innovations financing in Russian economy.

For this purposes the method of comparative studies has been used, and the next research tasks have been solved:

- to analyze models, methods and structure and to identify the main sources of financing innovations in developed countries,
- to analysis of structure of R&D funding sources and to define Russian dominant trends in financing of research,
- to carry out a comparative analysis of world experience with the Russian specifics,

- to modelling of R&D development tools and to determine the mechanisms to attract accessible private resources from money and financial markets for innovations.

OECD studies of the top-16 countries show a positive and significant effect of the growth of R&D spending on the growth of economic efficiency. According to the OECD, an increase in government spending on R&D by 1% leads to an increase in the probability of successful implementation of innovations by 0.85% and to an increase in the share of innovative goods in the economy by 0.7% [1]. At the same time, there is a synergistic effect of increasing returns on R&D spending: the high intensity of R&D in the country makes stronger the impact of innovation on economic growth and competitiveness [2], [3]. Trends in gross domestic expenditure on R&D by leading 16 countries are presented in Table 1. This shows that in recent years there has been an increase in gross domestic expenditure on R&D in all countries [4].

Table 1: Trends in gross domestic expenditure on R&D, OECD, 2015 (*updated*)

Country	Total, USD		As a percentage of gross domestic product, %		Per capita, USD	
	2013	2014	2013	2014*	2013	2014
USA	456977,0	...	2,74	2,75	1442,3	...
Korea	68051,5	72266,8	4,15	**4,29**	1355,1	1433,2
Israel	10998,9	11376,5	4,09	**4,11**	1365,3	1385,3
Japan	162347,2	166861,3	3,48	**3,59**	1275,0	1312,6
Finland	7321,7	7050,8	3,29	**3,17**	1346,1	1290,7
Sweden	14304,1	13882,8	3,31	**3,16**	1489,9	1431,8
Austria	11918,5	12498,0	2,96	**3,07**	1405,9	1462,8
Denmark	7841,6	7920,9	3,06	**3,05**	1397,0	1403,7
Germany	102573,0	108827,2	2,83	**2,90**	1271,9	1343,8
Belgium	11705,0	12023,3	2,43	**2,47**	1054,0	1077,6
Slovenia	1560,8	1496,1	2,60	**2,39**	757,8	725,6
France	57986,8	58750,3	2,24	**2,26**	880,2	887,9
United Kingdom	41743,4	44174,1	1,66	**1,70**	651,2	683,8
Canada	26303,8	25813,6	1,69	**1,61**	748,2	726,2
Russia	36611,2	39864,9	1,06	**1,09**	254,8	272,5
Turkey	13713,5	15132,3	0,94	**1,01**	181,0	197,5

*Sorted by percentage of gross domestic product in 2015, %

2 Methods: Analysis of Structure of R&D Funding Sources

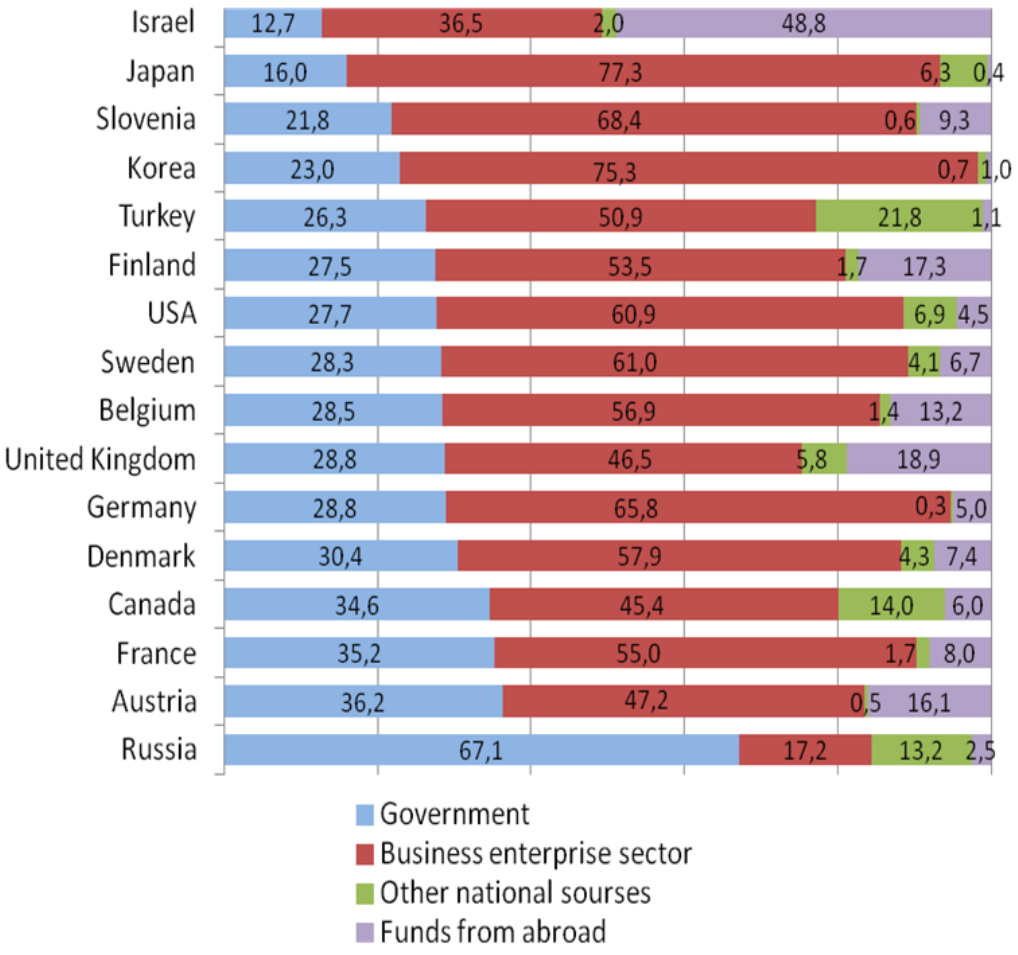
The ratio of financial sources for innovation by time and by executor varies depending on the stage of R&D, the needs and opportunities of investors and innovative companies, the goals and priorities of national innovation policy and the technological structure of the economy. Depending on the stage of the innovation process, different forms and methods of financing innovation are used. At the initial stages of the innovation process, direct government funding is the key way, and the closer to the implementation of the idea into a real innovative product or process, private sources become predominant and indirect incentive measures are used.

Funding of innovation in national economy measured by the amount of Gross domestic expenditure on R&D and carried out the following major sources: government (public) sector, business enterprise (private) sector, higher education sector, private non-profit sector and funds from abroad.

Innovative development can not only rely on the limited state budget. Modern foreign countries fund only a 25-30 % of R&D national expenditure. The experience of economically developed countries shows that the engine of the innovation economy is the demand for innovation from the private sector of the economy, these countries are leaders in the field of R&D [5].

The major part of the national allocation for R&D comes from the private sector, primarily industrial companies (over 60%). The most significant R&D share of the private sector exists in the countries occupying a leading position in international competitiveness rankings: Japan, Korea, unexpected Slovenia, Germany and Sweden (61 – 77, 3%). In Russia this source is 17, 2 % [6].

Figure 3: Trends in gross domestic expenditure on R&D by source of funds, %, 2014



2.1 Russian Dominant trends Research in R&D financing

The success of innovation as one of the main conditions for economic development is largely determined by the financial support and investments. Insufficiency of own financial resources directed to innovation activity and inaccessibility of external sources for innovative companies in most cases determines a low level of innovative activity and low effectiveness of economic entities. It is obvious that in order to overcome the situation in the sphere of innovation must not only review existing funding mechanisms of innovation in terms of efficiency commercialization of ideas, but also to create new ones. This leads to the relevance of R&D funding and investment processes in Russia. One of the most important components of the innovation development strategy and the key direction of the Russian state policy is to improve the efficiency of innovation financing processes.

Presented figures in table 2 differ Russia from the majority of foreign developed countries, public recourses is still a major source of funding for this sector. Such structure of financing innovation sources cannot provide a macro-premise for changing the technological order in Russia.

Due to the historical processes of its formation, for the past 20 years the structure of spending on R&D by financing public state sources was always about two-thirds of total gross domestic expenditure in Russia, in effect, replacing the funds of private and corporate investors in innovative processes [7]. It should be noted that the creation and development of the Russian national innovation system going so that public funding allowed under moderate economic growth and a slight nationwide R&D funding from the private sector to keep the scientific potential. Private financing market did not exist, and it was necessary to create. However, the preferred orientation on government funding of science and state participation in R& today creates serious obstacles to the development of innovation.

A study of the R&D funding structure in Russia revealed the disparity between public and private sectors and the asymmetry between the needs of the innovation economy and the possibilities of their funding.

The dominant trends in financing the modern innovation system of Russia today are:

- high share of the public sector,
- weak state development institutions,
- narrowing opportunities of public sector in funding R&D,
- weak development of reliable long-term investment instruments of the stock market as a source of financing for innovative projects,
- insufficient development of small innovative businesses and venture capital and business angels funding and private investments,
- lack of own funds for investments in R&D,
- absent of incentives to invest private capital in innovations due to the availability of other areas of more favorable allocation of capital.

Therefore, so relevant today it is important to create mechanisms for investing in innovative activities that can overcome the asymmetry of innovation investment processes. New instruments in the financial market are needed, which allow eliminating risks and attracting "long money" for a long time into the sphere of innovation.

In the economically developed countries with a predominance of market and cluster models of financing innovative activity, the key sources of investing in innovations are the stock and credit markets and these resources work for the economy. And the main private capital investors in innovative companies and products are corporate and institutional financial and credit investors: pension funds, infrastructure funds, banks, insurance companies, large industrial corporations, providing investments of up to 10% of GDP.

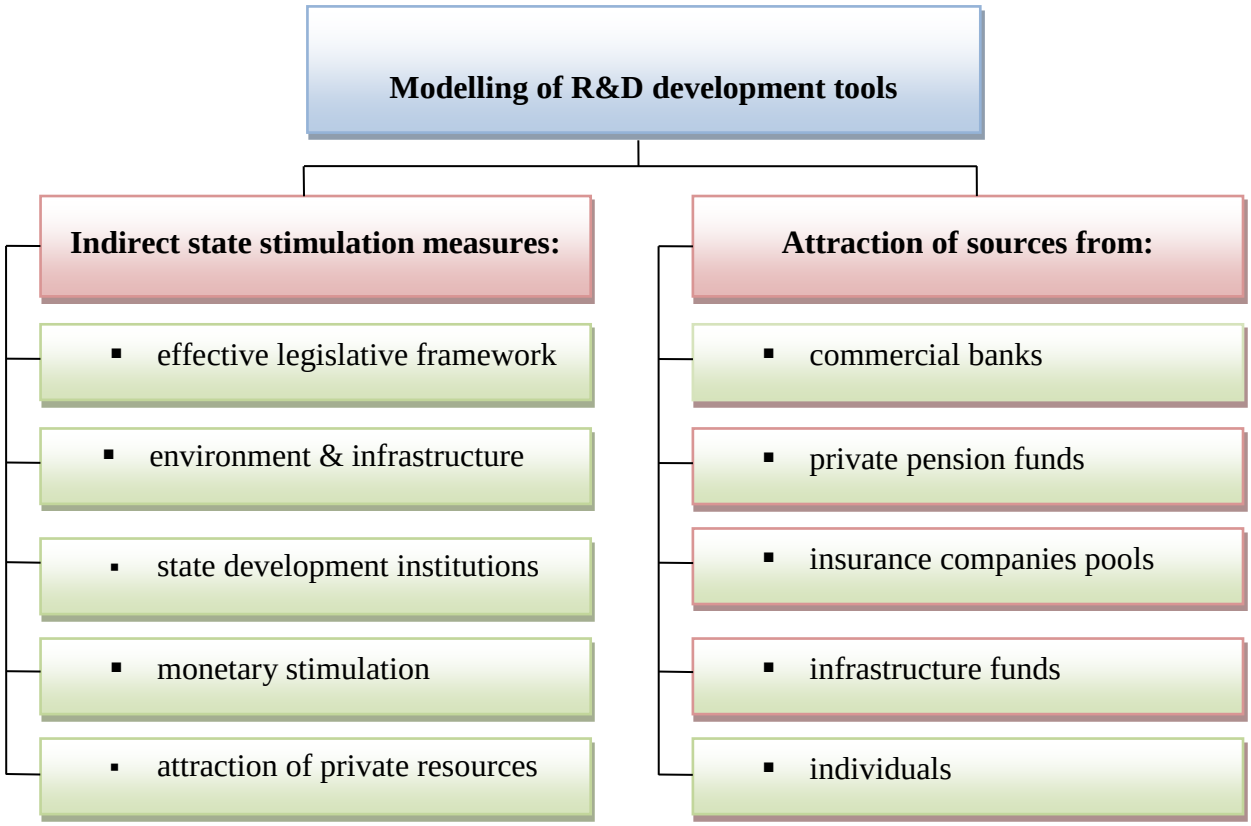
The funds of these institutions could become a significant investment resource for financing innovative enterprises in Russia. Insufficient development of innovative projects in Russia is hampered by the fact that corporate and institutional finance and credit investors: funds, banks , insurance

companies can not engage in risky financing and do not work in this area due to lack of the Russian stock market related tools and environment.

2.2 Modelling of R&D development tools

Modelling of R&D funding sources by state as a regulator of financial and innovative processes in the state-corporate model should provide participants of the market of investment resources with an effective legislative base, mechanisms and tools for accumulating "long" investments, guarantees of invested funds, improving the institutional environment, infrastructure to increase the availability of private sources and encourage private investors s and commercial banks to finance innovation (fig. 2). The implementation of these activities will contribute to the development of innovative activities and the creation of an effective innovative economy in Russia.

Figure 2: Modelling of R&D funding sources tools



Modelling the effective structure of sources of R&D funding should eliminate the existing asymmetry and ensure such proportions of sources of financing, when the private sector will invest in innovation activity not three times less than the state, but 5-10 times more.

It is necessary to develop our own resource base and activate bank lending as a financial tool for investing in innovation and R&D.

The state as the main subject of the innovation process right now it is necessary to activate additional measures of monetary stimulation of innovative activity financing to increase the interest of commercial banks in lending to innovations.

Interesting and important in this context the foreign experience of such indirect stimulation of financing innovative activity.

For example, in France, tax holidays for small and medium-sized innovative businesses are 5 years. In the United Kingdom innovative start-up companies pay a profit tax of 1% instead of 20%. The lower capital gains tax and the absence of a reinvestment tax in other companies add up to a 20% reduction in taxable income. "Patent Box" allows to pay corporate income tax from the use of patents and intellectual property at a reduced rate of 10% [8].

Japan implements an active protectionist innovation policy and makes extensive use of R&D indicative planning tools, high import customs tariffs, exemption of exporters of innovative products from some taxes, direct subsidization of innovation projects, active control of exchange with foreign countries in relation to innovative science-intensive products.

The experience of post-war Japan deserves close study. In the framework of state industrial policy, priority sectors and industries were singled out in 1946, and a "credit rationing" system was introduced to ensure these areas with credit resources. The Bank of Japan carried out credit expansion of private financial institutions and, in a recommendatory manner, established areas (primarily high-tech and innovative industries) and quantitative limits of lending volumes, which ensured the movement of financial resources in certain areas of government policy. In case of violation of these "recommendations", the Bank of Japan did not provide a loan to a commercial bank. Thus, "credit rationing" as an indirect measure of administrative management made it possible to pursue a flexible policy of targeted redistribution and concentration of private financial resources provided by private banks for priority financing of "selected" industries, which later influenced the creation of a high-tech structure of the Japanese economy [9].

Indirect measures of state regulation should influence first of all on stimulation of inflow of means of bank resources in innovative sector.

Infrastructure funds establish to co-finance infrastructure projects, acquire stake infrastructure companies to attract strategic investors for them and participate in corporate management to finance projects and companies providing maintenance services for innovative companies as startups need economic, financial and legal advice and such services is necessary for the participants of the innovative ecosystem. Investments in infrastructure are seen as defensive strategy in investment portfolios. Infrastructure investment assets now compete with traditional instruments, demonstrating yield comparable with the investments in stocks, but with less volatility. These funds are interested in investing in large-scale infrastructure and innovative projects, where the government guarantees a steady income.

Regarding private pension funds in Russia, saving interest because stable and predictable cash flows, inelastic demand, opportunities to hedge against inflation, the stability of the financial efficiency of projects to changing economic cycles continues to make these funds the most important source of innovation projects. These funds can also be considered as potential investors innovative projects in Russia.

Prerequisites for use of the Russian insurance companies pools is the positive trend receipt of funds of insurers. The insurance companies are investing in different types of assets: state and municipal bonds, real estate and mutual funds, they are also potential investors in R&D projects.

Individuals are also one of the possible sources of funding for the state of strategic projects and private investors have the financial resources to invest in projects with an acceptable level of risk.

There is positive example of using foreign funds individuals. In France, individuals can open in any commercial banks and non-taxable state guarantees special savings accounts to 15 thousand euros. Profit is indexed according to the inflation rate and the three-month interbank rate. All collected funds centralize of the special bank, which uses long-term secured loans (maturity up to 25 years) for the development of social housing and infrastructure projects [10].

3 Paper Results

The above means institutions can be a significant investment resource for R&D funding and investment innovation projects.

Commercial banks, having the best expertise evaluating innovative investment projects today because of the crisis are able to provide only short-term or medium-term liquidity. However, commercial banks are able to attract investment and to guide them in long-term projects, for example, by investing in innovation projects through deposit accounts. Such accounts may be invested only in innovating projects, should be subject to state deposit insurance system, the interest rate may be slightly higher than on ordinary deposits, they may have preferential tax treatment etc.

In conditions of low capitalization of the banking system, the development of syndicated loan facilities can contribute to solving the problem of underfunding the real sector of the Russian economy. This tool should be used to implement long-term financial projects, raise additional funds in the domestic market and redistribute banking risks. Syndicated lending also creates conditions for the banks of the secondary market to develop their shares in syndicated loans under cession or assignment agreements, which increases the liquidity of the bank's debt obligations. The development of the practice of syndicated lending in Russia is hampered by insignificant amounts of own and raised funds, insufficient experience in syndicated lending, low level of banks' interaction, lack of effective legal framework and weak methodological support, irrational organization of risk-oriented management in syndicate banks.

Increasing the use of project financing mechanisms and debt financial instruments: promissory notes and bonds, syndicated loans, bonds and credit linked notes, eurobonds and infrastructure bonds will attract long-term resources, effectively structure the debt repayment scheme, expand the innovation companies access to financial market.

In the field of state credit policy, it is necessary to develop a system of measures that allow to channel financial flows to the innovative sector of the economy and provide banks with the reliability of conditions and at the same time the profitability of lending to innovations through mechanisms and state guarantees of targeted and loans on beneficial terms to innovative companies. The use of targeted interest subsidies on sufficiently large scales for the implementation of innovative projects in priority sectors of the economy will help to ensure that loans are really affordable for innovative companies.

It is necessary to provide state financing in a more effective way of financing innovative activity by developing mechanisms for providing investors with guarantees of reimbursing a part of the invested funds, which will increase the availability of financial resources and will stimulate the attraction of private investors and bank lending to financing innovative activities.

Thus, to ensure investment prospects for realizing the modernization of the economy, an integrated strategic approach is needed through the strengthening of indirect measures to stimulate the financing of innovation.

Therefore, if the government manages to provide market participants with investment resources mechanisms that would allow projects to control and increase the level of trust between the participants there will be more innovative projects.

The role of the state in this process should be to effectively use the financial potential of government instruments to support innovation financing, to indirectly stimulate and attract private resources to the sphere of innovation, and to create a common stable institutional environment that ensures effective regulation of the relationships of all participants in the innovation process.

Presented results have a practical significance in discussions about the models of financing and the development of innovative activities in Russia. it is necessary to take into account the type of appropriate corporate-state / cluster / market models and foreign experience, it would expedient to integrate elements of the model taking into account the features of regional differentiation and the prospects for sustainable development of the Russian national economy.

4 Acknowledgment

The reported study was supported by Russian Foundation for Basic Research, project “Multivariate analysis and modelling of sources and structure of financing innovative enterprises by regions of Russia”, № 17-32-00050

5 Bibliography

[1] Eurostat: Science, technology and innovation in Europe, Pocketbooks. (2014). Eurostat.

[2] DOSI G., FREEMAN C., FABIANI S. (1994). The Process of Economic Development: Introducing Some Stylized Facts and Theories on Technologies, Firms and Institutions. Industrial and Corporate Change, 3(1), 1–45.

[3] WANG, E. C. (2007). R&D efficiency and economic performance: A cross-country analysis using the stochastic frontier approach. Journal of Policy Modeling, 29(2), 345-360.

[4] OECD science, technology, and industry outlook - 2014. (2014). OECD, Paris.

[5] Eurostat: Government finance statistics. URL: http://ec.europa.eu/eurostat/web/government-finance-statistics/data/main-tables

[6] The Russian Federal Service of State Statistics. URL http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/en/statistics/science_and_innovations/science/#

[7] National innovation system and state innovation policy of the Russian Federation. Basic report to the OECD review of the national innovation system of the Russian Federation. URL: http://mon.gov.ru/files/materials/6333/09.11.11-bd-rus.pdf

[8] Government Digital Service. Guidance. Corporation Tax: the Patent Box. URL: https://www.gov.uk/guidance/corporation-tax-the-patent-box

[9] Industrial policy in East Asia (1993) / Edited by R. INOUE, H. KOHAMA, S. URATA, JETRO, Tokyo, Japan, 11-25.

[10] FIRZLI M.N., BAZI V. Infrastructure Investments in an Age of Austerity: The Pension and Sovereign Funds Perspective (2011). Revue Analyse Financire, 41, 34-37.

MODIFICATION OF A TOOL FROM THE THEORY OF CONSTRAINTS FOR ECONOMIC PLANNING AND MANAGEMENT OF A CONSTRUCTION PROJECT

Omar Ameir; Jakub Chlopecký
Moravian University College Olomouc, department of Management and Marketing
omar.ameir@mvso.cz; jakub.chlopecky@mvso.cz

Abstract

The paper deals with modifying a tool from the Theory of Constraints, particularly the critical chain, for effective planning and management of a construction project. This tool is partly used for the execution of projects in manufacturing companies and information technology companies. However, construction project management has not used this tool so far.
Firstly, the tool from the Theory of Constraints will be modified to be compatible with the characteristics of construction project management. Afterwards, the applicability of this tool will be verified. Subsequently, the objective function of the applicability of the tool will be determined, which would help evaluate economic benefits of the proposed tool in practice. Finally, the time and financial savings of the project will be determined.

Keywords

Tool of strategic management, planning and management of a project, Theory of Constraints, critical path.

JEL: Q01, G32, O22

1. Introduction

Project management in manufacturing companies and information technology companies sometimes uses the principles of the critical chain method which is one of the methods of the Theory of Constraints, hereinafter referred to as ´TOC´. However, this method has not been used in the management of construction projects at all. This fact results from the literature review [1, 2, 3, 6], the results of the survey[35] [10] which dealt with the systematic nature of risk management in medium-sized construction companies in the Czech Republic, and from the experience of civil engineers. Construction projects are considered a field in which missed predetermined deadlines represent a very important issue.

The time shifts of construction projects happen in spite of the fact that time floats are assigned to many locations. Therefore, the time floats are created and allocated very inefficiently, which leads to their waste. This waste is a constraint, or the weak point of companies [6]. There are several reasons for this inefficient allocation of time floats. They include, for example, the faulty coordination of resources, multitasking, Student syndrome or Parkinson 's Law.

The expert publications [4, 5, 9] and practical experience offer various tools and methods to eliminate these reasons for the ineffective allocation of time floats. These measures often have a character of soft elements of the management system, such as the correct motivation of staff, concealment of the real length of time floats, etc. The TOC offers a non-standard solution by proposing changes in the principle of allocation of time schedules to the project. It means removing the time floats

[35] In 2014, the survey focused on the systematic nature of risk management in medium-sized construction companies in the Czech Republic. The evaluation of the degree of the systematic nature of risk management was based on several criteria. One of these was the application of the TOC optimization tool.

from particular activities and putting the time floats at the end of the set of activities where they function as a large buffer.

Although there are undeniable benefits achieved by implementing the TOC in the areas of information technology and manufacturing [1, 3], the awareness of the TOC in the management of construction projects is practically none, as mentioned above. In the view of this fact and topicality of the issue, the possibility to apply this tool during the time planning of a construction project appears to be convenient.

It thus raises an important question: if the TOC tool, used for managing project schedules, its modification for planning and management of a construction project, is applicable to the construction execution.

The aim of the paper is to modify the TOC tool for planning and management of a construction project and, subsequently, to verify the possibility of its implementation in order to increase the probability of completing the construction contract within the arranged period and thus achieve the time and financial savings of the construction.

2. Description of the basic optimization parameters arising from the theory of constraints

The optimization of project schedules based on the TOC has its basic rules and essential contexts. The principle of this optimization, or the tool for optimization of project schedules, resides in changing the lengths of time schedules of activities of the project, i.e. the construction contract. It means removing the time floats from particular activities of the project and, subsequently, putting them at the end of the set of activities in the form of one large float, or one large buffer. Based on the findings from the literature review [1, 2, 3, 6], the recommended ratio of shortening the durations of particular activities with the aim to insert them in the buffer at the end of the set of activities is the following: one half of the schedule of each activity is removed and a half of the sum of the removed time is added to the end of the set of activities. This means that at least a quarter of the original duration of the project is always saved.

When managing the construction project, it is necessary:

- to determine the value A which is equivalent to the sum of all the values that will be removed from the particular activities, see equation (1);

$$A = OP_1 + OP_2 + OP_3 + \cdots + OP_n \Leftrightarrow A = O(P_1 + P_2 + P_3 + \cdots + P_n) \Leftrightarrow A = O \cdot Q \qquad (1)$$

- to subtract 50% from the schedule of each activity, i.e. remove the determined value A from the sum of schedules of all project activities, see the mathematical entry (2);

$$T_j^{(0)} = P_1 - OP_1;\ P_2 - OP_2;\ P_3 - OP_3; \ldots; P_n - OP_n \Leftrightarrow T_j^{(0)} = Q - A \qquad (2)$$

- to add the value of 1/4 Q to the end of the set of activities, see the mathematical entry (3).

$$T_j^{(1)} = P_1 - OP_1;\ P_2 - OP_2;\ P_3 - OP_3; \ldots; P_n - OP_n + RQ \Leftrightarrow T_j^{(1)} = T_j^{(0)} + RQ \qquad (3)$$

where:

$T_j^{(0)}$ – is the new early start date of activation of the activity final node;

$T_j^{(1)}$ – is the new late start date of activation of the activity final node;

P – is the activity of the chain with the particular time schedule;

P_n – is the activity of the project graph chain;

A – is the sum of values of the time removed from all activities;

O – is the fraction that determines the P value ratio that is removed from the activity P (the value is $\frac{1}{2}$ based on the TOC recommendation);

Q – is the sum of the time schedules of all activities of the project $(Q = P_1 + P_2 + P_3 + \cdots + P_n)$;

R – is the fraction that determines the ratio of Q value assigned to the end of the project (the value is $\frac{1}{4}$ based on the TOC recommendation).

As mentioned above, the aim of the paper is the modification of the TOC tool for managing project schedules in order to make it applicable to the management of a construction project. This modification consists especially of these three points:

- finding two forms of application of the optimization TOC tool and their subsequent verification;
- specification of an objective function to determine the economic impact of the TOC tool;
- definition of the conditions of the TOC tool application in relation to the execution of a construction.

In terms of the focus of the paper, it is not essential to deal with the third point, i.e. defining the conditions of application of the TOC optimization tool. Only the first two points of the above mentioned will be described. During the application of the optimization tool, only the form that is suitable for the solution of the particular example will be verified.

3. Principle of calculating the suitable form of application of the proposed tool

An important change the modification of the TOC basic optimization tool offers is the possibility of its application in two ways, or forms. This finding as well as the design of two forms of application were achieved by the functionality verification of the proposed tool, i.e. the TOC tool for managing time schedules of a construction project, on particular examples. The first form is based on the principle that schedules of the construction project are reduced by half only in activities that are a part of the critical path of the project. The second principle reduces schedules by half in all project activities.

These two forms of application of the project schedule optimization tool differ in the fact that the first one has less impact on the project assignment, however, it reduces the values of total float of activities on a non-critical path more than the second form. This reduction always occurs because total floats of activities on the critical path are generated at the expense of the floats of activities on a non-critical path, and thus the critical path becomes non-critical. However, an important point is how large this reduction in the values of total float of non-critical activities is.

It can be said that if there is such reduction which does not cause the originally non-critical activities to become critical activities, this situation may be considered acceptable and the optimization tool can therefore be applied in the first form. However, if the values of total float are reduced so much that non-critical activities become critical, it will be necessary to apply the tool for project schedule optimization by means of the second form.

If a minimum interference in the project assignment table is required, it should be noted that this effort is the main reason why the first form of the application was created. Since this form reduces the schedule by half only in activities that are a part of the critical path of the project, it requires only minor changes.

If the optimization tool were applied only in the second form, the whole process would be easier because the step of finding out if the first form of the tool application is meaningful could be avoided. However, there would be always bigger changes in project assignments, even if they were not necessary.

Many circumstances related to the process of construction project activities influence whether the total float of other activities changes to zero after the schedules of only activities that are a part of the critical path have been reduced to half. The description and context of these factors cannot be the subject of this paper for capacity reasons.

The situation in which the non-critical activities become critical after removing a half of the schedules is determined by a specific moment, value, or so-called ‘break-even point’. Therefore, it is always necessary to find the value of this ‘break-even point’ if this optimization tool for effective assignment of project schedules is applied.

Such defined value can be interpreted as the unknown X, and the value of the unknown X is calculated in the formula (4), see below.

$$X = C - (A - D) \tag{4}$$

where:

C – is the value of the lowest non-zero total float in the graph (key value);

A – is the value of the removed schedules of the critical path activities (50% of the original schedule of each activity);

D – is the value of the removed schedules of activities which are mutual in both critical and non-critical path with the lowest non-zero total float.

If the value of the unknown X is a positive number, it means that it is possible to apply the optimization tool in the first form. If the value of the unknown X is not a positive number, it does not mean that the optimization tool needs to be applied in the second form only, but it may happen. The negative result of the unknown X arose because the lowest non-zero total float was not large enough to prevent the path, consisting of the activities with this lowest total float, from not having the value of its early finish date later than the critical path, the activities of which had been deprived of a half of the time schedules, and thus made non-critical.

If the above situation occurs (the unknown X is not a positive number), it is necessary to find a value indicating if the value of the lowest total float is so small that the value of early finish dates of the activities that have this lowest total float are higher than the value of the late finish date of the project[36]. We interpret this value as the unknown Y, and its calculation is described below in the formula (5).

$$\mathrm{Y} = \mathrm{X} + \mathrm{RQ} + \mathrm{B} \tag{5}$$

where:

R – is the fraction that determines the ratio of the Q value assigned to the end of the project, more precisely the value added to the late finish date of the project as the buffer (in relation to Q, the value is $\frac{1}{4}$ based on the TOC recommendation);

B – is the value of the previously removed mutual schedules, i.e. the time that was removed before the critical path and the path with the lowest non-zero value of the total float were separated.

The procedure for determining whether the optimization tool can be applied in the first form or needs to be applied in the second form can be mathematically described as follows:

$$\mathrm{X} = \mathrm{C} - (\mathrm{A} - \mathrm{D}) \tag{6}$$

$$\text{Application in the first form} \Leftrightarrow \mathrm{X} > 0 \tag{7}$$

$$\mathrm{Y} = \mathrm{X} + \mathrm{RA} + \mathrm{B} \Leftrightarrow \mathrm{X} \leq 0 \tag{8}$$

$$\text{Application in the first form} \Leftrightarrow \mathrm{Y} > 0 \tag{9}$$

$$\text{Application in the second form} \Leftrightarrow \mathrm{Y} \leq 0 \tag{10}$$

It should be noted that all of the equations the paper contains are original, i.e. the author's own work.

4. Defining the objective function

Each tool created for economic purposes must be economically evaluated to demonstrate its effectiveness and benefits. Similarly, this phase is included in this research after designing the TOC tool for managing the schedules of a construction project.

Such economic evaluation of benefits will consist of a simple mathematical calculation based on the assessment of cost factors of the construction project. It will be necessary to prove that the time saved during the execution of the project will bring the economic effect. The mathematical calculation created this way can be called the objective function because it fulfils the condition of selecting the best, optimal solution from all possible solutions based on given criteria.

[36] If the situation occurred, it would be really necessary to apply the optimization tool in the second form.

First, it will be necessary to define the cost factors of the construction project because the definition of the objective function is based on evaluation of the cost factors. The reason why it is not enough to consider only costs of each activity for economic evaluation, but it is necessary to specify selected cross-cost factors as well, is the principle of the tool for optimization of the time schedules. The principle enables us to execute the time saving of the project as a whole, thus not of individual activities[37]. To be more specific, this tool is based on shortening the schedules of individual activities, not shortening the activities themselves. It is not certain if the activity will be really shortened. The activity can be shortened by the application of the optimization tool, but it does not have to happen. However, before the execution of the construction project, it is not always in the hands of management to predict which activities will be shortened and which will not be shortened. In addition, it is important to note that there is no direct proportion between shortening the activity and reducing the cost of the activity execution. The cost of execution of the activity, the time flow of which has been shortened, can decrease, remain the same, or even increase. In addition, if such costs really get lower, the proportion will be different every time. For these reasons described above, it is not possible that the economic evaluation of the optimization tool is based entirely on costs related to particular activities of a construction project, but it is necessary to specify cross-cost factors that are related not only to specific individual activities, but also to other activities.

To specify the costs of a construction project which were taken into account in economic evaluation of the benefits of the optimization tool, it was necessary to respect the basic condition, or rather the constraint, that only the costs that were influenced by the time shift were decisive.

Such constraint for the selection of cost factor exists because some cost items are not affected by the change of the project finish date, thus they are resistant to this change.

The example is the amount of cement needed for a building construction. If the construction lasts 100 days or only 85 days, the same amount of cement will be required to build foundations and concrete features of the building. Such cost items cannot be included in economic evaluation of the benefits of the tool.

Cost factors of construction factors can be divided as follows [8]:

- regular project costs (direct and indirect);
- extra project costs, or claim costs (additionally required payments for shifting the project finish date).

Direct regular project costs are the most important to determine the cost factors that can be affected by the tool for optimization of project schedules. Indirect costs are not decisive, because they are collective in their nature, which means they include costs of all projects in the organization, and therefore cannot be assigned to one specific project for the purpose of economic evaluation of benefits of the optimization tool. On the contrary, extra costs, sometimes called 'claim costs', are markedly connected with the optimization tool because these costs are required to be covered by the organization for additional work that was not agreed in the original contract, or for additional work caused by the extension of the project execution period.

Based on the literature review [7, 8], with regard to the above-mentioned limitative conditions, a list of construction project cost factors which can be influenced by a tool for optimization of project schedules[38] and which are therefore appropriate for economic evaluation of the benefits of the tool. The costs include:

- labour costs, especially personnel costs (wages, health and social insurance);

[37] The entire concept of the tool for optimization of project time schedules is based on the idea that the original distribution of floats among activities is not suitable and, more importantly, when the float is higher than needed, all of it is used by the workers anyway. The time used for such surplus floats becomes the time saving of the project. That is why the rule says that time flows of the activities which included lower floats than needed will not be shortened in reality. Time flows of the activities, the original values of floats of which were higher than needed, must be shortened.

[38] Cost factors which can be influenced by the optimization tool can be automatically influenced by the time shift of the project finish date.

- travel costs (fare remains the same[39], but the costs on food services, accommodation, etc. decrease);
- site facilities;
- renting services necessary for the entire period of project execution;
- renting tangible property necessary for the entire period of project execution;
- renting intangible property necessary for the entire period of project execution.

In general, the financial saving (FÚ) acquired by the application of the tool for optimization of project schedules can be described using the following formula (11):

$$F\acute{U} = U(E - 0{,}1E) \tag{11}$$

where:

U – is the time saving (with regard to the assumption that the buffer will be fully depleted, the expected value of this saving will be 25 %, which means $\frac{1}{4}$) which can be described using the following formula (12):

$$U = \frac{\frac{Q - T_j^{(1)}}{\frac{Q}{100}}}{100} \tag{12}$$

E – is a set of cost items that are influenced by the time shift of the project finish date and which correspond to the particular project.

Indirect costs, or overheads, the value of which is about 10 % on average, must be subtracted from the defined cost factors [9]. The final value must be multiplied by the time saving U, thus 25%, or 0.25, which is the theoretically determined, pessimistic, but most probable value of the time savings of the project execution if the tool for optimization of project schedules is applied.

The above-mentioned mathematical notation of financial savings represents the objective function of the tool for optimization of project schedules.

At the end of the chapter, it should be noted that all equations and formulas the paper consists of are original, i.e. the author's own work.

5. Verification of the applicability of the proposed tool

The applicability of the proposed tool will be verified by means of the network analysis method. In particular, the CPM method, or the critical path method, will be used.

5.1 Assignment

The construction project to be solved is the construction of a family house at an approximate price of CZK 3,500,000. The project is described in the assignment table, see table 1 below.

[39] Eventual shortening of the project execution period does not mean that the number of business trips needs to be reduced.

Table 1: The assignment table of the problem for solving

Activity	Activity Description	Immediate Follower	Duration (days)	Approximate Price (thous. CZK)[40]
A	Decision about the construction	B, C, E, F	10	100
B	Administrative tasks	D	20	40
C	Production of roof covering	L	20	120
D	Foundations	I, N	4	750
E	Provision of water and electric power distribution lines	M	5	70
F	Preparation of material for siding and skeleton	G	30	40
G	Waterproofing insulation of the substructure, backfilling, retention wall	H	20	80
H	Substructure completion	Q	30	40
I	Siding and skeleton (ground level)	J	70	630
J	Ground level ceiling + strip footing	K	40	270
K	Siding and skeleton (first floor level)	L	20	650
L	First floor level ceiling + strip footing (including the roof completion)	Q	30	380
M	Wiring and plumbing	Q	30	90
N	Fixing of windows and doorframes + external plumbing	O	10	110
O	Internal rendering	P	10	40
P	External rendering	-	5	70
Q	Cleaning and finishing work	-	10	30

5.2 Project solution using the classical approach

The project's time demand, or the early finish dates and the late finish dates of the project, was determined on the basis of the substitution of time requirements, see Table 1, into the network graph and subsequent calculations applied using the CPM method.

Based on the application of the CPM method, fractional early finish dates and late finish dates of the construction were determined. These dates are not important for this paper, therefore they will not be mentioned. The early finish date of the entire construction is significant and equals 204 days.

5.3 Finding the form of application of the proposed tool

In this phase of verification of the applicability of the proposed optimization tool, the equations (1), (2) and (3) will be applied first. According to the TOC recommendation, the O and R values are the following: $O = \frac{1}{2}$ and $R = \frac{1}{4}$. As mentioned in the previous paragraph, the value 204 will be substituted into the equations as the early finish date of the entire construction.

The value $T_j^{(0)}$, or the new early finish date of the project, equals 102 days. The value $T_j^{(1)}$, i.e. the new late finish date of the project, equals 153 days.

[40] The price estimate of each item includes both the price of its material and costs spent on its execution.

In view of the fact that the value $T_j^{(0)}$ is smaller than the value $T_j^{(1)}$, it is evident that the second form of the application of the optimization tool will not need to be used, thus the first form of the application is feasible.

Calculation of the values X and Y is unnecessary for practical use. However, the values X and Y will be calculated to explain the principle of the proposed optimization tool and to justify the choice of the first form of its application.

Before the above-mentioned is done, it is good to remind ourselves of two statements that were said in connection with the conditions of the values X and Y. These are the relations (7) and (9).

In view of the fact that in the verification of the construction project the final condition was $T_j^{(1)} > T_j^{(0)}$, it is evident that the optimization tool can be applied in the first form. Therefore, from the above-mentioned conditions, it can be concluded that the values of the unknown X and Y must be >0. During the calculation of the values X and Y, we will proceed as was described in Chapter 3. The first step is to determine the unknown X which is calculated according to equation (6),

where:

C – is the lowest non-zero value of the total float in the graph, which is 104;

A – is a sum of values of the removed time schedules of the activities on the critical path, it equals 102 (as well as $T_j^{(0)}$, which confirms the principle that was mentioned in chapter 3);

D – is a sum of values of the removed time schedules of the activities that are mutual for both paths, i.e. for the critical path and the non-critical path with the lowest non-zero value of the total float, it equals 10.

After substituting into the equation (6):

$$X = 104 - (102 - 10)$$

$$X = 104 - 92$$

$$X = 12 \text{ days}$$

Because the value $X>0$, the optimization tool does not have to be applied in the second form.

However, the Y value will be calculated for further verification intentions. The previously mentioned formula for calculating this unknown, see (5), will be used. The B variable which represents the value of the previously removed mutual schedules, i.e. the time that was removed before the critical path and the path with the lowest non-zero value of the total float were separated, equals 5 (the removed value of activity A). After substituting into the above-mentioned formula (5):

$$Y = 12 + \frac{1}{2}\,102 + 5$$

$$Y = 12 + 51 + 5$$

$$Y = 68 \text{ days } (Y>0)$$

This confirms all the above-mentioned statements.

5.4 Execution by means of the ascertained form of application of the proposed tool

Based on the fact that the values X and Y are positive, it is possible to determine that the solution will be executed on the basis of the first form. Time schedules will be reduced by half in those activities that are a part of the critical path of the project. Let me remind you of the two most important results:

- the value $T_j^{(0)}$: 102 days;
- the value $T_j^{(1)}$: 153 days.

5.5 Calculation of economic benefits

The assessment of financial savings is of preliminary character as it concerns the evaluation before the start of the project.

To determine the value of the E variable, it is necessary to roughly quote prices of the selected cost factors. This pricing is shown below, see Table 2.

