

**XIII MEĐUNARODNI SIMPOZIJUM  
INŽENJERSKI MENADŽMENT I KONKURENTNOST  
EMC 2023**

# **EMC 2023**

**13th International Symposium  
“Engineering Management and  
Competitiveness” 2023**

**UNIVERZITET U NOVOM SADU  
TEHNIČKI FAKULTET “MIHAJLO PUPIN”  
ZRENJANIN**

**University of Novi Sad, Technical faculty “Mihajlo Pupin”,  
Zrenjanin, Republic of Serbia**

**Szent István University, Faculty of Economics and Social Sciences,  
Gödöllő, Hungary**

**Voronezh State University, Faculty of Economics,  
Voronezh, Russia**

**University of Montenegro, Maritime Faculty  
Kotor, Kotor, Montenegro**

**XIII International Symposium  
ENGINEERING MANAGEMENT AND  
COMPETITIVENESS  
(EMC 2023)**

**Proceedings**

**16-17th of June 2023, Zrenjanin, Serbia**

**XIII International Symposium  
Engineering Management and Competitiveness (EMC 2023) - Proceedings**

---

**Organizer of the Symposium:**

University of Novi Sad, Technical faculty  
“Mihajlo Pupin”, Zrenjanin, Republic of  
Serbia

**Partners:**

Szent István University, Faculty of Economics  
and Social Sciences, Gödöllő, Hungary  
Voronezh State University, Faculty of  
Economics, Voronezh, Russia  
University of Montenegro, Maritime Faculty,  
Kotor, Montenegro

**Publisher:** University of Novi Sad, Technical  
faculty “Mihajlo Pupin”, Zrenjanin, Đure  
Đakovića bb, 23000 Zrenjanin

**For publisher:** Milan Nikolić, Ph.D, Professor,  
Dean of Technical faculty

**Editor:** Dragan Čočkaló, Ph.D, Professor,  
University of Novi Sad, Technical faculty  
“Mihajlo Pupin”, Zrenjanin, Serbia

**Reviewers:**

Ivana Berković, Ph.D, Professor, University of  
Novi Sad, Technical faculty “Mihajlo Pupin”,  
Zrenjanin, Republic of Serbia  
Agneš Slavić, Ph.D, Professor, University of  
Novi Sad, Faculty of Economics Subotica,  
Subotica, Republic of Serbia

**Technical treatment:**

Dragan Čočkaló, Ph.D, Professor, University of Novi  
Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin,  
Serbia  
Mihajl Bakator, Ph.D, Assistant Professor, University  
of Novi Sad, Technical faculty “Mihajlo Pupin”,  
Zrenjanin, Serbia  
Verica Gluvakov, M.Sc, Teaching associate,  
University of Novi Sad, Technical faculty  
“Mihajlo Pupin”, Zrenjanin, Serbia  
Stefan Ugrinov, B.Sc, Teaching associate, University  
of Novi Sad, Technical faculty “Mihajlo Pupin”,  
Zrenjanin, Serbia

**Cover design:**

Ivan Palinkaš, Ph.D, Assistant, Higher Technical  
School of Vocational Studies in Zrenjanin,  
Republic of Serbia

**Lecturer:**

Edit Terek Stojanović, Ph.D, Professor, University of  
Novi Sad, Technical faculty “Mihajlo Pupin”,  
Zrenjanin, Republic of Serbia

**ISBN: 978-86-7672-365-2**

CIP - Каталогизacija u publikaciji  
Biblioteke Maticе српске, Нови Сад

62:005(082)(0.034.2)

**INTERNATIONAL Symposium Engineering Management and Competitiveness (13 ; 2023 ;  
Zrenjanin)**

Proceedings [Elektronskiizvor] / XIII International Symposium Engineering Management and  
Competitiveness (EMC 2023), 16-17th of June 2023, Zrenjanin, Serbia ; [organizer] Technical  
Faculty "Mihajlo Pupin", Zrenjanin. - Zrenjanin : Technical Faculty "Mihajlo Pupin", 2023. - 1  
elektronski optički disk (CD ROM) : tekst, slika ; 12 cm

Dostupno i na: <http://www.tfzr.rs/emc>. - Nasl. sa naslovnog ekrana. – Elektronska publikacija u  
formatu pdf opsega 240 str. – Bibliografija uz svaki rad. - Registar.

ISBN 978-86-7672-365-2

a) Инжењерски менаџмент – Зборници

COBISS.SR-ID 118010633

©2023 University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Republic of Serbia. This  
Proceedings is a part of the internal informational materials of EMC 2023.