Table 2: Priced cost factors that are influenced by the time shift

Cost Factor	An Approximate Value of the Cost Factor (in thous. CZK)
Labour force	900
Site facilities	200
Renting the tangible property	400
Renting the intangible property	100
Total	1,600

After these are substituted into the above-mentioned formula (11) for calculating the financial savings (FÚ) achieved by means of the application of the tool for optimization of project schedules, the following equation is formed:

$$\text{FÚ} = \frac{1}{4}\left(1\,600\,000 - 160\,000\right)$$

$$\text{FÚ} = 360\,000\ \text{Kč}$$

Theoretically speaking, if there were not a single day depleted from the buffer, the time saving could be 50 %. Then the equation (11) would look as follows:

$$\text{FÚ} = \frac{1}{2}\left(\text{E} - 0{,}1\text{E}\right)$$

$$\text{FÚ} = \frac{1}{2}\left(1\,600\,000 - 160\,000\right)$$

$$\text{FÚ} = 720\,000\ \text{Kč}$$

However, the saving of 50 %, or the situation in which there was not a single day depleted from the buffer, is very unlikely. Therefore, on the basis of subjective probability, it can be stated that the financial savings achieved by means of the application of the tool for optimization of project schedules are approximately CZK 360,000.

The approximate financial savings will be compared with the approximate financial value of the entire house construction. To determine the financial value of the entire construction, all the activities defined in the project assignment table will need to be priced. This pricing is thereinbefore, see Table 1.

The approximate value of the entire family house construction is CZK 3,510,000. The financial saving achieved by the application of the proposed tool for optimization of time schedules was CZK 360,000, and that is why it equals approximately 10.26 % of the entire construction value.

6. Comparison of achieved results

A clear comparison of the results on the basis of exactly assessable criteria is given below, see the table 3.

Table 3: Comparison of the results of classic and alternative solutions

Solution	The Early and Late Finish Date of the Project [days]	Time Saving [%]	Financial Costs [thous. CZK]	Financial Saving [thous. CZK]
Classic	204; 204	0	3,510	0
Alternative	102; 153	25 – 50	3,150 – 2,790	360 – 720

As already indicated, every time saving can be achieved at a different level of probability by means of the application of the optimization tool. The probabilities were assigned to individual savings to illustrate this phenomenon. The process of probability assignment was conducted using one of the methods of group decision-making that fall into the category of expert estimates. In particular, the Delphi[41] method was used.

The graph that displays the probability distribution of results which arose from the alternative solution is shown below, see the figure 1.

Figure 1: The probability distribution of results which arose from the alternative solution

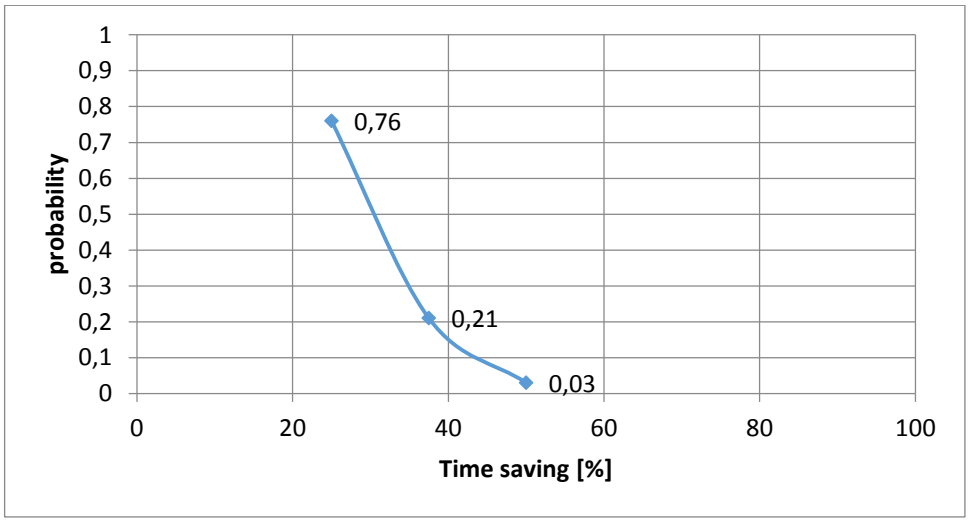


Figure 1 shows that the probability distribution of results which arose from the alternative solution is in the form of exponential distribution. This probability distribution corresponds with the values that arose from expert estimation. It concerns the probability values assigned to individual savings that were achieved by means of the alternative solution, see table 4.

Table 4: Probabilities assigned to individual savings that were achieved by means of the alternative solution

Achieved Time Saving [%]	Achieved Financial Saving [thous. CZK]	Assigned Probability of Execution
25	360	0.76
37.5	540	0.21
50	720	0.03

It should be noted that the value of the financial saving which is equivalent to the medium variant of time savings, i.e. 37.5%, was achieved by substitution into the equation (11).

[41] For paper capacity reasons, the process of assigning the probabilities to individual savings, which was conducted using expert estimates, cannot be described in detail.

The results show that the final financial saving is dependent on the expected time saving. The value of the time saving U, or the coefficient on which the value of financial savings is dependent, will always fall in the interval [R, O]. Based on the TOC recommendation, this interval is $[\frac{1}{4}, \frac{1}{2}]$ if the standard choice of values O and R is used. With respect to the probability of the time flow of the construction project execution, it can be expected that the U value of saving will always be close to $\frac{1}{4}$.

7. Discussion

The aim of the paper was to modify the TOC tool for planning and management of the construction project and subsequently to verify the possibility of its application in order to increase the probability of completing the construction contract within the arranged period and thus achieve the time and financial savings of the construction. The most important outputs and findings that are stated in the paper correspond with the stated aim. Therefore, the main output and benefit of the paper is the modification of the TOC optimization tool for planning and management of the construction project and, subsequently, the verification of its applicability. Three basic points of the tool modification were identified. They include:

- finding and description of the two forms of the tool application;
- specification of an objective function to determine the economic impact of the TOC tool;
- definition of the conditions of the TOC tool application in relation to the execution of a construction.

The first two points of the modification were described and elaborated in the paper. It consisted of defining the two ascertained forms of the tool application and determining the objective function. The new contexts were verified during the application of the proposed tool to a specific example. It has turned out that application of this modified tool can be achieved time and financial savings. The results were as follows:

- time savings: 37,5 %;
- financial savings: 540 thous. CZK (approximately 15,4 % of the entire construction value).

In respect of the insufficient situation in the field of finishing of constructions projects, the results are optimistic and applicability of the modified toll is very practical.

The theoretical contribution of this paper consists primarily in creating of starting position for further exploration of the applicability of TOC tool to management of time schedules of construction projects. The creation of basis for deeper discussion about the potential impacts of changes in values of parameters O and R on the way of application of the designed tool, or on other aspects associated with this application can be considered a further theoretical contribution of the paper. Finding the connections and relationships between the values of the parameters O and R creates space for further exploration of the whole issues.

8. Bibliography

[1] ASHLAG, Y. *TOC Thinking: Removing Constraints for Business Growth*. 1st ed. United States of America: North River Press Publishing Corporation, 2014. 118 pp. ISBN 978-0-88427-270-0.

[2] BASL, J. & MAJER P. & ŠMÍRA M. *Teorie omezení v podnikové praxi: Zvyšování výkonnosti podniku nástroji TOC*. 1st ed. Praha: Grada Publishing, 2003. 216 pp. ISBN 80-247-0613-X.

[3] COX, J. F. & SPENCER M. S. *The Constraints Management Handbook*. 1st ed. Boca Raton: St. Lucie Press, 2000. 318 pp. ISBN 1-57444-060-8.

[4] CROUCHY, M. & GALAI D. & MARK R. *The Essential of Risk Management*. 1st ed. United States of America: McGraw-Hill Education, 2014. 618 pp. ISBN 978-0-07-182115-5.

[5] FIALA, P. *Řízení projektů*. 3rd ed. Praha : Oeconomia, 2014. 186 pp. ISBN 978-80-245-2061-2.

[6] GOLDRATT, E. M. *Kritický řetěz*. 1st ed. Praha: InterQuality, 1999. 199 pp. ISBN 80-902770-0-4.

[7] MENCL, V. & NOVÁK J. *Řízení jakosti ve stavebnictví*. 1st ed. Praha : ŠEL, 2002. 156 pp. ISBN 80-86426-12-2.

[8] OLERÍNY, M. *Řízení Stavebních projektů. Claimový management*. 1st ed. Praha : C. H. Beck, 2005. 204 pp. ISBN 80-7179-888-6.

[9] PRITCHARD, C. L. *Risk Management: Concepts and Guidance*. 5th ed. United States of America : CRC Press, 2014. 474 pp. ISBN 978-14-8225-845-5.

[10] AMEIR, O. Systemic way of risk management in construction companies in the Czech Republic. In *CER - International Scientific Conference for Ph.D. students of EU countries*. London : CER Comparative European Research, 2014, pp. 68-71. ISBN 978-0-9928772-0-0.

NATIONAL INNOVATION POLICY IN THE RUSSIAN FEDERATION: CONTENT, PRINCIPLES OF ITS DEVELOPMENT, SUCCESS OF IMPLEMENTATION

Vavilina, Alla Vladimirovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
vavilina_av@rudn.university, vavilinaalla@mail.ru

Yakubova, Tatyana Nikolaevna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
yakubova_tn@rudn.university

Kalashnikov, Igor Borisovich
Doctor of Economics, Professor, Department of Economic Security,
Saratov Socio-Economic (branch) of Plekhanov Russian University of Economics
89,Radishchev St, Saratov, 410003, Russian Federation
Igor. Kalashnikov.1965@mail.ru

Annotation.

This article deals with the innovation policy as an element of economic one, as its new stage on the way towards the innovative economy development. The formation of this policy has become an objective need, a request of the developed economic system for its radical transformation, for the formation of these transformations procedures, the implementation of a new agenda of development of both economy, and society as a whole. While analysing innovation policy as a tool of implementing dynamic changes in society, it was formulated and justified vehicle for modernizing productive forces as a way to regulate innovation-oriented entities and its functions. The authors singled out the elements of this policy in the framework of which based on the criterion of participation in the general results of the economic system development the researchers identified the factors (economic processes or phenomena that ensure economic development), instruments (those economic processes or phenomena that while asserting or developing, make economy more sustainable, technology intensive and efficient) and tasks solution. The principles of the formation of an innovation policy are set forth. Taking into consideration the fact that advancement of Russian innovation policy is determined by its own, specific and independent Russian potential for success, the article proposes the method of choosing innovation policy - the method of prioritizing specific opportunities for success orientation.

The state's role in establishment and implementation of the innovation policy is specially emphasised. It is found that the state makes systematic steps to secure the changes in the economy, in the neoindustrial basis establishment, in the formation of new innovation development sources, in the policy providing for the development. The more precise the implementation of the measures is in accordance with the current trend of the pursued policy and in line with economic laws, i.e. laws of reproductive performance, integration, economic dynamics and the practical solutions taken, the timing

and the degree of their implementation is in sync with the set typical patterns, the more significant the influence that these measures exert on the economy.

***Keywords*:**

Innovation policy; innovation policy functions; methods of innovation policy selection; implementation mechanism of innovation policy; implementation instruments of innovation policy.

JEL: O31, O38

1 Introduction.

Innovation policy of the national economy is to a significant extent determined by the state economic strategy, objectives for coordinated implementation of national interests, domestic capital and the scientific community. The country's productive power sophistication, the formation pace of a new techno-economic paradigm, competitiveness of specific industries and organisations, the degree of individual household domain development and the national economic development depends on the content, methods and means of innovation policy. It is known to have an impact on innovation strategy development, preparation, adoption and implementation of business decisions, on the quality and intensity of the productive power mobilisation or to serve the basis for sustainable, safe economic system development. In a sense innovation policy can be considered a success potential of innovative transformations and modernisation of the economic system.

2 References review and discussion.

Innovation policy problems have a specific background in the world economic literature. The term 'innovation' was first mentioned in treatises by G.Tarde (2011)[10], J.Schumpeter (2008) [19] and P. Drucker (2007) [4] where it was studied as a society's growth driver. The process of formation and development of various innovation systems in different countries is thoroughly describes in works by C. Freeman (1987) [13], R. Nelson (1993) [17], B.Lundvall (1992, 2007, 2011) [14, 15,16], H.Chesbrough (2003) [12], N.I.Ivanova (2001, 2005) [5,6], A.A. Oreshenkova (2005). The Russian economic literature touches upon the issues of innovation policy in works by such scholars as V.V. Ivanter (2013) [7], N. Beketov (2009) [1], L. Abramovskikh (2016) [20], A.Babenko (2016) [20], R.A. Fatkhutdinov (2014) [21], K. Hubieva (2007) [11], V. Senchagov (2011) [22] and others.

General trends and the industries' priorities of the public sector are studied in the treatises by V. Shumaev (2013), O. Sukharev (2007) and others. The studies by S.S. Gubanov (2015), V.B. Daskovsky (2015) [2,3], V.B. Kiselev (2015), A. Amosov (2008), S.Nikitin (2016) and others devoted to neoindustrial development models of the Russian economy shed light on the underlying reasons to shape the innovation policy.

Alongside with that, there's no single generally accepted approach to defining the term 'innovation policy' as well as determining its content. The confrontation between the representatives of the liberal (the position was clearly defined during the presidium meeting of the Presidential Economic Council on 25 May 2016, in A.L. Kudrin's speeches and in V. Mau's works) and the socially-oriented school of the innovation policy content, peculiarities of its development and the changing priorities remains unabated. W. Rostow (1971) [18] , D. Bell (1973), S. Huntington (1993), E. Raynert (2011), P. Howitt (1995) F. Aguillon (2004) and others examined different development models of the state's modernisation in their works.

Although there's no unanimity of opinions concerning the factors and instruments of innovation policy implementation. Thus, some scholars consider "intensive funding of high-tech manufacturing as an adequate growth driver, while an early withdrawal from budgetary intervention may lead to a breakdown into recession"[12].

More and more scientists are inclined to believe that it would be better to reject liberal model in favour of the socially-oriented one relying on the Russian practice and taking into account geographical and other Russia's peculiarities. A new economic policy is required, something similar to an industrial "New Economic Policy". In this context there's a necessity to create a new planned system with a step-by-step formation of a completely new type of economic development, facilitating the interaction between the planned and market structures"[13].

3 Method of research

The methodological foundation of the research was the dialectical method. Relying on the components of this method, the research of innovation policy was built on the systematic approach, which made it possible to identify the main trends in the development of the national economy, to establish the roots and causes of the structure and content of the new policy formation. Developing and becoming more sophisticated, the economic system acquires the signs of innovation: there is emerging an innovation-oriented structure of the economy - the optimal logically justified model of managing "science - R & D - production-consumption" begins to operate - there is an innovation-oriented financial sphere; the government more and more actively forms a system of motivational attitudes toward the creation and application of innovations; there is activated the process of creating innovative value added, innovation-oriented enterprises, etc.

4 Main body

The public innovation policy is a policy implying building the relations between the state and innovation-oriented entities, exerting influence on their innovative activities using defining goals, trends, regulatory forms and comprehensive assistance from government agencies in the field of scientific research, technologies and the introduction of the said achievements into business practice. As for the form, the new Russian public policy is developed as a set of broad strategies for socio-economic programmes, forecasts, public contracts, investment projects and business agreements. These forecasts and contracts are realised by all economic entities, authorities and the population.

The economic sense of the innovation policy is determined by the Russian society's complex of interests; the ratio of all population groups and social groups' systematic interests; considerable significance of nation-wide interests, i.e. the interest of the whole nation in general; by experience, knowledge and responsibility of people (groups of people) who are in charge of adoption and implementation of the said policy. Such approach enables us to determine the main body of innovation policy which implies that it's a socio-economic policy designed for a long-term perspective and aimed at a planned establishment of a progressive industrial and technological, economic structure, hurdling of de-industrialisation and the manufacturing sector recovery.

As far as innovation policy is concerned, it should be recognized that there is no unequivocal definition of the word, however, the content of innovation policy is realized through a number of following functions: serving an instrument of achieving some strategic national aims; a means of realizing its scientific functions in the field of technologies and engineering; as a way of production organisation and nation's wealth accumulation within the framework of continually changing conditions; as a leverage on the economic growth constituents; as a form of state's and society's interests protection.

Innovation policy, being a part of the economic system and in a sense its extension at a new stage of development, has a specific object of influence. Here the specific object implies: the field of research and advanced development (R&D); scientific and technological innovations. Such a definition of innovation policy allows us to assert that there's an interaction and a unique relation between the policy and scientific, technical and engineering policy. New understanding of the interrelation between engineering and industrial technology sciences and the humanities imply a change in understanding of the interrelation between science and engineering of a more specific level. In this context, the new coordination means' issue applied to human qualities and technical parameters, accounting of human

capabilities and the undergoing processes, the analysis of the corresponding actions and organisation within a uniform system comprising heterogeneous elements continuously enters into the foregrounds of the scientific discussion. This circumstance demonstrates the issues of studying the economic environment and peoples' activities from a new angle. [23]. It's apparent that innovation policy is inseparably associated with scientific, technological and engineering policy but they do differ in their intended use as well as the complex of "knowledge, science, innovations, technologies and strategic management are considered as a set of different types of activities, different forms of labour and different results. They mustn't be mixed; different requirements must be imposed on them as well as the funding must differ" [20 p.38] different types of policies are supposed to be adopted to service these activities. Some claim that innovation policy consists of both scientific and technological policies. Such an extensive interpretation of innovation policy's content is hardly appropriate. Each of these policies has an intent and implementation instruments of their own. It should be recognised that innovation strategy occupies a specific place and executes its functions alongside scientific and technological policy within the framework of public administration and regulatory structure.

There's no denying that in view of modern challenges for innovative development the centre of gravity in the government regulation in Russia within the framework of general economic policy shifts towards technological policy (industrial) and formation of progressive structural proportions of the economy, providing for extensive reproduction and economic growth by means of active realisation of science policy. In such a case it deems possible to treat economic growth as a unique economic benefit whereas it demonstrates an increase in the population's standard of living and expand opportunities of redistribution and usage of various resources by creating significant stimuli for "social optimism" [20]. To ensure economic growth, the Russian Federation concentrate its efforts on: the development of science, technologies and educational system; on the improvement of national, investment and financial institutions for the sake of achieving the necessary degree of security in the military, defence industry and international domains.

According to experts estimates, "despite the fact that the innovation-based development offers the potential of breakthrough and an increase in workforce productivity as well as an increase in the population's standard of living, its establishment unfolds at an extremely languid pace. The reason lies in the absence of a commitment to overcome de-industrialisation of the national economy" [24]. To achieve sustainable economic growth it is suggested to: develop investment policy aimed at creation of a sustainable innovation-based economy; ensure prioritised funding for science-intensive industries, high-tech machine-building plants based on development of innovative scientific cycles and intellectual capital accumulation; determine the structural priorities of innovation-based economy development for a the long-term perspective; create government stimulation mechanisms to provide for efficient investment of resources into science-intensive manufacturing with an account to scientifically-based criteria of economic and investment security [21].

It seems essential for the Russian economy to find a method to choose the right type of innovation policy. Thus Fatkhutdinov R.A. outlines three possible methods: scenario writing method; games method; Delphi method [25]. It appears that the choice of innovation policy should be performed with due account for the specifics of emerging conditions, objectives and development aims. The point here is that the Russian innovation policy success is determined utilising its own unique independent success potential. The success predominantly depends: firstly, on how timely, clear and understandable the policy is for the society; on how motivated the entities are to implement it and how useful the applied instruments are; thirdly, on how efficient the measures taken are and how adequate the generated efforts are for their practical realization; fourthly, on how the existing institutions can ensure the innovation policy functions implementation under current conditions; fifthly, on how the newly established order correspond with the national peculiarities of the country, the population's needs, the historically developed moral and ethical social conventions. Successful policy can be organised in case it has the fundamental principles providing for the general effect of a compound socio-economic system at the heart of it. The scientific literature contains formal approaches to single out these tenets [22]:

1) The principle of accordance between the innovation policy structural and content elements and the innovation-based requirements of the national economy (the achievement of innovation policy adequacy about economic development requirements);
2) The government resources concentration principle aimed at creation and expansion of essential innovations (creation of progressive structural shifts in the economy and its transition to a new stage of development);
3) Technical innovations priority principle (adoption of conceptually new engineering solution in manufacturing, competitive growth of science-intensive products, an increase in the population's standard of living and the level of economic security);
4) The government institutions reinforcement principle (legislative recognition of their roles in the creation of new management models, information systems and techniques of cooperation with business);
5) The international cooperation expansion principle in the innovation field (consolidation of technological and engineering independence of the country)
6) Military build-up principle (the guarantee of the countries national security as a result of innovation activities)

The content of successful innovation policy is defined by a set of elements developed by the complex of economic system. These components comprise: organisation techniques of innovative processes and neoindustrial transformations; stimulation and regulation methods aimed at innovative activities; innovative activities management means; a system of factors and instruments providing for a safe functioning of the economy.

The following factors occupy an important position within the structure of innovation policy goals: to increase the overall technological level and the competitiveness of the domestic manufacturing; to promote innovative products on domestic and external markets; to extend the government support for innovative activities; to establish new economic, legislative and organisational conditions for innovative environment development; to substitute imported goods with high-tech domestic ones on the internal market and the transition of the industrial manufacturing into a sustainable economic growth phase based on it. The strategic innovation policy of Russia must be aimed at the prevention of technological degradation, the ultimate assimilation of the fifth wave of innovation and the transition to the next, higher phase, increase of innovative activities and the formation of uniform innovation policy for CIS countries.

Meanwhile, the implementation of the task is complicated by the fact that to tackle such a complex objective there's a need to establish a real and efficient innovation policy implementation mechanism within a limited period. The mechanism represents a complex of interacting entities, institutions, organisations, stimuli, rules, norms and ways of ensuring the establishment and supplementation of innovation policy, activation of ad hoc measures, stimulating the society's, governments and population's interests coordination in the wake of innovation changes implementation. According to the economic, literary sources, the scholars usually provide the following elements activating the state's innovation policy implementation mechanism: Bank for Development, Russian venture firms, technological clusters, technopolises, Federal grant programmes in the field of innovation policy and an efficiently working National innovation system. With an account for that understanding of innovation policy implementation mechanism, it should be added that the practical implementation of innovation policy is determined by the number and qualitative features of its entities, which adopt and implement it. These entities include: bodies of legislative and executive power of the Russian Federation; bodies of legislative and executive power of the Russian Federation constituents implementing government innovation policy with due account for the regional interests; industrial and financial associations; the scientific community; social agencies and trade unions acting within the powers recognised by the laws of the Russian Federation. However, the most crucial entity providing for innovation policy implementation mechanism is the government. The point is that the successful competitiveness of economic entities, an extensive transport system, the sufficiency of energy and raw materials as well as the financial coverage are within the authorities range of influence.

Some people claim that there's a necessity in profound changes in the Russian politics but the first steps have been made in order to tackle the challenges. For instance, fundamental changes are taking place within the political system; new institutions are being created. In addition to that, a planned centralised concentration of resources is taking place in the priority fields of structural innovative manoeuvres and breakthrough. An increasing significance of the government involvement in attracting investment sources of development, formation of new innovative economic regulators and innovative ways of making investments and providing stimulation. It certainly affected the condition of the manufacturing industry which serves the basis of the national economy even when it experiences unfavourable reproductive conditions. In 2015 it accounted for 41% of investment in equity across the country, 38.2% of the aggregate turnover of the Russian enterprises and 26.7% of the generated domestic product. The total of 463,5 companies across the industries employs 12786 thousand people or 18.7% of the average annual number of employees involved in the national economy [24].

5 Conclusions.

The role and importance of the government's innovation policy is on the increase during the technological crises, the transition to a new technological mode, that is during the period when the government support of basic innovations is of paramount necessity as well as of timely application of anti-trust laws with the view to restrain monopolies aspiring for retention of obsolete equipment and the old technological mode.

The on-going economic reforms in our country have had an ambiguous influence on innovation policy. On the one hand, new stimuli for commercialisation of innovations arise in connection with economic independence of companies and institutions, an increase of competition and the open character of the market. A new institutional mechanism is being developed as a system of various funds (government-funded, private, venture funds and foreign ones), which effect financing of R&D projects on a competitive basis. On the other hand, the innovative process management issue has become acuter: the authorities arm of governance has grown weaker; the number of coordinating structures has dwindled; the domain of science has suffered a decrease in funding which hindered the implementation of new scientific research results significantly; the human and economic potential has deteriorated as a result of internal and external brain-drain; the status of scientific workers had declined; the depreciation of equipment stock has reached the threshold value. Under these conditions, it's of vital importance to have the innovation policy able to ensure the dismantling of administrative barriers alongside the increase of government regulation significance and the economic independence of innovative process entities, the usage of new ways of government support and stimulation of innovative processes and innovative entrepreneurship.

6 Acknowledgments.

This paper was financially supported by the Ministry of Education and Science of the Russian Federation on the program to improve the competitiveness of Peoples' Friendship University of Russia (RUDN University) among the world's leading research and education centers in the 2016-2020.

7 References

[1] Beketov, N.V. The development prospects of interregional innovation systems and the establishment of innovation clusters within the structure of the Russian economy // Scientific, expert, analytical and informational support of the national strategic planning, innovative and technological development of Russia. 5-th Russian research-to-practice conference (Moscow, May 28-29 2009). - Moscow: Institute of Scientific Information for Social Sciences of the Russia Academy of Sciences, 2009.

[2] Daskovsky, V.B., Kiselev, V.B. A new approach to economic justification of investments - Moscow: Kanon-ROOI "Rehabilitation", 2015
[3] Daskovsky, V.B. On the neoindustrial model and economic development strategy / V.B. Daskovsky, V.B. Kiselev // Economist. - 2013. - № 6. P.34-49.
[4] Drucker P. Business and innovation: translation from English - Moscow: Williams publishing house, 2007
[5] Ivanova, N.I. Science within the framework of national innovation systems / N.I. Ivanova // Innovations. 2005. № 3 (80) - p.55-59.
[6] Ivanova N.I. National innovative systems / N.I. Ivanova // Economic issues. 2007. № 7. - p.61
[7] Ivanter V.V. The forecast of the new Russian economy // Quality economics, № 3-4, 2013
[8] Maksimov Yu.M. Senchagov V.K. Innovative transformations as an imperative of a region's economic security: a system of indicators // Innovations, №5 (151), 2011
[9] Robbins L. The history of economic thought: lectures from the London School of Economics / L. Robbins / translation from English by N.V. Avtonomova, under the editorship of V.S. Avtonomova - Moscow: the publishing house of Guydar Institute, 2013.
[10] Tarde G.The Laws of Imitation. / Translation from French made by F. Pavlenkov. Academic project, 2011. 304 pages
[11] Hubiev K.A. Innovations and the quality of economic growth // The philosophy of economy, 2007. № 6 (54) p.153-166
[12] Chesbrough, H. W. Open innovation: the new imperative for creating and profiting from technology / Harvard Business Press, 2003. – ISBN 1-57851-837-7.
[13] Freeman, C. Technology Policy and Economic Performance: Lessons from Japan [Electronic resource]. – Frances Printer Publishers, London, New York, 1987- (reference date 28.12.2017)
[14] Lundvall B-A. National Innovation Systems: Towards a Theory of Innovation and Interactive Learning. – Pinter, London, 1992.
[15] Lundvall, B.-A. National Innovation Systems – Analytical Concept and Development Tool [Electronic resource] // Industry and Innovation. 14:1. 2007. – P.114. – URL: http://infojustice.org/download/gcongress/dii/lundvall%20article.pdf- (reference date 28.12.2017)
[16] Lundvall, B.-A., Gregersen, B., Johnson, B., Lorenz, E. Innovation Systems and Economic Development [Electronic resource]. – P.10. – URL: http://www.ungs.edu.ar/globelics/wp-content/uploads/2011/12/ID-514Lundvall-Gregersen-Johnson-Lorenz-What-do-we-know-about-building-sustainable-national-r.pdf.- (reference date 28.12.2017)
[17] Nelson, RR, Rosenberg, N. Technical innovation and national systems, in Nelson RR (Ed.). National Innovation Systems: A Comparative Analysis. – New York, Oxford University Press. 1993. – P.3–21
[18] Rostow Walt Whitman. Politics and the Stages of Growth. — Cambridge University Press 1971. — 424 p.
[19] Schumpeter, J.A. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle [1911] // translated from the German by Redvers Opie, New Brunswick (U.S.A) and London (U.K.): Transaction Publishers, 2008.
[20] Abramovskikh L. Babenko A. On the search for a new economic development model // Economist, 2016. № 10. p. 39.
[21] Fatkhutdinov R.A. Innovative Management. PETER publishing house. 2014. p.243-254.
[22] Senchagov V. Does the 2010 budget contribute to modernisation of the Russian economy? // Economics issues. 2010. № 2.
[23] Kalashnikov I.B. The Russian economy: the transition to neoindustrial phase of development (theory and justification methodology) Saratov, 2012. p.135.
[24] http://knowledge.allbest.ru/economy/3c0b65.- (reference date 28.12.2017)
[25] Russia by numbers. 2016. A statistical book. Moscow: Federal Service of State Statistics, 2016.

ORGANIZATION OF CORPORATE INTERACTION IN RUSSIAN COMPANIES ON THE BASIS OF STAKEHOLDER THEORY

Kirillova, Oksana Yur'evna
Candidate in Economics, Associate Professor, Lead Researcher of Educational and Scientific Center "Management",
Plekhanov Russian University of Economics
(REU), Russia, Moscow
117997, Moscow, Stremyannyj pereulok. b.36
Kirillova.OY@rea.ru

Gorlova, Olga Sergeevna
Ph.D. (History), Associate Professor, Management Department, the Economics Faculty,
Peoples' Friendship University of Russia
(RUDN University), Russia, Moscow
117198, Moscow, ul. Miklukho-Maklaja, b.6,
gorlova_os@pfur.ru

Kirillova, Valeriya Aleksandrovna
Postgraduate Student of Chair for Management, the Economics Faculty,
Peoples' Friendship University of Russia
(RUDN University), Russia, Moscow
117198, Moscow, ul. Miklukho-Maklaja, b.6,
rabota-cts@yandex.ru

Abstract

Based on the advances in the stakeholder theory the authors consider the need to develop institutional mechanisms for corporate interaction in the Russian economic space. The detailed study of the issues related to the interaction of a corporation and parties having substantial interests in its activity (stakeholders) has made it possible to identify existing flaws in practical approaches to monitoring these processes. To eliminate contradictions and most fully take into account the interests of participants in corporate relations, the article proposes the companies to interact on the basis of a classical institutional matrix that transforms at the company level into a business-society triad and enables the company to exhibit effective socially responsible behavior from the perspective of corporate citizenship. In the organization of interaction the focus is placed on the corporate control, the subject area of which is different from managerial control, and implies the assessment of the channel of interaction with a s specific stakeholder (a group).

Key words

Corporate governance, corporate interaction, organization of interaction, stakeholders, stakeholder theory, stakeholders, system of corporate governance

JEL: G30, G34

1 Introduction

The classical stakeholder theory, based on the key principle of corporate governance - respecting the balance of interests of participants in corporate relations (stakeholders) - is currently in crisis from the methodology point of view. Its ideas, cornerstones and attitudes are clear to everyone and widely supported in entrepreneurship, but their practical implementation is hampered by the lack of specific economic and management tools. This theory equips managers with the means to attain corporate goals and moral grounds for building relationships with shareholders and other stakeholders of the company, but it does not offer tools for assessing and controlling these relationships.
All of the above mentioned things pose the challenge to the further development of corporate governance theory in general.

2 Literature review.

The issue of social interaction with the purpose to harmonize the interests of all stakeholders in the process of corporate governance was first studied in the works by E. Freeman, J. Post, L. Preston, S. Sachs.
Mechanisms for establishing a balance of interests between participants in corporate interaction are disclosed in the works by K. Goodpaster on the ethics of corporate relations; S. Dolan, S. Garcia – on managing by values; H. Bowen, L. B. Badmaeva, Yu.I. Blagova, G. Solomon, B. S. Bataeva, I.Yu. Belyaeva – on business social responsibility; E. Freeman, S. Velamuri, I. N. Tkachenko, O. Yu. Kirillova - on implementing mechanisms of harmonizing interests of participants in corporate relations. The aspect of the interaction of a large corporation with the government institutions is most fully represented in the works by S. P. Peregudov.

Passing through the views of J. Frooman [12], which are based on the concept of resource dependence of the firm, reflected in the simplest "input-output" model and assuming two types of stakeholder control: whether the firm will receive the necessary resources and whether it can properly use them, the stakeholder theory was supplemented by studies from the perspective of economic efficiency and even sociology, psychology and business ethics. The methodological foundations of such a "hybrid" theory, combining all the views available in science, were developed by A. Friedman and S. Miles [13]. They, in fact, created a theory of business relations, known as transaction theory or contraction (convergence) theory. Its key advantage is that it not only shapes norms and standards of behavior, but also offers reasons for compliance with them, explaining that the obtained results are practically acceptable and conform with the norms. A significant achievement of the convergence theory for the current situation is the assumption that the corporation is to build its economic interaction with stakeholders on the ground of trust-based relationship.

At present, the stakeholder theory in the international community develops in various directions: searching for normative postulates of interacting and developing a democracy of communication dialogue [19] improving the quality of social partnership, the influence of stakeholders on the stability of the corporation [15], the influence of personality characteristics (age, sex, profession, education) on the perception of corporate social practices [10]; the influence of stakeholder participation as controlling shareholders on the effectiveness of corporate social responsibility (CSR) [7]; the influence of the local community on the availability of resources and the increase in the company's value [9]. Some authors also explore the internal aspect of corporate interactions between directors, independent auditors and managers [e.g. 4].

3 Research Methods.

Within the framework of the conducted research the methods of system, situational, comparative, content analysis, abstraction, deduction and analogies were used. The sources of information were the results of fundamental research in the sphere of interaction of corporations with their parties concerned (stakeholders), statistics of professional unions and associations in the field of corporate governance: RID (Russian Institute of Directors); NACD (National Association of Corporate Directors); NCSU (National Certification Center for Managers) and several others, materials from corporate websites, as well as oral interview data, personal interviews and discussions with some top managers of corporations, state agencies, representatives of public associations and groups.

The dissemination of the principles of corporate governance in Russian economic practice has intensified the development of theory of corporate interaction. The specific character of the Russian model of corporate governance makes impact on it, which is manifested in the nature of business communication and company's communications with stakeholders, that should be taken into account when choosing the forms and methods of such interactions. Encompassing various theories (economics, management, corporate governance, stakeholder, social psychology, economic psychology, etc.), subject areas and processes, such as GR (government relations), PR (public relations), HR (human resources), advertising, sponsorship, charity, PPP (public-private partnership) and a number of others, the theory of corporate interaction badly needs to develop its own methodology, primarily in the sphere of practical tools for corporate governance systems.

This paper makes an attempt to systematize the tools available in the science and practice of corporate governance for assessing the effectiveness of interactions across the entire spectrum of relations between an abstract corporation and its stakeholders to develop proposals for the organization of a control function in corporate governance systems.

In the modern practice of corporate governance, the focus of attention in the process of organizing interaction with stakeholders is on assessing the extent of the stakeholder's influence on the company. The analysis of the processes of organizing interaction with stakeholders in international and Russian practice of corporate governance shows that the classical management cycle remains incomplete, since the control of efficiency (effectiveness) of impact is absent both as a stage and as a component. For example, NOVATEK identifies the following criteria for determining stakeholders as presented in Table 1:

Table 1. Criteria for determining the stakeholders of NOVATEK

Criteria	Degree and reasons for interest
Dependence	The party directly or indirectly depends on the company's operations, its products/ services or joint activity of the company
Responsibility	The party to whom the company has or may have in the future legal, operational, executive and ethical / moral obligations
Tension	The party, which needs immediate attention from the company because of financial, economic, social or environmental problems
Influence	The party that can influence the company's decisions
Various prospects	Parties whose views and opinions may lead to a new understanding of the situation and the identification of new opportunities for the company

Similar approaches are taken by some other companies. Review of annual reports of 30 Russian companies selected by the number of the Board of Directors (more than 5 members) and having a corporate secretary in the structure showed that the structure of their corporate governance bodies are in 90% of the cases look like to be "carbon copy". The provision on the corporate secretary, who is the central coordinator of the interactions of owners, directors and top management - in most cases cites the Corporate Governance Code, which is a framework document.

The main official forms of corporation interaction with a standard list of stakeholders are given below in Table 2. These are the most well-established channels, processes and methods in the framework of which the company interacts with the standard list of stakeholders.

Table 2. Methods of corporation interaction with its stakeholders

STAKEHOLDER	METHOD OF INTERACTION
Society/community/ public and religious organizations (non-governmental)	Sponsorship Charity Non-financial accounting Social investment CSR (corporate social responsibility): environmental aspects Open-book accounting
Government	The process of regulatory impact assessment (RIA) Public-private partnership Open-book accounting
Federal services - regulators: FAS, FTS etc.	The appropriate compliance with requirements and norms of the law Information disclosure Licensing
Shareholders	Open-book accounting (financial and non-financial accounting) Information impact in order to maintain the balance of interests
Investors	Open-book accounting (financial and non-financial accounting) Information impact in order to arouse interest to company's operations
Financial system/creditors	Open-book accounting (financial and non-financial accounting) Information impact in order to arouse interest to company's operations
Management	Information impact in order to maintain the balance of interests Social investments (career management) Social programs Development of internal regulatory environment
Customers/clients	Information disclosure CSR: product quality, security, safety Design-thinking Forums, fairs
Partners	CSR: compliance with standards and norms of business communication, balance of interests
Staff/Trade Unions	Social investments Social programs Development of internal regulatory environment
Competitors	Information impact: public awareness campaign to promote company's advantages
Mass media	Information interaction (crating newsworthy events and their coverage, advocacy of company's mission)

Source: developed by the authors

At the same time, despite the wide spectrum of technologies used by companies to interact with the state, society and market, the process of managing corporate interaction for the company remains eclectic. Theoretically, this means that:

the interaction is carried out without adjustments (there is no feedback);

the indication for its initiating is the the case when a particular stakeholder attracts corporation's management attention;

interaction is carried out by any means subjectively regarded by management as permissible and reasonable expenses.

These findings demonstrate the need to develop a scientifically grounded approach to assessing the effectiveness of corporate interactions, without which it is impossible to monitor these processes. The task is complicated by the multivector character and versatility of the these processes, which in turn requires the classification of the interaction methods in conformity with their assessment at each stage of the interaction process of with a particular stakeholder. In fact the assessment of interaction effectiveness is complicated nature and differs for each participant of corporate relations. This assessment is ambiguous and can encompass various indicators for a quantitative and qualitative measure. B

4 Results and Discussion

On the basis of the conducted research we can come to the following conclusions:

1. The economic essence of corporate interaction lies in the organization of an adequate mutually beneficial exchange of resources between the corporation and its stakeholders.
2. Corporate interaction of a particular company depends on the list of its stakeholders.
3. Throughout the life-cycle of a company the list of stakeholders may change, so it is necessary to keep it up to date.
4. The importance of the stakeholders to achieve corporate goals depends on the resource available to them, which is exchanged for the benefits provided by the corporation, representing a certain value for the particular stakeholder.
5. Prioritizing interactions (the distribution of efforts and resources by the corporation) depends on the assessment of the stakeholder's importance for the company based on the criteria of the value of the resource available to it (quantity, volume, capacity, etc.) and the power of the stakeholder's influence on the corporation (the corporation's dependence on the stakeholder).
6. The indicator of the corporate interaction effectiveness is essentially a kind of multiplier that takes into account the effectiveness of interaction for each stakeholder, adjusted to the importance of its resource for the corporation and includes a synergistic effect in the event of effectively organized interaction.
7. The main control object should be the channel of interaction with the stakeholder (group), which is a set of methods and technologies applied to organizing interaction in order to efficiently exchange resources.

The technologies of identifying meaningful "motivated participant" of interaction are a particularly important issue (as there is a temptation to consider the circle of "stakeholders" as broadly as possible, and this may reduce the effectiveness of management strategies) [5]. Table 3 lists the most significant features that must be taken into account when identifying important and meaningful stakeholders.

Table 3. Approaches to identifying important and meaningful stakeholders of a company

Feature	Content	Possible stakeholders
1. Level of company's responsibility for a stakeholder	Availability of current or future obligations of the company to the stakeholders: operational, financial. Availability of regulatory documents, contracts, agreements, joint politics, codes	Regulator's representatives State and municipal agencies; Partners Organizations of banking sector; Public associations etc.
2. Mass media,	Possibility to influence company's activity	Representatives of formal authority (federal, municipal); Mass media, Informal groups Public foundations etc.
3. Degree of direct proximity to the company	Interaction can be characterized as frequent, carried out on an ongoing basis, for an extended period of time, carried out in the close proximity to the geographical boundaries of the company	Internal stakeholders: Management, Staff; Local residents; nearby enterprises
4. Degree of stakeholder's dependence on the company	Dependence on the company in terms of security, obtaining means of living, health or well-being.	Clients, Buyers, Suppliers, Company's staff
5. Level of representativenes s in relation to the company	Presence of representative power based on belonging to the regulatory authorities, implementation of outsourcing functions, representation of the interests of legal entities and persons by proxy	Community leaders, Trade Union representatives, Advisers, representatives of other organizations acting on the basis of membership

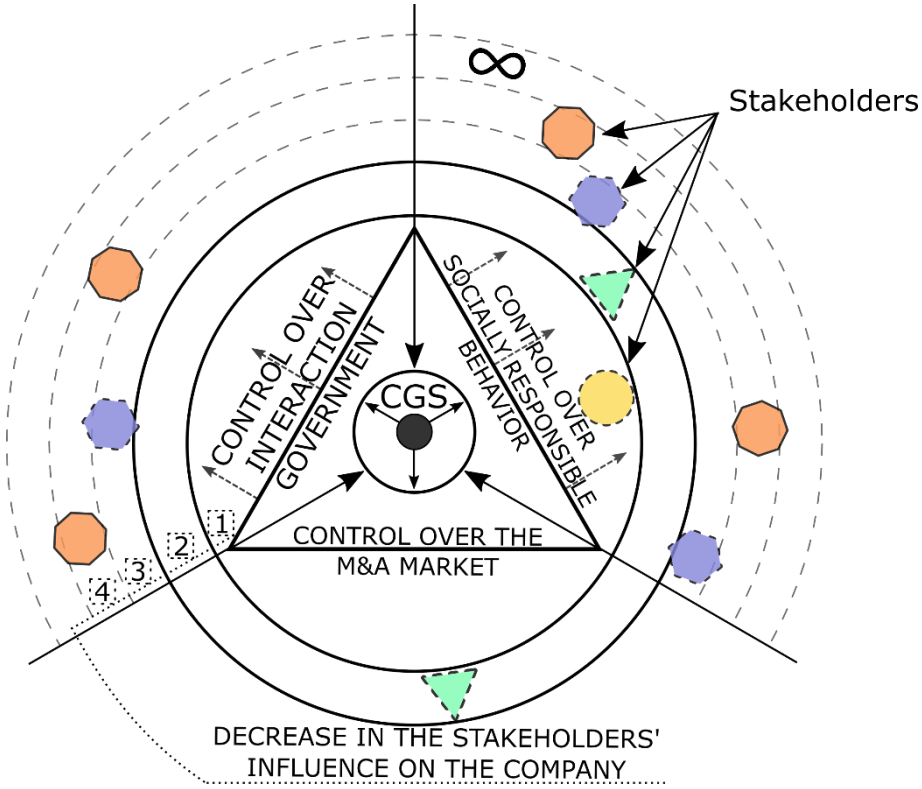
Source: developed by the authors

However, from the point of view of controlling the interaction, it is not enough for the stakeholder to identify the list of stakeholder and extent of their influence on the company or the company's dependence on the stakeholder.

To effectively organize corporate interactions, we propose an approach based on the transformation of the idea of an institutional matrix with respect to corporate interactions. Like every society has a unique institutional matrix that is specific to it, each corporation has its own institutional matrix structure of interactions with participants in corporate relations, based on institutions that define the structure, rules and limitations of this interaction. The alignment of the matrix of institutional interactions makes it possible to determine and assess the influence of basic and complementary institutions on the channels of interaction with stakeholders. The consideration of institutions in a single complex allows us to determine their internal unity with respect to a matrix of a certain type. The interdependence of institutions assumes their mutual correspondence in each matrix, and acts as a key to the search for contradictions in the process of organizing interaction.

Considering the corporation from the standpoint of corporate citizenship, we recognize that it is a part of society, its microsystem, for which the institutional matrix will be based on the triad of business-power-society. Each of these components will determine the set of basic and complementary institutions that in its turn determines the complex of interactions of the corporation depending on the specifics of its activities in the market. The core initiating interaction data will be the corporate governance system (CGS), aimed at solving the problem of providing the key process with the resources necessary and sufficient to achieve the strategic goal.

Fig. 1. Institutional matrix of corporate interactions control



Source: developed by the authors.

The solution to the problem of organizing effective corporate interaction with stakeholders is impossible without the control of this interaction. The control, in turn, requires the formation of a specific control object, information about which will serve as an indicator to the effectiveness of interaction. Supposing that in the interaction process there are two main concepts - method (technique) and technology, we propose to introduce the concept of "channel for interaction with the stakeholder", by which we mean a set of methods and technologies necessary for organizing effective interaction.

In so doing the focus in forming the channel is on a specific stakeholder (or group), having the resources necessary for activity in achieving its strategic goals.

5 Conclusion

The institutionalization of corporate interaction is an inevitable provision for its effectiveness in a modern globalizing world in which the financial success of a corporation depends not only and not so much on how it managed to organize its technological and business processes, but, first of all, on the success of its interaction with stakeholders and the suppliers of resources needed to achieve its strategic goals. For this purpose, in the theory and practice of corporate governance, there is an urgent need to distinguish the subject area of corporate and managerial control as a key final stage of management activity in the corporate governance system. Corporate control is to be aimed at the assessment of corporate interaction effectiveness. The definition and grounding of the content of its subject area, the building of a concept for the development of the institution of corporate control as a complementary institution of corporate governance is a topical task of modern science.

6 Acknowledgment:

The article was written with the financial support of the Plekhanov Russian Economic University (Moscow).
The authors are grateful for the provided statistical data to the National Certification Center for Managing Directors and personally to Zhiltsova V. A. director of the ANO (autonomous noncommercial organization) National Certification Center for Managers for assistance in gathering the necessary information for this article.

7 Bibliography:

[1] Bataeva B. S. Development of relationship management with key stakeholders of the Corporation/ Finogeev A. I., Bataeva B. S. // Russian economic Internet magazine. - 2017. - No. 3.- P. 49.

[2] Belyaeva I. Y. Corporate social responsibility^ management dimension / Monograph / under the General editorship of doctor of Economics, Professor I. Y. Belyaeva, doctor of Economics, Professor M. A. Eskindarov. — M.: KNORUS/ - 2008.

[3] Blagov Y. E. Corporate social responsibility: evolution of a concept / Y. E. Blagov; graduate school of management St. Petersburg state University.— 2nd ed. — SPb.: Publishing house "Higher school of management". -2011. - 272 p.

[4] The study of corporate governance practices in Russia: a comparative analysis for 2004-2014. [site]. URL: http://rid.ru/wp-content/uploads/2016/05/2015_И-РИД-2004-2014-итог.pdf (дата обращения 5. 02. 2017).

[5] Kirillova, O. Yu. Subject area of corporate control: an approach from the perspective of the stakeholder model of corporate governance / O.Yu. Kirillova // Economics and management: problems, solutions. Moscow: – 2017. Vol 5 (65). p.p. 89 -99.

[6] Tkachenko, I. N. Stakeholder model of corporate governance in public-private partnership projects / I. N.
Tkachenko, M. V. Evseeva // Management Sciences. 2014. №1. p. p. 26 -33.

[7] Argentino, L. G. Barriers and difficulties that may be found in the process of implementing corporate governance in companies: a study of the management process and the disclosure of information/ L. G. Argentino, J.L.D Sousa, , E.T. Nose, I.C. Petraglia, A. Rosini // Risus-journal on innovation and sustainability/ - 2017/ - Vol 8. issue 1 p.p. 106 -129.

[8] Bryson, J.M. What to Do When Stakeholders Matter: A Guide to Stakeholder Identification and Analysis Techniques. A paper presented at the London School of Economics and Political Science 10 February 200. [Electronic resource]. Access mode: https://fadm.gov.ru/ (date of access: 12/10/2017

[9] D`Anselmi, Values and stakeholders in an era of social responsibility/ P. D`Anselmi. -N.Y. The Free Press. – 2011.

[10] Donaldson, T. The stakeholder theory of the corporation: concepts, evidence, and implications/ T. Donaldson, L. Preston // Academy of management review. – 1997. Vol. 22, №1. p.p. 61 -74.

[11] Dorobantu, S. Valuing Stakeholder Governance: Property Rights, Community Mobilization, and Firm Value / S. Dorobantu, K.Odziemkowska // Strategic management journal. – 2017. Vol. 38. issue 13 p.p. 2682 -2703.

[12] Erdiaw-Kwasie, M.O. Modelling Corporate Stakeholder Orientation: Does the Relationship Between Stakeholder Background Characteristics and Corporate Social Performance Matter? /M.O. Erdiaw-Kwasie, K. Alam, E. Kabir // Business strategy and the environment. – 2017. - Vol. 26. issue 4 p.p. 465 -479. - [Electronic resource]. - Access mode: http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=3&SID=C56YBf3wY53B2xUjGkp&page=29&doc=288&cacheurlFromRightClick=no (дата обращения 12. 12. 2017).

[13] Freeman, E. Strategic management: a stakeholder approach/ E. Freeman, E. – Cambridge: – Oxford University Press. – 2010.
[14] Frooman, J. Stakeholder influence strategies/ J. Frooman // Academy of management review. – 1999. Vol. 24. - № 2. – p. p. 191 -205.
[15] Friedman, A. Stakeholders: theory and practice/ A. Friedman, S. Miles. - L.: Oxford University Press. – 2006.
[16] Johnson, G. Exploring corporate strategy/ G. Johnson, K. Scholes. – Cambridge: – Cambridge University Press. – 2008.
[17] Herremans, I. M. Stakeholder Relationships, Engagement, and Sustainability Reporting/ I. M. Herremans , J. A. Nazari, F. Mahmoudian // Journal of business ethics. – 2016. - Vol. 138. issue 3. p. p. 417 -435.
[18] Goodpaster, K. E. Conscience and corporate culture/ K. E. Goodpaster. - Blackwell Publishing: Malden (MA). – 2007.
[19] Peregudov S. P. Corporate citizenship: concepts, world practice and Russian realities / S. P. Peregudov, I. S. Semenenko; Information on the world economy and the international market. ran's relationship. - M.: Progress-Tradition. - 2008. - 447 p.
[20] Preston, L. Boards and company performance – research challenges the conventional wisdom/ L. Preston // Corporate governance: an international review. – 2004. Vol. 11. No. 3 p.p. 148 -161.
[21] Solomon, J. Corporate Governance and Accountability/ J. Solomon, J. -UK: John Wiley & Sons Ltd, The Atrium. – 2010.
[22] Richter, U.H. Stakeholder theory: A deliberative perspective / U.H. Richter, K.E. Dow // Business ethics-a european review. – 2017. - Vol. 26. issue 4. p.p. 428 -442.
[23] Teixeira, M.G. Institutional logics and the decision-making process of adopting corporate governance at a cooperative organization / M.G. Teixeira , K. D. Roglio, R. Marcon // Journal of management & governance/. – 2017. - Vol. 21. issue: 1. p.p. 181 -209.
[24] Velamuri S. Ramakrishna, Venkataraman S. Why Stakeholder and Stockholder Theories are Not Necessarily Contradictory: A Knightian Insight / S. R. Velamuri, S. Venkataraman // Journal of Business Ethics. – 2005. - 61(3). – P. 249-262
[25] Walker, S. Stakeholder power: a winning strategy for building stakeholder commitment and driving corporate growth/ S. Walker, S. – Cambridge: Mass. – 2001.

PLACE BRANDING AS A FACTOR OF COMPETITIVE RECOVERY OF RUSSIA ON AN INTERNATIONAL TOURISM MARKET

Yakubova, Tatyana Nikolaevna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
yakubova_tn@rudn.university

Vavilina, Alla Vladimirovna
Associate Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
vavilina_av@rudn.university, vavilinaalla@mail.ru

Komarova, Tatiana Vitalievna
Assistant Professor, Department of Management, Faculty of Economics
Peoples' Friendship University of Russia (RUDN University),
6, Miklukho-Maklaya Street, Moscow, 117198, Russian Federation
komarova_tv@rudn.university

Abstract

This article deals with the problems of the development of a powerful brand of a country as well as places' brand that is extremely important for the attraction of foreign tourists, foreign exchange inflow and national economic growth. The development of place brand is a somewhat complicated process that is based on a comprehensive approach to the search and development of territory identity. Place branding is also aimed at providing a specific target group with the information about the advantages of a particular territory with the help of the creation of a bright and attractive image. The ultimate purpose of this process is the development of a brand as a combination of rational, emotional and visual attributes that reflect the main idea and conception which are supported by the territory as a brand carrier.

Key words:

National brand of a country, place brand, place branding, factors of increase of country's competitive recovery, international tourism market.

JEL: M38

1 Introduction

The concept of place branding is based on the statement that with the help of an appropriate and professional approach almost any territory can become an owner of a powerful brand and claim on the inflow of foreign tourists. However, due to the principle of cyclic development, it is most likely that territories suitable for branding are those that face any crisis rather than territories with economic, social and cultural stability [10]. Thus, for instance, one of the most famous experts in the sphere of place branding Sicco van Gelder distinguishes four groups of such territories [6, p. 29-30]:

1. Places with strong and developing competition;
2. Geographical units that face difficult issues of development;
3. Places that face slow and steady decline;
4. Places that have overcome a crisis and are in need of innovations.

The positioning of any territory is based on its uniqueness and distinctiveness. The chosen territory is attractive for tourists only in case if it possesses interesting sights, abundant natural resources, unique monuments of history, culture and architecture, religious objects, cultural and national peculiarities of the population. Besides, the vital role in the development of a positive image of a region is given to the stable political and social and economic situation, developed railway network and highway system, available communications facilities, developed tourist infrastructure, non-existence of life-threatening natural disasters and the correspondence of the price to the level of tourist services.

However, it is necessary to point out that the attractiveness for tourists can change due to its inconstancy depending on various factors that can influence the tourist attractiveness of territory in this or that way. These factors include: existence of modern material and technical base of tourism, in particular, new hotel facilities, specialised enterprises and institutions with a wide range of services that they provide and so on. [16, pp. 1165-1166]

2 References review

Nowadays scientific literature contains a particular set of knowledge in the sphere of creation and promotion of a place brand or place branding. Thus, for example, Ph. Kotler, Ch. Asplund and D. Haider consider theoretical aspects of place brand creation in their works [8]. According to their opinion, in a modern world, people turn to be consumers while territories, cities and even countries are goods. S. Anholt pays special attention to the system of national brand assessment in his works [1, 2,17,18]. P. Temporal researches the advantages that a country can get with the help of a powerful brand [23]. Sicco van Gelder considers the questions of successful development and realisation of place brand strategy [6]. The Russian authors, such as T.A. Ataeva [3], A.S. Brusovaya [4], and I.S. Vazhenina [5] study the issues connected with place marketing as a factor of region's infrastructure development as well as image and reputation as a basis for its promotion in a competitive environment. I.Ya. Rozhkov [13] analysis questions connected to the formation of Russia's image. V.K. Malkova [11], T.V. Metsheryakov [12], E.A. Rudaya [14], H.P. Shalygina [16], I.V. Loguntsov [10] talk about the branding role in the formation of the tourist attractiveness of a region.

3 Method of research

In this paper the authors applied the methods of analysis, examination, synthesis, statistical monitoring, summing up and grouping materials of statistical monitoring.

The sources on which the findings and conclusions of this article are based are scientific works by foreign and Russian authors in the field of territorial branding, brand creation and development, as well as Anholt-GfK ratings of the strongest national brands in 2016 and the most visited countries in the world in 2016.

4 Main body

In today's world, territories are involved in the continuous fight for development and growth of population welfare. In order to increase the opportunities, regions are to attract investors, potential residents, tourists as well be able to create bright and decisive place brand. Despite the fact that the term 'place branding' is quite popular in the literature, its common definition is still a topic for discussions. This notion is multifactorial, and it should be systematised. Let's consider the most popular definitions of 'place brand' and 'place branding' suggested by various researchers. Thus, for instance, T.A. Ataeva considers place brand as 'a brand of a certain territory unit that turns to be a key factor in territory development and

promotion. It is based on sociocultural, political, economic, human, natural and recreational potential together with local manufacturers brands' [3, p.8]. A.S. Brusovaya considers place branding as ''a deliberate formation of a country or region image in the minds of representatives of national and international community' [4, p.34]. A rather interesting definition of place branding is given by F. Go: 'the process of searching for resources that are the key asset for a particular territory' [19, p.5].

A competent expert in the sphere of national branding S. Anholt points out that place branding is an 'act of promotion of a region by means of sociocultural exchange that is not a goal in itself, but it is one opportunity of territory image formation' [1, p.18]. He examines branding from strategic positions and says that 'each city, region or country should compete for tourists, investments, trust, reputation and mass media respect in this global world. The country image is its competitive advantage. Country branding is a strategic approach to the development of this advantage and the understanding of the fact where the country could go. Without this understanding, the country could not compete. Thanks to the companies, allies, words that other people say about this country and words that country says itself. We do not trust advertising; we do not trust that others tell about the country' [2, p. 92].

Thus, the primary task of any state or country branding is to create and keep positive associations with the country, citizens and goods. Sometimes it is aimed at changing of negative stereotypes that do not correspond to the reality. However, the ultimate and main aim of country branding is a contribution to the increase in population welfare.

Paul Temporal confirmed that the powerful national brand gives a number of advantages to a country including: improvement of currency stability, restoration of international confidence and investors' assurance, international rating drift, increase in international political influence, growth of branded goods and services export, increase in inbound tourism, increase in winning opportunities against regional and global competitors as well as protection of its markets [23].

A strategy of a national brand is based on five main dimensions: tourism promotion, brand export, investment raising, external politics, and culture representation. Though, except for these aspects, there are also other essential aspects of national branding such as local branding, the role of cinematography in brand promotion, usage of diaspora as a brand communicator, etc. However, the creation of the positive image of a country beyond its territory is a long-term and systematic activity. During the previous decades governments in the majority of developed western countries such as Great Britain, France, Germany established special services that were aimed at developing of advantageous background for political, social and commercial activity. Thus, for instance, Information Agency (USIA) has such a role in the USA. Its purpose is to spread positive information about the country, its politics, Americans, culture and formation of positive American image around the world. One more goal is to provide the President of the United States with the information on public opinion changes connected with the critical issues within the country and all over the world.

Nowadays it is possible to say that the governments in the majority of developed countries and a number of developing countries have already realised the meaning of country brands and manage them to attract foreign tourists. These are such countries as Switzerland, Greece, Turkey, Singapore, Italy, Spain, and France, Germany, Japan, the USA. This list can be enlarged by such countries as Ireland, New Zealand, Australia, Republic of South Africa that have improved their image quickly and as a result, their economies together with self-esteem have strengthened considerably. Let's consider one of the most influential brands. Brand "America": a country, symbol of freedom, myth, ideal, Hollywood, "the most democratic elections of the President". Other countries such as Malaysia, Poland and China have just started their way to become active and recognised brands.

An interesting fact is that every year the GFK research group conducts an assessment of national brands reputation among 50 countries all over the world. Thus, results provided by Gfk National Bran Index of Anholt-Gfk showed that the USA, Germany, Great Britain, Japan and France are among the leading countries (table 1). It is necessary to point out that the USA, Germany, France, Great Britain and some other countries are also leaders in the international tourism market. Russia did not manage to join the

top 10 leaders in 2016, and it took only the 22nd place in the rating of the most authoritative countries [24].

Table 1 – Anholt-GfK rating of the most powerful national brands in 2016

The place in the rating (2016)	Country
1	The USA
2	Germany
3	Great Britain
4	Canada
5	France
6	Italy
7	Japan
8	Switzerland
9	Australia
10	Sweden

Source: [24]

The present research - Anholt-GfK Nation Brands Index^{SM} measures the perception of the image of 50 developed and developing countries around the world. It is based on the assessment of 23 national attributes that are sorted and analysed in accordance with 6 key aspects of national branding: export (external reputation and attractiveness of goods and services produced by a country), state regulations (authority image and perception of state regulation quality), culture (interest to national culture and history, assessment of sporting achievements, etc.), people (foreign people's opinion about country's citizens as workers, friends, business partners), tourism (country attractiveness for tourism), immigration/investments (country attractiveness for investments and talants).

Vadim Volos, the senior vice-president of Gfk company, says: "Each nation can influence the condition of the main factors of its reputation using promotion of its greatest advantages in order to attract tourists' flows, talents and investments. Our research gives an opportunity to analyse the condition of country's reputation today and to find out prospects for the further development of a powerful national brand" [24].

A high number of experts in the sphere of place branding believe that while forming a powerful and confident national brand of Russia, particular attention should be paid to its culture. This assumption confirms the fact that in 2016 Russia took the 8th place in the rating of countries with the most interesting cultures for people. However, it was impossible to get the leading positions in "Anholt-Gfk rating of the most powerful brands" due to such criteria as "Government administration": 34th place out of 50 [24]. Besides, it was not included in top 10 of the most visited countries in 2016 according to the data provided by the World Tourism Organisation (UNWTO) (table 2) [25].

Table 2 - Top 10 the most visited countries around the world in 2016

Rating	Country	Rating	Country
1	France	6	Great Britain
2	The USA	7	Germany
3	Spain	8	Mexica
4	China	9	Thailand
5	Italy	10	Turkey

Source: [25]

However, the authors highlight that the USA keep the leading positions in the volume of tourism proceeds ($ 206 billion) (the next places are given to such countries as Spain ($ 60 billion), Thailand and China, France got the 5th place ($ 42 billion), Russia didn't get any leading positions according to the criterion despite its rich potential.

5 Conclusions.

In conclusion of this article, the author wanted to point out that strategy planning on development of national brand requires observance of specific terms: existence of political resources that are eager to closely and efficiently cooperate with private sector; existence of real and sequential plan for economic and social development, which forms the basis for brand development strategy; confidence and goodwill of companies, organisations, local and regional governments, city authorities, public services, trading groups, tourism committees and population that are necessary for strategy acceptance; as well as a certain degree of basis financial stability. A significant contribution to the formation of a strong national brand will also be made by the positive symbols of the country, which foreign tourists will be able to associate with Russia. The realization of recommendations expressed in this study also requires the government's support. All these measures, implemented in a comprehensive manner, will have a positive influence on the formation of a strong national brand of Russia and will help the country to take a leading position on the international tourism market.

6 Acknowledgments.

This paper was financially supported by the Ministry of Education and Science of the Russian Federation on the program to improve the competitiveness of Peoples' Friendship University of Russia (RUDN University) among the world's leading research and education centers in the 2016-2020.

7 References

[1] Anholt S. Brand America: The Mother of All Brands - M: LLC "Publishing house "Dobraya kniga", 2010.
[2] Anholt S. Brand New Justice: The Upside of Global Branding - M.: Kudits-Obraz, 2004.
[3] Ataeva T.A. Place marketing as a factor of infrustracture development in a region // Marketing - reality and projection for the future: conference materials (Varna, 28-29 June 2012). - Varna, 2012. - p.8
[4] Brusovaya A.S. Development of regional brand as a basis for provision of balanced social and economic development of the territorial entity of the RF as examplified by the Ivanovo Region // Regional economy: theory and practice, No.14, 2010, pp. 34-42
[5] Vazhenina I.S. Image and reputation of a territory as a basis for promotion in competitive environment// Marketing in Russia and abroad, No.6, 2006, pp. 82-98
[6] Sicco van Gelder How to improve the chances of successfully developing andimplementing a place brand strategy// Brand-management. - 2009. - No. 2 (45). – p. 29-33.
[7] Dinnie K. Place branding. The best world's practice / eds K. Dinnie; translated from Englsih by Vera Sechnaya. - M.: Mann, Ivanov and Ferber, 2013.
[8] Kotler Ph., Asplund C., Haider D. Marketing places. Attraction of investments, enterprises, residents and tourists to cities, communes, regions and countries of Europe - Spb.: Publishing house "Stockholm School of Economics", 2005
[9] Kotler Ph. Marketing places. An attraction of investments, enterprises, residents and tourists to cities, communes, regions and countries of Europe/ Ph. Kotler, K. Aspund, I. Rein, D. Haider. - Spb: Stockholm School of Economics in St. Petersburg, 2005.
[10] Loguntsova I.V. Theoretical backgrounds of powerful brands' development of modern territories // Governmant administration. E-journal, No. 33, 2012

[11] Malkova V.K., Tishkova V.A. Culture and space: historical and cultural brands and images of territories, regions and places: [collection of scientific papers] - Rostov-on-Don.: Southern Scientific Center of the Russian Academy of Sciences, 2012
[12] Mesheryakov T.V. Brand as a type of communicative capital // Issues of modern economy, No. 1, 2011, pp 149-153
[13] Rozhkov I. Image of Russia. Resources. Experience. Priorities/ I. Rozhkov, V. Kismereshkin. - M.: Yurist, 2008.
[14] Rudaya E.A. Fundamentals of brand-management - M.: Aspekt-press, 2010
[15] Trout J. The magic lamp of a businessman/ J. Trout. - Spb.:Piter, 2009.
[16] Shalygina N.P. On the role of branding in the formation of tourist attractiveness of region//Basic Research, No.8, 2013, pp. 1165-1168
[17] Anholt S. Competitive Identity: The New Brand Management for Nations, Cities and Regions – 1-st edition –NY: Palgrave Macmillan, 2007
[18] Anholt S. Places: Identity, Image and Reputation - – NY: Palgrave Macmillan, 2009
[19] Go F. Place Branding: Glocal, Virtual and Physical Identities, Constructed, Imagined and Experienced – NY.: Palgrave Macmillan, 2009
[20] House R. J., Hanges P. J., Ruiz-Quintanilla S. A., Dorfman P., Javidan M., and Dickson M. Culture influences on leadership and organisations: Project GLOBE// Advances in Global Leadership. – 2002. - № 1. – P.171-233.
[21] Kramer A. Selling the World on Russia (Leaving Out the Spies) // nytimes.com: The New York Times. – 29.12.2010. – [Electronic resource]. - URL: www.nytimes.com/2010/12/29/business/media/29adco.html?_r=1&partner=rss&emc=rss (reference date 28.12.2017).
[22] Wang H. National image building: a case study of China. International Studies Association meeting paper. Hong Kong.2001.
[23] www.asianc.com - [Electronic resource] - (reference date 28.12.2017)
[24] http://www.gfk.com/ru/insaity/press-release/indeks-nacionalnykh-brendov-anholt-gfk-2016 - [Electronic resource] - (reference date 28.12.2017)
[25] http://www2.unwto.org - [Electronic resource] - (reference date 28.12.2017)

SENSORY EVALUATION OF HONEY BY YOUNG CONSUMERS IN SLOVAKIA: PILOT TESTING

Peter Šedík
Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Slovakia
sedik.peter@gmail.com

Renáta Benda Prokeinová
Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Statistics and Operations Research, Slovakia
renata.prokeinova@gmail.com

Elena Horská
Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Slovakia
elena.horska@gmail.com

Abstract:

Growing trend in eating healthy food has certain impact on overall popularity of honey among consumers. Honey is considered to be nutritionally complex food with many health benefits which encourage many consumers to include it in their diet. Annual consumption per capita in Slovakia is continuously increasing and in 2016 it was estimated to be at 1 kg. Current situation in the world honey market attracts attention in terms of honey adulteration. Due to the frequent frauds, honey belongs to category of the most adulterated product in food market. The purpose of the study was to identify consumers' perception of intrinsic attributes (sensory qualities) between domestic honey and imported honey in the absence of extrinsic attributes (price, country of origin, brand, label, producer) by pilot testing of blind sensory test. Evaluation of sensory attributes was part of a questionnaire survey conducted in spring 2017 on a sample of 200 young respondents (18 – 30 years) in Slovakia. Each respondent evaluated taste, aroma, colour and consistency of each sample on 5-point scale and afterwards selected which sample they preferred more. Based on the results, sample A (domestic honey) obtained better rating in taste and aroma while sample B (imported honey) was evaluated better in colour. Young consumers are not able to distinguish domestic honey from local beekeeper from imported honey only according to sensory evaluation. Nevertheless, respondents who purchase honey directly from beekeeper preferred more sample A.

Key words:

Honey, consumer research, sensory analyses, young segment, Slovakia

***JEL*:** M31

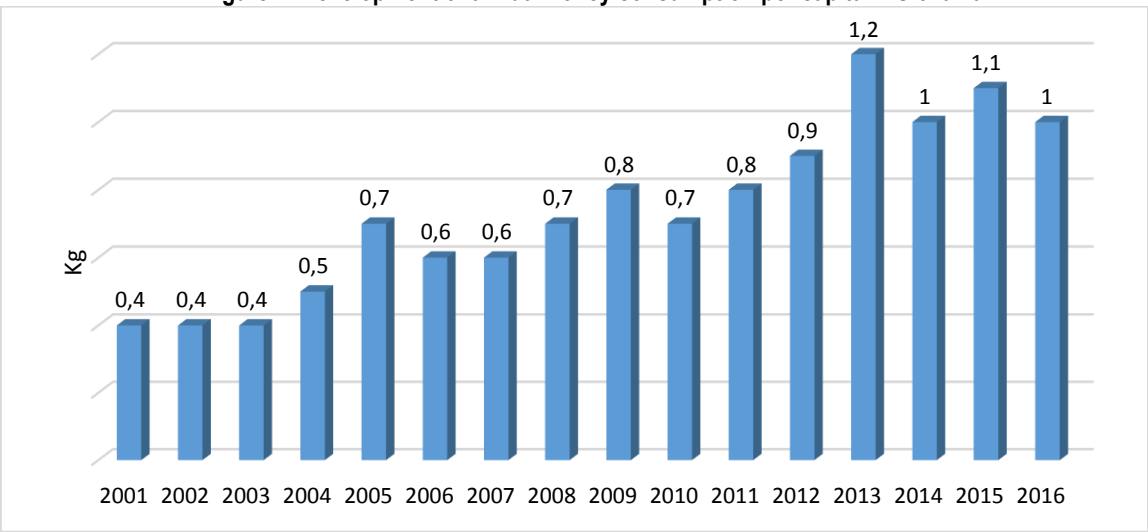
1 Introduction

In recent years, food market has been influenced by growing consumer interest in healthy lifestyle including healthy eating habits. Consumers are more concerned about their health and prefer to purchase natural and healthier food. Even many parents seek for natural products in order to ensure their children a healthy diet [3]. Honey is considered to be natural source of energy, nutritive product rich in minerals,

vitamins, flavonoids and antioxidants, alternative sweetener with health benefits and healing effects [5], [15], [18], [21]. The popularity of honey is driven by its multifunctionality involving healing effects, positive effects on immunity, natural character, nutritional aspects and compatibility with healthy eating habits [25], [14].

Consumption patterns of honey in Slovakia is slowly changing (Fig. 1) and since 2003 the annual consumption per capita has increased from 0.4 kg to 1 kg which represents approximately 150 % increase. Nevertheless, recent Slovak study identified low honey consumption among young consumers [11]. The same situation occurs in Poland [16], Hungary [28], the Czech Republic [27] and Romania [19]. In general, the frequency of honey consumption is influenced by tradition or habit [24] and depends on consumers' perception. Usually honey is perceived as natural and local food produced by beekeepers [20] and consumers buying motives are connected with product healthiness and safety [22].

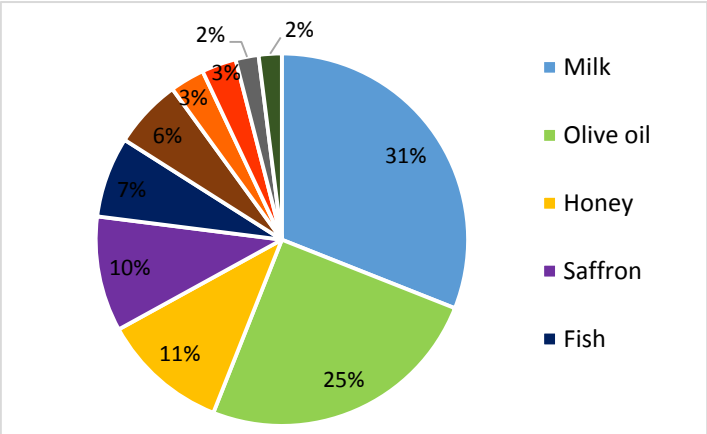
Figure 4: Development of annual honey consumption per capita in Slovakia



Source: Statistical Office of the SR, 2017

Due to increasing consumption, honey market in the European Union is flooded with cheap imported honey. Approximately 40 % of overall consumption in the EU is covered by import from third countries [7]. In general, imported honey does not have precise country of origin due to legislation, which maintains labelling rules which allows producers to indicate honey origin in following form: blend of EC honeys, blend of non – EC honeys or blend of EU and non – EU honeys. [4]**.** Current legislation decreases traceability of honey which creates opportunities for adulteration and frauds.

Figure 2: Most favourite targets of fraud



Source: Phipps, 2017

Nowadays, honey is the 3rd most adulterated food in world market (see Fig.2), therefore many consumers have started to focus on country of origin which correlates with its quality. [17].

2 Objective and Methodology

The aim of contribution was to identify consumers' perception of intrinsic attributes (sensory qualities) between domestic honey and imported honey in the absence of extrinsic attributes (price, country of origin, brand, label, producer).

Primary data was obtained by questionnaire survey with blind sensory testing on the sample of 200 respondents which evaluated to samples of polyfloral honey. First sample A was domestic honey from local beekeeper and sample B was honey purchased from selected supermarket with country of origin labelled as blend of EC and non – EC honey which ensured that sample contains imported honey. Research was conducted in spring 2017 and targeted at young consumers in Slovakia consisting students between 18 – 30 years studying at university.

Respondents evaluated sensory attributes of both samples such as taste, aroma, colour and consistency using 5-point scale (very good, good, neutral, bad, very bad). After sensory evaluation each respondent had to indicate which sample they prefer (see Tab. 1). Obtained data were processed, analysed and statistically tested in SAS Enterprise Guide 7.1

Tab. 1 Blind sensory test

Sensory attributes	Sample A	Sample B
Taste		
Aroma		
Colour		
Consistency		

Source: own research

Applied statistical tests:

- Chi – Square Test of Independence
- Cramer´s V Coefficient
- Mann – Whitney U Test

Formulated hypothesis

Hypothesis no. 1: We assume young consumers prefer both samples in equal proportion.

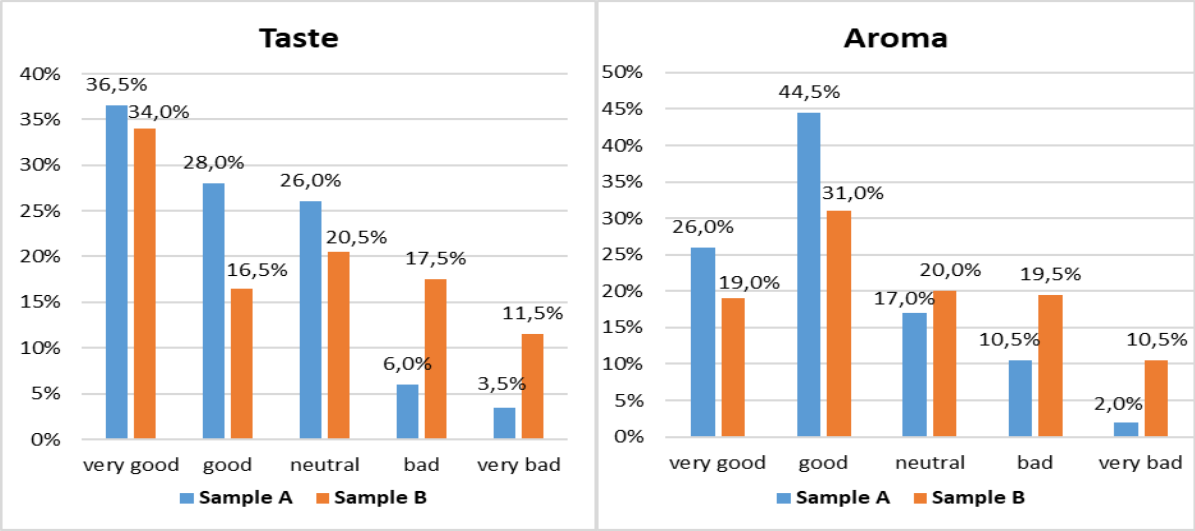
Hypothesis no. 2: We assume there exists significant differences in evaluation of sensory attributes between samples

Hypothesis no.3: We assume there exists dependence between sample preferences and respondent´s place of purchase

3 Paper results

In blind sensory test, respondents evaluated taste, aroma, colour and consistency of both samples. Based on the results, better evaluation in taste and aroma (Fig. 3) was acquired in sample A. Respondents evaluated taste of sample B as slightly worse than sample A. Interesting results are in case of aroma where the majority of respondents rated aroma A either very good or good. Only a half of respondents liked aroma of sample B. According to Mann – Whitney test at the level of significance ($\alpha = 0.05$) in both taste (p-value = 0.0048) and aroma (p-value = 0,0001) were proven statistically significant differences between samples.

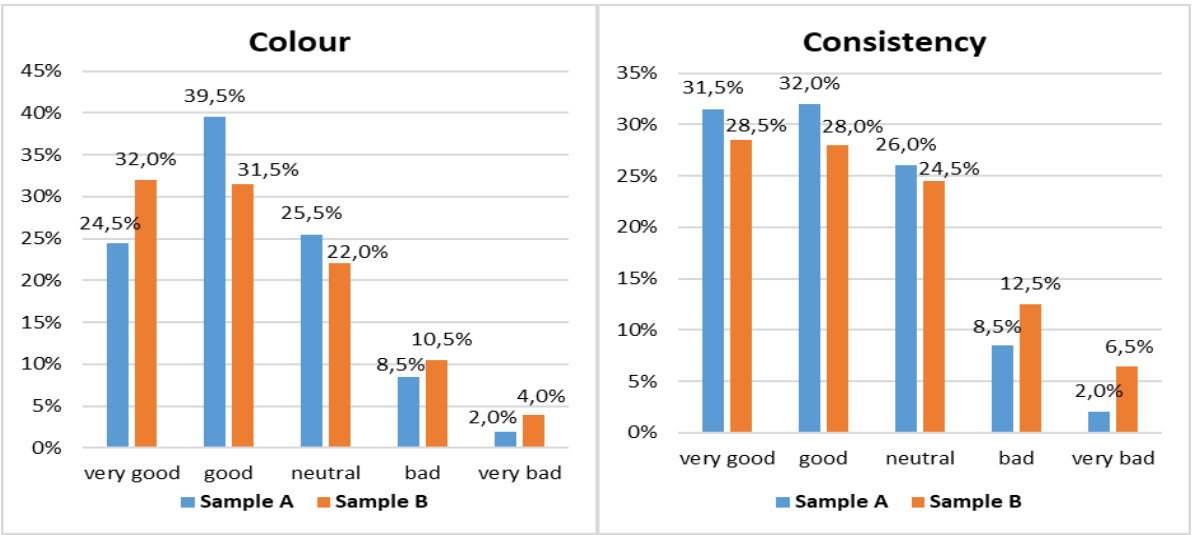
Figure 3: Blind sensory testing – taste and aroma



Source: blind sensory test– own research, 2017

Another evaluated sensory attributes were colour and consistency (see Fig.4). Better rating of colour was obtained by sample B where 32% marked it as very good while sample A aroma obtained only 24.5% as very good. In case of consistency, we can observe better evaluation for sample A regarding very good and good rating while sample B obtained higher percentage in bad and very bad. Based on Mann – Whitney test at the level of significance (α = 0.05) in both colour (p-value = 0.9291) and consistency (p-value = 0.0637) were not proven any statistically significant differences between samples.

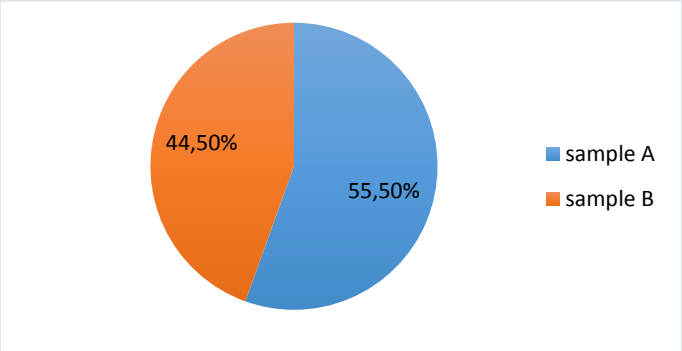
Figure 4: Blind sensory testing – colour and consistency



Source: blind sensory test– own research, 2017

Furthermore, respondents indicated which sample they prefer more. Results showed (Fig.5) no major differences between choice of preferred sample among respondents. Domestic honey from local beekeeper was slightly more preferred than imported one. Based on the results, young consumers are not able to distinguish domestic honey from imported only according to sensory attributes.

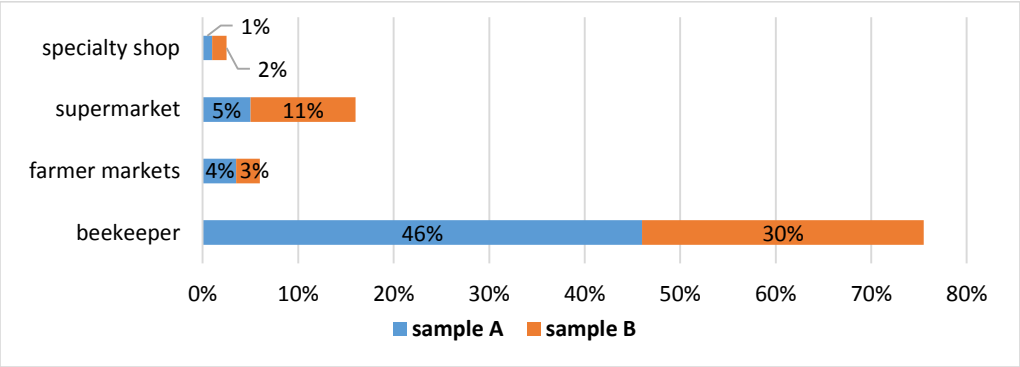
Figure 5: Sample preferences



Source: blind sensory test – own research, 2017

In a context of preferred sample was formulated hypothesis, which assumes there exists dependence between sample preference and respondents' place of honey purchase. Chi – Square Test of Independence was applied at the significance level (α = 0.05) and the dependence was confirmed (p-value = 0.0190). According to Cramer´s V Coefficient the strength of dependence is weak (0.2230).

Figure 6: Sample preferences according to place of honey purchase



Source: questionnaire survey and blind sensory test, 2017

Based on the results (see Fig.6), respondents who purchase honey directly from beekeepers prefer more domestic honey (sample A) and vice-versa, respondents who purchase honey from supermarkets prefer more imported honey (sample B).

4 Discussion

Product quality is commonly determined according to its properties and qualities based on sensory analyses evaluating taste, aroma, colour and consistency as well as physicochemical properties. Several authors conducted sensory evaluation in various countries involving Denmark [26], Finland [13], Italy [6], Spain [10], [9], India [1] and Arab Gulf region [12], who analysed taste, colour and texture of various samples of honey. In general, consumer research comprising sensory analyses is concentrating on product quality and its perception by consumers.

Sensory analyses in consumer research is widely used in sensory marketing **[2]**. Consumers are testing food products according to sensory attributes as taste, aroma, colour and consistency and based on their own perception they rate each of them. For evaluation is commonly used 5-point hedonic scale (1– extremely unpleasant, 2– unpleasant, 3 – neither like nor dislike, 4 – like, 5 –like very much) [23]. The main role of sensory marketing is influence consumer perception, opinion and decisions through human

senses such as taste, smell, touch and sight. Generally, this type of marketing is connected with consumers' expectations and loyalty which is influenced by consumers 'experiences [8].

5 Conclusion

In conclusion, young consumers are not able to perceive differences in preference between examined samples based on intrinsic attributes (sensory evaluation) without extrinsic attributes (price, country of origin, brand and producer). Nevertheless, respondents who purchase honey directly from beekeeper preferred more sample A (domestic honey) and sample B (imported honey) was preferred more by those who purchase honey from supermarket.

Sensory evaluation revealed significant differences in taste and aroma between samples. Domestic honey – sample A obtained slightly better evaluation in taste than imported honey – sample B. In case of aroma, majority of respondents rated sample A as very good and good. Insignificant differences were obtained in colour and consistency, even though intensive colour of imported honey was rated better than domestic honey.

In quality evaluation of honey according to sensory attributes, consumers should consider aroma as the most important factor during their decision – making process due to the fact that imported honey, which are mostly being adulterated have less intensive aroma or do not have aroma at all.