### Program Committee:

---

**Dragan Čočkaló, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia – President of the Program Committee

**Sanja Stanisavljev, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia – Vice President of the Program Committee

**Ješa Kreiner, Ph.D.**, Professor, California State University, Department of Engineering, Fullerton, CA, USA

**Poór József, Ph.D.**, Professor, Szent István University, Gödöllő, Hungary

**Ali Reza Afshari, Ph.D.**, Assistant professor, Islamic Azad University, Iran

**Mohammad Anisseh, Ph.D.**, Assistant professor, Imam Khomeini International University, Qazvin, Iran

**Ioannis Filippopoulos, Ph.D.**, Professor, University of Thessaly, Department of Computer Science, Lamia, Greece

**Boštjan Antončič, Ph.D.**, Professor, University of Ljubljana, Faculty of Economics, Ljubljana, Slovenia

**Larisa Nikitina, Ph.D.**, Professor, Voronezh State University, Management Department, Russia

**Danilo A. Đurović, Ph.D.**, Professor, University of Montenegro, Maritime Faculty, Kotor - Dobrota, Montenegro

**Robert Minovski Ph.D.**, Professor, “Ss. Cyril and Methodi” University in Skopje, Faculty of Mechanical Engineering, Skopje, North Macedonia

**Bojan Jovanovski, Ph.D.**, Associate professor, “Ss. Cyril and Methodi” University in Skopje, Faculty of Mechanical Engineering, Skopje, North Macedonia

**Maša Magzan, Ph.D.**, Assistant Professor, University of Rijeka, Croatia

**Teodora Rutar Shuman, Ph.D.**, Professor and PACCAR Professor Mechanical Engineering, Seattle University, College of Science and Engineering, USA

**Zoran Filipi, Ph.D.**, Professor, Clemson University, Department of Automotive Engineering, South Carolina, USA

**Zdenek Dvořák, Ph.D.**, Professor, University of Žilina, Faculty of Special Engineering, Slovakia

**Vesna Spasojević Brkić, Ph.D.**, Professor, University of Belgrade, Mechanical faculty, Serbia

**Cariša Bečić, Ph.D.**, Professor, University of Kragujevac, Faculty of Technical Sciences, Čačak, Serbia

**Matej Černe, Ph.D.**, Associate Professor, University of Ljubljana, Faculty of Economics, Ljubljana, Slovenia

**Milan Delić, Ph.D.**, Associate Professor, University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

**László Szabó, Ph.D.**, Professor, Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary

**Jasna Auer Antončič, Ph.D.**, Assistant Professor, University of Primorska, Faculty of Management, Koper, Slovenia

**Violeta Cvetkoska, Ph.D.**, Associate professor, “Ss. Cyril and Methodius” University, Faculty of Economics, Skopje, North Macedonia

**Miroslava Petrevska, Ph.D.**, Lecturer, The College of Tourism, Belgrade, Serbia

**Srđan Bogetić, Ph.D.**, Belgrade Business and Arts Academy of Applied Studies, Belgrade, Serbia

**Miloš Vorkapić, Ph.D.**, Scientific associate, University of Belgrade, Institute of Chemistry, Technology and Metallurgy (ICTM) - Center of Microelectronic Technologies, Belgrade, Serbia

**Zvonko Sajfert, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia

**Dejan Đorđević, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia

**Milan Nikolić, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia – President of the Organizing Committee

**Edit Terek Stojanović, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia

**Mila Kavalić, Ph.D.**, Assistant Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia

**Mihalj Bakator, Ph.D.**, Assistant Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia



### **Organizing Committee:**

---

- Milan Nikolić, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia - President of the Organizing Committee
- Edit Terek Stojanović, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia – Vice President of the Organizing Committee
- Dragan Čočkalo, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia– President of the Program Committee
- Sanja Stanisavljev, Ph.D.**, Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia
- Mila Kavalić, Ph.D.**, Assistant Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia
- Mihalj Bakator, Ph.D.**, Assistant Professor, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia
- Dragana Kovač, M.Sc.**, Assistant, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia
- Verica Glovakov, M.Sc.**, Teaching associate, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia
- Stefan Ugrinov, B.Sc.**, Teaching associate, University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Serbia

## **INTRODUCTION**

---

*Department of Management and Technical faculty “Mihajlo Pupin” from Zrenjanin have started the organization of International Symposium Engineering Management and Competitiveness (EMC) in 2011. Since 2013 the organization of the EMC symposium has been supported by the following foreign partners: Szent István University, Faculty of Economics and Social Sciences, Gödöllő, Hungary, Voronezh State University, Faculty of Economics, Voronezh, Russia and University of Montenegro, Maritime Faculty, Kotor, Montenegro.*