6 Acknowledgement

The paper is part of the two research projects:

- VEGA 1/0890/16 "Quantification of sustainable consumption through modelling of consumer behaviour in food consumption" conducted at the Department of Statistics and Operations Research at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra
- KEGA 038SPU4/2016 "Using of new technologies and interdisciplinary associations in consumer studies" conducted at the Department of Marketing and Trade at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra.

7 Bibliography

[1] ANUPAMA, D., BHAT, K. K., and SAPNA, V. K. 2003. Sensory and physico-chemical properties of commercial samples of honey. *Food Research International*, vol. 36, p. 183–191.

[2] BERČÍK, J., and PALUCHOVÁ, J. 2017. Progressive methods of market research for retail and services. *The Poprad economic and management forum*. Ružomberok: VERBUM, pp. 271-279.

[3] BODNAR, K., NAGY, E., and MAKRA, L., 2016. Planning of a honey based product´s introduction to the market. *Lucrari Stiintifice*, vol. 18, no. 2, p. 27–30.

[4] Council Directive 2001/110/EC of 20 December 2001 relating to *honey*

[5] CRITTENDEN, N. A. 2011. The importance of honey consumption in Human Evolution. *Food and Foodways: Explorations in the History and Culture of Human Nourishment*, vol. 19, no. 4, p. 257-273.

[6] ESTI, M., PANFILI, G., MARCONI, E., and TRIVISONNO, M. C. 1997. Valorization of the honeys from the Molise region through physico-chemical, organoleptic and nutritional assessment. *Food Chemistry*, vol. 58, 125–128

[7] European Commission 2016. Agriculture and Rural Development, *ISAMM CM*. https://ec.europa.eu/agriculture/sites/agriculture/files/honey/programmes/national-apiculture/nap-sk_sk.pdf Accessed 17.05.11.

[8] GÉCI, A. RYBANSKÁ, J. and NAGYOVÁ Ľ. 2017. Impact of Sensory Marketing on Consumer´s Buying Behaviour. *Potravinárstvo*. vol. 11, no. 7, p. 709-717. https://dx.doi.org/10.5219/835

[9] GONZÁLEZ LORENTE, M., DE LORENZO CARRETERO, C., and PÉREZ MARTIN, R. A. 2008. Sensory attributes and antioxidant capacity of Spanish honeys. *Journal of Sensory Studies*, vol. 23, p. 293–302.
[10] GONZÁLEZ-VIÑAS, M. A., MOYA, A., and CABEZUDO, M. D. 2003. Description of the sensory characteristics of Spanish unifloral honeys by free choice profiling. *Journal of Sensory Studies*, vol. 18, p. 103–113.
[11] GUZIY, S., ŠEDÍK, P., and HORSKÁ, E. 2017. Comparative study of honey consumption in Slovakia and Russia. *Potravinárstvo*, vol. 11, no. 1, p. 472-479. https://dx.doi.org/10.5219/784
[12] KAAKEH, W., and GADELHAK, G. G. 2005. Sensory evaluation and chemical analysis of Apis mellifera honey from the Arab Gulf region. *Journal of Food and Drug Analysis*, vol. 13, p. 331–337.
[13] KORTESNIEMI, M. et al. 2018. Sensory and chemical profiles of Finnish honeys of different botanical origins and consumer preferences. *Food Chemistry*. https://doi.org/10.1016/j.foodchem.2017.10.069
[14] KRYSTALLIS, A., PETROVICI, D., and ARVANITOYANNIS, I. 2007. From Commodities to the Consumption of Quality Foods in Eastern European Context. *Journal of East-West Business*, vol. 12, no. 4, p. 5-37. https://doi.org/10.1300/J097v12n04_02
[15] MARGHITAS, L. A., et al.. 2010. The development of a biochemical profile of acacia honey by identifying biochemical determinants of its quality. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca,* vol. 38, no. 2, p. 9-13.
[16] MATSUDA, A. H., and SABATO, S. F. 2004. Effect of Irradiation on Brazilian Honey's Consistency and Their Acceptability. *Radiation Physics and Chemistry*, vol. 71, no. 1-2, p. 107-110. https://doi.org/10.1016/j.radphyschem.2004.03.068
[17] PHIPPS, R. 2017. International honey market: A Second Point of Inflection has been attained. A Point of Equilibrium is Approaching. The NMR test is gaining international attention and acceptance. *American Bee Journal*, pp. 597-604.
[18] PIDEK, A. 2001. Youth preferences in honey consumption. *Journal of apicultural science*, vol. 45, p. 115-119.
[19] POCOL, C. B. 2011. Modelling the honey consumption behaviour in Romania by using socio-demographic determinants. *African Journal of Agricuture Research*. vol. 6, no. 17, p. 4069-4080.
[20] POCOL, C. B. and BOLBOACA, S. D. 2013. Perception and trends related to the consumption of honey: A cse study of North-West Romania. *International Journal of Consumer Studies*. vol. 37. pp. 642-649. https://doi.org/10.1111/ijcs.12046
[21] POCOL, C. B. and STAN, L. 2015. Ethical concern in Romanian beekeeping, pp.400-405, Eursafe, *Know your food - Food ethics and innovation*. Wageningen Academic Publishers, ISBN 978-90-8686-264-1
[22] POCOL, C. B., and ILEA, M. 2011. The development of local products in Romania: A case study of honey. Lucrări Ș tiin ț ifice, Universitatea de Ș tiin ț e Agricole Ș i Medicină Veterinară a Banatului, Timisoara, Seria I, Management Agricol, vol. 13, no.2, p. 153-160.
[23] POCOL, C. B., STAN, L. and TESELIOS, C. M. 2015. Sensory Analysis of Dehydrated Plums and Pears. *Bulletin of University of Agricultural Sciences And Veterinary Medicine Cluj-Napoca. Horticulture*, vol. 72, no. 2. pp. http://dx.doi.org/10.15835/buasvmcn-hort:11441
[24] ROMAN, A., et al. 2013. Factors influencing consumer behavior relating to the purchase of honey part 2. product quality and packaging. *Journal of apicultural science*, vol. 57, no. 2, p. 175-185. https://doi.org/10.2478/jas-2013-0027
[25] ROMAN, A., POPIELA-PLEBAN, E., & KOZAK, M. (2013). Factors Influencing Consumer Behavior Relating to the Purchasing of Honey Part 1. The Buying Process And The Level Of Consumption. *Journal of Apicultural Science*, vol. 57, no. 2, p. 159–72.
[26] STOLZENBACH, S., BYRNE, D. V., and BREDIE, W. L. P. 2011. Sensory local uniqueness of Danish honeys. *Food Research International*, vol. 44, no. 9, p. 2766–2774.

[27] ŠÁNOVÁ. P., NOVÝ, J., SVOBODOVÁ, J., and ŠERÁKOVÁ, P. 2015 Pilot analysis of key factors in honey consumption. *Proc. 24th Conference Agrarian Perspectives – Global Agribusiness and Rural Economy*, Prague, Czech Republic, p. 416–424.

[28] VANYI G. V., CSAPO, Z., and KARPATI, L. 2010. Honey consumption in Europe with especial regard to Hungary. *45th Croatian & 5th International Symposium on Agriculture: Agricultural Economics and Rural Sociology*, pp. 200–204.

STRATEGIC MANAGEMENT TOOLS IN THE SMALL AND MEDIUM SIZED ENTERPRISES: A LONG-TERM VIEW

Jarmila Šebestová
Silesian University in Opava, School of Business Administration in Karvina,
Department of Business Economics and Management
sebestova@opf.slu.cz

Abstract:

Extensive global research has shown that strategic management tools play significant role in successful business and its adaptive behaviour, not only in SME sector. Data from several studies suggest that the behaviour is dependent on national environment only. There is little published data on that problem on regional level. The purpose of this paper is to review recent research in the area of strategic management in SMEs and classify recent trends in that area. A case study of the Moravian-Silesian Region was used to explore differences in results in genera. This case study confirmed significant relationship between start-up motivation and strategic management tools use in SMEs. A low-cost tool like SWOT or brainstorming were significant for small business, while time and resource consuming tools (TQM, EVA) were significant for medium sized companies.

Key words:

Motivation to start-up, SME, Strategic management, strategic plan

JEL: L26, M21, M19

1 Introduction

Strategic methods and tools are closely connected with strategic management use in general. A strategic management can be defined as a set of theories and frameworks, supported by special methods, tools and techniques, which are primarily designed to assist managers of organizations in thinking, planning and acting strategically (Stonehouse and Pemberton, 2002, Berisha Qehaja, Kutllovci and Shiroka Pula, 2017). On the other hand, strategy tool is could be a generic name for any method, model, technique, tool, technology, framework, methodology or approach used to support strategic management work in the non-stable business environment (Stenfors et al., 2007, Afonina and Chalupský, 2013; Golsorkhi et al., 2010; Vaara and Whittington, 2012).

What is the long-term position of the small and medium sized companies (SME) in that area of research interest? Gibb and Scott (1985) argued that as small business managers adopt a more formal planning process, they can most certainly influence the growth strategy for the enterprise and provide a framework for enhancing the existing size of the enterprise. Since most of strategic tools were developed for the sector of large companies, the raising question is how successful would be the transformation process of original method to the SME company use (Abosede, Obasan and Alese, 2016, Krasniqi and Kume, 2013). Problems of strategic tools implementation could be seen in term of area of business, the company size, the country and finally in motivation to start up (Lukeš et al., 2013). Those differences can be distinguished within literature comparison (Holmes and Ferrill, 2005; Jun et al., 2013; Popper, 2008; Phillips, 2013; Vishnevskiy and Egorova, 2015) in the table 1.

Table 1: SME and Large businesses difference in strategic management

Criteria	SME company (< 250 employees)	Large company (>250 employees)
Main motivation to use/prepare strategy	Finding a new investor Adaptation to changes in the business environment	Innovative strategy Risk analysis for decision-making Entry to the new market
Attributes of strategy	Description of current stage Transfer knowledge from other	Systematic, long term work New knowledge creation
Resources for strategy implementation	Limited by the company stage and the company size	A budget is closely connected with planned company changes
Tools, techniques	Tools for the environment observation Creative tools - Brainstorming, Brainwriting	Approx. combination of five to six tools, together with a trend analysis, own research, an expert estimation.
Main barriers	Most of time is spent by operative management Lack of the future anticipation	Company size and organizational structure, stability in managerial positions.

Source: author´s comparison based on literature review

As confirmed with the table 1 a use of strategic management, accompanied with appropriated tools and techniques is connected with personality of company owner, but there is little published data on that problem (Abosede, Obasan and Alese, 2016; Masurel and Smit, 2000; Ogbadu, Aduku and Nafiu, 2017). As explained earlier, the use of strategic management tools depends on expected results in comparison to costs. Despite this, little progress has been made in the work of Vishnevskiy and Egorova (2015) who divided strategic tools, used in SMEs according previously presented criteria. These authors presented four groups of tools, used by SMEs such as:

- **Low-cost**. These tools are easy to transfer to SME company to use, but result could be limited due to experience of the final user or data inputs, which were used for the analysis (e.g. SWOT, Interviews, reviews).
- **Highly informative**. In comparison to previous group, these tools bring deeper range of information at lower costs (e.g. Expert panels, Benchmarking, Scenarios).
- **Highly specialized**. These tools achieve mostly positive effect on using. Opposite to that, they are time and finance consuming. Specialized personnel are needed for data collection and final report preparation (e.g. Modelling, Extrapolation, Indicator setting).
- **Resource consuming**. These methods were originally designed for large companies, so implementation at SME level could be quite difficult (e.g. Surveys, Delphi…)

A problem could be examined on the two main layers. Which trends could be seen on the global level in SME companies? In contrast to that, which tends could be seen in the national point of view, especially in the Czechia?

Main goal of this paper is to classify the most used tools in the SME area in selected Czech region in comparison to global trends. A brief case study will be used to support it in detail. Those findings will identify main reasons, why SMEs do not use strategic management tools more actively.

2 Methods

In order to identify main groups of strategic tools use, both data sources (secondary and primary data) were used. Those data were sorted to global, national and regional level. All studies, describing behaviour of the large companies were excluded.

A case-study approach was chosen in the second part to obtain further in-depth information on the differences in strategic tools use in Moravian-Silesian region to be able to compare results on the global, national and regional level. The key task of the questionnaire based research is to ascertain the respondents' awareness of and attitudes towards the basic elements of cooperation between the region

– municipality and the entrepreneur and the definition of factors influencing small and medium-sized enterprises in the Moravian-Silesian (MS) Region. We used long term analyses – a quantitative research which was repeated three times in the same group of entrepreneurs. The evaluation period covers years 2007-2014. In each period researchers computed minimum of research sample, when the minimum was computed on 153 respondents); the sample was representative to the original structure of businesses in the region in years 2011, 2013, 2015. Researchers conducted several random checks for internal consistency in responses when Cronbach's Alpha was in whole sample 0.845. SPSS statistical package was used for data evaluation.

Finally, tools classification based on Vishnevskiy and Egorova (2015) was used. The benefit of this approach is that problem description and solution is compared with all level of existing data.

3 Paper results

Having reviewed empirical studies, asserted that research into strategic management efforts within SME's was still in its infancy. Those results could be summarised as follows:

Global level of strategy tools use. Rigby and Bilodeau (2015, 13,000 respondents) stated, that large companies use in average 8.1 tools, medium-sized 7.6 and small companies 5.3 tools. Long term observation showed that regional variation in tool use is significant. China and India used the highest average number of tools in 2014 (8.0) compared with North America (7.2), Europe (6.6) and Latin America (6.2).In terms of sectors, the industries with the highest tool use are transportation and tourism, manufacturing, and technology and telecommunications, when table 2 provides an overview of significant strategy tolls used in SMEs between years 2000-2014.

Table 2: Top 10 Strategic Tools in the global context 2000-2014

	2000	2006	2008	2010	2012	2014
1	Strategic Planning	Strategic Planning	Benchmarking	Benchmarking	Strategic Planning	CRM
2	Mission and Vision Statement	CRM	Strategic Planning	Strategic Planning	Supply Chain Management	Benchmarking
3	Benchmarking	Customer Segmentation	Mission and Vision Statement	Mission and Vision Statement	Employee Engagement Surveys	Employee Engagement Surveys
4	Outsourcing	Benchmarking	CRM	CRM	Benchmarking	Strategic Planning
5	Customer Satisfaction	Mission and Vision Statement	Outsourcing	Outsourcing	BSC	Outsourcing
6	Growth Strategies	Core Competencies	BSC	BSC	Core Competencies	BSC
7	Strategic Alliances	Outsourcing	Customer Segmentation	Change Management Programs	Outsourcing	Mission and Vision Statement
8	Pay-for-Performance	Business Process Reengineering	Business Process Reengineering	Core Competencies	Change Management	Supply Chain Management
9	Customer Segmentation	Scenario and Contingency Planning	Scenario and Contingency Planning	Strategic Alliances	Supply Chain Management	Change Management
10	Core Competencies	Knowledge Management	Mergers and Acquisitions	Customer Segmentation	Mission and Vision Statement	Customer Segmentation

Source: Rigby and Bilodeau (2015)

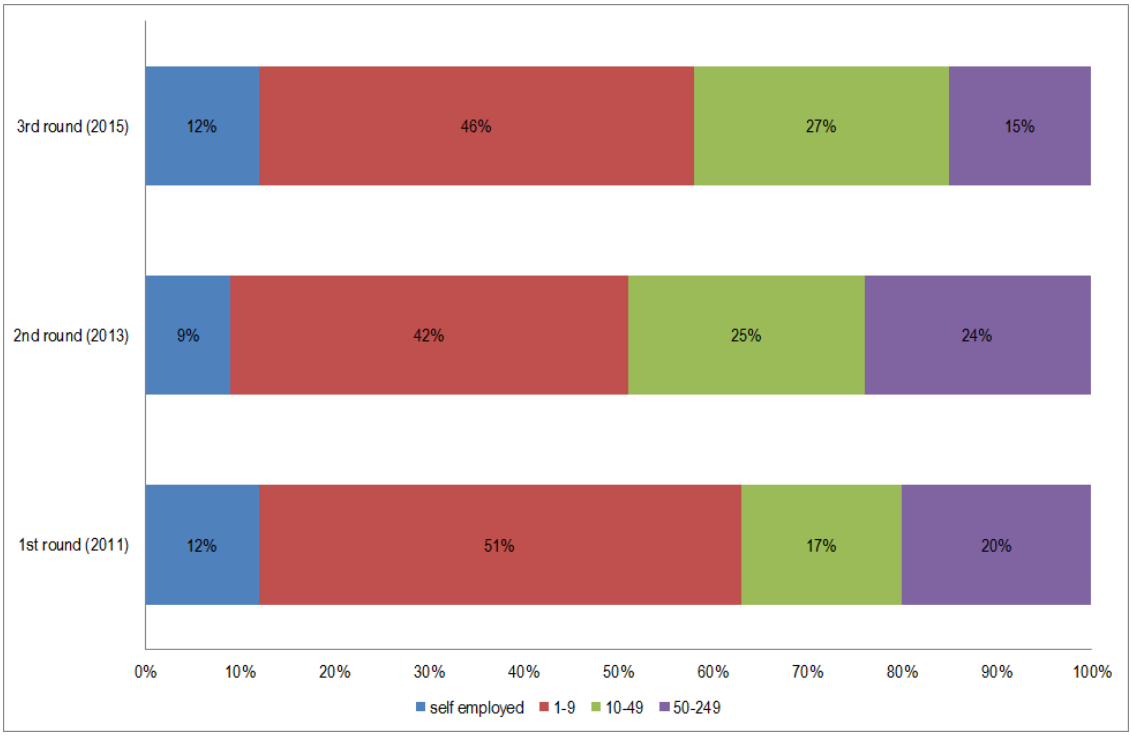
One interesting finding is, that Strategic planning as "whole package" of tools and procedures placed in the TOP 5 during whole observed period. Second popular method globally used was benchmarking. However, these results were not very encouraging in area of SMEs strategic tools use, when most of them depend on group of time and resource consuming tools (Vishnevskiy and Egorova, 2015).

On the other hand, in spite of these recent findings about the role of strategic tools in SMEs, **national studies** showed country differences. Kalkan and Bozkurt (2013) argued that small business owners in Turkey prefer traditional and well explained tools like SWOT analysis, strategic scenarios and financial planning. In the same way, Afonina and Chalupský (2013) supported those findings by their results in the Czechia, where SWOT, PEST and model of Five Porter forces are dominating in respondent's answers. In addition to that, they confirmed the same trend in Finland, Australia and Great Britain. Finally, Ogbadu, Aduku and Nafiu (2017) mentioned financially oriented tools and pro-innovative approach to strategy in Nigeria. Those findings confirmed use of low-cost tools in the sectors of SMEs. In addition to previous findings, it is important to ask if there is any difference **on regional level**. As a good example to that the Moravian-Silesian-Region was chosen to describe current situation.

3.1 Case study of Moravian – Silesian Region

The key task of the questionnaire based research is to ascertain the respondents' awareness of and attitudes towards the basic elements of cooperation between the region – municipality and the entrepreneur and the definition of factors influencing small and medium-sized enterprises in the Moravian-Silesian (MS) Region. We used long term analyses – a quantitative research which was repeated three times in the same group of entrepreneurs. The evaluation period covers years 2007-2014. In each period researchers computed minimum of research sample, when the minimum was computed on 153 respondents); the sample was representative to the original structure of businesses in the region in years 2011, 2013, 2015. Researchers conducted several random checks for internal consistency in responses when Cronbach's Alpha was in whole sample 0.845.

Figure 5: Data sample description



Source: own research.

The most interesting aspect of this research is, that the least important strategic planning is for self-employed persons (19.0 %), followed with small companies till nine employees (16.7 %). The most surprising aspect of the data is in the area of strategic planning. They use 1.41 of tool in average. When small businesses achieve the peak of its business cycle paradoxically stop to use planning and strategic tools (58.8 %). In the long term point of view TOP 5 methods in the regional level are:

- TQM (27.2 %),
- SWOT (21.7 %),
- EVA (11.5 %),
- Controlling (9.6 %),
- BSC (5.0 %).

This case study (table 3) confirms the importance of relationship between strategic management tools and motivation to start-up. The case study is based on research data from the year 2015, when it was possible to connect variables such as motivation, longevity of the strategy, parts of business plan and distinguish overall groups of strategic management tools and leadership styles.

Table 3: Motivation to start-up, Longevity of strategy and strategic tools and leadership styles

Motivation to start-up	Longevity of strategy (years)	Parts of strategic plan (used/prepared)	Leadership styles	Strategic tools
PULL MOTIVATION (based on business opportunity, 72.2 % of the sample)				
Be own boss (27.0%)	< 2 (43.4 %)	Finance (63.1 %)	Democratic (19.2 %)	N/A
Family tradition (9.0%)	2 (27.8 %)	Finance (23.1 %)	Directive (10.0 %)	Process management (12.7 %)
Self-realization (22.0%)	2-3 (70.0 %)	Finance (23.0 %) Development (17.5 %) Marketing (15.4 %)	N/A	Operative management (8.0 %)
Desire to try something new (14.2%)	1 (60.0 %)	Marketing (24.0 %) Development (23.1 %)	Common sense (15.2 %)	N/A
PUSH MOTIVATION (based on necessity; 27.8 % of the sample)				
Economic situation (12%)	2 (38.9 %)	Purchase (33.3 %) Finance (29.7 %)	N/A	Process management (17.4 %)
Situation on the labour market (4%)	3-5 (61.1 %)	Production (50.0 %) Development (30.0 %)	Directive (20.0 %)	N/A
Dissatisfaction in employment (11.8%)	3-5 (34.5 %)	Production (43.2 %) Finance (33.5 %) Development (23.9 %)	N/A	Production management (19.2 %)

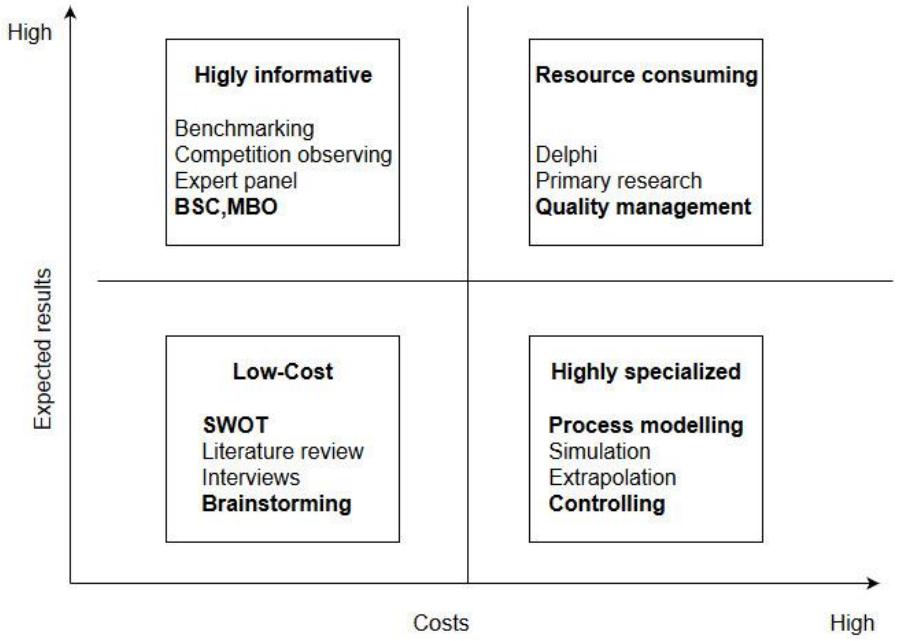
Source: own research, N/A – not available - respondents do not reported any information.

These findings, presented above, are rather disappointing. Business owners mostly led by push motivation use for strategy implementation their leadership skills more than some empirical tools for performance growth. Compared with pull motivated entrepreneurs, push motivated entrepreneurs are more dependent on evaluations, planning and managerial decisions; their strategy is more stable than others. This could be an important issue for future research – why start-up motivation is still so important during the business operation.

4 Discussion and Conclusion

This paper has identified significant differences in relationship between SMEs and strategic tools use on different country level. This does not mean that SMEs do not use any strategic management tools in long-time frame such as SWOT, benchmarking, PEST or Cost-benefit-analysis (Rigby and Bilodeau, 2015; Pasanen, 2011; Afonina and Chalupský, 2013; Gică a Balint, 2012; Nedelko, Potocan and Dabic, 2015; Afonina, 2015, figure 2). As shown in Figure 2, final comparison of strategic management tools was made according Vishnevskiy and Egorova (2015), where tools in highlighted bold were confirmed and added by author. Those tools were significant on regional level – level of the Moravian-Silesian region.

Figure 6: Classification of strategic management tools in long-term frame



source: comparison based on Holmes and Ferrill, 2005; Vishnevskiy and Egorova, 2015; own research

These results suggest that low-cost tools are still popular in the SMEs sector in contrast to the resource consuming tools, where only one tool has been identified. Although the current study is based on a small sample of participants, the findings suggest some reasons, why SMEs are motivated to use strategic management tools. The use of them could bring adaptive behaviour within planned strategy, when it is combined with clarifying of vision and mission of the company (Rigby and Bilodeau, 2015, Afonina and Chalupský, 2013, Pawliczek and Navrátilová, 2016). On the other hand, figure 2 confirmed, that SMEs do not prefer time and finance consuming methods due to unexpected results and unstable business conditions' would be motivated to try and use strategic management tools, when they would be updated for them and the result will be measurable by simple indicators.

5 Bibliography

[1] Abosede, A.J. ,Obasan, K. A and O. J. Alese, 2016. Strategic Management and Small and Medium Enterprises (SMEs) Development: A Review of Literature. *International Review of Management and Business Research,* 5(1), 315-335.

[2] Afonina, A. 2015. Strategic management tools and techniques and organizational performance: Findings from the Czech Republic. *Journal of Competitiveness*, 7(3),19 – 36.

[3] Afonina, A. and V. Chalupský, 2013. Investigation of strategic management tools and techniques. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61(4), 833 – 840.

[4] Alkan, A. and Ö. Ç. Bozkurt, 2013. The Choice and Use of Strategic Planning Tools and Techniques in Turkish SMEs According to Attitudes of Executives. *Procedia - Social and Behavioral Sciences,* 99, 1016-1025. DOI: 10.1016/j.sbspro.2013.10.575.

[5] Gibb, A. and M. Scott, 1985. Strategic Awareness, personal commitment and the process of planning in the small business. *Journal of Management Studies*, 22(6), 597 – 632.

[6] Gică, O.A. and Balint, C. I. 2012. Planning practices of SMEs in North-Western region of Romania – An empirical investigation. *Procedia Economics and Finance*, 3: 896 – 901.

[7] Golsorkhi, D., Rouleau, L., Seidl, D. and E. Vaara, 2010. *Cambridge handbook of strategy as practice.* Cambridge: Cambridge University Press.

[8] Holmes, H. and M. Ferriill, 2005. The application of operation and technology roadmapping to aid Singaporean SMEs identify and select emerging technologies, *Technological Forecasting and Social Change*, 72(3), 349–357.

[9] Jun, S.-P., Seo, J.H. and J.-K. Son, 2013. A study of the SME technology roadmapping program to strengthen R&D planning capability of Korean SMEs', *Technological Forecasting and Social Change*, 80(5), 1002–1014.

[10] Krasniqi, E., and A. Kume, 2013. Entrepreneurship and Strategic Management In Emerging Economies: Kosovo's Perspective. *Annales Universitatis Apulensis Series Oeconomica*, 15(1), 2013, 267-279

[11] Lukeš, M., Zouhar, J., Jakl, M. and P. Očko, 2013. Faktory ovlivňující vstup do podnikání: začínající podnikatelé v České republice. *Politická Ekonomie*, 2, 229-247.

[12] Masurel, E. and H. P. Smit, (2000). Planning Behavior of Small Firms in Central Vietnam. *Journal of Small Business Management*, 38(2), 88-94.

[13] Nedelko, Z., Potocan, V. and M. Dabić, 2015. Current and future use of management tools. *E+M Ekonomie a Management*, 18(1): 28 – 45.

[14] Ogbadu, E., D. Aduku and A. Nafiu, 2017. Small Firms' Strategy Adoption and Business Outcomes in Business Games: An Empirical Investigation from Nigeria. *Asian Journal of Economics, Business and Accounting*, 4(1), 1-13. DOI: 10.9734/AJEBA/2017/34233.

[15] Pasanen, M. 2011. *Strategic management tools and techniques in SMEs*. In: Conference on Interdisciplinary Business Research 2011. Society of Interdisciplinary Business Research, pp. 1-8.

[16] Pawliczek, A. and D. Navrátilová, 2016. Utilization of Modern Management Methods in Moravian Companies – Advanced Stage Research Results. 1st International Conference on Lifelong Learning and Leadership for All. Olomouc: ICLEL, pp. 336-343.

[17] Phillips, J., 2013. *Technology foresight for small- to medium-sized enterprises*. LAP Lambert Academic Publishing.

[18] Popper, R., 2008. *Foresight methodology. The Handbook of Technology Foresight*. Northhampton: Edward Elgar.

[19] Qehaja, A. B., Kutllovci, E. and J. S. Pula, 2017. Strategic Management Tools and Techniques: A Comparative Analysis of Empirical Studies. *Croatian Economic Survey* , 19 (1), 67-99.

[20] Rigby, D. and B. Bilodeau, 2015. *Management tools and trends 2015*. Bain & Company. [online] [cit. 2017-08-21] Available from http://www.bain.com/publications/articles/management-tools-and-trends-2015.aspx.

[21] Stenfors, S., Tanner, L., Syrjänen, M., Seppälä, T. and Haapalinna, I. 2007. Executive views concerning decision support tools. *European Journal of Operational Research*, 181(2): 929 – 938.

[22] Stonehouse, G. and J. Pemberton, 2002. Strategic planning in SMEs-some empirical findings. *Management Decision*, 40 (9), 853-861.

[23] Vaara, E. and R. Whittington, 2012. Strategy as practice: taking social practices seriously. *The Academy of Management Annals*, 6(1), 285 – 336.

[24] Vishnevskiy, K. and O. Egorova, 2015. Strategic Foresight for SMEs: Choice of the Most Relevant Methods. XXVI ISPIM Conference – Shaping the Frontiers of Innovation Management, Budapest, Hungary on 14-17 June 2015. p.54

THE DEVELOPMENT AND RELATIONS OF LABOUR PRODUCTIVITY IN V4 COUNTRIES

Eva, Jílková, eva.jilkova@mvso.cz
Veronika, Říhová, veronika.rihova@mvso.cz
Moravian University College Olomouc

Abstract:

The paper focuses on the comparison of labour productivity in Visegrad Four countries and briefly deals with a measurement of labour productivity in macroeconomic scale. The main goal of this paper is to compare the development of labour productivity in Visegrad Four countries and provide the critical information for prognosis values the time series for the future using timeline analysis. The growth of productivity in sectors that are part of the information and communication technology sector (for example in 2010 the fastest compared to other sectors) are the main causes its growth. The contribution uses Box-Plot, a tool that allows the set of values to identify outliers that, in classical data processing, distort the resulting statistical characteristics such as mean, scatter, and performance indices. This visual analysis of labour productivity shows the best positions for Slovakia. The reasons for this success are a better use of labour potential, a high degree of division of labour that increases its productivity.

Key words:

Labour productivity, V4 countries, Box-Plot, time series analysis, linear trend function

JEL: C10, C22, E24, O47

1 Introduction

Labour productivity at a company and national level are important for every company, whether large, medium or small. Labour productivity is measured by certain indicators and it is possible to influence its level by some factors.

Labour productivity is the important and monitored indicator.

Each business entity operating effectively is interested in increasing labour productivity, since labour productivity is one of the main indicators of company performance. This issue has been often mentioned in discussions on competitiveness of both local and foreign companies in the extended European market. In order to increase labour productivity, it is necessary to measure and monitor this indicator. Labour productivity is expressed as GDP per person employed.

2 Goals and methods

The main goal of this paper is to compare the development of labour productivity in Visegrad Four countries and provide the critical information for prognosis values the timeline for the future using timeline analysis.

Trend component is the most important component of the time series analysed, and therefore the trend description is one of the most important tasks of time series analysis. The Trend Component provides critical information for forecasting time series values for the future. We use two general approaches: analytical and synthetic to determine the trend component.

The analytical approach to trend determination is based on previously known types of trending functions characterized by the presence of parameters that need to be determined as best as possible

with respect to the actual values of the time series indicator. From a large number of trending functions, we will focus on a linear trend that is especially important in economic applications (Kočenda, Černý, 2015).

The most common method of estimating unknown trend function parameters is the least squares method (MNC). Here we apply this method to a special type of simple regression for data in the form of an economic time series, i.e., when the independent variable is time and the dependent variable is the monitored economic indicator (in our case, labour productivity).

The synthetic approach to trend determination is to offset the deviations of a given pointer in the time series (so-called equalization) so that the obtained equilibrium values express the trend factor contained only in the time series, not the factor input from the outside. Therefore, we do not need to know in advance the type of trending function, which is a synthetic approach to the analytical approach. Its disadvantage is, on the contrary, more difficult to use for predicting time series values.

The most commonly used trending function for an analytical approach is the linear trend function:

$$T_T = B_0 + B_1 \cdot t$$

where B_0, B_1 are unknown parameters and t = 1,2, ..., n is the time variable. Estimates of unknown parameters are obtained using the smallest squares method, which gives the best impartial estimates (Adamec, 2010). Therefore, it is necessary to solve 2 normal equations and to carry out time transformations. We get this solution of normal equations:

$$B_0 = \frac{\sum y_t}{n}, B_1 = \frac{\sum t' \cdot y_t}{\sum (t')^2}$$

Parameter B_0 is interpreted as the arithmetic mean of the time series values, parameter B_1 indicates how the increment of the value T_t corresponds to the unit increment of the variable t.

The expected quantity (in our case, labour productivity) in 2017, 2018 is calculated by assigning t', corresponding to the relevant year, to the specified trend equation.

A major problem of time series analysis is the problem of determining a particular type of trending function. The basis for deciding on the appropriate type of function should be substantive-economic criteria, i.e. the trend function should be chosen on the basis of a factual analysis of the examined economic phenomenon. During a factual analysis, it is usually possible to assess whether the function is increasing (or decreasing), with the growth trend above all the limits or a certain final value (asymptote).

The graphical representation of the time series will allow in rough lines to reveal the basic tendencies in the development of the analysed indicator. The risk of choice based on visual selection lies in its subjectivity. Different analysts can assess the situation differently and choose different types of trending features. The danger here arises from the fact that the shape of the graph is to a large extent dependent on the choice of the scale used.

We measure the adherence of the data to the trend curve with the R^2 determinant:

$$R^2 = \frac{St}{Sy}$$

Part of the overall variability explained by the regression model is characterized by the theoretical sum of squares of S_t.. Unexplained portion of total variability is the residual sum of squares S_r (Bockvell, Davis, 1993).

It can be shown that there is a basic relationship between squares:

$$S_y = S_t + S_r.$$

We can use the Determination Coefficient to compare the suitability of the trend even now. In principle, an assessment can be made in which the most appropriate trend model gives the highest value to the determinant coefficient.

2.1 Labour productivity and its measure

It is true that work is one of the most important input factors. The professional public perceives work productivity in a narrower and broader sense. The narrower concept of labour productivity is used in practice, which defines the extent of the work done in proportion to the output produced (total output divided by labour inputs) and is often identified with the concept of efficiency.

Labour productivity refers to the volume of output (output) per unit of labour consumed (number of employees or hours worked) over a certain period (year, month, day, hour) depending on the period in which we determine this productivity.

It is clear that labour productivity is increasing as a result of better technology and time savings, higher work skills and deepening of capital.

Basically, it is the productivity of the national economy and it is designed as the index in relation to the EU 28 average. If this index is higher than 100 for a particular country, it means that GDP per employed person in this country is higher than the EU average and vice versa. The basic data is presented in the Purchasing Power Standard (PPS) – a common currency which blurs the differences in price levels among countries, allowing the comparison of GDP among the particular countries. On this occasion, we do not distinguish whether the employed person is employed on a full time or part time basis.

Some authors (Fišer and Sixta, 2009) analyze the suitability of the individual labour input indicators and tend to use the number of hours worked compared to the number of people employed.

The productivity growth is demonstrated by a decreased amount of labour expended on producing one item of production or by an increased amount of produced production using the same amount of expended labour. The savings in labour and labour costs, which appear when the production increases, depend on many factors. These factors mainly include:

- Amount and quality of capital investment in labour (the availability and performance of cooperative production factors, technological production changes, and modern technologies)
- Quality of workforce (education, qualifications, flexibility, and motivation)
- Effectiveness of using economic resources and their mutual combinations (the division of labour and specialization)
- Overall economic conditions (business cycle phases, political and social factors)
- Quality of natural resources (the availability of mineral raw materials, technological development, and import)
- Institutional and legislative framework of the economy (the protection of private rights, the enforceability of law, corruption, etc.)

There are many factors that affect labour productivity. Above all, it is the job qualification, but also the productivity of other cooperative factors that the company is currently engaging in production. However, it is influenced by the company's management and technological methods, i.e. how the company can use knowledge capital and other factors of production.

The issue of labour productivity is also addressed in the scientific works of e.g. Dornbusch, Fischer (1990), Mankiew (1999), Jílek et al. (2001) and others.

The quantity of work or the number of hours worked depends on the real wage rate, i.e. the share of the wage rate and the price of the goods. It is expressed in measurable values - economic units. In terms of time series, fixed prices are used.

The easiest calculation of labour productivity, which shows how much a worker has earned per shift, month, quarter or year:

$$\text{Labour productivity} = \frac{\text{Output (outputs, turnover, value added)}}{\text{Number of employees (Hours worked)}}$$

3 Time series analysis

We used Eurostat data for countries of the Czech Republic, Slovakia, Poland and Hungary and assessed the nominal labour productivity figures in 2005-2016 (EUROSTAT, 2017). For the selected countries, the following calculated values are derived.

Czech Republic

The coefficients B_0 and B_1 of the linear trend of labour productivity in the Czech Republic are as follows:

$$B_0 = \frac{\sum y_t}{n} = \frac{547,1}{7} = \underline{\mathbf{78,2}}$$

$$B_1 = \frac{\sum t' \cdot y_t}{\sum (t')^2} = \underline{\mathbf{0,68}}$$

Based on the calculated coefficients, a prediction can be determined for the next two years (2017, 2018). We will arrive at specific predictive values through the trend component equation.

$$\boldsymbol{T} = B_0 + B_1 \cdot t$$

$$T_{2017} = 78,2 + 0,68 \cdot 4 = \underline{\mathbf{80,92}}$$
$$T_{2018} = 78,2 + 0,68 \cdot 5 = \underline{\mathbf{81,60}}$$

The determination factor in this case is as follows:

$$R^2 = \frac{St}{Sy} = \frac{12,94}{18,19} = 0,71 \rightarrow \underline{\mathbf{71\ \%}}$$

Which means that 71 % of total variability has been explained, 29 % neglected.

Slovakia

The coefficients B_0 and B_1 of the Slovak labour productivity linear trend are as follows:

$$B_0 = \frac{\sum \boldsymbol{y_t}}{\boldsymbol{n}} = \frac{580,7}{7} = \underline{\mathbf{82,9}}$$
$$B_1 = \frac{\sum t' \cdot y_t}{\sum (t')^2} = \frac{-0,4}{28} = \underline{\mathbf{-0,014}}$$

Based on the calculated coefficients, a prediction can be determined for the next two years (2017, 2018). We will arrive at specific predictive values through the trend component equation.

$$T_{2017} = 82,9 + (-0,014) \cdot 4 = \underline{\mathbf{82,84}}$$
$$T_{2018} = 82,9 + (-0,014) \cdot 5 = \underline{\mathbf{82,83}}$$

The determination factor in this case is 72 %, which means that 72 %% of total variability has been explained, 28 % neglected.

Poland

The coefficients B_0 and B_1 of the Poland labour productivity linear trend are as follows:

$$B_0 = \frac{\sum y_t}{n} = \frac{514,4}{7} = \underline{\mathbf{73,50}}$$
$$B_1 = \frac{\sum t' \cdot y_t}{\sum (t')^2} = \frac{18}{28} = \underline{\mathbf{0,64}}$$

Based on the calculated coefficients, a prediction can be determined for the next two years (2017, 2018). We will arrive at specific predictive values through the trend component equation

$$T_{2017} = 73,5 + 0,64 \cdot 4 = \underline{\mathbf{76,06}}$$
$$T_{2018} = 73,5 + 0,64 \cdot 5 = \underline{\mathbf{76,70}}$$

In case of Poland, 73 % of total variability has been explained, 27 % neglected.

Hungary

The coefficients B_0 and B_1 of the linear trend of labour productivity in Hungary are as follows:

$$B_0 = \frac{\sum y_t}{n} = \frac{501,4}{7} = \underline{71,6}$$

$$B_1 = \frac{\sum t' \cdot y_t}{\sum (t')^2} = \frac{-22}{28} = \underline{-0,79}$$

Also in Hungary, based on the calculated coefficients, a prediction can be determined for the next two years (2017, 2018). We will arrive at specific predictive values through the trend component equation.

$$T_{2017} = 71,6 + (-0,79) \cdot 4 = \underline{\mathbf{68,44}}$$

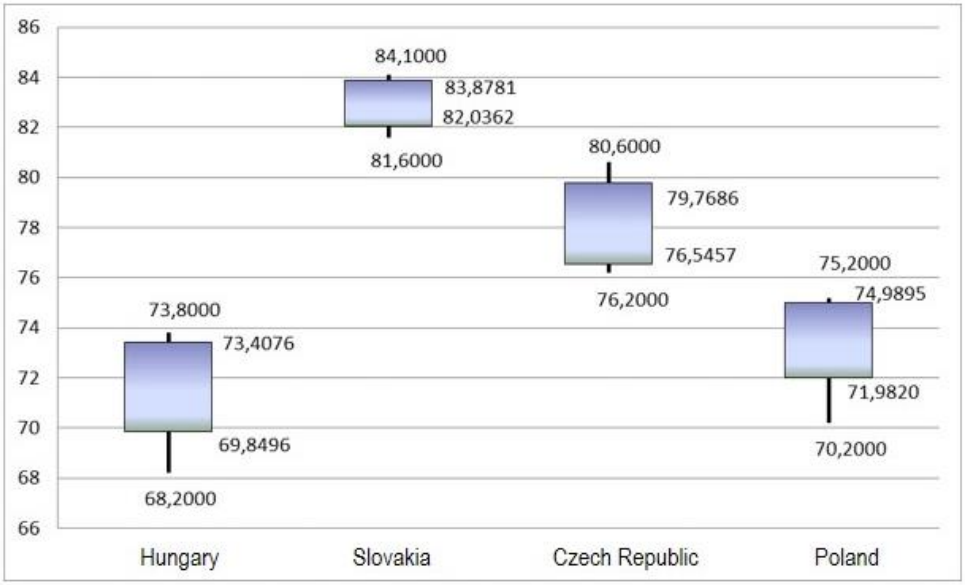
$$T_{2018} = 71,6 + (-0,79) \cdot 5 = \underline{\mathbf{67,65}}$$

The determination factor in this case is 79 %, which means that 79 %% of total variability has been explained, 21 % neglected.

4 Labour productivity visualization by Box Plot

Box Plot is a tool that allows the value set to identify outliers that, in classical data processing, distort the resulting statistical characteristics such as average, scatter, and performance indices. From the Box Plot, you can quickly detect any skewness in the shape of the distribution and see whether there are any outliers in the data set (Mendenhall, Beaver, Beaver, 2009). Not always remote values are due to process instability or low "capability". Sometimes, for the "emergence" of these outlying values, there are objective technical and technological reasons. Box Plot is a quick way to examine one or more sets of data graphically. In our case, we can compare the labour productivity values for the countries tested.

Figure 7: Labour productivity using a Box Plot



It is clear from the graph in the fig. 1 that in the case of Slovakia the box graph is significantly higher than other V4 countries, especially Hungary and Poland. This may be due to increased use of information and communication technologies, the higher involvement of more and more effective cooperation of other factors of production, or is the influence of education.

5 Discussion and Conclusion

For the prediction of labour productivity values, no doubt, other mathematical models, which are dealt with by time series theory, can also be chosen. Based on a graphical view, we have chosen a linear model that suits our conditions according to the results.

Labour productivity is judged separately from other sources in the economy. It is clear, however, that in the aggregate factor productivity, in addition to labour, capital plays an important role, also soil.

The development of labour productivity in the Czech Republic has been driven by the development of labour productivity since 1995, mainly in the manufacturing, wholesale, retailing, repair and maintenance of motor vehicles, information and communication activities, and financial and insurance (TREXIMA, 2016).

The relatively favourable rate of labour productivity growth in the Czech Republic has not been able to sustain almost any sector. In the 1990s, the Czech economy had a certain potential, which has exhausted or insufficiently exploited over the years. Nevertheless, the Czech economy developed quite well in comparison with other countries, but in recent years the structural shortcomings of the labour market have been deepened, with which it has not yet fully balanced, as shown by the international comparison.

As the results of the correlation analysis (Jílková, Říhová, 2017) speak, the Czech Republic and Slovakia are likely to make better use of new modern technologies to increase the value of labour productivity.

The visual analysis of labour productivity in this paper shows the best positions for Slovakia. The reason for this success is better use of work potential, a high degree of job division that increases productivity.

An industry that produces significant effects for all sectors of the national economy, especially for services that are directly related to it, is very important. The labour productivity in industry is growing much faster than in services, which results in lower costs and lower relative prices of industrial products compared to service prices and thus the optical share of industry is decreasing. But the importance of the industry is that it has always been and is the engine of innovation.

In addition, labour productivity is related to many other factors that may hamper its positive development (Samuelson, 2010), such as oil price developments, price and wage regulation, energy industry regulation, and decrease in research and development spending.

A good technological base and its positive change, external savings, economies of scale, increased investment, etc., on the contrary, cause positive changes in productivity rates. Its growth is almost always followed by the use of modern information technologies and innovation in these technologies (software, hardware and telecommunications.

Although the Czech Republic is showing productivity growth, the Czech Republic and other V4 countries are lagging behind advanced EU countries. What is alarming, however, is that the Czech economy has begun to catch up in recent years with countries that were considered European economic outsiders in the 1990s. E.g. in the case of Romania (formerly the Czech Republic had a triple lead). In a situation where the Czech Republic has outstripped Slovakia in terms of the level of labour productivity, or it is significantly catching up with Poland and Hungary, the position of the Czech Republic changes fundamentally. The Czech Republic is losing its position in the Central European region and it is a question of whether it will maintain its current position at least (TREXIMA, 2016).

Increasing labour productivity and overall economic performance can be achieved in two ways:

1) appropriate setting of conditions at the central level,

2) increasing the efficiency of the functioning of individual economic entities.

It follows that the economic policy of the state and its corresponding system of changes and support tools are of importance, besides the conscious approach of the employers.

Czech productivity is only 71 percent of the Union average because domestic companies are relatively low on the "production scale". This means that they produce mainly parts, while final products are produced somewhere else.

6 Bibliography

[1] ADAMEC, V. *Applied statistics*. Brno, Mendelova univerzita, 2010. ISBN 978-80-7375-455-6.

[2] BROCKWELL, P. J. a R. A. DAVIS. Time series: theory and methods. 2nd ed. New York: Springer-Verlag, 1993. Springer Series in Statistics

[3] DORNBUSCH, R., FISHER, S. *Macroeconomics*. 5. ed., 2. [Dr.]. New York: McGraw Hill, 1990. ISBN 0071006966.

[4] EUROSTAT. Národní účty a HDP. 2017 (online) http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_and_GDP/cs#Produktivita_pr.C3.A1ce

[5] FISHER, J., VLTAVSKÁ, K., DOUCEK, P. Vliv informačních a komunikačních technologií na produktivitu práce a souhrnnou produktivitu faktorů v České republice. *Politická ekonomie*, 2013, No. 5, s. 653-674. Dostupné z: file:///C:/Users/uzivatel/Downloads/922.pdf

[6] FISCHER, J.; SIXTA, J. K propočtu souhrnné produktivity faktorů. *Politická ekonomie*, 2009, Vol. 57, No. 5, s. 544–554.

[7] JÍLEK, J. *Nástin sociálněhospodářské statistiky*. Praha: Vysoká škola ekonomická, 2001. ISBN 80-245-0214-3.

[8] JÍLKOVÁ, E., ŘÍHOVÁ, V. Regression and Correlation Analysis of Labour and Resource Productivity Indicators Compared within the V4 countries. *Zeszyty Naukowe*. 2017, after reviews, in press

[9] KOČENDA, E., ČERNÝ, A. *Elements of time series econometrics: an applied approach.* Third edition. Prague: Charles University in Prague, Karolinum Press, 2015. ISBN 978-80-246-3199-8.

[10] MANKIW, N. G. *Zásady ekonomie*. Praha: Grada, 1999. Profesionál. ISBN 80-7169-891-1.

[11] MENDENHALL, W., R. J. BEAVER a B.M. BEAVER. *Introduction to probability and statistics.* 13th ed. /. Belmont, CA: Brooks/Cole, Cengage Learning, c2009. ISBN isbn978-0-495-38953-8.

[12] SAMUELSON, P, A. a W.D. NORDHAUS. *Economics*. 19th ed., International ed. Boston: McGraw-Hill/Irwin, 2010. ISBN 9780071263832.

[13] SCHILLER, BRADLEY R. *The macro economy today*. 8th ed. Boston: Irwin McGraw-Hill, c2000. ISBN 0-07-366277-1.

[14] TREXIMA, s.r.o. Svaz průmyslu a dopravy České republiky. *Analýza úrovně mezd*. 2016 (online) http://www.spcr.cz/images/stories/Projekty/NORD_Analyza_urovne_mezd.pdf

THE FLOW PROCESSES OF THE CULTURAL INDUSTRIES - INTEGRATED INDICATORS

Malshina Nataliya Anatolyevna
Research Institute of goods circulation and wholesale market conjuncture
(ITKOR Institute)
E-mail: malsnataliya@yandex.ru
Bryntsev Alexander Nikolaevich
Research Institute of goods circulation and wholesale market conjuncture
(ITKOR Institute)
E-mail: btcentr@mail.ru

Abstract:

The notion of "integrated service center" is considered by the author who has analyzed of existing domestic and foreign views on the definition and evaluation of the cluster approach to the regional culture services in Russia, its advantages and disadvantages. Identified innovative component of service logistics in the culture industry represents a service flow as the integrator. A proposed method makes it possible to quickly response to changes in the environment and get integrated into the economy of a particular region of the Russian Federation, to apply the logistic method in management. Method of research include the use of logistics principles to services culture. Proposed in the paper method allows to reduce the budget expenses for culture, to control the ratio and quality of free and paid services to make a profit and implement internal reserves of enterprises in the cultural industry

Key words:

Integrated service center, the mechanism of public-private partnerships in the cultural industries, the cultural cluster of the region, support services cultural

JEL: H00, H41, Z00, Z1

1 Introduction: The culture industry as a sector of the economy

When you define the culture industry initially focused attention on the inherent of its components - production and distribution of services of culture, namely, symbols and texts that influence our perception and understanding of the world. However, the culture industry is a complex business structure, which is interested in making a profit through the production and distribution of symbols and texts [1].
The culture industry as a sector of the economy, of course, is considering providing only paid services and profit-oriented. Paid services provided to population of the Russian Federation represent a useful production results that meet for a fee certain citizens ' needs, but not embodied in financially-material form. They are the object of sale and are sold at prices that entirely or largely covering the costs of the manufacturer (by sales revenue) and providing him a profit.

2 Methods: Innovative component of service logistics in the culture industry

The use of logistic modeling methods in this study has long been used in economic analysis and has traditionally proven positive. The methodology of logistics involves the optimization of flow processes operating in the cultural industry. The methodology of logistics modeling includes the study of logistics systems and processes by constructing and studying their models, where the logistics model is

considered as any image, abstract or material, logistics process or logistics system used as their Deputy, with the main goal - to predict the behavior of the system, in this case, the system of services of the cultural industry.

The study determines the basis of the methodology for the formation of functional and providing complexes of the logistics system of services of the cultural industry. It is possible to develop the methodology of creating functional and providing complexes of logistic system of services of the cultural industry by applying logistic support of the cultural industry. Integrated logistic support ILP (ILP — Integrated Logistic support) is defined as a set of management technologies, which is a continuous process of engineering improvement of the product, providing its support while reducing costs in the process of providing and after-sales service.

Achievement of the set goals in the system of integrated logistic support is possible with the help of Continuous Acquisition and Life cycle Support — continuous information support of deliveries and product/service life cycle. Modern approach to the design and production of high-tech and high-tech products, which consists in the use of computer technology and modern information technology at all stages of the life cycle; providing uniform ways of process control and interaction of all participants in this series: products customers, suppliers/producers, operating and maintenance personnel; implemented in accordance with the requirements of international standards governing the rules for the interaction primarily through electronic data interchange.

In the 1990s in European countries, the economic effect of the functioning of the sphere of culture was directly used to create the investment attractiveness of the regions of crisis, creating jobs. However, the General trend of the total paid services of the Russian Federation in 2017, shows a negative value for the volume, and the index with the exception of the seasonal factor varies at approximately the same level in 2016 [2]. The practices to improve the competitive advantages of the regions lay in the creative industry [3, 4, 5] that can provide 5-15% growth of gross regional product (GRP).

Innovative component of service logistics in the culture industry represents a service flow as the integrator. Related material flow and Finance, information and service flows. Service flows - service flows (intangible activities, a special kind of production or product) generated by the logistic system or its subsystem (element, element) to meet external or internal consumers of business organization.

To form a model for hierarchical logistics system services the culture industry is possible on the basis of the many subsystems of logistics services. Each set of subsets at a lower level is set for the following subsets. This model is a hierarchical logistic services of cultural industries are most effectively implemented in integrated service complexes, demonstrating the relationship between all parties to the delivery of services culture and the possibility of end-to-end system management previously dispersed flow processes, ensure interaction flows between a, and the optimization of the management of each flow with impact on characteristics such as direction, volume, flow rate, etc.

The algorithm for managing a service flow of cultural industries is implemented in the integration process and consists of two main levels: strategic and technological (operational).

A single object the management of paid and free services of culture in integrated service complexes on the basis of state-private partnership allows to reduce budget expenditures for the services of culture, to control the ratio and quality of free and paid services culture, enhance the profitability of cultural industries. The combination of the two approaches – traditionally innovative the logistics and service logistics, will achieve a comprehensive picture of the logistics system of service and service culture, enhance the synergistic functioning of the system as a whole and the profitability of each element of the system in particular, as well as increasing the quality of provided services.

3 Paper results.

The embodiment of this model possible with the development and application of organizational-economic mechanism (OEM) support of cultural industries (ICA). Studies the principles of formation and implementation of OEM support service system IR is able to provide industry development services in General, will improve the effectiveness of the system of socio-cultural services to the lagging regions. Identified above, the specificity of cultural industries and its high competitiveness reaffirms the need for creating integrated service systems (Integs) [6]. Integs may be considered in the form of Autonomous organizations involved in the stakeholder network consisting of agents, requirements, mechanisms, and rules of activities. Then the actions of the state (municipal) institutions of culture, focused on the interests of different stakeholder groups that contribute to profit maximization in accordance with the priorities of social policy that demonstrates the coincidence of interests of the services sector of culture and the state. In this case, Integs as multi-actor, multi-purpose system, transformerait individual goals of stakeholders in a single direction, making a profit. Integrated service complexes of cultural industries can implement the functions of the social responsibility of business, the culture industry to the society and making a profit.

The formation of integrated service centres is based on compliance with a range of business interests, financial and information structures, service providers, consumers, regional and local state governing bodies and other stakeholders. Search localized partners and end consumers in the culture industry is the fundamental task of creating integrated service systems. Financial interests lie in the search of organizational structures providing uninterrupted supply, production and provision of services subject to the cost reduction of flow processes. The implementation of these interests is in providing joints of different types of flow processes within integrated service systems. The quantity and quality of services of culture should match the needs of the market.

3.1 Integral flow industry culture.

On the stage of direct services culture in integrated service centers, involving the time of the meeting of the consumer and of the producer, the interaction integral thread in the form of completed services and the consumer. The number of combinations between elements of the integrated flux can be found by the formula.

$$C=n(n-1),$$

where n is the number of elements in the system.

The totality of the relationship of the elements taking into account external and internal to the system elements to order more of their number.

The characteristics of the surrounding system elements of the environment and elements of its internal environment (service flow) can be represented in the form of the distribution function of entropy:

$$S=f\ln f,$$

where f is the number of degrees of freedom.

Entropy for socio-economic systems can be found by the formula A. Lyapunov. Under some very General conditions that the amount of socio-economic phenomena has a distribution close to normal, although each of the components may not be subject to the normal law of probability distribution.

So $\xi_1, \xi_2, \dots, \xi_n, \dots$ a sequence of pairwise independent random variables with mathematical expectation $M(\xi_i) = a_i$ and variances $D(\xi_i) = \sigma_i^2$, have the following two properties:

1) There is a number L that for any i we have the inequality $|\xi_i - M(\xi_i)| < L$, t, i.e. all values of random variables are said uniformly bounded, relative to the mathematical expectations;

2) the Sum $\sum_{i=1}^{n} \sigma_i^2$ grows infinitely as $n \to \infty$.

Then for suciently large *n*, the sum $\xi = \xi_1 + \xi_2 + \cdots + \xi_n$ has a distribution close to normal. Let a_i and σ^2 is the mathematical expectation and variance of a random variable ξ=ξ_1+ξ_2+⋯+ξ_n.
Then

$$\alpha = M(\xi) = M(\xi_1 + \xi_2 + \cdots + \xi_n) = M(\xi_1) + M(\xi_2) + \ldots + M(\xi_n) = \sum_{i=1}^{n} a_i,$$

$$\sigma^2 = D(\xi_1 + \xi_2 + \cdots + \xi_n) = D(\xi_1) + D(\xi_2) + \cdots + D(\xi_n) = \sum_{i=1}^{n} \sigma_i^2,$$

As the consequence of the Lyapunov theorem, the random variable ξ for large values of n, has a distribution close to normal, that is the ratio

$$P(X_i < \xi_1 + \xi_2 + \cdots + \xi_n < X_2) \approx \Phi\left(\frac{X_2 - a}{\sigma}\right) - \Phi\left(\frac{X_i - a}{\sigma}\right),$$

where f(x) - integral of probabilities.

That is, if a random variable X is the sum of a very large number of mutually independent random variables for which condition is satisfied:

$$\lim_{n \to \infty} \frac{\sum_{k-1}^{n} b_k}{\left(\sum_{k-1}^{n} D_k\right)^{\frac{3}{2}}},$$

where

- b_k is the third absolute Central moment of the values of $X_к$;
- D_k is its variance, then X has a distribution close to normal.

Then the Lyapunov condition means that the effect of each term in the sum is negligible [7].
Dynamics of entropy in time is determined, is widely known from statistical mechanics the Liouville equation. The Liouville equation describes the evolution of $p\ (p_i, q_i; t)$ in time *t* according to the rule of finding the complete integral of the function subject to the incompressibility of the flow in phase space:

$$i = 1, \ldots, d, \ \frac{dp}{dt} = \frac{\delta p}{\delta t} + \sum_{i=1}^{d} \left(\frac{\delta p}{\delta} \frac{dq_i}{dt} + \frac{\delta p}{\delta p_i} \frac{dp_i}{dt}\right) = 0,$$

where *i=1,...,d, d=3N*, the system with q_i coordinates and conjugate momenta .

Then the distribution in phase space $p\ (p_i, q_i)$ determines the probability $p\ (p_i, q_i)\ d^d q d^d p$ that the system will be in the volume element $d^d q d^d p$ of its phase space.
The concept of entropy is associated with optimal usage of available resources as their organization and functioning increases the efficiency of the entire system. Optimality is the degree of use of system resources, i.e., the ratio of resources to be consumed to resources actually consumed.
This model will allow to deliberately construct a mechanism for the development of the service industry culture, which is based on organizational, behavioral and technical relationships, and to develop public policies for the realization of the form of logistical support of cultural industries in a modern economy, promoting the competitiveness of each organization.

3.2 Public interest in the establishment of integrated service centres

Public interest in the establishment of integrated service centres is to provide a legal framework for the creation and use of integrated service centres, standardization and licensing services, as well as provide essential resources in the consumer sector. The interest of Russian constituent entities in creating Integs is waiting for income from the operation and placement of integrated service centres, increase of employment and standard of living of the local population, improving the ecological environment.

The main functional goal of integrated service centres should be the optimization of business processes through contracts, including all transactions for the creation and provision of services to the end user with operational control at any stage. Achieving this goal is possible on the basis of information interaction between all participants of business processes.

As a result, components of the process of service provision culture in an integrated service complex includes:

1. Internal logistics: data collection, service, customer and staff, etc.;
2. Marketing: promoting and selling products, related products, advertising, information provision, preparation of proposals, etc.;
3. External logistics: order processing, shipping tools and personnel reporting;
4. Providing services: direct contact of consumer and producer services as a result of the implementation of a service culture;
5. Post-implementation services: customer support, feedback from consumers, regulation complaints, repairs etc.

Based on the potential specific subject support and selected support: infrastructure development; governance processes; social capital; innovation climate; information security; supply (tools, advertising and area, etc.). these types of support can be implemented by both state and non-state organizations and enterprises of different sectors of the economy.

Linking from one side the stages of the process of providing services and culture support matrix may support the provision of culture (Table 1) showing the relationship between the measures support services culture and process of the service industry culture.

Table 1: Matrix organization and support services culture

Support institutions	***Support measures***				
	Internal logistics	***Marketing***	***External logistics***	***Services***	***Post-implementation services***
Government organizations	Development programmes of line ministries	Media	Development programmes of line ministries	Public-private partnerships, government programs	State development institutions
Commercial organizations	Private grants, venture funds, investment	Private firms, banks	Private grants, venture capital funds,	Corporate and commercial-entertainment centres, Ford direct investment	Private grants, venture capital funds
Non-profit organizations, public sector	Grants sponsors, trade unions	Public organizations, trade unions	sponsors	Professional associations and unions	Public organizations, trade unions, , sponsors

Depending on the specifics of the sectoral system of a specific subject, the structure of the matrix may vary.

In this sense, services of cultural industries are an innovative product and there is a qualitative correlation between the provision of services, income and lifecycle services culture and support services of the cultural industries.

Currently, there is a need for new forms of interaction between governmental structures, public organizations, non-profit organizations and the business community. These support measures could lead to the creation of conditions for attracting investments, increase of competitiveness of services of culture,

of efficiency of functioning of the culture industry, modernization of infrastructure of the Russian Federation, improving the quality of services culture.

3.3 Increase of efficiency of functioning of the culture industry.

The initial stage of increase of efficiency of functioning of the IR sector of the economy is the indicators of calculating the potential in terms of value. The system of indicators for calculating the potential of cultural industries in terms of value, you must take into account the socio-economic development of the country, the means of achieving them and the results obtained, as well as economic and social effects.

Traditionally, the main estimate of potential is the economic potential. According to the statistical data, it is possible to calculate the economic potential of cultural industries in terms of value. To determine the importance of each indicator in the final indicator in the first approximation, it is possible, assessing their average values. The more the average value of a particular factor, calculated by the number of units of observation, the greater their number the value of this indicator is significant and makes a substantial contribution to the final result.

If in the economic sphere, the criterion of efficiency are the indicators of economic efficiency – the ratio of costs and profit in the cultural sector, this scheme of assessment is applicable only in part.

Recognizing the value of creative industries, cultural industries and the need to transform the external environment of public spaces, we must not forget their boundary status at the intersection of Economics and culture.

The calculation of the economic potential of cultural industries, in our view, it is possible to produce by means of 4 indicators:

1. indicator of the economic potential of cultural institutions

$$F = (T \times Q) / R,$$

where

- R is the resource capacity of the organization, determined by the volume of budget financing of cultural institutions or involved investment (billion c. u.);
- T is the total volume of services provided to users of cultural institutions (mldr. c. u.);
- Q – the cash equivalent units of free time of an individual which he can aim at improving their cultural level (budget allocated for the financing of organizations and cultural institutions (billion c. u.).

expressed in terms of value as

$$F=(99\times1,0)/4488=0,02 \text{ (billion c. u.)},$$

2.indicator family consumption

$$RS = (V-C_c)/K_c,$$

where

- P_c is the amount of total family consumption (thousand c. u.);
- V is the total family income (in c. u. thousand);
- C_c – total family savings (in c. u. thousand);
- K_c – number of family members expressed in terms of value as

$$RS = (22,9-5,725)/3,6=4,77\text{(thousand c. u.)},$$

3. indicator family savings

$$SS = (V-P_c)/K_c,$$

where

- C_c is the total family savings (thousand rubles);
- P_c – the amount of total family consumption (c. u. thousand),;
- V is the total family income(thous.)

expressed in terms of value as

SS = (22,9-12,6)/3,6=2,8 (thousand c. u.),

4.an indicator of the economic status of the family

〖Es〗 s=(V+ 〖KV〗 _c)/K_c,

where

- 〖ES〗 _c – economic status of the family;
- V is the total family income (in thousand c. u.);
- 〖KV〗 _c, the total investment of the family (thousand c. u.);
- K_c – number of family members

expressed in terms of value as

〖Es〗 s=(22,9 +1,245)/3,6=6,7 (thousand c. u.),

For logistical resources are added, and often dominated by socio-cultural resources. Not material resources the range of services of culture are expressed in qualitative terms – creativity, spiritual and intellectual costs of the Creator when creating works of art that form the Museum, music collection etc.

For the solution of management problems of the cultural industries are the criteria expressed in quantitative terms, it is quite amenable to calculation.

Also possible to calculate quantitative indicators of the existing social potential of cultural industries by using 5 indicators:

1.the indicator of the standard of living of the family;

〖REALLY〗 s= 〖US〗 t+ 〖US〗 b+ 〖US〗 d,

where

- 〖REALLY〗 s – cost-of-living family (costs c. u./ month);
- 〖US〗 d cost of leisure time (costs, c. u. / month),
- 〖US〗 t – labor costs(expenses, c. u./ month),
- 〖US〗 b cost of living(costs c. u./ month)

expressed in terms of value as

〖REALLY〗 s=877,2+2615,6+6059=9551,9 (rubles / month),

2.consumption of additional socio-cultural services

R(du) = R(C) - Ron,

where

- P_c is the amount of total family consumption (c. u. thousand);
- R(du) is the consumption of additional social services (thousand c. u.);
- Ron – consumption of basic social services (thousand c. u.)

expressed in terms of value as

R(du) = 12637,3 – 4426,4 = 8210,9 (thousand c. u.),

3. indicator employment rate/amount of free time

〖Zan〗 _(total) = TS/Team ×100%,

where

- 〖Zan〗 _(total) – employment rate,;
- TS – the number of employed people at t-th date (thousands of persons);
- Team – the number of economically active population at t-th date (thousands of persons)

expressed in terms of value as

〖Zan〗 OBS=67969 / (75675) × 100= 8,9%,

4. the indicator of mortality

〖CM〗 _(total)= Y/S ×100%,

where

- 〖CM〗 (total) – mortality, – number of deaths (million people);
- S - mid-year population (million people).

expressed in terms of value as

〖CM〗_(total) =1,898/143,3 ×100= 1,3%,

5. the indicator of fertility

R(total)= R/S ×100%,

where

- R(total) – overall birth rate;
- R – the number of births (thousand persons);
- S - mid-year population (million people).

expressed in terms of value as

Robs=1,896/143,3 ×100=1,3%,

Recall that the evaluation can only be "institutional" and "materialized" potentials. "Internalized" cultural potential is not quantifiable, and is expressed in qualitative terms. In the study, quality refers to the degree of usefulness of use-value services, i.e. the degree of compliance with the requirements, suitability to meet the need for specific economic conditions.

4 Discussion

Calculating the capacity of functioning of cultural institutions or cultural potential in terms of value, in our opinion, it is possible to produce 5 indicators:

1. the indicator of provision of cultural services

〖Prdc〗u= 〖PDA〗u/Cs ,

where

- 〖Prdc〗u – share provided by cultural services;
- 〖PDA〗u – total cost (rubles per month);
- K_c – expenditure on cultural activities (c. u. per month)

expressed in terms of value as

〖Prdc〗u=12637,3/877,2=14,4,

2. the indicator of consumption of cultural services family

〖CPC〗s=(〖PK〗s)/Cs,

where

- 〖CPC〗_c, the level of consumption of cultural values of family;
- 〖PK〗s – the cost of visits to cultural institutions (c. u. per month);
- K_c is the average number of family members (person)

expressed in terms of value as

〖CPC〗s=877,2/3,6=243,6,

3.the indicator of the educational level of family members

〖UO〗s= 〖CD〗s/Cs

Where

- 〖UO〗s – the level of family formation;
- 〖CD〗s – expenditure on education (c. u. per month);
- K_c – number of family members (person)

expressed in terms of value as

〖UO〗s=159,7/3,6=44,36,

4.indicator update services

〖The DEA〗u= 〖CT〗_(y)/ 〖NV〗u ,

where

- 〖DEA〗u – upgrade level of services;
- 〖CT〗_(I) – the volume of paid services (million c. u.);
- 〖NV〗u - the volume of innovative services (mln. c. u.).

The calculation of the potential of cultural industries in terms of value the basis for the development of organizational mechanism and gives the possibility to calculate the effect of the implementation of the program of support of cultural industries defined at the end of the program. In this case, considered the effect of supporting the cultural industry on the quality of life (level of consumption of material, cultural and social benefits that are evaluated mainly by gross domestic product per capita and level of social stability), on the competitiveness of the state.

In addition to organizing and supporting the production process of services of logistics business process will ensure a high level of synchronization of the stages of the design and delivery of services. Optimization of logistic business-processes allows to obtain a synergistic effect on these stages and on the stages of controlling the quality of services.

On the basis of the conducted analysis it is possible to argue on necessity of development of methodology of logistical spheres of socio-cultural service and service culture by adapting this concept to the customer-specific subject of the Russian Federation. Methodological principles allow to realize the resource potential of the sector socially-cultural service and increase the efficiency of its use, the quality of public services social and cultural services and the end result is to ensure the competitiveness of enterprises in the sphere of socio-cultural services.

Accordingly, by applying the concept of logistics as a system of views on improving the efficiency of economic activities through the improvement of flow processes, to financial flows in the sector can be increased the efficiency of the entire logistics system of the service as a whole. The integral effect can be expressed by the following formula [8]:

$$W_{i=1}^{n}(C) = \sum_{k=0}^{k}{}^{k}(\sum^{k} Q\ (C_0) + \Delta^0(\ C_i^k\ , \dots, C_i)) + {}^{\circ}\Delta_n\ (C_n^k, \dots, C_n),$$

where

- $W^k\left(C^k\right)$– the effect is achieved of the k-th subsystem when it is a separate functioning in the presence of its own production, the transport operations for the delivery of consumers or producers of culture;
- $\Delta\ (\ C_i^k, \dots, C_i^k)$is a synergistic component of the integral effect due to the interaction of subsystems;
- $\Delta_n\ (\ C_n^k, \dots, C_n^k)$ - is a synergistic component of the integral effect of the system due to cooperation with independent contractors;
- n – number of companies with which it interacts; With system; k – subsidiary (integrated) of the company;
- W (C) – integral effect.

Creating a new type of Autonomous organization of culture aims the combination of different forms of ownership and management within a single organization, thus attracting various sources of funding and improve the functioning and profitability. Financial autonomy of cultural organizations creates the preconditions for the combination of different activities, involvement of partner organizations, both Russian and foreign producers of services.

Funding of cultural industries based on public-private partnerships based on service differentiation culture and their effects should take into account social interests and economic benefits of each specific subject of cultural activities [9].

5 Conclusion.

The application of logistic support of the service system of the cultural industry provides access to cultural services and their quality delivery to the consumer. The calculations confirm the supporting role of logistics in the cultural industry, which provides an increase in the integrated indicator of the efficiency of the flow processes in the target installation. In addition, it provides access to the services provided and their quality delivery to the consumer. The theoretical and methodological basis for the development of the SEM to support the services of the cultural industry solve an important state task to improve the living standards of the population and the economic growth of the Russian Federation.

As a result, the solution of optimization problems together will increase the effectiveness of supply chain services culture.

6 Bibliography

[1] Hesmondalgh D. 2014. Culture / per.from English. I. Kushnareva; under the science. edited by A. Mikhalev; NAT. research. University "Higher school of Economics". M.: Publishing House. house of the Higher school of Economics, 2014. pp. 18

[2] Federal service of state statistics URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/retail/# (accessed 06.12.2017)

[3] Creative industries and development // UNCTAD XI: United Nations Conf. on Trade and Development, 11th sess., São Paulo, 13–18 June 2004 www.unctad.org/en/docs/tdxibpd13_en.pdf. (accessed 18.08.2011)

[4] Creative Industries Mapping Document 1998, 2001 // Department for Culture, Media and Sport, United Kingdom (accessed 02.08.2011 www.culture.gov.uk/global/publications/archive_2001/ci_mapping_doc_2001.htm.

[5] F E S E L B., SÖNDERMANN M. 2007. Culture and creative industries in Germany. Bonn, 2007. pp. 21

[6] MALSHINA N. A. 2012. Theoretical bases of increase of efficiency of functioning of stream processes logistics systems of the services sector on the basis of traditional concepts - financial flows / Proceedings of the Saratov University. Ser. Economy. Management. Right. 2012. Vol. 12. Vol.1., pp. 72-76

[7] PONTRYAGIN L. S. 1974.Ordinary differential equations. 1974. M., Nauk. pp.

[8] NOVIKOV D. T. 2012. Formation of logistic support in the promotion of scientific and technical developments / RISK. 2012. № 4., pp. 27

[9] MALSHINA N. A., BRYNTSEV A. N. 2017. Support of cultural services through the integrated service centers: prospects for development. Journal of Advanced Research in Law and Economics. Fall 2017. Volume VIII. Issue 6 (28). pp. 1827-1839.

THE FUZNET DEVELOPMENT SYSTEM

Petr, Čermák
Jiří, Martinů
Moravian University College Olomouc, Department of Computer Science and Applied Mathematics
petr.cermak@mvso.cz
jiri.martinu@mvso.cz

Abstract:

The FUZNET – Fuzzy-neural development system – allows modelling of complex systems needed control, regulation or prediction approaches. The FUZNET is presented in three versions. The First version is the implementation in C, C++ with interface to Matlab or other programs using DLL calling. The second implementation uses the functional programming approach in the Scheme programing language. The R5RS Scheme version is adopted on different platforms like PC, microprocessors (ARM) and FPGAs. This allows an easy transfer of Scheme code between the mentioned platforms. Third version is the FUZNET implementation in HDL language and it is used in hardware implementation on FPGA. Understanding the article assumes at least basic background in the area of fuzzy logic, (fuzzy) neural networks, genetic algorithms and functional programing (Lisp, Scheme…).

Key words:

Fuzznet, fuzzy, neural network, ARM, FPGA, Scheme, control

JEL: C45

1 The FUZNET development system

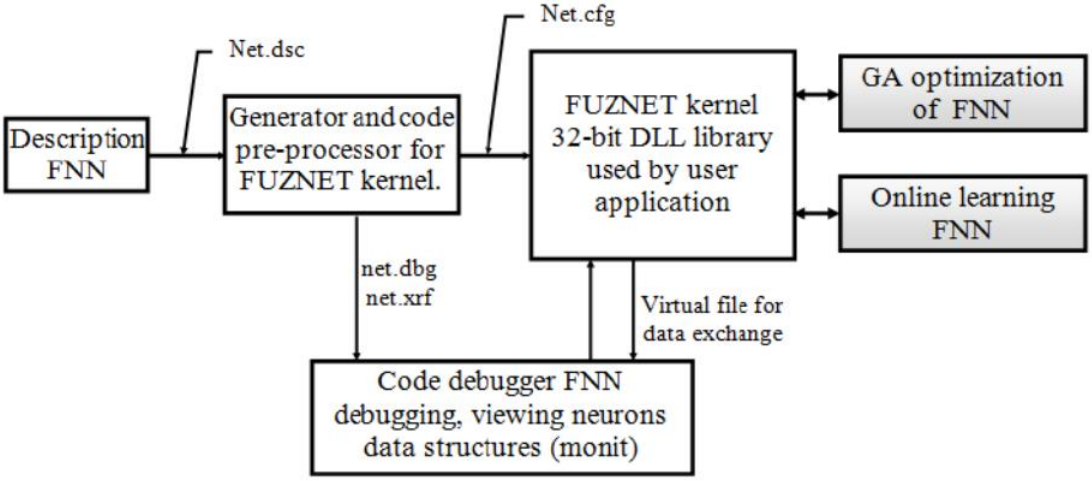
The T-S fuzzy non-linear regression models (Takagi-Sugeno models) appear as one of the suitable tools used in complex systems modeling techniques [0]. Identification of fuzzy models can be divided into two steps: a structure identification and a parameter estimation. The structure identification depends on the relevant input variables, number of rules and partitioning of the input space. In the parameter estimation phase the model parameters are determined. Parameter estimation process can be relatively easily automated by different optimizing techniques with the help of a neural network learning process. A structural identification takes high influence to a quality of modeling. Procedures of the structural and parametric identification was implemented into the FUZNET Fuzzy neural network development system. The FUZNET system implementations allow fuzzy reasoning, parametric and structural identification on different platforms, pure application software implementation on a particular OS, mixed software implementation on a bare metal with the Scheme programming language. Whenever we need faster response, we must select implementation/synthesis on a Field Programmable Gate Arrays (FPGA). All those implementations are further discussed in the following chapters.

The FUZNET system structure

The proposed FUZNET program tool was developed based on a fuzzy neural network technology including the new identifying procedures [1, 2, and 4]. This fuzzy neural network environment appears to be suitable for fuzzy non-linear regression model identification as well as for the FUZNET program including its application in real system modelling.

The system is an extension of the neural network (NN) development system based on the Back Propagation algorithm. The Figure 1 shows the basic FUZNET structure.

Figure 1: Block diagram of the FUZNET development system [1]



FNN description

For the FUZNET Kernel and its Fuzzy-Neural network the number of inputs with the language values, determination of layers (and its neurons), initial values, weights and the membership functions types must be specified. The algorithms, data structures and interfaces for the FNN learning process and its following computations constitute the FUZNET Kernel. Included are also procedures (scripts) for communication with debugging GUI tools and an interface for the Dynamic Link Libraries (DLL) for exporting the interface function to the Matlab m-files. The scripts allow monitoring of the FNN structure and step-by-step debugging.

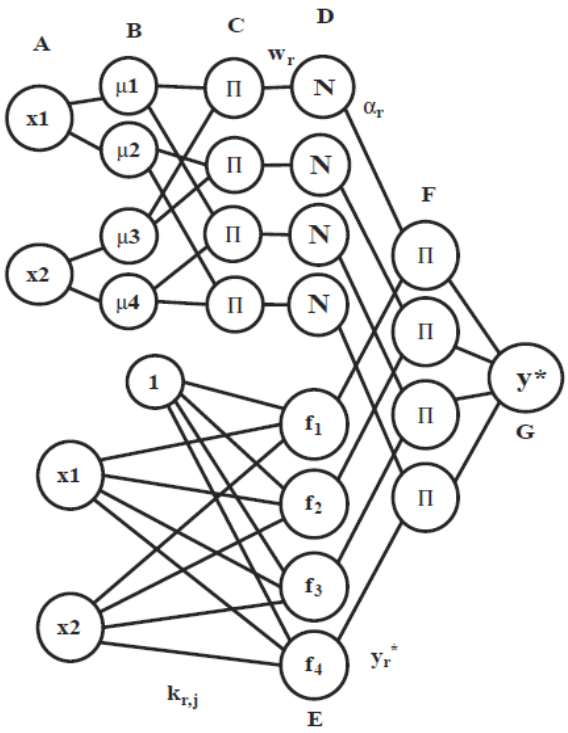
Brief background of TS fuzzy neural modelling

This chapter briefly introduces the TS (Takagi-Sugeno) fuzzy neural modelling on particular case. T-S fuzzy nonlinear regression model is described by a system of the following rules:

$$
\begin{aligned}
&IF\ (x_1\ is\ \mu_1)\ AND\ (x_2\ is\ \mu_3)\\
&THEN\ (y_1 = k_{1,0} + k_{1,1}x_1 + k_{1,2}x_2)\\
&IF\ (x_1\ is\ \mu_2)\ AND\ (x_2\ is\ \mu_3)\\
&THEN\ (y_2 = k_{2,0} + k_{2,1}x_1 + k_{2,2}x_2)\\
&IF\ (x_1\ is\ \mu_1)\ AND\ (x_2\ is\ \mu_4)\\
&THEN\ (y_3 = k_{3,0} + k_{3,1}x_1 + k_{3,2}x_2)\\
&IF\ (x_1\ is\ \mu_2)\ AND\ (x_2\ is\ \mu_4)\\
&THEN\ (y_4 = k_{4,0} + k_{4,1}x_1 + k_{4,2}x_2)
\end{aligned}
$$

Configuration of the FNN is adjusted on two inputs and one output. Each language variable has exactly two language values. Language values are expressed by membership functions. The example configuration determines max number of rules to four.
On the Figure 2, we can see the FNN of TSK system with 4 rules [4]. The antecedent parts of the rules are in the layer (C) and consequent part is in the layer (E). The Layer (B) computes values of membership functions according to Layer (A) inputs:

Figure 3: Structure of the Fuzzy Neural Network and object assignment [4]

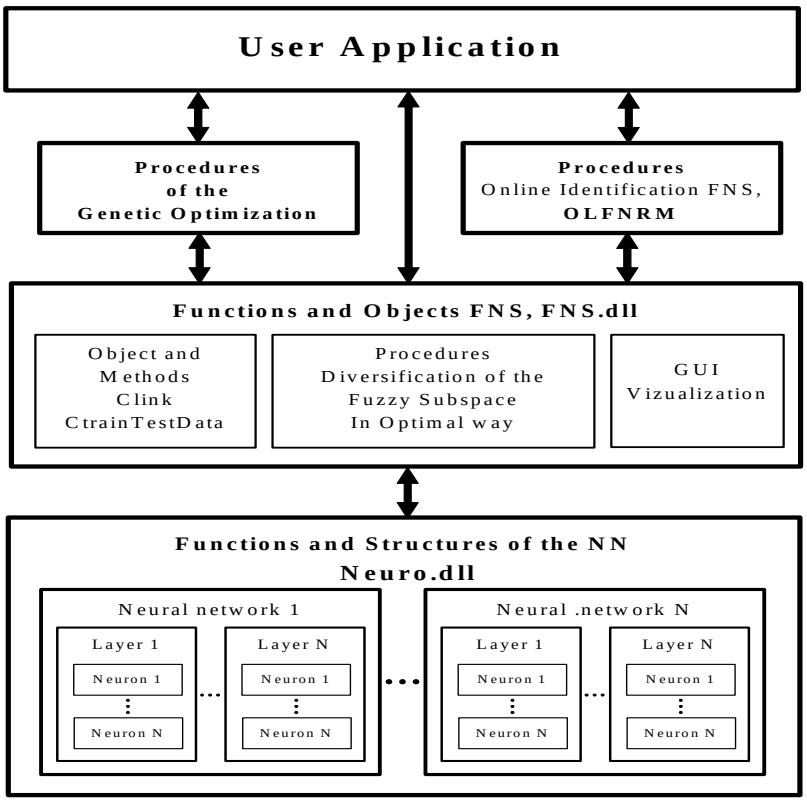


TSK	Object	Desciption
G	agreg	Agregation in layer G, apply operation "+"
F	agreg	Apply operation "*" for each neuron in all inputs
D	normalize	Make normalization for all w_r
C	agreg	Apply operation "*" for each combination of inputs
B	FV	Compute membership's function outputs
A	terminals	input values to FNN
E	agreg	Calculate product for each neurons with using scheme (apply + (map * **K X**))
1	base	Output value 1

2 FUZNET system implementation

The Figure 3 shows the block diagram of the FUZNET development system implementation.

Figure 3: FUZNET SW development system structure



Neuro.dll library

The Neuro.dll library is implemented using the C programing language. It consists of eight data objects:

- Neural Network
- Neural Network Layer
- Neuron
- Neuron internal parameter
- Neuron internal parameter used in a particular layer
- Relation between two neurons
- Weight between two neurons
- Special parameter of a neuron

Parameters for the above mentioned objects are shown in the following Table 1:

Table 1 FUZNET objects parameters

Object type	*Dir=0 loading*	*Dir=1 modification*
Neural network	Number of layers	N/A
Network layer	Number of neurons	N/A
Neuron	Number of relations with other neurons	0 - delete neuron 1 - keep neuron
Neuron internal parameter	Parameter value	Parameter value
Neuron internal parameter used in a particular layer	Parameter value	Parameter value
Relation between two neurons (between two layers))	0 - relation disconnected 1 - relation OK 2 - relation temporarily disconnected	0 - delete relation 1 - connection 2 - temporary disconnection
Weight between two neurons	Weight value	Weight value
Special parameter of a neuron	Parameter value	Parameter value

The parameters can be modified by the CFG_Get_Set function. This function is the key function of the FUZNET system.
Functions implemented within the frame of the Neuro.dll library can be divided to the following classes:

- **general functions** – serve to basic network operations, e.g. test, adaptation, networks saving.
- **configuration functions** – capable to get or change information on network. There are two types of information: data (e.g. weights and outputs sizes) and structural ones (number of neuron relations, number of neurons within the layer).
- ***Exec_Cmmd*, *push* and *pop* functions** – give the possibility to use the FUZNET internal functions and to call them from the user application.