*The objectives of the Symposium EMC are: presentation of current knowledge and the exchange of experiences from the field of Engineering management, consideration of development tendencies and trends in Serbia and the world as well, gathering researchers from this field with the aim of expanding regional and international cooperation, raising the level of professional and scientific work at Technical faculty “Mihajlo Pupin” from Zrenjanin, expanding cooperation with economic and educational institutions and encouraging young researchers within this field. Taking into account that this Symposium is international, the importance of this event is obvious for the town of Zrenjanin, Banat region, Vojvodina and Serbia. Organization of EMC by the Technical faculty “Mihajlo Pupin” from Zrenjanin represents this scientific-educational institution as one of the major representatives of economic and social development in Banat.*

*Within this Proceedings all accepted papers received for XIII International Symposium Engineering Management and Competitiveness (EMC 2023) are presented. This year at the symposium we have 36 papers and 2 abstracts. The authors come from 9 countries: Bosnia and Herzegovina, Greece, Hungary, Iran, North Macedonia, Russia, Slovenia, USA and Serbia. The papers are divided into seven sessions: Plenary session, Session A: Management and operation management, Session B: Human resource management, Session C: Marketing management, Session D: Economy, Session E: IT Management, Session F: Abstracts.*

*We wish to thank the Technical faculty “Mihajlo Pupin” from Zrenjanin and the dean Prof. Ph.D Milan Nikolić for their active role concerning the organization of the Symposium. We are also expressing our gratitude to all authors who have contributed with their papers to the organization of our thirteenth Symposium EMC.*

*The EMC Symposiums become a traditional meeting of researchers in June, every year. We are open and thankful for all useful suggestions which could contribute that the next International Symposium Engineering Management and Competitiveness become better in an organizational and program sense.*

**President of the Programming Committee**  
*Professor Dragan Čočkaló, Ph.D.*

*Zrenjanin, June 2023.*

# CONTENTS

---

<b>Plenary session</b>	<b>...1</b>
Ali Reza Afshari, Farideh Sobhanifard ASSESSMENT OF PROJECT PROCUREMENT PLANNING	...3
Dragan Čočkaló, Mihalj Bakator, Sanja Stanisavljev, Edit Terek Stojanović, Milan Nikolić, Mila Kavalić ENTREPRENEURSHIP ECOSYSTEM WITHIN THE CONCEPT OF SOCIETY 5.0	...11
Larisa Nikitina, Anna Kosobutskaya, Anton Prachenko, Yuriy Treshchevskiy ANALYSIS AND FORECASTING OF INNOVATION PROCESSES IN THE LEADING RUSSIAN REGIONS	...19
László Szabó PHYGITAL EXPERIENCES IN LOGISTICS	...25
Bruno Završnik THE INFLUENCE OF INSTAGRAM ON PURCHASE DECISION GEN Z	...29
<b>Session A: MANAGEMENT AND OPERATION MANAGEMENT</b>	<b>...35</b>
Ali Reza Afshari, Farzad Ghaderi Bafti CONSTRUCTION PROJECT PROCUREMENT MANAGEMENT	...37
Ali Reza Afshari, Niloofar Ghayeni ENERGY MANAGEMENT IN RESIDENTIAL BUILDINGS WITH EMPHASIS ON CONSUMABLES IN NORTH KHORASAN PROVINCE	...43
Aleksandra Božović, Milena Cvjetković SIX SIGMA AND TQM CONCEPT IN THE FUNCTION OF IMPROVING BUSINESS PERFORMANCE	...49
Spasoje Erić, Aleksandar Rajić, Ivan Palinkaš DIAGNOSTICS OF AIR CONDITIONER FAILURES AS A DIGITAL SYSTEM	...54
Goran Janačković, Dejan Vasović, Bojan Vasović, Violeta Milićević, Zoran Jovanović KEYBOARDS AS INPUT DEVICES: STANDARDIZATION AND FUTURE TRENDS	...60
Nikola Milicevic, Nenad Djokic, Ines Djokic INTENTIONS TO USE BICYCLES AND ENVIRONMENTAL CONCERNS	...66
Slavica Prvulovic, Ivica Micic, Jasna Tolmac, Milos Josimovic, Slobodan Juric, Milica Josimovic SELECTION OF WATER PRESSURE BOOSTER PLANTS IN THE FIRE HYDRANT NETWORK FOR A WAREHOUSE FACILITY	...71
Sanja Puzović, Jasmina Vesić Vasović, Vladan Paunović INDUSTRY 5.0 AN EMERGING PARADIGM: INCEPTION, CONCEPT AND CHALLENGES	...77
Marija Stanojeska, Robert Minovski, Bojan Jovanoski THE MOST INFLUENTIAL POLICY AND INFRASTRUCTURES FACTORS IN QMS – PRACTICES FROM THE FOOD PROCESSING INDUSTRY	...83

**Session B: HUMAN RESOURCE MANAGEMENT** **...93**

Ali Reza Afshari, Saman Nejatpuor THE FUTURE OF SPORT MANAGEMENT RESEARCH IN IRAN	...95
Mihalj Bakator, Mila Kavalić, Edit Terek Stojanović, Verica Gluvakov, Dragan Čočkalo EDUCATION AND INTELLECTUAL CAPITAL MANAGEMENT IN SMEs AS MEANS OF IMPROVING COMPETITIVENESS	...100
Srđan Bogetić, Zorana Antić THE IMPACT OF MENTAL HEALTH AND PSYCHOSOCIAL RISKS ON A SAFE AND HEALTHY WORKPLACE	...106
Verica Gluvakov, Sanja Stanisavljev, Dragana Kovač, Stefan Ugrinov, Dejan Bajić THE ROLE OF LEADERSHIP IN KNOWLEDGE MANAGEMENT	...112
Dragana Kovač, Mihalj Bakator, Ivan Palinkaš, Maja Gaborov, Melita Čočkalo-Hronjec CREATIVE PROBLEM SOLVING IN MODERN ORGANIZATIONS	...118
Srđana Taboroši, Biljana Maljugić, Zoran Lajić, Jelena Rajković, Siniša Mitić EMPLOYEE TURNOVER DURING THE GREAT RESIGNATION	...124
Edit Terek Stojanović, Milan Nikolić, Predrag Mali, Jelena Rajković, Sinisa Mitić SOCIAL MEDIA AS A PR STRATEGY	...129

**Session C: MARKETING MANAGEMENT** **...135**

Valentina Bozoki FASHION, MARKETING AND FASHION MARKETING – ANALYSIS OF THE IMPACT ON BRAND SUCCESS IN THE FASHION INDUSTRY	...137
Vladimir Milošev, Dubravko Marić STRATEGY OF BRAND DEVELOPMENT AND MARKETING POSSIBILITIES OF APPEARANCE ON THE FOREIGN MARKET ON THE EXAMPLE OF THE COMPANY "JAFFA" CRVENKA	...143
Stefan Ugrinov, Verica Gluvakov, Mila Kavalić, Sanja Stanisavljev, Maja Gaborov ROLE OF DIGITAL MARKETING IN CREATING COMPETATIVE EDGE	...151

**Session D: ECONOMY** **...157**

Marko Aleksić, Radmila Bjekić, Nemanja Berber, Maja Strugar Jelača, Dimitrije Gašić APPLICATION OF RESOURCE EFFICIENCY IN THE GREEN BUSINESS CONCEPT	...159
Valentina Bozoki MANAGEMENT IN THE TEXTILE INDUSTRY - THE FUNCTION OF MANAGEMENT AND ITS RESULTS	...165
Miloš Ivaniš FACTORING – INSTRUMENT OF ENTERPRISE FINANCING	...171

Miloš Ivaniš FORFAITING – INSTRUMENT OF ENTERPRISE FINANCING	...177
Branimir Kalaš, Vera Mirović, Nada Milenković, Milica Indić INTERDEPENDENCE BETWEEN BUDGET DEFICIT AND PUBLIC DEBT: THE CASE OF BRICS COUNTRIES	...183
Nada Milenković, Branimir Kalaš, Jelena Andrašić, Miloš Đaković SME BANK LOANS VS. VC FUNDS ACTIVITY IN SERBIA	...188
Miloš Pjanić, Mirela Mitrašević, Stevan Luković CYBER INSURANCE MARKET: STATE AND FUTURE DEVELOPMENT DIRECTIONS	...194
Aleksandra Zhemkova THE IMPACT OF COVID-19 ON THE PRODUCTIVITY OF RUSSIAN COMPANIES	...200
<b>Session E: IT MANAGEMENT</b>	<b>...207</b>
Dragana Sajfert, Jesa Kreiner, Srđan Barzut, Ana-Marija Vukić, Milica Jevremović THE EFFECT OF ELECTRONICS BUSINESS ON USER SATISFACTION	...209
Dragana Sajfert, Jesa Kreiner, Srđan Barzut, Svetlana Anđelić, Ana-Marija Vukić THE INFLUENCE OF INFORMATION TECHNOLOGIES ON ORGANIZATIONAL COMMITMENT IN THE ENVIRONMENT	...215
Dragana Sajfert, Srđan Barzut, Ana-Marija Vukić, Milica Jevremović THE IMPACT OF ELECTRONIC BUSINESS ON THE MOTIVATION AND PROFESIONAL CHALLENGES OF EMPLOYEES	...221
Nataša Đalić, Živko Erceg, Irena Đalić THE IMPORTANCE OF INFORMATION SYSTEMS FOR ACHIEVING THE QUALITY AND BUSINESS RESULTS OF THE COMPANY	...227
<b>Session F: ABSTRACTS</b>	<b>...233</b>
Mohammad Anisseh, Narges Sharifi, Zahra Akbari EVALUATION OF UNIVERSITYIES SERVICE QUALITY THROUGH SERVQUAL METHOD	235
Károly Szabó, László Szabó POSSIBILITEIS OF SHORT SUPPLY CHAINS IN THE SUSTAINABLE LOGISTICS	236
<b>Author Index</b>	<b>...237</b>