FNS.dll library

This dynamic library is implemented in the C++ programming language. It contains the following objects: Clink, CTrainTestData, CNetEdit, CNetwork, CLayer, CNeuron.

- CLink – allows access to the neural network objects. It also allows to determine the symbolic names, to determine and modify all the network parameters.
- CTrainTestData – allows working with the training and test sets, e.g. to perform normalization, fuzzy-neural network training and testing, to define mean values, dispersions, etc.

- CNetEdit – allows definition of the fuzzy-neural network structure and the CNetwork, CLayer and CNetwork objects. These objects allow graphical representation of the FNN structure and parameters and of the equivalent rules base. The membership functions, regression coefficients and training coefficients can be monitored within the frame of parameters. It is also possible to monitor parameters of multiple networks, neurons and layers.

Genetic Algorithms (GA) - Parameters Optimization Block

The implemented GA block is implemented in the C++ programming language and it consists of the following objects:

- CGA – Complete Genetic Algorithm
- CChromozom – the Chromosome implementation
- CGen – the Gene implementation

It should be noted that the CGA uses the RMSE and AVG error. The errors are passed to the CGA upon completed training of the fuzzy-neural network. The GA parameters and the fuzzy-neural network structure (saved in the dnet.cfg file) serve as an inputs to the CGA. The CGA output consists of chromosomes and errors of individual generations.

FUZNET implementation in Scheme

The FUZNET implementation in C, C++ (in particular, the cognitive analysis implementation of multiple fuzzy rule bases) delivers the following problems:

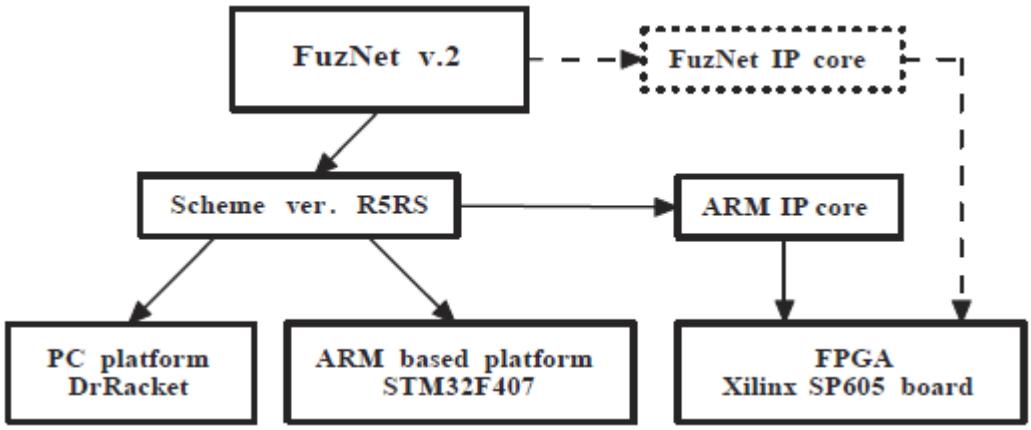
- The object structure of the FUZNET is not flexible according to strict data-types declarations.
- The program code does not change after it is compiled to the .exe file.
- We cannot declare functions in the course of learning process, simulation, or GA optimization.
- Transfer to embedded platforms is complex and problematic.
- The development of new procedures of FUZNET is not easy on embedded platforms.

That problems implies two questions, which platform and language have to be selected? We thought about language from a set of functional programming languages. We have specified the following constrains:

1. The number of procedures must be quite small (minimalistic language) but allowing all needs for constructing objects, linear lists, trees, etc.
2. Complex operations have to be expressed in terms of simpler operations (good isolation operation and sub-operation).
3. Conforming to Referential transparency.
4. The set of procedures must be the same on PC and embedded platform.
5. The language interpreter on embedded platform must be smaller than 128 kBytes.

After considering Lisp, Scheme, Haskel, pseudo-functional programing in Java, Phyton and other languages we select the Scheme (Schemer) revision R5RS. We found that the Scheme is implemented good on PC platform and ARM processors and conforms to constrain. There are implementations on PC platform namely MITScheme, DrRacket, Guile. We selected DrRacket. DrRacket allows to extend their function with custom DLL or you can embed DrRacket into your project.
DrRacket also have extensions to graphic, socket simple programming and http support.
There is also implementation on ARM processors - Armpit Scheme. This implementation covers many ARM based processors.

Figure 4: FUZNET v.2 implementation possibilities [4]



A constructor (see Algorithm 1) implemented in Scheme is a core of the FUZNET v.2 system. The constructor creates all Layers of FNN in right-left direction (Figure. 4.). A "new" function parameters are the following ones:

6. Object template
7. Symbol list of the tree-hierarchy
8. New instances of objects - Layers precede of the actual layer
9. Additional configuration parameters

In a tree-data structure, the parameters like regression coefficients, shapes of membership functions and other configuration parameters are stored. This approach allows us to store and recall the whole configuration of the FNN whenever needed.
Additional configuration parameters changes behavior of the predefined template objects. For example, we can choose the fuznet-agreg object with the '(test rules consequent) tree label in the following configuration:

"'all-to-all '(agreg ,+ ,*) '(weights-random 0 1)"

We can easily find that object instance belongs to the (E) layer. The 'all-to-all' symbol means that connections will be realized between all neurons of the (E) layer and the (A,1) layer. Finally, the '(weights-random 0 1)' symbol configures regression coefficients values as random values confined to the <0..1> range.

Algorithm 1: TSK system Constructor in Scheme

```
(new fuznet-agreg (list 'test 'output)
 (new fuznet-agreg '(test mult)
   (new fuznet-normalize '(test norm)
    (new fuznet-agreg '(test rules_antecedent)
     (new fuznet-FV '(test memb1)
           (new fuznet-terminals '(test inputs)
                '(inputs 2))'(index 0) 'ekvidist 'trapezoid)
        (new fuznet-FV '(test memb2)
         (new fuznet-terminals '(test inputs) '(inputs 2))
            '(index 1) 'ekvidist 'trapezoid)
          'combin `(agreg-apply ,min)))
         (new fuznet-agreg '(test rules_consequent)
          (new fuznet-terminals '(test inputs)
           '(inputs . 2))
```

```
        (new fuznet-base '(test base_1))
      'all-to-all `(agreg ,+ ,*) '(weights-random 0 1))
    'one-to-one `(agreg-apply ,* ))
  'one-to-one `(agreg-apply ,+ ))
```

This style of programming is a solution of more problems:

10. Creation of all objects
11. Creation all FNN connections between layers
12. Immediate initializations of parameters
13. Actual state storage in the data-tree upon initialization

FUZNET implementation in HDL

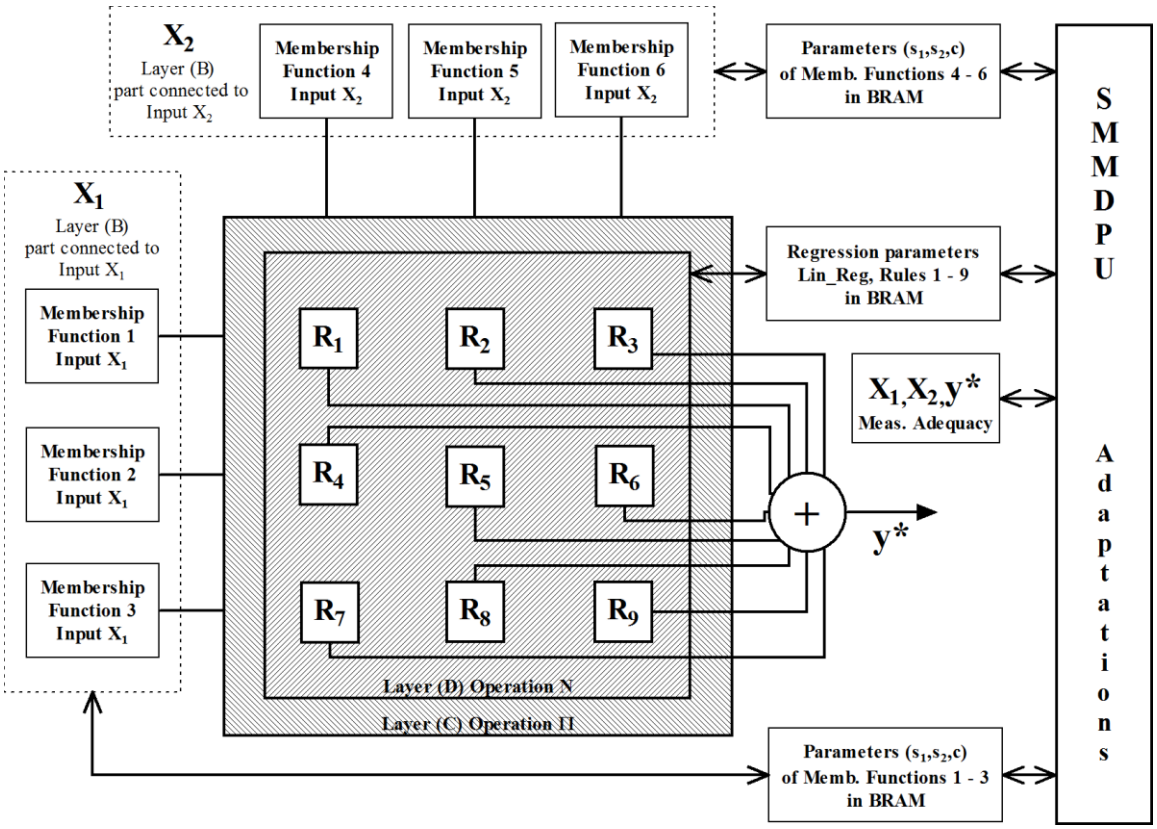
In the real engineering, we need to model complex systems working in Real Time in time critical applications. The Time Response and Transport Delay must be in the order of milliseconds and also some space restrictions exist. In such situations, we must use the FPGA or ASICs (in production). Computation on processor based systems (Intel, ARM, etc.) could be distributed on each of the cores. But overhead of OS and the bottleneck - access to RAM - it is a serious problem. We need an amount of a distributed RAM as storage for the Fuzzy Neural Networks coefficients and for the set of quite simple operations like comparison, multiplexing signals and DSP (Digital Signal Processor block). Because operations, distributed memory and BRAM are hardware blocks, we need to define connections between them. We can use some languages for electronic design automation. The major software systems for a HDL design supports two languages, namely VHDL and Verilog.

Let the programmable logic to realize forward computation and the Softcore processors to realize on-line adaptation to join to the new proposed tool - FUZNET-FPGA [5]. The Figure 5 shows the proposed block diagram of the FUZNET-FPGA with TS configured as follows:

14. 2 Inputs,
15. 1 Output
16. 3 Membership functions per Input
17. The maximum number of rules is set to 9.

Computation process consists of steps given by single or multiple clocks on Programmable Logic.

Figure 5: Block diagram of the FUZNET-FPGA for TS configuration [5]



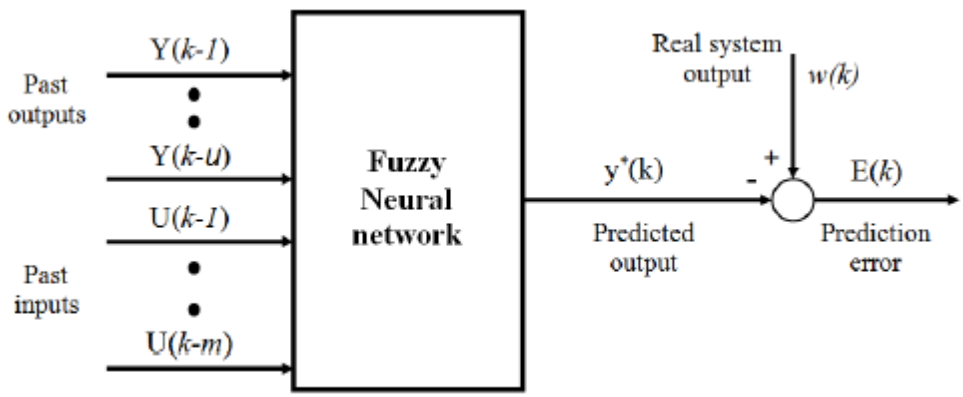
For the FUZNET particular implementation on the FPGA the VHDL programming language was chosen.

3 Case studies

The FNRM Prediction

The Fuzzy Rule based Predictor is identified in FUZNET. The *k*- determines step of prediction, *u* sets numbers of past outputs and *m* sets number of past inputs. A prediction error can be measured. The errors like RMSE or AVG we can use for decision course of adaptation mentioned above. More detailed description and examples can be find in [1].

Figure 6: The Fuzzy Rule based Predictor [1]

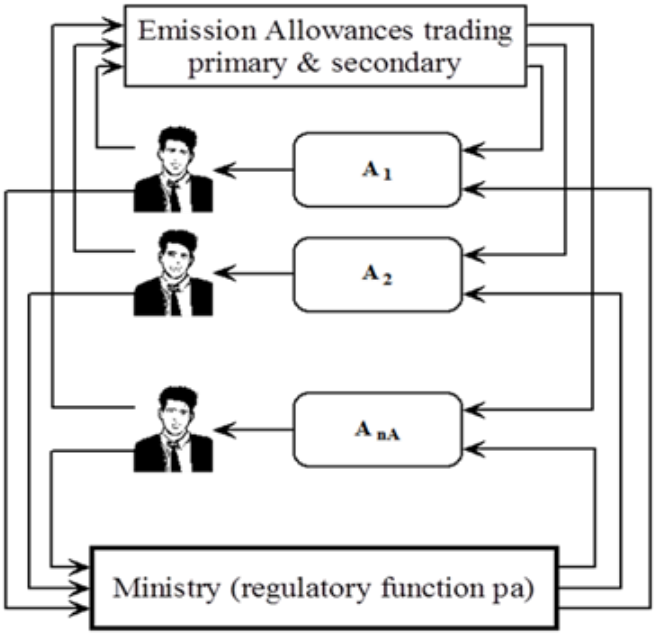


The Fuzzy Rule based Predictor can be used for non-linear system behavior prediction control.

Broker

The above mentioned predictor was used for simulations of Emission Allowances trading within the EU emission trading system using multiagent simulation model [3] which integrates different original soft computing and decision making methods, namely an expert systems with fuzzy rule bases, nonlinear fuzzy rule based predictors and fuzzy rule based behavior modelling.
Following Figure 7 shows the scheme of a multiagent system of the EU emission allowances trading.

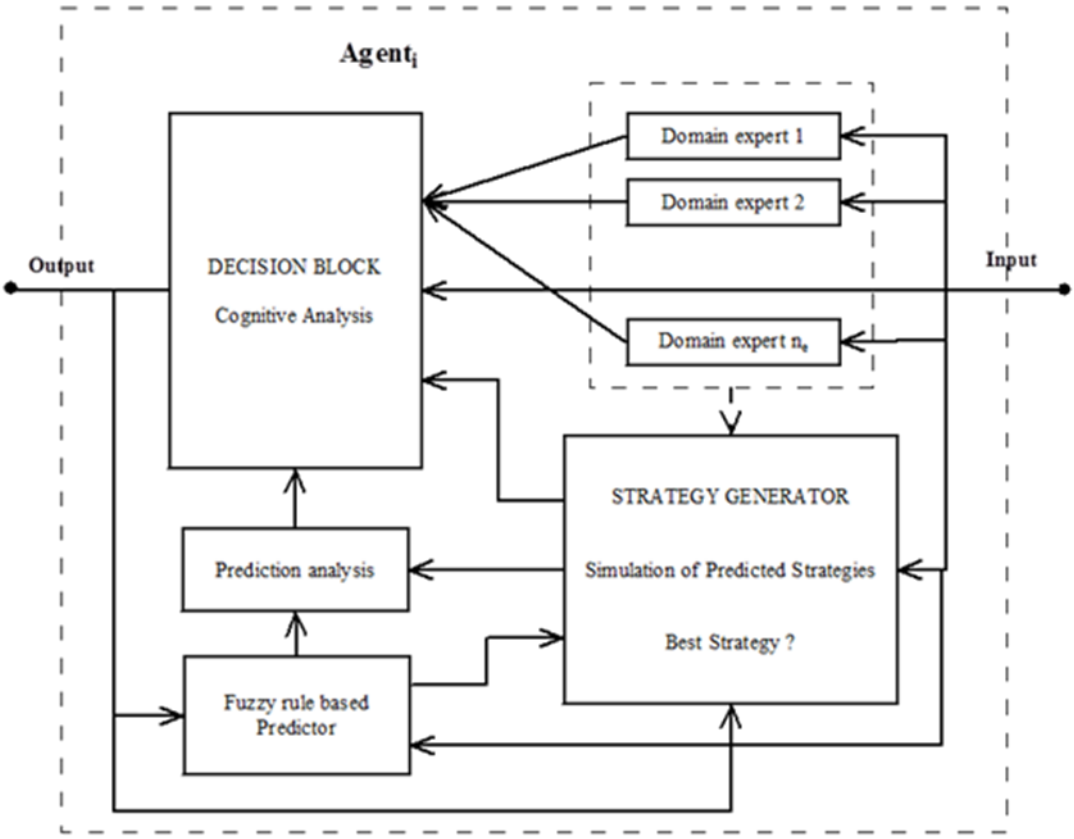
Figure 7: Model of the EU Emission Allowances Trading [3]



Agent behavioral and decision making model. This Agent consists of particular simple functional blocks shown on Figure 3. In this case, a decision making process is in fact multidisciplinary. We use knowledge from different areas. Each area represents single block described as “Domain expert”. In case of contradictory decisions of particular experts we apply cognitive analysis in “Decision block”. The fuzzy nonlinear regression model is used for the purposes of the prediction “sell/buy amount of allowances” together with actual price. This model allows us to predict short term behavior of the CO2 allowances trade. Extracted rules can obtain information in more readable form in comparison with neural network. In case of rapid changes on the emission allowances market or in case of great increase of RMSE error, we can adopt fuzzy nonlinear regression model. Both the RMSE error and particular rules can give information used by “Prediction analysis” block. This block gets information to the “Decision block”. Each type of company have own strategy how to achieve desired goals. If this kind of long term goal could be defined and implement as cost or fitness function, we can used evolution strategy optimizing techniques.

The following Figure 3 shows the scheme of a single agent model.

Figure 8: Model of the EU Emission Allowances Trading[3]



4 Discussion

In this paper, we have introduced the FUZNET system – the rule based development system based on the Takagi-Sugeno model.

The FUZNET system structure, Takagi-Sugeno neural model brief description and FUZNET system implementation were discussed in the paper chapters.

The FUZNET system was implemented on three different platforms – standard PC (using C, C++), ARM (using Scheme) and FPGA (using VHDL).

In the last chapter, we have seen two examples of the FUZNET system utilization – for the Non-linear Systems Predictive Control and for the Agent behavioral and decision making model.

In a near future, we plan to implement the FUZNET in the F# programming language. The F# provides many favorable characteristics of functional programming allowing adaptation of the FUZNET system to many other needs and its integration with the C#, VB.NET, etc. for development user-friendly applications with a graphically rich user interface.

This allows creating and modeling complex systems with possibility of adaptation, self-learning and cognitive analysis of the fuzzy rule base. Cognitive analysis allows evaluation of the rules and selection of rules for removing and optimizing the FRB structure.

5 Bibliography

[1] CERMAK, P., ZIMMERMANNOVA, J., LAVRINCIK, J., POKORNY, M., & MARTINU, J. 2015. The Broker Simulation Model in the Emission Allowances Trading Area. International Journal of Energy Economics and Policy, 5(1), 80-95.

[2] Takagi,T., Sugeno,M.: Fuzzy Identification of Systems and Its Application to Modelling and Control, IEEE Trans., MAC, 15, No.1, 116-132.

[3] CERMAK, P.: Online Learning of Neural Takagi-Sugeno Fuzzy Model, 24rd International Conference of the North American Fuzzy Information Processing Society June 22-25, 2005 Ann Arbor, Michigan,USA, ISBN 0-7803-9188-8, IEEE Catalog No. 05TH8815C
[4] CERMAK, P., CHMIEL P.: Parameters optimization of fuzzy-neural dynamic models, 23rd International Conference of the North American Fuzzy Information Processing Society June 27-30, 2004 Banff, AB, Canada, ISBN 0-7803-8377-X, pp. 762-767.
[5] Goldberg,D.E.: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley Publ. Comp., INC., 1989, ISBN 0-201-15767-5
[6] Roupec, J.: Genetic optimization algoritms in fuzzy regulators, dissertation thesis, Brno, 1999.
[7] CERMAK, P., ZIMMERMANNOVA, J., LAVRINCIK, J., POKORNY, M., & MARTINU, J. 2015. The Broker Simulation Model in the Emission Allowances Trading Area. International Journal of Energy Economics and Policy, 5(1), 80-95.
[8] CERMAK, P., POKORNY, M.: The fuzzy-neuro development system FUZNET, Methods and Models in Automation and Robotics (MMAR), 2013 18th International Conference on, vol., no., pp. 75, 80, 26-29 Aug. 2013, ISBN 978-1-4673-5506-3.
[9] Montas, H.: A Scheme Interpreter for ARM Microcontrollers, Fischell This fuzzy development system was used in many projects Department of Bioengineering of the A.J. Clark School of Engineer- ing at the University of Maryland at College Park, Maryland, USA, covers prediction time series, power consumption prediction http://armpit.sourceforge.net/, (2012)
[10] CERMAK, P., MARTINU, J.: Fuzzy Neural Networks on Embedded platforms, 20th Czech-Japan Seminar on Data Analysis and Decision Making under Uncertainty, September 17-20, 2017, Pardubice, pp. 25, 33, ISBN 978-80-7464-932-5.
[11] Xilinx. 7 Series FPGAs Memory Resources, User Guide, UG473 (v1.12) https://www.xilinx.com/support/documentation/user guides/ September 27, ug473 7Series Memory Resources.pdf, 2016.
[12] Xilinx. 7 Series DSP48E1 Slice, User Guide, UG479 (v1.9) September 27, https://www.xilinx.com/support/documentation/user guides/ug479 7Series DSP48E1.pdf.
[13] Xilinx. 7 Series FPGAs Data Sheet: Overview, https://www.xilinx.com/support/ documen- tation/data sheets/ds180 7Series Overview.pdf.
[14] SYSTEM MEDIA, SMMDPU IP Core, User Guide, 2016, Opava.

THE MECHANISM FOR IMPLEMENTING THE MODEL OF THE INNOVATIVE DEVELOPMENT OF AN INDUSTRIAL ENTERPRISE

Elena, Vetrova [a]***, Irina, Gladysheva*** [b]

[a] *Saint Petersburg, St. Petersburg State University of Economics, Russian Federation, Department of Economics and Management of Enterprises and Production Complexes,*
e-mail: vetrovaelenik@gmail.com

[b] *Peoples Friendship University of Russia (RUDN University), Russian Federation, Department of Management,*
e-mail: givrisha2007@gmail.com

Abstract:

The conceptual model of the innovative development of an industrial enterprise in the conditions of resource limitations is studied by us with the utilization of the theory of entrepreneurship, technology, strategy and institution, the model of clusters and industrial organization. Every theory makes a certain contribution to the model while their integration helps to increase the objectiveness of the model itself, as well as the efficiency of its implementation. At the same time, the achievement of the innovative development goals calls for working out a mechanism to implement the used model and determine the main tools of the former. Corporations, clusters, PPP, technological platforms, and special economic zones are the tools of the mechanism we study. The purpose of this research study is to find the most topical and efficient tool.

Objective: Finding a suitable tool which makes the implementation mechanism of the innovative development model act efficiently.

Methods: analysis and synthesis, modern theories and models of governance of production systems.

Results: substantiation of public-private partnership as a tool of the implementation mechanism for an industrial enterprise's innovative development model.

Key words:

Innovative development, manufacturing industry, innovation strategy, public-private partnership, open innovations, strategic choice.

JEL: O3, O4

1 Introduction: Heading for the introductory chapter

The conceptual model of the innovative development of an industrial enterprise in the conditions of resource limitations is studied by us with the utilization of the theory of entrepreneurship, technology, strategy and institution, the model of clusters and industrial organization. Every theory makes a certain contribution to the model while their integration helps to increase the objectiveness of the model itself, as well as the efficiency of its implementation. At the same time, the achievement of the innovative development goals calls for working out a mechanism to implement the used model and determine the

main elements, methods and tools of the former. The aim of this research is to construct such a mechanism.

2 Methods

2.1 Substantiation of innovative development

In this research we find it reasonable to use a set of theoretical approaches: theories of entrepreneurship, technology, strategy and institution, cluster model and the theory of industrial organization.

J. Schumpeter's theory of entrepreneurship [1] substantiates the need for innovative development. M. Porter's cluster theory [2] can be used because a cluster has resources to achieve development goals. The theory of technology (A. Smith, A. Marshall, J. Hicks, J. Robinson, E. Chamberlin et al.) allows optimizing the structure of a company during its development by the criterion of expenses. In terms of the theory of strategy (H. Mintzberg, K. Andrews, I. Ansoff, J. Quinn, M. Porter et al.) it is possible to determine the ways a company can follow to come to a new level of development based on the strategic choice. Institutional approach allows us to form the circle of market players necessary to pursue the innovative development goals [3].

The theory of industrial organization, which is presented to the fullest extent in the paper by J. Tirole [4], embraces three most important concepts: the company itself, competition conditions and its relationship with the state.

2.2 Substantiating the tools for the implementation mechanism of the innovative development model

In order to choose the tools for the implementation mechanism of an industrial enterprise's innovative development model we have used the corporate governance theory [5, 6, 7, 8, 9], cluster model [1], theory of institution [3, 5], model of open innovation and technological entrepreneurship [10, 11, 12]. The tools have been chosen by the method of logical selection for the modern conditions and in the strategic aspect.

3 Paper results

3.1 Substantiation of strategic choice

The innovative activity of enterprises is determined by many factors. In our opinion, the factors of innovative activity can be divided into two groups:

1) the externalities of the enterprise, such as: institutional environment and state policy, sectoral technological level, level of competition.
2) the internalities of enterprises, i.e. their resource provision.

The full cycle of managing a modern enterprise includes certain stages, which are common for organizing any type of activity, type of business organization and form of ownership. But, at the same time, in respect of innovation companies we cannot agree with F. Taylor that "good" organization of work, even if the equipment is old, is always better than "bad" organization and new equipment. Our position is justified by the important role these enterprises play in innovation processes and, consequently, in the conditions of technical and other changes.

The full cycle of innovation process is quite common for a modern industrial enterprise. It was defined already by J. Schumpeter as research and development, designing, production, marketing, sales, and service [1]. Taking into account the existing position, according to which innovation is not a technical

but an economic concept, implying change at all levels of management: interfirm governance, production management, human resource management [13], we find it reasonable to speak about the need for technological and organizational update of enterprises in the process of their innovative development. In turn, it implies updating their resources.

Hence, it is important and desirable for an industrial enterprise to choose an innovative development strategy. In addition to the above we understand the formation of a new business model by methods which create both new value for the consumers, stakeholders and a competitive advantage for the enterprise itself [8].

Innovation strategies for enterprises can include business models oriented on: creating new products, technologies and services; enhancing R&D and production; developing organizational structures; utilizing new types of resources and new approaches to applying traditional resources.

Today Russian and foreign researchers propose different variants for choosing an innovation strategy, which can be roughly determined as:

1) technological breakthrough based on one's own radical innovations;

2) technological borrowing.

There are different opinions with regard to selecting the variant of strategy. Thus, for example, it is believed that the second variant is preferable for the Russian economy, i.e. borrowing and assimilation of western technologies and simultaneous creation of conditions for growth due to principally new products [14]. Justifying his hypothesis, V.M. Polterovich writes about the "trap of underdevelopment". It prevents innovation from becoming the driving force of economic growth, while backward production does not form the demand for innovation and suppresses its supply, which, in turn, slows down the demand.

On the other hand, some others (S. Yu. Glaziev, G.G. Fetisov, B.N. Kuzyk, Y.V. Yakovets etc.), on the contrary, suggest following the strategy of technological breakthrough [15, 16], which calls for a considerable increase in investment activity. Thus, according to L. I. Abalkin, for the Russian economy to be modernized, investments must grow within the next 15 years by approximately 18% to the previous year [17]. According to the expert estimations, in order to enter the mode of expanded reproduction of fixed capital, the volume of production investments has to be tripled and R&D has to be quintupled.

In the modern economic and state policy conditions, most enterprises in Russia have limitations in pursuing both radical and substitutive innovation strategy.

On the one hand, the first variant is desirable (radical strategy), since the second variant (substitutive strategy) implies that foreign technologies are utilized, which is limited to application in the subject area under the modern conditions. On the other hand, the existing investment activity in sectoral projects is not enough for technological breakthroughs.

Under these conditions, organizational changes are needed in the functioning and interaction of industrial enterprises. As variants of such changes, we see the changes of the existing model of organization of industrial enterprises and their interaction with each other and / or shift for new models by variants - corporation, cluster, public-private partnership (PPP), technological platform, free economic zone.

3.2 Selecting the form for industrial enterprises to interact

The main aim of setting up a corporation is to increase the efficiency and, consequently, the competitiveness. It is achieved through synergy, which lies in the concentration of resources on development and assimilation of key, radical innovations. According to O. Williamson, a modern corporation should be understood mainly as a product of a series of organizational innovations, whose aim and outcome is to minimize transaction costs [8]. If it is complicated and expensive to agree on the joint development and transfer of knowledge (i.e. the cluster structure is inefficient), then coordination within the limits of a corporate structure is more attractive than market one.

J. Schumpeter believed that large industrial corporations are ideal for the introduction of technological innovations [1], since the profits they accumulate are the main source of financing radical innovations, which are not possible or hardly possible for small and medium enterprises. Moreover, there is a view, according to which the advantage of innovative activity belongs to large corporations, which are in the conditions of monopoly, differently from smaller firms, working in the conditions of intensive competition [7].

Some research studies substantiate the ambiguous efficiency of corporate forms in the provision of the required level of innovative activity [7]. For example, there is an insight about the presence of a reverse U-shaped dependence between competition and innovation. The impact of increasing competition on innovative activity is positive first, but starting from a certain level it goes down and becomes negative. If the competitive pressure is low, corporations do not have enough incentives for the growth of innovative activity. If the external pressure is high, they are limited in resources due to a fierce price opposition.

There are different explanations why the innovative activity of corporations in non-uniform. Thus, G. Mensch explains the non-uniformity of innovative activity by the specifics of the market economy and believes that firms begin introducing radical innovations in the period of depression, when investments in the current projects become inefficient [6].

K. Freeman, on the other hand, believes that in the period of depression, the innovative activity of firms slows down. According to K. Freeman, a corporation introduces innovations in the period of stable growth, when it is sure in the expansion of the market and growth of profits [9].

A. Kleinknecht emphasizes that innovations are risky and during depression the strategy of profit maximization gives way to the strategy of loss and uncertainty minimization [6].

At the time of J. Schumpeter the main way to create technological and product innovations was corporations' own research. However, later on the role of university research, as well as that of technology parks, small innovative and venture companies has increased. Even for large corporations with their own well-developed basis for research and development, external resources are becoming a more and more important source of innovations: university laboratories, small innovative firms, etc. Thus, it is the proof of the efficiency and importance of the concept of a national innovation system (NIS) - a network of institutions in the private and public sectors, whose activity and interaction ensure that new technology emerges, imported, modified and spread [8]. It should be noted that an efficient innovation system is just being formed in Russia.

In parallel, the cluster form of organization, as well as the interaction of market players, is developing and substantiated in order to increase innovative activity. In addition, a cluster is seen not as a stable structure (which prevails in Russia), but as a flexible and mobile form of contractual relations between participants, interested in its advantages.

The concept of "open innovation" can be considered as a way to develop corporate and cluster forms of organization and ensure growth in innovative activity. One of the authors of this concept, H. Chesbrough believes that in the competitive environment it is inefficient to do all R&D within a corporation itself, hoping to keep the intellectual advantage only by the company's own forces [10]. The technology progress calls for continuous innovations, which often go out of the limits of an individual corporation. The concept of open innovation means partnership, alliances, structures with a low level of bureaucracy, allowing combining the resources existing inside the company and outside it. The concept of open innovation implies that a corporation attracts knowledge and technology of other organizations and adapt them, thus reducing its own R&D costs [10].

Judging by its low innovative activity and (global) competitiveness, a corporate firm in the existing form is inefficient for innovative development of enterprises.

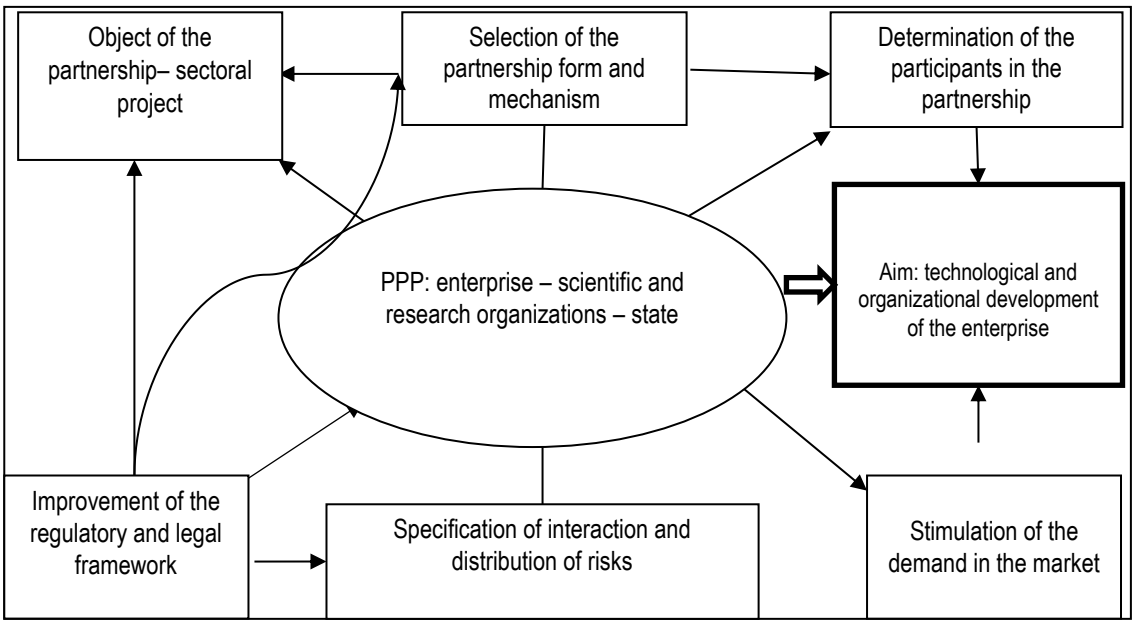
On the other hand, application of the concept of open innovation by corporations in Russia is currently limited by a number of problems, one of which is a low level of information openness. At the same time, in the international experience this is believed to be the most promising direction. Within this concept it is possible to use such tools as technological platforms, special economic zones, etc. We agree with this and consider it strategically correct. But at the same time, we believe that under the modern conditions an efficient innovation strategy will be a strategy based on a business model of flexible interaction between enterprises, state, science and education akin to the triple helix model by H. Itzkovitz [18]. In addition, differently from the original model, where the leading role is attributed to science and education, we assume that it is necessary to comply with the principles of balancedness and equality of interests of all participants on the basis of harmonization of the former. This leads to the substantiation of a PPP model, which originally relies on these principles.

We think that the PPP model should be implemented in a project form, where the object of PPP is a project and the composition of participants is determined on the competence basis. The advantage of such a model is the expansion of enterprises' resource basis sources, integration of enterprises by objectives and composition of projects, independently on the form of ownership, capability to implement the full innovation cycle within individual projects and settlement of other related problems.

In the context of the triple helix model, it is suggested that its implementation variant should be chosen: exogenous, endogenous or hybrid models. We assume that for a science-driven enterprise it is desirable to use an endogenous model and create scientific parks with the involvement of large companies' branches; to set up university-based research groups of "multipurpose knowledge" where theoreticians and practitioners closely work together, inventions are generated, spin-off companies get started, new products appear, and new knowledge is generated.

Conceptually, this interaction model of a science-driven enterprise, educational institution and state is presented in a figure.

Figure 1: A PPP model of an import substitution project in manufacturing industry



4 Discussion

Creating favorable conditions for the growth of innovative activity is the necessary pre-requisite for forming an implementation mechanism of the model of an industrial enterprise's innovative development. So we have looked into the variants of innovation strategy and tools of their implementation in the form of models of organizational-technical functioning and interaction of enterprises: a corporation, a cluster, a technological platform, a free economic zone, a technological platform and PPP. We assume that the conditions the corporate sector functions today do not make it oriented on innovations since the risks of investing in innovative projects are objectively high. The cluster model in the Russian economy is being implemented as a mere formality and does not produce the necessary effects. On this basis an innovation strategy relying on the tools of PPP is desirable as a mechanism to implement the innovative development model. Differently from the variants of PPP that are being implemented, we propose a model of a project type, in terms of which all participants interact until the end of the project. Such tools as technological platforms and SEZ are promising in the strategic aspect.

Acknowledgment The publication was prepared with the support of the “RUDN University Program 5-100”. The publication was prepared with the support of the «RUDN University Program 5-100».

5 Bibliography

[1] Schumpeter J. The theory of economic development (Research of entrepreneurial profit, capital, credit, interest and cycle of market conditions): translated from English. J. Schumpeter. – Moscow: Progress, 1982 – 455 p.
[2] Porter M. International Competition. – Moscow., Mezhdunarodnye Otnosheniya, 1993. – 256p.
[3] Robbins L. The nature and essence of economic science // THESIS. Vol. 1. Issue 1. – 1993. – PP. 18 - 28.
[4] Tirole J. (1996).Markets and market power: The theory of industrial organization, St. Petersburg, Russia: St. Petersburg: School of Economics.
[5] Williamson O. E. The Economic Institutions of Capitalism. Firms, Markets, Relational Contracting. – St. Petersburg: Lenizdat, 1996.
[6] Mensch G. Fundamentals of organizational design. – Moscow, 2002.

[7] Aghion P., Bloom N., Blundell R., Griffith R. and Howitt P. Competition and Innovation: An Inverted U Relationship, NBER Working Paper, 2002.
[8] Hamel G. The Future of Management, 2008.
[9] Freeman C. Continental, national and sub-national innovation systems - complementarity and economic growth. Research Policy Vol. 31, 2002. - P. 191–211.
[10] H. Chesbrough Open innovation. The New Imperative for Creating and Profiting from Technology. – Moscow: Pokolenie, 2007.
[11] Perez C. (2013). The new technological revolution, Technology Frontiers Forum of the Economist, pp. 12-16.
[12] Perez C. (2015). Capitalism, technology and a green global golden age: The role of history in helping to shape the future, Political Quarterly, vol. 86, S1, pp. 191-217.
[13] Drucker P.F. Market: how to become a leader. Practice and principles. – Moscow, 1992. – 459 p.
[14] Polterovich V.M. Modernization strategies, institutes and coalitions // Voprosi ekonomiki. – 2008. – No. 4. – PP. 4-24.
[15] Glaziev S.Yu., Fetisov G.G. New course: breakthrough strategy: scientific report. – Moscow: Publishing house of the RAS, 2012.
[16] Kuzyk B.N., Yakovets Yu.V. Russia – 2050: strategy of innovative breakthrough. – Moscow: Ekonomika, 2005. – 624 p.
[17] Abalkin L.I. Speculating on long-term strategy, science and democracy // Voprosy ekonomiki. – 2006. – No12. – PP. 4-19.
[18] Itzkovitz H. Triple helix. Universities - enterprises - state. Innovations in action // Translated from English under editorship of A.F. Uvarov. http://old.tusur.ru/export/sites/ru.tusur.new/ru/innovation/triplehelix/ickovic.pdf.

THE SECRET SAUCE: A REVIEW OF THE CHARACTERISTICS THAT DEFINE ENTREPRENEURS AND OWNER-MANAGERS

Nick, Chandler
Budapest Business School, Institute of Management Studies
Chandler.nicholas@uni-bge.hu

Judit, Sági
Budapest Business School, Institute of Finance
sagi.judit@uni-bge.hu

Abstract:

The aim of this paper is to review the personal characteristics that have been found in empirical studies as exemplary of entrepreneurs and owner-managers. The differing and similar characteristics of owner-managers and entrepreneurs are examined and indeed highlight the difference between managers and entrepreneurs, as well as the strengths and obstacles that small business founders face

Key words:

Entrepreneur, owner-manager, characteristics, divergence

JEL: L26, M21

1 Introduction

If we look for a suitable term for the person that is responsible for small enterprises, then many emerge. Many of the terms indicate a particular interest or activity in the business, such as entrepreneur, owner and manager. However, these activities can be combined, and likewise, the terms are also combined so we have: entrepreneur-owner, entrepreneur-manager, owner-manager and even entrepreneur-owner-manager (Jennings and Beaver, 1995).

In this section, we focus on the individual owner that has set up a business and is managing the small business. This owner-manager could also be considered a entrepreneur in the basic meaning of the term. Merriam-Webster put forward a definition that fits our view of an owner-manager as "*one who organizes, manages and assumes the risks of a business or enterprise".* However, some experts argue that a true entrepreneur is more than this[42]. A true entrepreneur is looking for opportunities and making a difference. In other words, it's about finding something new and applying it to a market, identifying a need and filling it. Steve Spoonamore, is a serial entrepreneur and a member of Forbes' list of Amerca's most promising companies and explains true entrepreneurs as follows: "*there are people who love to sail the ocean or climb mountains, and more power to them—but it's nowhere near as interesting as taking a technology nobody has heard of, finding a market for it and launching it to your customers. That's satisfying".* The owner-manager has to climb the mountain of building a business from scratch, and the entrepreneur sees potential and adapts a technology to fill a need in a particular market. Thus, some owner-managers may be entrepreneurs in its true meaning, but not all.