**Plenary session**

---

**Papers (pp. 3-34):**

Ali Reza Afshari, Farideh Sobhanifard ASSESSMENT OF PROJECT PROCUREMENT PLANNING	...3
Dragan Čočkaló, Mihalj Bakator, Sanja Stanisavljev, Edit Terek Stojanović, Milan Nikolić, Mila Kavalić ENTREPRENEURSHIP ECOSYSTEM WITHIN THE CONCEPT OF SOCIETY 5.0	...11
Larisa Nikitina, Anna Kosobutskaya, Anton Prachenko, Yuriy Treshchevskiy ANALYSIS AND FORECASTING OF INNOVATION PROCESSES IN THE LEADING RUSSIAN REGIONS	...19
László Szabó PHYGITAL EXPERIENCES IN LOGISTICS	...25
Bruno Završnik THE INFLUENCE OF INSTAGRAM ON PURCHASE DECISION GEN Z	...29



## **ASSESSMENT OF PROJECT PROCUREMENT PLANNING**

**Ali Reza Afshari**

Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran

E-mail: [afshari@mshdiau.ac.ir](mailto:afshari@mshdiau.ac.ir)

**Farideh Sobhanifard**

University of Sistan and Baluchestan, Department of Industrial Engineering, Zahedan, Iran

### **ABSTRACT**

Project procurement management is among the ten knowledge areas that a project manager must be familiar with for a successful implementation of a project work. Depending upon the specific type of project being managed, over 50 percent of the total project cost can be attributed to parts, supplies and services procured. For many high-technology projects, this procurement fraction can approach 90 percent. This study is targeted to assess project procurement practice of Mapna Group Company by addressing the process undergone Procurement planning. The primary data was collected from a total of 60 respondents from a total population of 198 out of which 60 was approached for answering questions related to planning procurement process. Then the data presented quantitatively using descriptive statistics with the help of table, frequency and percentage. Accordingly, the finding of the study reveals the company fail to provide training related to project and project procurement, fail to arrange pre-proposal visit, not considering suppliers risk management issue as evaluation criteria, weak monitoring system for products arrived at the project site and not gathering suppliers' performance status report from concerned stakeholders. Thus, a recommendation has been made under this study on what actions should be taken in order to improve project procurement management practice of Mapna Group Company.

**Key words:** Procurement, Project Procurement Management, Procurement Planning, solicitation planning.

### **INTRODUCTION**

Project procurement management is among the ten knowledge areas that a project manager must be familiar with for a successful implementation of a project work. It is needed to acquire products, services, and/or results needed for the project. Procurement systems make a difference in project implementation, while poorly managed project procurement relationships negatively with project performance. Procurement is the nerve center of performance in every institution which needs a tight system to be adopted and followed. Many procurement activities suffer from neglect, lack of proper direction, poor co-ordination, bureaucracy, lack of open competition and transparency, differing levels of corruption and not having a trained and qualified procurement specialists who are competent to conduct and manage the procurement process in a professional, timely and cost effective manner. Week project procurement in Ethiopia resulted from insufficient planning, shortage of funds, and timely inaccuracy of large procurement (Karlsson, 2011).

Effective procurement is critical for execution of projects successfully. Depending upon the specific type of project being managed, over 50 percent of the total project cost can be attributed to parts, supplies, and services procured, and for many high-technology projects, this procurement fraction can approach 90 percent (Morris & Pinto, 2010). Karlsson (2011), conducted a study to understand project management in Ethiopia and Sweden which conclude method of procurement management has big weakness and the lack of adequate planning often causes problems in the production when materials, machines and parts are delivered too late or not at all in Ethiopia, however, the study was on construction companies. Seife (2015) was conducted on effective public procurement management impact in the implementation of successful public project, but the study is on the area of housing development projects of the country. Another study on project procurement practice conducted on Iran road maintenance project having an objective to assess the studied project procurement practice.

The Major gap from the different studies is that they do not cover up each process of the project procurement. The general question of this study was How does the project procurement planning look like in Mapna Group Company? The general objective of the study is to describe the practice of project procurement management in Mapna Group Company. While attempting to achieve the stated general objective, the study was also specifically tries to examine the project procurement planning practice in Mapna Group Company. This study will help the company to evaluate its current project procurement practice. Findings and recommendations also will guide the studied company to maximize the contribution of its sourcing and program management functions to meet projects objective. The findings may be of great use to the academia, especially those who may wish to carry out further research on project procurement.