[42]https://www.forbes.com/sites/brettnelson/2012/06/05/the-real-definition-of-entrepreneur-and-why-it-matters/#c7760de44562

2 Owners of small vs large businesses

Entrepreneurs and owner-managers of small firms differ from managers of multi-nationals and other larger organisations. Bridge et al. (1998) make the following distinctions for smaller businesses:

- Absence of Functional Managers: as mentioned earlier, the management of a small business remains with one person, necessitating certain skills and attitudes.
- On-the-Job Learning: small business owners are often new to running a business, despite some expertise or experience in a given industry. The missing knowledge of running a business is generally acquired on the job.
- Investment and Resources: the money invested in the business is often personal money rather than received from Venture Capitalists or other impersonal investors. This can lead to an unwillingness to spend money, or a greater focus on short-term returns, when compared to counterparts in larger organisations.
- Discontinuities and limitations: when a large company is overloaded, they may apply for a bigger budget, temporary staff or extra help from another department. In a small business, there may only be one or two people and the labour cost of two extra staff would double i.e. be too high for the small business.
- Identification with the business: A manager in a large multi-national will not have the same personal link to the business as a founder who set up the business and watched it grow
- Values: as will be seen later in this section, the values upheld in a small business will be those of the owner-founder or entrepreneur and can be observed throughout the entire business from quality standards through to the treatment of employees.

Driel and Poutsma (1989) also compared SMEs and larger companies and found differences in personal entrepreneurship and direct personal work relations, and division of work. Personal entrepreneurship relates to the personal (financial) contribution to the company that the owner-manager or entrepreneur has made. In small businesses, the degree of work division was found to be lower, whilst at the same time there is a higher degree of autonomy (van Driel & Poutsma, 1989).

In Europe, a small and medium-sized company employs from one to 249 employees and has a yearly turnover of to two to fifty million Euros. Therefore, entrepreneurs and owner managers play a key role in small to medium-sized companies. They have to manage a range of business activities from budgeting and marketing through to human resource management tasks. In many cases, a small business outsources functions such as human resource management or may not perceive them as necessary in the early stages of development of the business.

3 Common characteristics of owner managers and entrepreneurs

Although we made a distinction between owner managers and entrepreneurs in the previous section, there are some similarities. For example, they are both overworked and, because of this high workload, they don't have enough time to deal with all management tasks. Here are some of the other characteristics.

3.1 Short-termism

Entrepreneurs and owner-managers also focus on short-term actions and thinking. Therefore, they make decisions on a daily basis or week by week. There is often a single line system in small and medium-sized companies. This means that only the owner manager or the entrepreneur has the right to reach a decision. Consequently, management tasks concentrate on them. This leads to owner manager's or entrepreneur's accumulations of tasks and excessive demands. Because of often missed skills and knowledge and also lack of time and lack of personnel, small and medium-sized enterprises

commission business consultants (if they have sufficient funds) who have the tasks of defining and realizing opportunities.

3.2 Creativity

An owner manager should be creative because of the need to develop constructively company policies, systems and procedures. In other words, the creativity is required for the business to function effectively. An entrepreneur not only thrives on the creative process, but cannot set up a business before the creative aspect has come into play by perceiving a need and finding the means to satisfy that need.

3.3 People skills

Assertiveness is needed with the various stakeholders such as suppliers, accountants, or staff But he should be sensitive as well when he has to mediate differences of opinion between employees or when he has to deal out criticism to employees. But he also needs the competence in motivating the employees – this is especially important as any staff employed will be required to undertake a range of tasks and activities. It is not unheard for a staff member to be involved in marketing, finance and logistics. Discretion and trustworthiness are essential behaviours which an entrepreneur or an owner manager should have because he knows or works with individual-related data.

3.4 Knowledge and the liability of newness

An entrepreneur or an owner-manager should have knowledge in aspects of accounting such as budgeting, marketing techniques, networking and many other areas, since the business often rests on their shoulders alone. One particular aspect of knowledge that is worth consider is that of 'newness' i.e. being new to the arena of running a new small business. Owner-managers of young firms have to contend with particular difficulties that have been classified as part of the "*liability of newness*", which may lead to a greater chance of failure. The causes for failure are all based on the need to learn something new and include: new roles that have to be learned; new routines to solve problems; establishing new social relations with strangers; and new connections with those who use their services (Stinchcombe, 1965). This need to learn and develop during the course of growing the business leads to a make or break situation: Carroll (1983) found that organizational death rates decline with firm age. Phillips and Kirchoff (1989) found that three out of five new firms fail within their first six years and Nucci (1999) also found this regardless of industry, size grouping, or region. The new situation was found by Freeman et al. (1983) to depend upon the cooperation of the owner-manager with strangers, whereas older organizations have developed stable and established networks. In a nutshell, the owner-manager is faced with a steep learning curve.

4 Distinguishing characteristics of owner managers and entrepreneurs

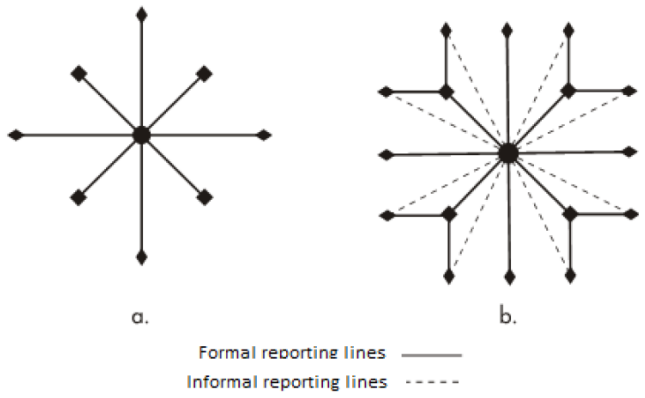
If we turn from the similarities to the differences between entrepreneurs and owner-managers, then we see some characteristics as specific to one of the two only. Looking first at entrepreneurs, they have the following distinguishing characteristics.

4.1 The entrepreneur's drive to solve problems (mastery)

Littunen (2000) see mastery as increasing after the start-up phase and, conversely, control by powerful others decreases. *Opportunity recognition* skills were found in a study by Sambasivan et al. (2009) to increase venture performance and these skills acted as a mediator between the qualities and skills of the entrepreneur, and venture performance. *Alertness* (Sambasivan et al., 2009) also has been found to improve venture performance. *Prior knowledge* of the given area in which the entrepreneur plans to fill the need is also a contributor to better venture performance (Sambasivan et al., 2009). In

relation to prior knowledge, some studies have found that the majority of entrepreneurs (56%) are educated to Bachelor degree level (Okoye and Adigwe, 2015). *Social network skills* are needed to establish relationships for collaboration and as a means of overcoming the limited resources and knowledge. Networking is so intense on the part of the entrepreneur, when compared to managers of large businesses that Burns (2002) compares it to the spinning of spiders webs and this is also borne out in the informal organizational structure where staff are also encouraged to network and, thereby, the web gets bigger still. However, with these social networking skills and an informal structure, the entrepreneur communicates directly with all staff, which would be impossible in a larger organisation and has been found to have a limit of around 20-30 employees (Lobontiu and Lobontiu, 2014). The following figure highlights this different approach using social network skills:

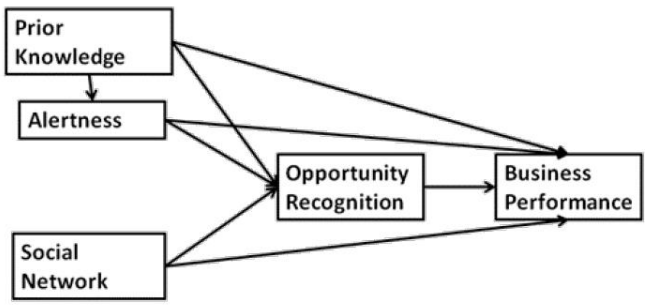
Figure 1. The growth of the entrepreneurial spider's web



Source: Burns, P. (2002) *Entrepreneurship and Small Business* (p. 241-242). Hampshire: Palgrave

Social network skills are also seen as a part and package with alertness and prior knowledge that constitute the means by which entrepreneurs recognize opportunities, prior to setting up a business. This is shown in the following figure (Lim and Xavier, 2015):

Figure 2. Three key entrepreneurial characteristics



In this way, we can see the interplay between skills and how the three characteristics lead to the enhancement of opportunity recognition skills, as well as firm performance:

- *Vision-centred*. According to Mintzberg (2002) in his book *Strategy* Safari there are ten schools or approaches to strategy. The main focus of the entrepreneurial school is on the leader and his / her vision. The vision is a representation of a strategy existing in the mind of the leader and perhaps can be considered as a vision of the organization's future. The vision is thus seen as an image rather than some advanced plan. As such, the School considers the mental processes of the leader as well as the issues of typology, traits and talents of a leader and entrepreneur.

- Regardless of the differing concepts of a leader and an entrepreneur, Mintzberg's Entrepreneurial School also considers the *intuition, wisdom and experience* that the leader / entrepreneur employs as a means of strategy formation, although it seems that such strategy formation is an almost semiconscious process.
- The entrepreneur is the key to strategy formation in this School, the vision is promoted by the leader under his close personal control so that specific aspects can be reconsidered if necessary. This implies that *power is centralized* with the leader and that the leader is likely to be the head of the company, founder or CEO.
- *Risk-taking***.** The entrepreneur is often characterised as a risk-taker, although entrepreneurs such as Richard Branson, claim that this is calculated risk-taking, rather than a simple gamble.
- Gubitta and Tognazo (2017) highlight that a strong drive or *passion* to achieve is also required from entrepreneurs. However, passion can be divided into two types: harmonious passion and obsessive passion. The claim that harmonious passion prevails over obsessive passion among entrepreneurs and propose that harmonious passion positively affects entrepreneurs' subjective career success, while obsessive passion has a negative or no impact on it.

There are also personality aspects that could be considered such as *narcissistic* being one aspect that has been found as characteristic of entrepreneurs (Kets de Vries, 1996). A more recent study by Piper (2017) found that narcissism affects a companies' financial performance and that firms' future operational performance can be assessed based on the indicators of CEO narcissism. This would also apply to the case of entrepreneurs – especially form the view that confidence and leadership are misinterpreted and should in fact be seen as narcissism, which could be detrimental to the performance of the firm.

4.2 Distinguishing characteristics of owner-managers

Owner-managers have a certain short-termism that could be reflected in a lack of planning, however, problem solving or 'fire-fighting' and self-management could be considered as key requirements. Such characteristics of owner-managers that distinguish them from entrepreneurs can be seen in the following:

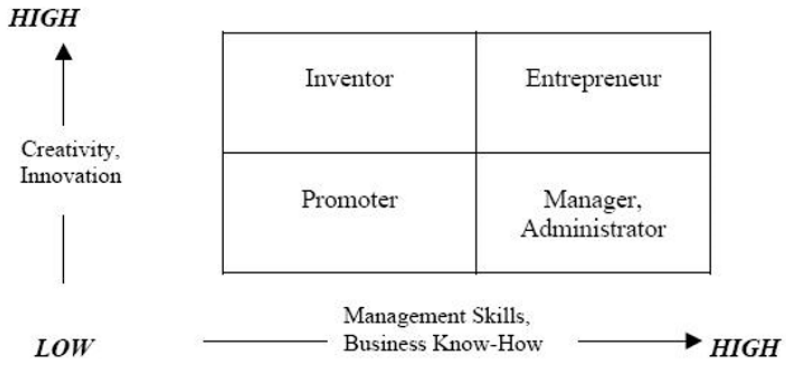
- Owner-managers need *multi-tasking* skills covering a wide range of areas. A one-man business, as mentioned earlier, means the owner manager has to deal with marketing, finance, logistics and all the other areas of the business. Conversely, entrepreneurs may see an opportunity and set up a business with a number of staff – depending on the amount of funds secured from investors. As the company grows these responsibilities may be split between management, but still with managers covering more than one field.
- *Fire-fighting* is the need to solve problems as they emerge on a daily basis and limit the damage caused by these challenges as they are overcome
- *Self-management / time management* is related to the need to multi-task. Owner managers have a lot to learn and a lot of tasks to manage. The need to prioritise and be organised are encapsulated in the need to manage oneself and one's time.

5 Discussion

As we have seen, there are some similarities and differences between entrepreneurs and owner-managers. The owner manager appears, by definition, to be closer to a manager with the necessary management skills and business know-how. Conversely, entrepreneurs have a greater leaning towards

creativity and innovation. A final indication of the differences between these two groups can be seen in a study by McNeil et al. (2004)[43]:

Figure 3. The divergence and convergence of entrepreneurs and owner managers



(Timmons, 1989:21)

The owner-manager is seen by Timmons (1989) as possessing the necessary management skills and know-how but somewhat weak (generally speaking) in creativity and innovation, leading owner-managers to fall into one of two categories: 'Promoter' or 'Manager / Administrator'. The entrepreneur is also possible a 'promoter' or an 'inventor'. When the entrepreneur also has sufficient management skills and know-how or the owner-manager has high creativity and innovation, then we see the best of both worlds in the form of a true 'entrepreneur'.

Our study highlights the key characteristics that have been attributed to the success of entrepreneurs and owner-managers. Many of the skills and traits can be developed and for small business owners, the development of these skills should be an important consideration as some of these characteristics have evolved to overcome obstacles specific to small-scale business – such as the need for networking skills to overcome the liability of newness.

Through an understanding of the division of characteristics between entrepreneurs and owner-managers, there is also the implication that a combination of these characteristics results in a form of 'hybrid' that gives a small business a greater chance of survival and success. For small business owners, of course, success is not guaranteed but for those looking for greater entrepreneurial or managerial focus, the list of characteristics signifies potential developmental areas.

For researchers, there has been a lot of focus on particular characteristics but not on the whole picture. Whilst it may be difficult to generalise on the combination of factors that contribute to success, this review should aid researchers in considering the range of elements that could be included in empirical studies of entrepreneurs and owner managers. This study is limited to solely a literature review of the topic and as such, it does not in itself provide generalisable findings. However, it does serve to provide inspiration for future research directions such as, which combinations of personal characteristics are the most effective or further examination of the nature of the 'hybrid entrepreneur' that has the characteristics of both the entrepreneur and the owner-manager.

To conclude, our study sought to examine the characteristics of owner-managers and entrepreneurs, and then combine and contrast them. These characteristics will change and develop in relation to both internal and external demands. However, there are certain characteristics that seem timeless such as the need for networking skills in general, and vision and risk-raking for the entrepreneur.

Our study has found that there are also characteristics that need to be reduced or changed in scope. For example, entrepreneurial narcissism is a negative characteristic that should be limited,

[43]http://www.acoaapeca.gc.ca/eng/publications/ResearchStudies/Pages/EntrepreneurshipinAtlanticCanadianUniversityEnvironments1.aspx

and short-termism may be a necessity for small businesses, but this should not also dictate the overlooking of a long-term vision.

6 Bibliography

[1] Bridge, S., O'Neill, K., and Cromie, S. (1998). Understanding enterprise, entrepreneurship and small business. London: Macmillan Business.

[2] Burns, P. (2002). Entrepreneurship and Small Business (p. 241-242). Hampshire: Palgrave

[3] Carroll, A. B. (1983). Corporate social responsibility: Will industry respond to cut-backs in social program funding? Vital Speeches of the Day, 49, p. 604-608

[4] Driel, H.J. van, and Poutsma, E., (1989). SME and Control: Autonomy for Flexibility. In: Poutsma, E., & Walravens, A. (Eds.), Technology and Small Enterprises. Technology, Autonomy and Industrial Organisation (pp.105-123). Delft: Delft University Press.

[5] Freeman, J., Carroll, G. R., and Hannah, M. T. (1983). The liability of newness: Age dependence in organizational death rates. American Sociology Review 48, 692-710

[6] Gubitta, P. and Tognazo, A. (2017). Entrepreneurs' Career: Satisfaction, Passion and Depression, EURAM conference 2017 proceedings.

[7] Jennings, P.L., and Beaver, G. (1995). The managerial dimension of small business failure. Journal of Strategic Change, 4(4), 185–200.

[8] Kets de Vries, M. (1996). The anatomy of the entrepreneur: Clinical observations. Human Relations, 49 (7), 853–883

[9] Lim, W. L., and Xavier, S. R. (2015). Opportunity Recognition Framework: Exploring the Technology Entrepreneurs. American Journal of Economics, 5(2), 105-111

[10] Littunen, H. (2000). Entrepreneurship and the characteristics of the entrepreneurial personality, International Journal of Entrepreneurial Behavior & Research, Vol. 6 Issue: 6, pp.295-310, https://doi.org/10.1108/13552550010362741

[11] McNeil, S., Fullerton, D., and Murphy, L. (2004). Understanding Entrepreneurs: An Examination of the Literature. Entrepreneurship in Atlantic Canadian University. The Atlantic Canadian Universities Entrepreneurship Consortium. Centre for Small Business and Entrepreneurship Acadia University Wolfville, Nova Scotia. Available at: http:// www.entreoasis.com/resources/pdf/4091120042219.pdf

[12] Mintzberg, H., Ahlstrand, B. W., and Lampel, J. (2002). Strategy safari: A guided tour through the wilds of strategic management. New York: Free Press.

[13] Nucci, A. R. (1999). The demography of business closings. Small Business Economics 12 (1): 25–39.

[14] Okoye, N and Adigwe, P. (2015). Who wants to be an entrepreneur - An insight into the profile of individuals interested in entrepreneurship in Nigeria, European Journal of Business and Management, vol. 7, no. 21, 93-103

[15] Phillips, B. and Kirchhoff, B. (1989). Formation, growth and survival; small firm dynamics in the US economy. Small Business Economics, 1(1):65–74

[16] Piper, M. (2017). CEO Narcissism and Financial Performance In European Firms, EURAM conference 2017 proceedings.

[17] Sambasivan, M., Mohani, A., and Yuzliani Y. (2009). Impact of Personal Qualities and Management Skills of Entrepreneurs on Venture Performance in Malaysia: Opportunity Recognition Skills as a Mediating Factor, Technovation 29.11, 798–805.

[18] Stinchcombe, A. L. (1965). Social structure and organizations. In J. G. March (Ed.), Handbook of Organizations: 142-193. Chicago: Rand McNally

[19] Timmons, J.A. (1989). The Entrepreneurial Mind, Andover, Mass., Brick House Publishing

THE STUDY OF THE DIRECTIONS OF DEVELOPMENT OF INDUSTRY ON THE BASIS OF R&D

Elena Vetrova [a]***, Liudmila Lapochkina*** [b]

[a] *Saint Petersburg, St. Petersburg, Russian Federation, Department of Economics and Management of Enterprises and Production Complexes, e-mail: vetrovaelenik@gmail.com.*

[b] *Northern Arctic Federal University, Department of Economics, Russian Federation, email: lyvip@yandex.ru.*

Abstract:

Industry serves as a basis for economy development and defines the directions of most R&D all over the world. On the whole, one can speak of six leading industrial sectors, in which R&D is concentrated: life science, aerospace industry/defence, new materials, ICT, automobile and energy industries. Each sector uses its own technologies, but general directions of technological development are of a universal nature. It is therefore important for every company to have the R&D market access tools. At the same time, the existing tools are restricted by formal and/or political environment, which impedes free access of companies to the world R&D achievements or entrance of those companies to the world market with their own R&D achievements. It substantiates the topicality of searching for new directions of development of the companies' tools to enter the global R&D markets for the purpose of their development.

The purpose of the study: to build a conceptual model of industrial development on the global market by means of development of R&D access tools.

Methods: analysis and synthesis, life-cycle theory, theories of strategic management and entrepreneurship.

Results: validation of the model of access to the R&D market to provide industrial development and competition on the global market.

Key words:

Industry, R&D, technology platform, competition, development.

JEL: O3, O4

1 Introduction

Industry as a basis for economy is, on the one hand, the major consumer of R&D; on the other hand, it sets out the main directions of R&D. This is due to the importance of technological factors in a modern industrial enterprise [1]. Especially important it is for research-intensive enterprises defining the basic tendencies of the global technological development. Moreover, in research-intensive enterprises, alongside with providing operational processes, it is necessary to get integrated into the process of developing new products and improving the existing ones, i.e. to establish the strategies of technological development. It requires resources and investments that are often limited. The topicality of the research into the directions of development of industry is reinforced nowadays due to the following factors:

- the level of research intensity of industry and its content are changing, which necessitates modifications in the ways production and R&D are organised;
- there exist systemic problems in the functioning of research-intensive enterprises in developing countries, including Russia, that are connected with their lagging behind the world standards;
- despite the diverse nature of R&D, it is used by a certain range of industrial sectors and their leaders; therefore, the importance of the R&D market access tools becomes highlighted;
- the existing methods of access to the world technologies and the tools for using them in industrial enterprises are often restricted by formal and/or political environment.

In scientific and methodical literature, there is currently an active discussion of conceptions, approaches, forms and methods of R&D and organisation of the manufacturing of new products; we also have developing theories of life cycles, strategic management and technology entrepreneurship. However, such aspects as promoting access tools of an industrial enterprise to R&D on the global market for the purpose of its development or providing its entrance to that market with its own R&D, are not paid due attention to in the present context.

2 Methods

2.1 Characteristics of research-intensive industrial

By a research-intensive industrial enterprise, it is common to understand an industrial enterprise in which the manufacturing of products presupposes conducting a certain amount of research and R&D (by various estimates – from 15 to 40-50% and more). In the world practice the classification of sectors and enterprises according to their level of research intensity is carried out on the basis of the research-intensity coefficient, which is the ratio of R&D expenses to the volume of gross output in this given sector (more than 17% [2]).

The main specific features of a research-intensive industrial enterprise are as follows [3, 4]:

- integrated nature of the activity that frequently includes a full cycle of the innovation process - from R&D to serial production and operation, which underlies its project approach to management;
- considerable volume of R&D; creating test samples of products and improving them during the whole production time with due consideration of design changes and modifications;
- different lengths of life cycles of products which complicates production management because of the time delay between control actions and their effects and thus increases responsibility for selecting a development strategy;
- coordination of the R&D purpose and operation activities with the promising directions of research and technology development;
- high scientific and technical level of products that must match and exceed the world standards;
- dominance of the evolution process of technology over the production process and its organisation and the consequent need for timely and permanent updates and development of fixed assets;
- polytopicality of R&D, diversity and polynomenclature nature of manufacturing;
- non-availability of R&D results to other market players;
- high rate of development of production and its organisation, including types, methods and forms of production organisation;
- development of a new product is normally carried out simultaneously with designing its basic elements and requires considerable investments under the conditions of limited resources;
- unique staff with a lot of researchers, highly-qualified specialists and industrial workers;

Accordingly, we can draw conclusions, first, about the importance and complexity of managing a research-intensive industrial enterprise's development under the conditions of limited resources;

second, about the advisability of promoting a free R&D market to provide companies with access to R&D results. As a whole, it stimulates competition and is beneficial to all market players.

The present study is based on the assumption of dominance of the strategic approach to managing a research-intensive enterprise. This brought about the need to use the life cycle theories of a project, product, organisation [5, 6], the strategic management and technology entrepreneurship theories. This forms the basis of the suggested industry development model.

Making a decision about the enterprise's entrance to a project entails the problem of coordinated assessments of the possibilities available on the market and of the current state of one's own powers, i.e. assessment of the potential [7]. Therefore, it is suggested to assess the advisability of selecting a development trend from a lot of variants on the basis of an enterprise's potential. To that end, it is advisable to use the strategic management theory that provides a strategic selection of the strategy implementation tools.

Access to R&D is essential for the development of a research-intensive industrial enterprise. For that purpose, the technology entrepreneurship theory was used and a technology platform was selected as the main instrument of innovative development; also, ways of its improvement were identified.

2.2 Study of R&D problems in industry

Industry serves as a basis for economy development and defines the direction of most R&D in the world. The range of research-intensive sectors, in which R&D plays an important role, is confined to the following set: life science, aerospace industry/defence, new materials, ICT, automobile and energy industries. These sectors account for more than half of industrial expenses in the world. Each sector uses its own technologies, but general directions of technological development are of a universal nature. It is therefore important for every company to have the R&D market access tools.

In recent times, due to various reasons Russian industrial enterprises have lost their positions in terms of research intensity. Internal expenses on R&D are insufficient (about 1% of GDP); innovative activity of Russian enterprises is low (less than 10%), including research-intensive ones. Investments in fixed assets of research-intensive activities have been in decline since 2014; depreciation of fixed assets of technology-intensive enterprises remains critical (Table 1).

Table 1 – Characteristic of the state and development of research-intensive and technology-intensive production in the Russian Federation, % [8]

Indicators	2010	2011	2012	2013	2014	2015	2016
Share of products of technology-intensive and research-intensive sectors in GDP, %	n/a	19,7	20,3	21,1	21,8	21,5	22,4
Internal expenses on R&D, % of GDP	1,13	1,01	1,03	1,03	1,07	1,10	1,10
Innovative activity of organisations — technology-intensive economic activities	n/a	n/a	31,3	30,4	32,0	31,7	30,8
Innovative activity of organisations — research-intensive economic activities	n/a	n/a	8,9	8,8	8,6	7,8	7,3
Average share of technology-intensive products in total exports, %	n/a	n/a	n/a	9,9	8,7	11,3	13,3
Average share of technology-intensive products in total imports, %	n/a	n/a	n/a	62,5	61,2	58,5	59,2

Fairly high innovative activity in technology-intensive sectors of economy (more than 30%) is connected with the development of the domestic market, but it yields no considerable results on foreign markets – exports of research-intensive and technology-intensive products are low and lag more than

40% behind imports. This reveals insufficient efficiency of R&D expenses in technology-intensive and research-intensive industries or their insufficient commercial implementability.

In the USA two-thirds of all R&D is carried out and implemented by industrial organisations. In Europe and Asia the share of R&D for industrial enterprises is 50% and 75% of its total volume. Global comparison of investments in R&D (R&D) reveals that Russia, which is among TOP 40 in terms of internal expenses on R&D (GERD), lags far behind developed countries (Table 2).

Table 2 - Forecast Gross Expenditures on R&D [9]

	2015 Actual			2016 Estimated			2017 Forecast		
	GDP PPP Bil, US$	R&D as % GDP	GERD PPP Bil, US$	GDP PPP Bil, US$	R&D as % GDP	GERD PPP Bil, US$	GDP PPP Bil, US$	R&D as % GDP	GERD PPP Bil, US$
United States	17950	2,77	496,84	18237	2,81	512.46	18638,0	2,83	527.46
China	19390	1,92	372,81	20669.7	1,94	400.99	21951,3	1,96	429.54
Japan	4830	3,41	164,59	4854.2	3,55	172.32	4883,3	3,5	173.36
Germany	3841	2,92	112,16	3906.3	2,88	112.50	3961,0	2,84	112.49
South Korea	1849	4,04	74,7	1898,9	4,26	80,89	1995,9	4,29	83,91
India	7965	0,85	67,7	8,570.3	0,85	72,85	9221,7	0,84	77,46
France	2647	2,26	59,82	2,681.4	2,24	60,06	2716,3	2,24	60,84
Russia	3718	1,5	55,77	3,688.3	1,5	55,32	2757,2	1,5	55.93

As a result, on the world R&D market Russia has a 3% share and this share is expected to go down (Table 3).

Table 3 - Share of Total Global R&D Spending [9]

	2015 Actual	2016 Estimated	2017 Forecast
North America (12 countries)	27.9	27,8	27,7
United States	25,8	25,6	25,5
South America (10 countries)	2,7	2,5	2,4
Europe (34 countries)	21,6	21,2	20,8
Germany	5,8	5,6	5,4
Asia (24 countries)	41,3	42,3	42,9
Japan	8,5	8,6	8,4
China	19,4	20,1	20,8
South Korea	3,9	4,0	4,1
India	3,5	3,6	3,8
Africa (18 countries)	1,0	0,9	0,9
Middle East (13 countries)	2,5	2,4	2,5
Russia/CAS (5 countries)	3,0	2,9	2,8
Total (116 countries)	100	100	100

The total growth of global investments in R&D is due to their significant increase in Asian countries, especially in China that has been increasing investments in R&D over the last few years by more than 10% a year. The current rate of growth of R&D in China is about 7%, which is more than twice as high as in the USA and most European countries. As shown in Table 3, Asia accounts for more that 40% of all global investments in R&D and its share continues to grow. The USA economy continues to

outperform many western economies – over the last two years investments in R&D have increased, while investments in other directions have gone down.

As a result, on the world market of research-intensive products, Russia has only about 0,3 % – 0,5 %, while the USA – 36 %, Japan – 30 %, Germany – 17 % [4].

According to the BEEPS research by the European Bank for Reconstruction and Development and the World Bank, only one third of Russian enterprises introduce new technologies, which would lead one to conclude that the problem of absence of our own technological solutions still remains unsolved.

When assessing the state of research-intensive enterprises in Russia, one should note, that their production process is not in conformity with the basic characteristics of research intensity, the following ones, in particular: 1) the rate of growth (it must be 3-4 times as high as that in other sectors of economy); 2) the share of added value in final products (it must be significant); 3) the workers' salary (it must be increased); 4) the volume of exports (it must be significant) and, which is especially important, the innovative potential (it must be high and serve not only the sector that possesses it, but also other related sectors of economy). Among the main reasons for such a situation one should mention the following ones [3]:

1) Underfunding of basic and applied science; decline in importance and relevance of R&D management.
2) Disintegration and privatisation of enterprises that are part of scientific production associations that existed in the days of the USSR. Consequently, production has lost its research intensity; enterprises with such production capacities have lost their positions on the market. In most cases, internal resources are not enough to deal with the situation, and state orders do not provide an opportunity to execute a complete cycle – from R&D to the introduction of new products to the market and their mass production.
3) Introduction of assembly production which turns out to be progressive in some activities. This resulted in the use of sustained but outdated foreign technologies in many industrial enterprises and a sharp decline in standards of Russian design and construction, respectively.
4) Common usage of foreign design systems which exploit foreign components and which fail to meet the specific requirements to complex research-intensive Russian products.
5) Absence of free access of industrial companies to the global R&D market.

This situation is typical of most developing countries, including those of Eastern Europe. Thus, researches have demonstrated the need for changes in research-intensive and technology-intensive sectors of economy, and on the R&D market on a global scale.

Basic strategies of technological development can be roughly divided into two groups: conducting high-standard independent R&D and using ready-made R&D results. The first strategy requires considerable investments and can be implemented using the tools of direct funding of R&D (Asia), public-private partnership (USA, Japan). The users of the second strategy are characterized by limited investment resources and such preferred tools as special economic zones (international practice) and technology platforms. This strategy is mainly typical of technology businesses and we consider such an instrument as technology platforms to be promising in terms of promoting the development of industry and competition on a global scale.

Technology platforms can be build in accordance with the directions of technology development, on the basis of different sectors and other characteristics. In the world practice, technology platforms are built on formal grounds of membership of a particular union of countries and are greatly dependent on political factors. For example, in the Eurasian Economic Union there are 14 approved technology platforms in such fields as space, medicine, information and communication technologies, photonics, natural resource extraction, ecology, agriculture and industrial technologies. However, their usage by industrial enterprises is limited at the level of the EAEU states, which, in our vision, contradicts the conception of open innovations.

As a result, we have the conceptual model of industrial development whose dimensions are competition, development and efficiency of all market players, and whose basis is providing free access to the R&D market on independent technology platforms.

3 Paper results

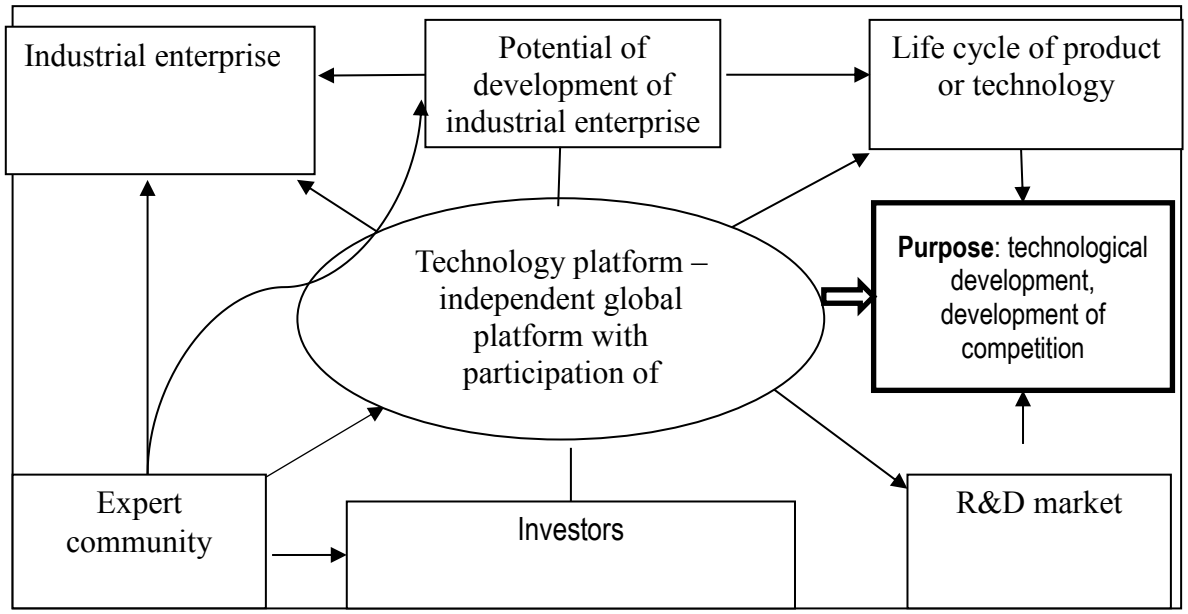
Individual companies can create their own advantages in their sectors by investing in technologies. Every sector has its leaders who developed due to traditions, innovations, administrative leadership, intellectual property, as well as aggressive marketing, entrepreneurial risk and activity. At the same time, there are a lot of companies whose resources to carry out their own R&D are very limited.

In many sectors, there are a lot of new technologies. Here belong constantly developing information and communication technologies (ICT), nanotechnologies, biotechnologies, artificial intelligence, intelligent software, intellectual calculations and more. Each of these technologies is based on one another and on the sector into which it is integrated. Each sector has R&D expert communities and also general education and information resources. As a result, technological development revolves around six leading industrial sectors: life science, aerospace industry/defence, new materials, ICT, automobile and energy industries. These sectors account for more than half of industrial expenses in the world.

For the development of industry it is advisable that companies have free access to technologies. Such access can be provided on global technology platforms where a technological broker brings into contact the developer of the technology, its consumer, investor and other market players. The current technology platforms are limited in their functioning by formal organisations such as EAEU. We argue that industrial companies must have free access to such platforms with transparent rules of market competition. These platforms must be independent of national state regulation and act in compliance with international rules.

As an alternative to the existing researches, but with due consideration of their results and focus on the best practices, we suggest an original development model of an industrial enterprise in the context of access to the R&D market. The conceptual framework of the model is reflected in Fig. 1.

Figure 1: Conceptual Model of industrial development



This conceptual model is build on the basis of:

1) the theory of life cycles of an organisation, technology and product;
2) assessment of an enterprise's potential to implement the strategy of technological development;
3) optimisation of the strategy in terms of time and expenses, which is carried out on the basis of the technology platform as a tool of free access to the R&D market.

As a result, we have a model of industrial development whose dimensions are competition, development and efficiency of all market players, and whose basis is providing free access to the R&D Write the paper results here

4 Discussion

Modern researches discuss several approaches to the problem of development of research-intensive industrial enterprises: exogenous, endogenous and hybrid ones. The exogenous approach relies on direct investments; the endogenous approach presupposes the incubation of research-intensive businesses and a relevant transfer of technologies based on local sources; the hybrid approach is a combination of the exogenous and endogenous approaches in different proportions.

Having analyzed the opportunities offered by the three approaches, we consider the hybrid model of creating independent global technology platforms to be most promising in terms of providing free access to the R&D market and organizing a cooperation between research and applied science and operational practices of real industrial enterprises. In our vision, the existing model of functioning of technology platforms is outdated because of formalization and polarization of their activities. Development of independent technology platforms with the involvement of competent partners will give industry an opportunity to develop, and society will be enabled to experience socio-economic effects of this development.

5 Bibliography

[1] Vikhanskiy O.S. Strategic Management: A Textbook. - Moscow: Gardarika, 2011. – 296 p.

[2] Science, Technology and Industry. Scoreboard of Indicators 2007/Paris: OECD, 2007.

[3] Vetrova E.N., Vashchillo A.A. On the effectiveness of the personnel and technical policy of a small and medium-sized enterprise in the radio electronic industry under conditions of import substitution // Fundamental research. 2017/10 - 3. C. 565-569.

[4] Dolgova M.V. Current trends of development of the science-intensive and high technology industries // Fundamentalnyie issledovaniya. 2014. № 11-4. P. 852-857.

[5] Adizes I. Corporate Lifecycles: how and why corporations grow and die and what to do about it. Englewood Cliffs, N.J.: Prentice Hall, 1988.

[6] Vetrova E.N., Vashchillo A.A. Business culture in management of industrial enterprise: resource approach. Economy & Business Journal, Bulgaria. 2017. 11. P. 148-156.

[7] Vetrova E.N, Gutorova N.V Analysis of the directions of development of the strategic potential of an industrial enterprise // Scientific and Technical Bulletins of the St. Petersburg State Polytechnic University. Economic sciences. 2011. № 1 (114). Pp. 92-98.

[8] Russian Statistical Yearbook 2017: Stat.book/Rosstat - R76 M., 2017 – 686 p.

[9] Global R&D Funding forecast // A Supplement to R&D Magazine, Winter – 2017. P. 3-5.

TRANSFORMATION OF RUSSIAN MASTER'S EDUCATION IN THE KNOWLEDGE ECONOMIC CONDITIONS

Alzhanat E. Suleimankadieva
Specialized Department of PAO "Gazprom", Saint-Petersburg State University of Economics, Russia
saljanat@mail.ru

Abstract:

This paper attempts at justifying the causes and process of transformation of the system of Master's education in Russia in the context of the knowledge economy. The author: a) showed the process of gradual transformation of the Master's degree in Russia and using the example of Saint Petersburg State University of Economics (UNECON) b) performed a statistical analysis of knowledge content and self-sufficiency and SWOT-analysis of the effectiveness of Master's education in UNECON; c) justified the feasibility of integrating science, education and real economy, and determined strategic prospects for the development of Master's education.

Key words:

Transformation of Master's degree, lifelong education, knowledge economy, cognitivization, "knowledge capacity", self-sufficiency, integration, strategic prospects.

JEL*:* I21, I23, I25.

1 Introduction

Since the early XXI century, there have been significant changes in the Russian higher education, which are defined by the top-priority directions of the new economy. Russia has faced the problem of constructing a well-developed and knowledge-driven economy, in which: 1) knowledge plays the leading role, it has become a key tool in the development of the economy [5; 6]; 2) it has become necessary to find ways to modernize higher education, introduce high technology in the educational process, above all, in the training of highly qualified specialists in economic sectors [9].

The main change in the system of Russian higher education is associated with Russia's entry into the Bologna process in 2003 and the introduction of the multilevel training system "Bachelor - Master - Post-graduate (Doctorate)." In this triad an important role is played by the system of Master's training, since, as an intermediate link, it: 1) stabilizes and adapts the first level of higher education (Bachelor's degree) to economic conditions; 2) acts as innovative infrastructure of the university, serves as a laboratory and a platform for the implementation of solid research projects; 3) creates a basis for generating, transforming, transferring and utilizing new knowledge in the real economy; 4) is an important factor and educational technology in the concept of *Lifelong Education*, thereby contributes to the formation of an innovative type of development of the country's economy.

2 The aim of the paper and used methods:

The aim of this paper is to analyze the process of transforming the system of Master's training in Russia, first of all, by using the example of Saint Petersburg State University of Economics (UNECON), in the conditions of the knowledge economy and to assess its knowledge capacity and self-sufficiency. The main methods used in this paper are: gradual and a comparative analysis of the transformation of

the Master's degree since the early 1990s up to the present; statistical analysis of “knowledge capacity” and “self-sufficiency” indicators and definition of an integral indicator of accumulation and translation of new knowledge in the system of Master's training on the example of UNECON; SWOT-analysis and definition of the strategic prospects for the development of Master’s training in Russia.

3 The results of paper

3.1 The transformation of the model of Master’s education in Russia and the main trends of its development in the context of universal cognitivization

In modern Russia, the transformational processes taking place in the system of Master's education are of the greatest interest. This is the second level of education in the concept of *"Lifelong Education"* and it plays an important role in the formation and development of an innovative economy, based on the principle of cognitivization and digitization. For less than fifteen years the popularity of training in the system of Master's education has increased by more than 9 times: from 8.4 thousand people in 2000 to 77.4 thousand people in 2015.

The process of gradual transformation of the Russian Master's education model from 1992 to the present is shown in Table 1[44]. This transformation process deals with: *firstly*, the changes, which are appeared in the Federal State Educational Standard of Higher Education (FSES HE) of Russia and *secondly*, the Russia's entry into the Bologna process. These facts explain the choice of these intervals (of three stages) in the substantiation of the transformation process in the development of the Russian’s masters education.

Table 1 – Stages of transformation and development of the Russian system of Master's education (ME)

Stages, Criteria	First stage (1992 – 2002)	Second stage (2003 – 2014)	Third stage (2015 – up to the present)
Features of the educational process	Creation of Master's degree education and its integration into the system of higher professional education (1992). Along with the graduated specialists the universities carry out the training of Bachelors and Masters	Russia's entry into the Bologna process. The transformation of the Russian ME	Enhancement (development) of ME
Purpose and features of training	Training of a Master of Science. ME has a research nature	Training of a professional Master, oriented on working not only in the scientific and research environment, but also in professional environment. Graduates have "high added value", a set of knowledge, skills, creative abilities and additional competencies that are not included in Bachelor's programs	Training a Master who is a generator, translator and user of the new knowledge, able to solve complex problems in the context of innovative type of economic development based on system approach to problem solving

[44] This table was built by author, based on Law of the Russian Federation “On education in the Russian Federation”; The Law of the Russian Federation “On education” in 2016; Federal State Educational Standard of Higher Professional Education in stream 0802200 “Management” (qualification (degree) “Master” no. 337 as of 15 may, 2010; Federal State Educational Standard of Higher Education in stream 38.04.02 “Management’ (Master's level); Nikulina E.G. Research of Changes in the Training of Masters in Russia from 1992 to the Present Time [1; 2; 3; 4; 8].

ME orientation and main focus	The emergence of research-scientific and research-pedagogical activities. Emphasis on the contents and learning technologies in Master's programs, which correspond to the aims of the educational process in the "Learning through research"	Diversification of the ME, the emergence of subject-oriented activities: research; pedagogical; project; management and others. Shifting the emphasis from the orientation of Master's training to the rationalization of teaching technologies.	Emphasis on the innovative methods (technology) of training in Master's program and their development. The network form of ME development is top-priority, development of distance learning, individualization of the educational process
The role of Master's programs	A platform for training Masters for scientific research	Place for the development of research competence, put into practice in the future professional activities of graduates	The institution where qualified Masters are trained for work in the innovative sector of the economy, where new knowledge is being developed and disseminated
Model of the educational standard	SES HVE (state educational standard of higher professional education), according to which the Master's degree is assigned to the third level of higher education, following the Bachelor's degree and specialist's degree	FSES HE (federal state educational standard of higher education), according to which a Master's program is an in-depth professional training, allowing graduates to work in the chosen field of activity, to obtain universal and subject-specialized competencies, which promote social mobility and stability in the labor market. ME has a professional nature	FSES HE, FSES HE3++[45]
Implemented competences	Scientific-research and scientific-pedagogical ones	Cultural, general cultural and professional ones	Universal, general cultural and professional ones

The need to transform and create an integrated Master's education structure in the context of its continuity is determined by the following reasons: a) The new technological paradigm relies on interdisciplinary and transdisciplinary research and development, which is the result of the "merging" of continuous fundamental and applied science, the system of lifelong education and the real economic sector; b) high speed of modernization and globalization of scientific and technological progress imply reduction of the development cycle of high technology industries, the rapid diffusion of high-efficiency innovations, humanization, miniaturization and ecologization of equipment and technology; c) acceleration of the process of continuous updating of new knowledge and competences (both formal and informal) necessary for the successful development of companies; d) science and education obtain an entrepreneurial nature (venture research and production companies, the demand for "hybrid product" emerges and grows).

[45] Three questions in table 1 are used because the new Federal State Educational Standard of Higher Education with two pluses (FSES HE 3++) is not yet introduced in all educational programs and directions of master's education. There is only a project of new transformed Educational Standard and we are familiar with its content, but in fact it is not approved everywhere, it works only in several directions of master education system yet. All facts which have been showed in the table 1 were obtained from FSE HE of Russia. They were analyzed by author.

These phenomena, taking place in the modern cognitive economy, justify the expediency of advanced training of creative personnel, specialists and professionals in the field of innovation, information technologies of knowledge-intensive industries. The modern system of Master's training meet these requirements.

3.2. Features of the gradual development of the system of Master's training in St. Petersburg State University of Economics

Saint Petersburg State University of Economics (UNECON) is a major institution where specialists in finance, economics and management are trained. It has a unique and a long history of development.

In our opinion, the experience in constructing the educational process at the UNECON Institute of Master's programs, which was established in 2007 and to the present moment underwent a series of cardinal changes, seems to be the most successful example of the transformation of the traditional model of the educational process into an innovative one, allowing responding flexibly to emerging demands of the labor market, and aimed at improving the quality of Master's training [2; 7, pp. 5 - 15]. From 2007 to the present moment the university has experienced large-scale and gradual process of restructuring and the formation of a single objective as a result of consolidation of the three major universities in the area of economic staff training. This was an intensive process of unification of educational programs, the creation and development of a single organizational culture and the identification of trends and agreed strategic guidelines of the newly formed university.

The first stage (2007-2012) was marked by the beginning of transformations in the field of Master's training [10, pp. 94-101.], aimed at creating a single independent centralized structure that ensures the implementation of the objective to increase the competitiveness of university Master's degree graduates. The basis for this approach was the experience of the leading American and European universities whose Master's degrees are widely recognized in the international scientific and business community. By the end of the first stage the Institute of Master Programs began to work as a single mechanism for the development and implementation of strategic tasks to improve the level of research and educational activities of Master's students. It was achieved by combined the efforts of leading scientists of St. Petersburg State University of Economics and Finance. A scientific and methodological council was set up. It included the leaders of the largest Master's programs and had a mission to work out methodological approaches and regulations, synchronize the training schedules, which has led to the improvement of the quality of the educational process and the research activities of Master's students.

The second stage (2012-2013) of development of the Institute of Master's Programs is associated with the merging of St. Petersburg State University of Economics and Finance and St. Petersburg State University of Engineering and Economics in 2012 and the formation of St. Petersburg State University of Economics (UNECON). In this period there was a significant increase in the programs of "Management", "Economics" and "Finance and Credit", which led to the creation of a well-developed system of integrated training for Master's students in programs that allowed reaching a new level of requirements, which include: the formation of single approaches and principles to the opening of new programs taking into account the minimum number of students in the program (15 people); implementation of an individual training trajectory of Master's students, granting them the opportunity to choose the training in various scientific schools of the united university within the framework of a specific program. This period is characterized by a change in the organizational structure of the Institute of Master's Programs, the emergence of academic departments in the areas of management, economics, in science and practice, as well as the creation of educational-methodological and scientific-methodical departments, and the expansion of the academic council of the Institute of Master's Programs.

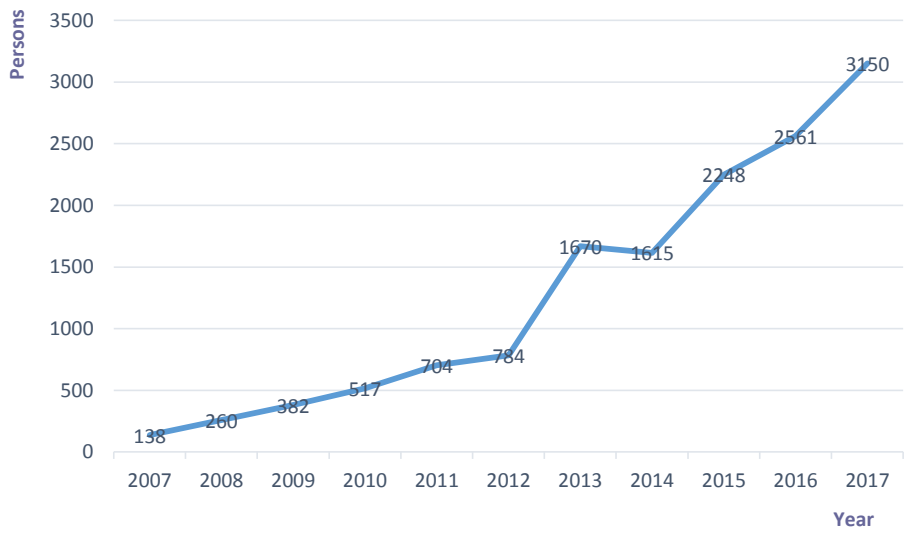
The third stage is associated with the consolidation of St. Petersburg State University of Service and Economics to the UNECON in 2013 and successful accreditation of sixty-eight educational programs at the united Institute of Master's programs. In this period a process of synchronization and harmonization of training within the twenty-one streams of Master's training was initiated, which later developed at the inter-stream level within the framework of the enlarged group. All the above processes were held against

the background of a continuous increase in the number of students. The statistical data is presented in Figure 1.

At the beginning of the 2017/18 academic year, more than three thousand students were trained as full-time and part-time students in sixty-two Master's programs within twenty-one streams. Up to one third of the total number of students have the opportunity to take annual internships abroad.

Currently, there is a further progressive development of the Institute of Master's Programs, due to the specialized department of PJSC Gazprom set up on its basis and the opening of targeted programs aimed at obtaining professional competencies at employers' request. A new momentum was also given to establishing some forms of networking cooperation with foreign and Russian partner universities.

Figure 1: Dynamics of the total number of students studying at the Institute of Master's Programs, UNECON, 2007 -2017.



The fourth stage includes assessment of the effectiveness of the higher education system, which involves an expert judgment of the integrated indicator of the new knowledge accumulation in the system of Master's training in the UNECON, using the example of an enlarged group "Economics and Management" (which includes such streams as: economics, management, finance and credit, trading business, personnel management and state and municipal administration) (P_{comp}), utilizing gradual assessment methodology of *"knowledge content"* (P_1) and *"self-sufficiency"* (P_2) composite indicators of the Institute of Master's Programs [9, PP. 29-31]. Both P_1 and P_2 indicators are composite and based on scoring. Their values vary within (0 - 1,0). Each indicator includes an analysis of a number of lower-order indicators (partial indicators). All indicators (composite and partial) used in this paper are norm-based and one-directional. They are given in comparable form and vary from 0 to 1.0. The indicators are built in such a way that the higher the value of each of them is (that is, the closer to 1.0), the better the position is in the metrics. Conversely, the closer the value of the partial indicator is to 0, the position of the indicator is worse.

To estimate the knowledge capacity ($P_1=\sum P_{1i}$), partial indicators were measured. They characterize the following potentials: *intellectual-knowledge* (P_{11}); *educational* (P_{12}); *innovative* (P_{13}); *scientific* (P_{14}); *spiritual-cultural* (P_{15}); *informational-communicational (including technological)* (P_{16}) and *social ones* (P_{17}). To determine the consolidated indicator of self-sufficiency of the educational system ($P_2=\sum P_{2j}$), the indicators that characterize the following potentials were calculated: *resource* (P_{21}); *financial* (P_{22}); *economic* (P_{23}); *investment* (P_{24}); *organizational-managerial* (P_{25}) *and personnel* (P_{26}); *safety potential* (P_{27}). All of these indicators were determined by weighted arithmetic mean's formulas and each of them is changed from 0 to 1.0. The knowledge capacity indicator (P_1) is equals to 0.920 and self-sufficiency indicator (P_1) is equals to 0.618. These metrics were obtained experimentally, it is the expert's estimation.

Further, the complex indicator *(P_{compl})* was calculated on the basis of the weighted arithmetic mean by the formula: $P_{compl} = P_1N_i + P_2N_j$, where N_i is the significance coefficient of the consolidated indicator. In this calculation, the experts determined the same significance of each consolidated indicator, i.e. it is 1.0. As a result of calculation of the complex indicator of new knowledge accumulated in the system of the UNECON Master education's value of 0.769 was obtained. This value indicates a reasonably high level of self-sufficiency of the new knowledge concentration in the system of Master's education in the streams of the enlarged group "Economics and Management" in the UNECON's Master programs Institute. These assessment results were achieved through joint efforts of the administration of the University and Master's programs Institute, the heads of Master's programs, the teaching staff, as well as the efforts of employers taking an active part in the implementation of Master's programs.

At the present day, under the conditions of active environmental changes and challenges of globalization [12] the University, including the Institute of Master's Programs is in the whirl of turbulent processes, which require active monitoring and participation in these changes. The main trends the university deals with are: a) an inseparable link of the knowledge economy with the services and labor market. It is characterized by participation of the consumer in the creation of knowledge; b) development of networking cooperation between universities in the system of Master's education in the knowledge economy; c) labor productivity to a greater extent depends on the utilization of scientific and technological progress achievements, quality of received and processed information and knowledge management; d) a deep transformation of the production process organization and the globalization of production processes, management, markets, labor, information and technology and their independence of the national borders; e) the revolutionary nature of the technical and technological changes, which are based on information technology and convert the material foundation of the modern world; f) accelerated development and utilization of intangible assets and material environment of economic activity [5; 6; 9; 11; 13; 14]. These processes lead to the integration of scientific and educational systems, on the one hand, and the educational system and the system of the real economy, on the other hand, in conditions of cognitivization.

3.3 SWOT-analysis of the effectiveness of Master's training system in St. Petersburg State University of Economics[46]

The effectiveness analysis of the Institute of Master's programs which is made with the help of SWOT-analysis allows obtaining a meaningful and generalized picture of the status and trends taking place in the development of the Master's education system. For the analysis of the state of the Master's training system in the university we selected a number of criteria that allow (on the basis of expert judgment) identifying strengths and weaknesses, opportunities and threats.

The results of such an analysis carried out at the UNECON Institute of Master's Programs show that the strongest aspects and positive opportunities of the institute are: a high level of competitiveness of Master's programs and a wide range of offered educational products that meet employers' requirements, a large competition for admission to Master's programs, the matrix principle of formation of Master's programs, a unified and, at the same time, individualized approach to the construction of Master's programs, a module form of training, active utilization of interactive teaching methods, qualified teaching staff, a high level of quality of Master's training, development of network communication with foreign partner universities. Weaknesses and threats include: insufficiently developed marketing and advertising activities of the Institute of Master's Programs, which can lead to the loss of competitive leadership in the market of educational services, the need for a more frequent update of the material, technical and resource support of Master's programs; insufficient development of the principles of network communication of the university with business partners within the country, the fact that the best teachers

[46] The SWOT-analysis of the master's education system in UNECON was conducted by the author and colleagues on the basis of expert evaluation. This analysis identifies those strengths and opportunities and weaknesses and threats that were noted by the majority of respondents. The analysis assumes the advisability of conducting a deeper quantitative assessment of the factors.

can be “stolen” from the UNECON by other universities, the insufficiently developed legislative framework regulating the network communication of the university within the country, the threat from growing competition.

4 *Discussion and conclusion:* Strategic prospects for development of Master's education in the context of its continuity

To determine strategic prospects for the development of the Master's education system in Russian universities, it is reasonable to conduct continuous monitoring of the educational services market and analyze changes in the requirements of employers and the real economic sector (business). The strategic perspectives for the development of Master's education in the context of lifelong education create the basis for long-term socioeconomic growth of the country, since they are based on the principles of modernization of higher education, where the following aspects has the leading role: 1) development of innovative infrastructure of the educational sphere; 2) integration of the system of Master's education in the international and in the national educational space (development of network communication); 3) continuous monitoring of the globalizing market of educational services and professional environment requirements; 4) unified and standardized requirements for the construction of Master's programs on inter- and multi-departmental basis; 5) development and inclusion of disciplines in engineering economics, digital technology in the curricula of Master's programs; 6) refined and individualized approach to the implementation of Master's programs considering the consumers’ interests; 7) construction of Master's degree programs in the context of continuity and implementation of the interrelationship in the triad "System of Continuous Science – System of Lifelong Education – System of Real Economy ". This is a rather complicated task of coordinating the interrelations of elements in a triad, but its implementation can contribute to the creation of new knowledge in the scientific sphere, transformation of the educational environment, including the framework of Master's education, and the utilization of new knowledge in real economic environment. According to this concept, the system of Master's education has an important role of the knowledge translator. The implementation of new knowledge in the real economy ensures that innovations and technologies forming an innovative type of economy are created; 8) strengthening of the role and place of research work of the UNECON Institute of Master’s Programs in the educational process and its transformation into a catalyst for the development of a scientific and practical territorial cluster. More intensive work of the Institute of Master’s Programs in organizing and holding regular round tables, guest lectures, Master’s classes and other types of classes on the actual problems of science and practice, which in the near future will become the leading factors in the development of the innovative knowledge economy; 9) productive and actively creative methods and forms of education. The teaching staff and employers act as organizers of training and moderators of group (project) work and utilize an individual approach and interactive methods of working with students in the educational process.

The aim of the innovative model of education is not only to provide knowledge, skills, but also let students have the experience in searching information, choosing methods of analysis and making decisions independently, which ultimately forms a competent and well-demanded specialist on the labor market.

5 Bibliography:

[1] Federal Law of the Russian Federation "On Education in the Russian Federation" No. 273-FZ of 29 December, 2012 (as amended on 29 July, 2017). URL: http://www.consultant.ru/document/cons_doc_LAW_140174/ (date of visit 10.01.2018).

[2] The Law of the Russian Federation "On Education" in 2016 (273-FZ RF 2016) [Electronic resource]. URL: http://ipipip.ru/zakon-ob-obrazovanii-2/ (date of visit: 15.12.2017).

[3] Federal State Educational Standard of Higher Professional Education in Stream 0802200 "Management" (Qualification (Degree) "Master" No. 337 as of 15 May, 2010;

[4] Federal State Educational Standard of Higher Education in Stream 38.04.02 "Management" (Master's level // Order of the Ministry of Education and Science of Russia No. 322 as of 30.03.2015;
[5] N.M. Abdikeev, A.D. Kiselev. Managing the Knowledge of a Corporation and Business Reengineering: a textbook / Under the editorship of Doctor of Technical Sciences, Prof. N.M. Abdikeyev. – Moscow, INFRA-M, 2010.
[6] Gaponenko A.L., Orlova T.M. Knowledge Management. How to Turn Knowledge into Capital / A.L. Gaponenko, T.M. Orlova. Moscow, Eksmo, 2008.
[7] Gladkikh B.A. Can the Bologna Process Stimulate the Improvement in the Quality and Effectiveness of Education at a Russian University? // Economics of Education - 2007. – No. 6 (43).
[8] Nikulina E.G. Research of Changes in the Training of Masters in Russia from 1992 to the Present Time // Internet journal "Naukovedenie". Issue 3, May - June 2014 URL: http://publ.naukovedenie.ru (date of visit 26.11.2017).
[9] Suleimankadiyeva A.E. Continuous Education in the Context of Knowledge Economy. Monograph. - St. Petersburg, publishing house ETU «LETI», 2012.
[10] Tumarova T.G., Dobroserdova I.I., Fomicheva N.M. Evaluation of the Effectiveness of Master's Training in the System of Continuous Education in the Context of the Knowledge Economy // Discourse. – 2016. – No. 2.
[11] Batalgazieva M. & Sorokina E. Knowledge as a Process: Dynamics and Possible Patterns: Master's Thesis/ Master of Science in Business Administration; Strategic Management of International Organizations. – Sweden, Linköpings Universitet, 2009.
[12] Floyd P. Organizational Change. – Great Britain, Oxford, 2002. – P. 114.
[13] Rastogi P. Knowledge Management and Intellectual Capital: The New Virtuous Reality of Competitiveness // J. Human Systems Management. – 2000. – No. 19 (1).
[14] Rodriguez A., Dahlman C., Salmi J. Knowledge and Innovation for Competitiveness in Brazil: Washington/ The International Bank for Reconstruction and Development, 2008.

USAGE OF METHODS OF BETA CONVERGENCE AND SIGMA CONVERGENCE IN MEASURING REGIONAL DISPARITIES

Široký, Jan[1] - Zemanová, Martina[2] - Krajňák, Michal[3]

[1]Moravian University College Olomouc, Department of Economics, jan.siroky@mvso.cz; [2] Fire Rescue Service of the Czech Republic – Region of Vysočina, martina.jan@email.cz; [3] Moravian University College Olomouc, Department of Business Economics, michal.krajnak@mvso.cz

Abstract:

The paper's aim is to explore the possibilities of usage of less common methods of beta convergence and sigma convergence in measuring of regional disparities. The causes and development of regional disparities can be identified using the mentioned methods. The paper applies these methods to the example of regions NUTS 3 in the Czech Republic for the indicator of gross domestic product per capita. The results illustrate the significant specifics of the indicator values in case of the Capital City of Prague.

Key words:

Regional development theory, regional disparities, NUTS 3, beta convergence, sigma convergence.

JEL: R11, R15, R50**.**

1 Introduction

The development of regional policy within the territory of the current European Union can be divided into several development stages. In the first stage, there were not very large differences in development level among the individual states (EU-6) and within the states themselves, so regional policy was implemented only at the macroeconomic level. In the second stage, as a result of the accessions of new countries (EU-9) and the economic crisis back then, the differences among the individual states and their regions increased. In 1975, the European Regional Development Fund was established. Over the next years of 20th century, there has been a steady increase in regional disparities due to the accessions of other states (EU-12, EU-15).

Another significant change took place at the beginning of the 21st century (the fifth period of the regional policy), which was influenced by the Agenda 2000 document in this period. In 2004, the European Union (EU-25) was historically the largest, with the entry of ten new members there was a significant further increase in regional differences among the individual countries and regions.

By joining the EU, the Czech Republic has been given the opportunity to draw funds intended for regional policy and for reducing the regional disparities throughout its entire territory.

In the sixth period of the European Union regional policy (2007 - 2013), the regional policy objectives were adjusted to the objectives of (i) Convergence, (ii) Regional competitiveness and employment and (iii) European territorial cooperation. For the future, the Europe 2020 strategy has been created which aims to achieve a new growth in the next decade, and that the EU will create an intelligent and sustainable economy in today's changing world.

The presentation of the very analysis of the regional disparities development in the individual NUTS 3 regions in the period 2006-2015 is a key contribution of the paper. The development of regional disparities is analysed using β-convergence and σ-convergence indicators.

2 Methodology and Methods

The paper is methodologically based on normative-positivistic economics, for a practical research itself, special methods of β-convergence and σ-convergence were used in addition to general scientific methods.

The period 2006-2015 is the monitored period and a gross domestic product per capita[47] was chosen as the indicator of the development of regional disparities. Data were collected from a website of the Czech Statistical Office (ČSÚ, 2017) and were applied to the NUTS 3 region in the Czech Republic.

The key concept of "regional disparity" is most frequently defined as the diversity or difference of regional and economic differences among the regions, provinces, states or continents.

The original OECD definition, according to which regional disparities express the degree of difference in the intensity expression of the examined economic phenomenon observed within the regions of a particular state, was later reworded to indicate that territorial disparity indicates the degree to which the intensity of certain economic phenomenon varies among the regions within a given country (OECD, 2002).

In the Czech Republic, the Ministry for Regional Development defines regional disparities in the Regional development strategy as the differences in a level of economic, environmental and social development of the regions to an extent that is recognized by society as undesirable.

Regional disparities are also specified as differences in the degree of socio - economic development of the regions that are the effect of its disparity (Matlovič, Matlovičová, 2005). Disparities can be classified as negative disparities and positive disparities. The very existence of negative disparities has created the basis for the emergence of regional policy of the European Union. It is based on the principle of helping the less developed countries and regions in such a way as to achieve a gradual convergence of all the regions to the same level.

There is a whole series of the methods used for assessing the development of regional disparities. The most frequently used method in the Czech Republic is an interregional comparison method. Based on the previous analysis, it compares the individual regions and their ongoing processes in order to discover common and different features in their development. Its output are usually only verbally assessing regional analyzes.

More specialized measurement methods include the usage of a degree of variability. This is an evaluation by means of a standard deviation and coefficient of variation (Hamada, 2014, Svatošová, 2012 or Ježdík, Chlad, 2009). It is advisable to use both these indicators at the same time because the standard deviation is not a dimensionless number and it depends on the overall level of a given phenomenon in a given region, while the coefficient of variation is, on the contrary, a dimensionless number that shows the size of the variability.

Regional differences can also be measured using the Gini index (Matlovič, Matlovičová, 2005, Hamada 2014, Atkinson, 1970, or Novotný, Nosek, 2006) or multidimensional statistical models, especially cluster analyzes (Hloušek, 2004).

A comparatively new method for measuring regional disparities is the use of β- convergence and σ- convergence indicators (Barro, Sala-i-Martin, 2004, Shen, 2008, Pukelienė, Butkus, 2008, or in Czech and Slovak literature Blažek, Csank 2007 and Buček, Gerulová, 2008).

3 Beta convergence method

Beta convergence identifies the relation where the less developed countries or regions grow faster than the rich countries or regions, so these "poorer" territories tend to catch up with more developed

[47] The paper is based on a broader survey where both the so-called hard indicators (besides gross domestic product per capita also the net disposable income, gross fixed capital formation and unemployment) and so-called soft indicators (committed criminal offenses and SO2 emissions) were monitored, which the methods of β-convergence and σ-convergence allow. For more details see Jílková et al., 2018.

territories. Originally the "poorer" countries or regions show a higher growth dynamics, and this leads to a progressive convergence among territories.

It can therefore be stated that the individual regions converge in a given period of time if the lower initial value y_0 in the jth-region, where j = 1, 2, ..., m, corresponds with the higher value of average growth coefficient of this region and vice versa. The average growth coefficient is calculated according to the relation 1.

$$k = \sqrt[n-1]{\frac{y_n}{y_0}} \quad (1),$$

where n is a number of years, y_n is the last and y_0 the first value.

For further calculations, it is necessary to convert values to logarithmic variables - log y_0 and $\log k$. Then, a beta convergence is calculated using linear regression, where the dependency of two variables is analysed; one variable is the value of the selected indicator from the beginning year and the second variable is the value of the logarithmic growth coefficient. Based on this calculation, a graph is created which is interpolated by a regression line. The equation of the regression line can be written according to the relation 2.

$$\log k = c_0 + c_1 \log y_0, \quad (2),$$

where c_1 is a slope of the regression line.

In the next step, based on the slope of the line and the coefficient of determination, it is assessed whether beta convergence or divergence occurred in the given period. This information will be provided by the slope of the line; if the line has a negative value of the slope, then the development points to the predominant convergence tendency, if the value of the slope is positive, then it is rather divergence. If the directive had a zero value, then it would point to a constant distance among the examined regions (Dufek, Minařík, 2010).

4 Sigma convergence method

Sigma convergence occurs if the variability measured by e.g. the standard deviation of the income or product logarithm per capita for countries or regions is constantly decreasing over time (Barro, Sala-i-Martin, 2004).

With regard to the assumption of approximation to the normal distribution, the values are again converted to logarithmic variables, the results are plotted on the chart, the x-axis depicts the individual reference years and the y-axis shows the values of the standard deviation of the observed indicator among the individual regions in the individual years under review.

The sigma convergence indicator is the standard deviation (see relation 3).

$$\sigma_t = \sqrt{\frac{1}{m-1}\sum_{j=1}^{m}\left(\log y_{jt} - \overline{\log y_t}\right)^2} \quad (3),$$

for t = 1, 2, ... T and j = 1, 2, ... m, where m is the number of regions and the index **t** indicates a corresponding year.

Beta convergence tends to generate sigma convergence but this process is constantly balanced by new disturbances that tend to increase a variances again (Barro, Sala-i-Martin, 2004).

Beta convergence identifies a relation where poorer countries grow faster than rich countries, so these less developed countries tend to catch up with richer countries in terms of income or product level per person. Originally poorer countries show higher growth dynamics and thus a convergence among countries is gradually taking place.

Table 1: Development of GDP per capita in mil. CZK. Source: own calculation

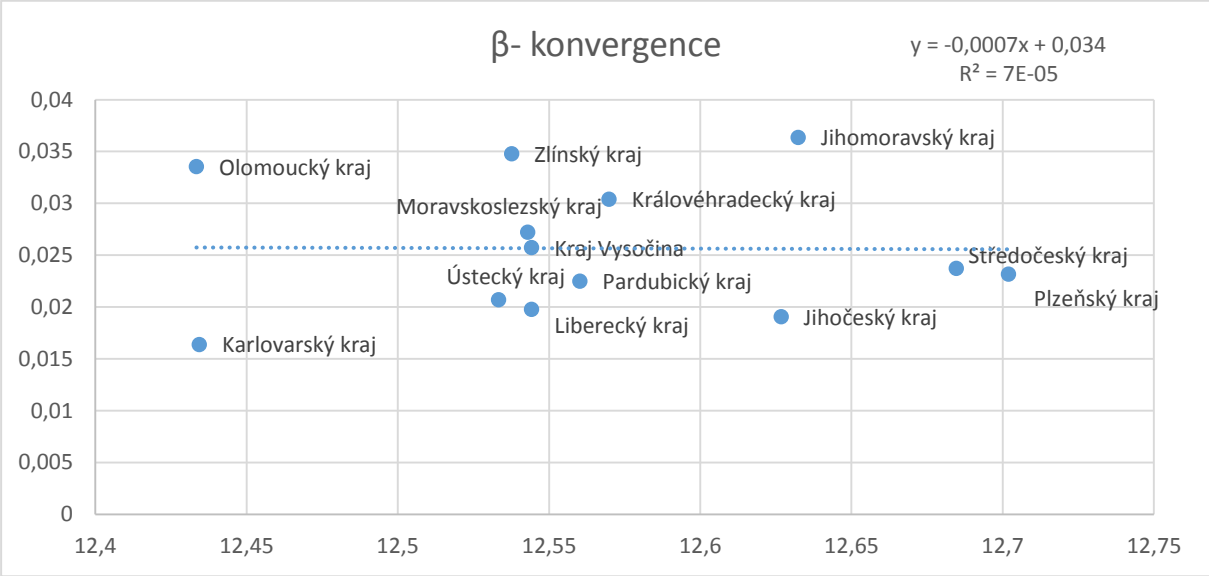
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average coef. growth
Capital City of Prague	730 658	807 732	838 605	805 686	811 822	810 814	807 594	812 460	834 578	881 411	1,02106
Central Bohemian Region	322 766	349 521	361 055	338 680	333 680	346 428	349 550	348 696	376 832	399 682	1,02403
South Bohemian Region	304 597	317 797	320 403	319 487	317 054	320 440	327 529	333 103	344 516	361 699	1,01927
Pilsen Region	328 384	341 415	334 076	338 474	346 460	354 520	346 955	363 319	388 432	404 565	1,02345
Karlovy Vary Region	251 303	272 027	272 587	274 281	269 200	273 805	272 428	272 456	282 096	291 304	1,01655
Ústí Region	277 425	295 466	306 244	306 617	298 627	302 300	303 122	302 416	309 863	334 249	1,02092
Liberec region	280 484	289 513	292 838	280 984	287 144	294 489	300 005	302 114	317 744	335 210	1,02000
Hradec Králové region	287 745	315 273	326 177	323 375	327 441	331 212	333 429	335 312	359 156	378 326	1,03088
Pardubice Region	284 988	311 876	315 159	303 432	308 768	321 009	306 424	313 716	333 110	348 996	1,02277
Vysočina Region	280 476	306 952	305 159	302 228	300 530	316 535	323 976	327 539	341 282	353 587	1,02607
South-Moravian region	306 314	337 266	360 502	350 464	353 185	362 048	372 135	387 592	404 513	424 994	1,03705
Olomouc region	251 051	272 766	285 593	279 203	285 621	296 974	300 777	301 163	318 621	339 556	1,03412
Zlín Region	278 640	300 583	323 242	316 007	313 138	324 536	324 583	330 803	365 317	381 168	1,03543
Moravian-Silesian Region	280 125	306 426	322 178	303 351	311 598	329 361	332 781	324 580	344 328	357 939	1,02761

5 Application of methods for per capita gross domestic product

Gross domestic product (GDP) is one of the key indicators of economic development and evolution of economy. It represents the sum of all monetary values generated by processing in all branches using the production factors originating in the Czech Republic. GDP includes all activities considered to be productive in the national accounting system. Values of GDP per capita in the individual regions are shown in Table 1.

Table 1 shows that the gross domestic product values of the Capital City of Prague are significantly different from the other regions surveyed; in case of all other regions, with some exceptions, in the observed years, this indicator was growing. The highest increase is identifiable in the South-Moravian Region, where this value increased in 2015 by almost 39% in comparison with the first monitored year 2006. The lowest, 15% increase in gross domestic product was recorded in the Karlovy Vary Region, 19% increase in the South Bohemian and Liberec Regions. The Karlovy Vary Region together with the South Bohemian and Liberec Regions are also regions with the lowest GDP per capita in all the years under review. Figure 1 shows the result of the β-convergence calculation.

Figure 1: Result of the β- convergence



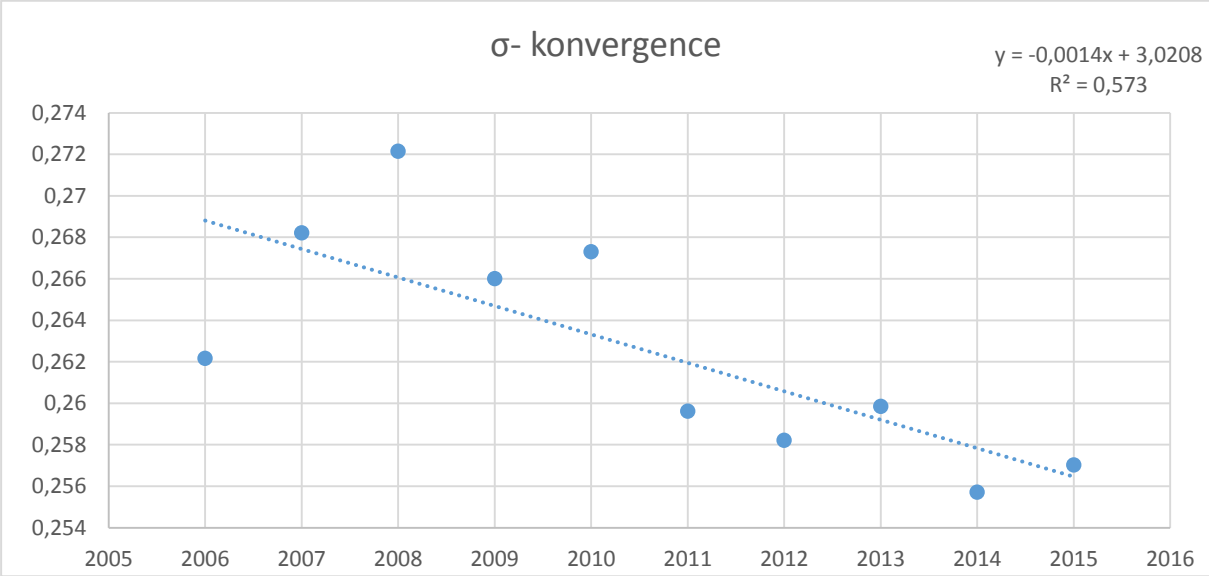
Source: own calculation

Figure 1 serves to illustrate that for a GDP per capita indicator it is possible to identify a weak beta convergence, the regression line has a negative slope, it is decreasing. It is also evident from Figure 1 that the determination index is very low (7E-05), so the observed convergence is not reliably demonstrable.

For the gross domestic product indicator, the σ- convergence was calculated as well.

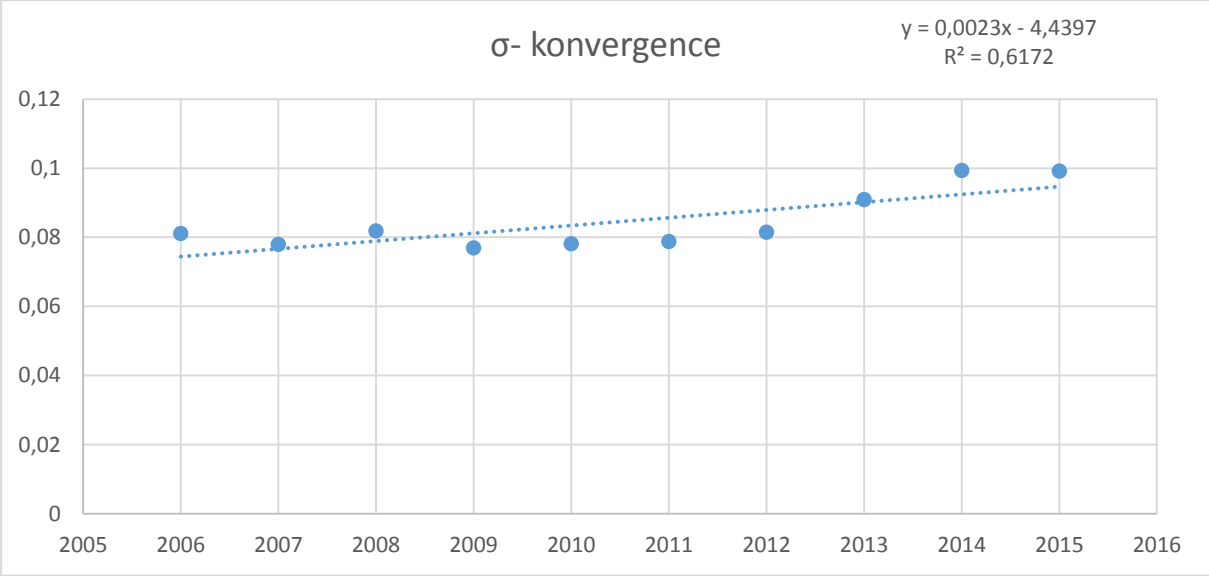
Due to the totally deviant (and quite incommensurable) examined values when including the Capital City of Prague, or without counting the Capital City of Prague, the two diagrams were created that are shown in Figure 2, respectively Figure 3. The first one shows that in the case of the exclusion of the Capital City of Prague Region, the regression line is increasing, it has a positive slope and thus it can be stated that the differences among the regions have been increasing in the monitored years, the regression dependency determination index has a high value of 0,617 and therefore this convergence can be unequivocally identified and proved. Otherwise is the case when calculating the convergence with the Capital City of Prague. Here (Figure 3) the regression line is decreasing and the determination index is high 0,573.

Figure 2: Result of sigma convergence including Prague



Source: own calculation

Figure 3: Result of sigma convergence excluding Prague



Source: own calculation

It can be stated based on the results obtained for the per capita gross domestic product indicator that the non-detectable β-convergence was found in the monitored years. Sigma convergence is significant in the observation of all regions, on the contrary, after the exclusion of the Capital City of Prague Region, there occurs a significant divergence in the monitored years.

6 Discussion and Conclusion

The aim of the paper was, above all, to illustrate the practical application of the methods of measurement and development of regional disparities on the basis of β-convergence and σ- convergence indicators and to assess the development of these regional disparities in the individual NUTS 3 in the

Czech Republic in 2006-2015 on the example of a single indicator of gross domestic product per capita[48].

The methods of research were selected on the basis of a search of literature dealing with this issue.

The beta convergence indicator is based on a neoclassical concept of economic growth where GDP growth is negatively dependent on the initial economic level, which is reflected by the fact that less developed countries show higher growth dynamics than richer countries and there is a gradual convergence among these countries. The sigma convergence indicator is also based on the neoclassical theory of regional growth where all countries converge to the same level of development, or to the same economic performance.

It should be noted that there were two observations carried out in the paper - including the Capital City of Prague Region and excluding the Capital City of Prague Region due to the fact that this region generated in case of all calculations the departed observation that would significantly affect the overall result. The summary of results is displayed in Table 2.

Table 2: Summary of the research results

	β- convergence	**σ- convergence**	
		including the Capital City of Prague	**excluding the Capital City of Prague**
Gross domestic product	negligible convergence/low determination index	significant convergence/high determination index	weak divergence/high determination index

Source: own calculation

The theme for further research could be monitoring of the development of the values of the analysed indicators within the examined regions, e.g. how they differ, or how they are developing in the settlement town of the region and in other localities.

7 Bibliography

[1] ATKINSON, A. (1970). On the Measurement of Inequality. *Journal of Economic Theory*, No. 3, p. 244- 263. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.521.849&rep=rep1&type=pd.

[2] BARRO, R., SALA-I-MARTIN, X. (2004). *Economic Growth*. 2nd Ed. Cambridge: MIT Press, 654 p.

[3] BLAŽEK, J., CSANK, P. (2007). Nová fáze regionálního rozvoje v ČR. *Sociologický časopis*, No. 5, pp. 947-964. Available from: http://sreview.soc.cas.cz/uploads/d2ffd3fa8a03b8e86e13607a250144d6e459df19_512_07-5%20Blazek.pdf.

[4] BUČEK, M., GERULOVÁ, L. (2008). Regionálna konvergencia resp. divergencia na pozadí teoretických koncepcií. In: *Regionální disparity*. Available from: http://alkut.cz/edice_cd/cd3_regdis_2008/pdf/02%20regdis_2008.pdf…

[5] ČSÚ (2017). *Statistrické ročenky jednotlivých krajů za rok 2017*. Available from: https://www.czso.cz/csu/czso/domov?p_p_id=3&p_p_lifecycle=0&p_p_state=maximized&p_p_mode=view&_3_struts_action=%2Fsearch%2Fsearch&_3_redirect=%2Fweb%2Fczso%2Fkatalog-produktu-vydavame&_3_keywords=Regiony&_3_groupId=0.

[48] See footnote 1)

[6] DUFEK, J., MINAŘÍK. B. (2010). *Hodnocení rozvojového potenciálu krajů České republiky z hlediska lidských zdrojů*. Brno: MZLU, 142 p.
[7] HAMADA, R. (2014). *Vybrané spôsoby a metódy merania a hodnotenia regionálnych disparít*. Available from: http://www.regionalnirozvoj.eu/sites/regionalnirozvoj.eu/files/02_hamada_opraveny.pdf.
[8] HLOUŠEK J., (2004). *Využití vícerozměrných statistických metod při hodnocení krajů*. Available from: //www.agris.cz/Content/files/main_files/61/139319/hlousek.pdf.
[9] JEŽDÍK, V., CHLAD, M. (2009). *Rozdíly mezi kraji ČR - vývoj a příčiny*. Praha: ČSU. Available from: https://www.czso.cz/documents/10180/20535610/138209.
[10] JÍLKOVÁ, E. a kol. (2018). *Hospodářská politika a regionální rozvoj*. Olomouc: Vydavatelství Univerzity Palackého, 208 p.
[11] MATLOVIČ, R., MATLOVIČOVÁ, K. (2005). Vývoj regionálnych disparít na Slovensku a problémy regionálneho rozvoja Prešovského kraja. *Folia geographica*, pp. 66-88.
[12] NOVOTNÝ, V., NOSEK, V. (2006). Regionální dimenze sociálně-ekonomických nerovností v Česku: pojetí, měření, empirie. In. *Sborník příspěvků z XXI. sjezdu České geografické společnosti*, pp. 121-133. Available from: https://web.natur.cuni.cz/~nosek6/admin/volne/CB_conf.pdf.
[13] OECD (2002). *Geographic Concentration and Territorial Disparity in OECD Countries*. Paris: OECD Publications Service. Available from: https://www.google.cz/?gws_rd=ssl#q=OECD.+Geographic+Concentration+and+Territorial+Disparity+in+OECD+Countries.+Paris:+OECD+Publications+Service%2C+2002.
[14] PUKELIENĖ, V., BUTKUS, M. (2008). Evaluation of Regional β convergence in EU Countries at NUTS 3 Level. *Economica*, No. 2, pp. 22–37.
[15] SVATOŠOVÁ, L. (2012). The development of regional disparities in Czech Republic over the 2005-2010 years. *Acta univ. agric. et silvic. Mendel. Brun.*, No. 7, pp. 337–344.

International Day of Science 2018 — Economics, Management, Innovation
Proceedings of the International Scientific Conference
Moravian University College Olomouc
Olomouc 2018

Editor: Jarmila Zimmermannová
Technical editors: Radka Husaříková, Kateřina Vranová, Michaela Nováková
Publication design: Adam Kazmíř

Published by: Moravian University College Olomouc, 2018
1st edition, 2018 – number of copies 100
Printed by: Tribun EU s.r.o., Cejl 892/32, 602 00 Brno

ISBN 978-80-7455-074-4