## **PROJECT PROCUREMENT MANAGEMENT**

Kerzner (2017), Define Procurement as the acquisition of goods and services by involving two parties customer who is buying and supplier who is selling with different objectives who interact in a given market segment. Procurement characterized by most often a dynamic and repeated activity with short term objectives often conflicting with long term ones. Another definition of procurement is management of a broad range of processes that are associated with an organization desire to obtain the necessary goods and services needed for manufacturing a product, transforming inputs to outputs, or indirectly operating the organization. These processes involves identifying and analyzing user requirements and type of purchase, selecting suppliers, negotiating contracts, acting as liaison between the supplier and the user, and evaluating and forging strategic alliances with suppliers (Morris & Pinto, 2010). Its function extends to acquisition of suppliers, pricing, purchasing, and administration of contracts. It also involves to storage, logistics, inspection, expediting, transportation, and handling of materials and supplies. According to Laby et al. (2016), a procurement process involves a series of activities like purchasing, transporting, stoking and supply. Since it is economically difficult for companies to make all the materials they use, procurement process is used to ensure the buyer receives goods, services or works at the best possible price, when aspects such as quality, quantity, time, and location are compared. It is also a practice that can increase corporate profitability by taking advantage of quantity discounts, minimizing cash flow problems, and seeking out quality suppliers (Kerzner, 2017). Efficient procurement is a core necessity for firms' profitability as well as survival. But the problem is that most companies see the procurement process as tactical rather than strategic and as cost rather than a benefit to the company (Dimitri, Piga, & Spagnolo, 2006).

Project procurement management is one of the ten knowledge areas of project management that includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team. Another definition of project procurement management is the processes to control and administrate contracts and purchase orders from sources external to the project organization. Project procurement management involves deciding what must be procured, issuing requests for bids or quotations, selecting suppliers, administering contracts, and closing them when the job is finished (Karlsson, 2011). PMBOK identifies four processes of project procurement management namely plan procurement management, conduct procurements, control procurements, and close procurements. Plan procurement Management is the process of documenting project procurement decisions, specifying the approach, and identifying potential sellers. While conduct procurement is the process of obtaining seller responses, selecting a seller, and awarding a contract. Control procurement is a process of managing procurement relations, monitoring contract performance, and making changes and corrections to contracts as appropriate. Finally, close procurement process is about completing each procurement. Wysocki (2011) identified six phases of project procurement management namely procurement planning, solicitation planning, solicitation, source selection, contract administration and contract closeout.

Plan Procurement Management is the process of documenting project procurement decisions, specifying the approach, and identifying potential sellers. Care need to be taken at this stage since

other activities of the project procurement implementation decisions emanates from its planning document. The purpose of project procurement plan is to determine whether to acquire outside support, and if so, it determine what to acquire, how to acquire it, how much is needed, and when to acquire it. Morris et.al (2010) sates procurement planning used to identify factors in the decision, make or buy analysis and contract type selection of the project procurement. According to Laby et.al (2016), Project procurement planning identifies the items that are needed to procure, define the process for acquiring those items and finally schedule the time. Procurement plan use project management plan, requirements documentation, risk register, activity cost estimates, stakeholder register, enterprise environmental factors, and organizational process asset as an input. Using make or buy analysis, expert judgement, market research and meeting as technique and tool to produce an output of procurement management plan, procurement statement of work, procurement documents, source selection criteria, make-or-buy decisions, change requests and project documents updates. Procurement plan includes defining the need for the project, development of the procurement statement of work, specifications and work breakdown structure, performing a make or buy analysis, laying out the major milestones and the timing/schedule, determining if long lead procurement is necessary, cost estimating including life-cycle costing, determining whether qualified sellers exist, identifying the source selection criteria, preparing a listing of possible project/procurement risks (i.e., a risk register), developing a procurement plan and obtaining authorization and approval to proceed (Kerzner, 2017). The plan required to define items to be procured with justification statements and timelines, type of contract to be used, risks associated with procurement management, how procurement risks will be mitigated, determining costs and if/how they're used as evaluation criteria, any standardized procurement templates or documents to be used, how multiple suppliers will be managed if applicable, contract approval process, decision criteria, establishing contract deliverables and deadlines, how procurement and contracts are coordinated with project scope, budget, and schedule, any constraints pertaining to procurement, direction to sellers on baseline requirements such as contract schedules and work breakdown structures (WBSs), vendor management, identification of any prequalified sellers if applicable and performance metrics for procurement activities. Procurement management plan sets the procurement framework for the project that will serve as a guide for managing procurement throughout the life of the project and updated will be possible as acquisition needs change (Kovács, 2011).

## **RESEARCH METHODOLOGY**

The study apply descriptive research design since it attempts to assess the practice of project procurement management in Mapna Group Company. Descriptive design helps to present a picture of the specific detail of a situation and describing the characteristics of a particular situation (Neuman, 2007). Since the research purpose was to describe a particular phenomenon at a single point in time it was a cross-sectional study. The target population used to answer for the planning procurement phase of the study includes 50 staff members who are participated in the planning phase.

The study applied non-probability sampling. It is useful for certain studies that require the researcher to collect the data from particular individuals that have knowhow about the studied situation. It enables the researcher to choose sample of participants that are necessarily sufficient for the study. The sampling type applied in the study was purposive sampling. It is useful when focusing on a limited number of informants, whom we select strategically so that their in-depth information give optimal insight into an issue. Such type of sampling is appropriate when a researcher use it to select unique cases that are especially informative, and when it wants to identify particular types of cases for in-depth investigation. The researcher found it appropriate due to the total population for this study involves in procurement activities for a project directly having assignment letter and indirectly on temporary base besides with their operational responsibility. 60 of the respondents was approached to collect data about the planning process practice of project procurement. In order to get appropriate data, the study uses both primary and secondary sources of data. Primary sources of data include questionnaire and semi-structured interview to supply firsthand information from sample respondents based on the review of related literature important to the subject of the study. The reviewed literature



was made to develop an insight on procurement management practice within the process related with projects. Thus, interview and questionnaires was designed focusing on the practice of project procurement management and its process. The secondary sources of data emanates from the company policy and procedure documents, project management working manual, reports, process templates and magazines. In addition relevant books, journals and empirical research also used.

The data collected was analyzed using both quantitative and qualitative methods. The data obtained from close ended questionnaire was analyzed using SPSS version 20.00 software which helps to make descriptive analysis of the gathered data to present quantitatively using frequency and percentage. While the semi structured interview made was analyzed by organizing the common ideas and concepts of the response into a generalizable format.

## RESULTS AND DISCUSION

The objective of this section is to provide the findings and results from the data collected through close ended questionnaire and semi structured interview which is analyzed using SPSS statistics version 20.0 in order to assess the practice of Mapna Group Company project procurement management practice and to provide adequate recommendations for the identified gaps. This section summarizes and presents the demographic characteristics of the respondents such as age, level of education, year of work experience and current work position.

*Table 1: General Characteristics of the Respondents*

		Frequency	Percent	Valid Percent	Cumulative Percent
Age of the Respondents	20-30	13	21.7	21.7	21.7
	31-40	27	45.0	45.0	66.7
	41-50	13	21.7	21.7	88.3
	Above 50	7	11.7	11.7	100.0
	Total	60	100.0	100.0	
Level of Education	Diploma	4	6.7	6.7	6.7
	Degree	35	58.3	58.3	65
	Postgraduates	21	35.0	35.0	100.0
	Total	60	100.0	100.0	
Year of Work Experience	Less than 5 Year	3	5.0	5.0	5.0
	5-10	18	30.0	30.0	35.0
	11-15	28	46.7	46.7	81.7
	Above 15	11	18.3	18.3	100.0
	Total	60	100.0	100.0	
Current Work Position	Supervisor	5	8.3	8.3	8.3
	Expert	9	15.0	15.0	23.3
	Specialist	19	31.7	31.7	55.0
	Administrator	27	45.0	45.0	100.0
	Total	60	100.0	100.0	

The researcher applied five point Likert scale questionnaire where (1 =Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree and 5 = Strongly Agree) to collect data from respondents. 60 questionnaire were distributed to the target group of respondents and all of them are filled and returned. Part of the questionnaires related to general information of the respondents and training related questions are distributed to all of the 60 respondents. The data was analyzed and presented using SPSS software program while semi structure interview results have been analyzed qualitatively.

This part of the study discussed on the first step of the project procurement management. The analysis has been conducted and presented depending on the responses collected from participants through questionnaire, semi structured interviews and relevant document review.

*Table 2: Make-or-buy analysis for planning procurement*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	-	-	-	-
	Disagree	8	13.3	13.3	13.3
	Uncertain	8	13.3	13.3	26.7
	Agree	32	53.3	53.3	80
	Strongly Agree	12	20	20	100
	Total	60	100	100	

The above table 2 reveals that out of the total respondents, 13.3% disagree, 13.3% uncertain, 53.3% agree and the remaining 20% agree that there is consideration make-or-buy analysis before deciding to buy from outside vendors to meet the project procurement need of the company. Furthermore, interview made with the Contract Management Program Managers also confirmed that the analysis is made to identify what the company cable to make, what is available from local suppliers and what to acquire from foreign suppliers. The project management process of the company also states it is important to identify whether to acquire or not at the planning phase of the project.

*Table 3: Expert judgment for planning procurement*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	-	-	-	-
	Disagree	-	-	-	-
	Uncertain	8	13.3	13.3	13.3
	Agree	28	46.7	46.7	60.0
	Strongly Agree	24	40.0	40.0	100.0
	Total	60	100.0	100.0	

According to table 3, 13.3% of the respondents are uncertain while 46.7% agree and 40% strongly agree that the use of expert judgement for planning project procurement. To triangulate the data, interview conducted with project managers and contract managers also reveals that there is establishment of Expert Group for the entire planning phase of the project who are selected based on their past experience, skill and ability, work experience and participation in previous projects of the company. In addition to expertise within the company, external experts are used who are providing consultancy service in requirement selection, technology selection and contract preparation.

*Table 4: Conducting market research for planning procurement*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	6.7	6.7	6.7
	Disagree	8	13.3	13.3	20.0
	Uncertain	4	6.7	6.7	26.7
	Agree	16	26.7	26.7	53.3
	Strongly Agree	28	46.7	46.7	100.0
	Total	60	100.0	100.0	

The above table 4 illustrates, out of the whole respondents 6.7% strongly disagree, 13.3% disagree, 6.7% uncertain, 26.7% agree and 46.7% strongly agree about conducting market research for planning procurement. Data obtained from interview also confirms that the company use market assessment as its sourcing policy element for its project and operational procurement. The market information consists of product list and portfolio, supplier profile, price offer and other related information and update the data periodically and as needed. It helps to view supply and demand within the market, identify the power of suppliers, and level of competition. The company also collect information about suppliers and there products online on its official website. New suppliers both from local and foreign market register and update their information accordingly. The required information includes company profile, recent consecutive three years financial audit report, product or service portfolio, recommendation letter, and valid license and certificates.

Table 5: Consideration of past project procurement documents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	-	-	-	-
	Disagree	8	13.3	13.3	13.3
	Uncertain	16	26.7	26.7	40.0
	Agree	4	6.7	6.7	46.7
	Strongly Agree	32	53.3	53.3	100.0
	Total	60	100.0	100.0	

Table 5 depicts that more than half of the respondents (53.3%) strongly agree that consideration of past project procurement documents for making future decision while the remaining 13.3% disagree, 26.7% uncertain and 6.7% agree. Interview with Contract Management program Managers also confirms there is reference of past project procurement documents to review issues such as suppliers profile and performance, type of goods and/or services provided, content of the contract, contract management issues, risks incurred, claims and way of solving, issues related to contract change and contract audit report. Such reference helps to identify possible threats, and opportunities as well as learn from past mistakes for making better decision.

Table 6: Activity resource and cost estimation consideration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	-	-	-	-
	Disagree	-	-	-	-
	Uncertain	12	20.0	20.0	20.0
	Agree	32	53.3	53.3	73.3
	Strongly Agree	16	26.7	26.7	100.0
	Total	60	100.0	100.0	

Table 6 reveals 20% of the respondents are uncertain while the remaining 53.3% and 26.7% agree and strongly agree respectively about consideration of activity resource and activity cost estimation for planning procurement for projects. According to the company project management process document and Construction Projects charter, there is activity definition to identify specific activities to be performed to produce the various project deliverables and sequencing them to support for the development of an achievable schedule. This helps for resource estimation to identify the type and quantity of resources require to accomplish each activities. After estimating the required resources, an approximation of the costs of the resources needed to complete the project activities is estimated. According to project management process of the company its states activity cost must be estimated for all resources (people, services, material, hardware and software) that will charged to the project. According to Contract Management Program Managers such estimation helps to decide on what to acquire at what cost.

Table 7: Associated risks and mitigation plan identification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	6.7	6.7	6.7
	Disagree	12	20.0	20.0	26.7
	Uncertain	12	20.0	20.0	46.7
	Agree	20	33.3	33.3	80.0
	Strongly Agree	12	20.0	20.0	100.0
	Total	60	100.0	100.0	

Table 7 depicts that 6.7% strongly disagree, 20% disagree, 20% uncertain, 33.3% agree and the remaining 20% of respondents strongly agree. Most of the respondents reveals the company identify associated risks and prepare mitigation plan for its projects. The issue is confirmed via interview and by reviewing Construction Projects charter. Project risk management activity of the company not only

involves in identification of risks and develop risk responses but also implement and track the risk responses.

*Table 8: Identification of overall procurement need of the project*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	8	13.3	13.3	13.3
	Disagree	4	6.7	6.7	20.0
	Uncertain	8	13.3	13.3	33.3
	Agree	24	40.0	40.0	73.3
	Strongly Agree	16	26.7	26.7	100.0
	Total	60	100.0	100.0	

Table 8 reveals that 13.3% strongly disagree, 6.7% disagree, 13.3% uncertain, 40% agree and 26.7% agree on the identification of overall procurement need for the project. According to interview with the program contract managers and project managers, at the end of procurement planning issues such as whether to acquire, what to acquire, how to acquire, how much to acquire and when to acquire is determined.

*Table 9: Separate procedure followed for managing project procurement*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	6.7	6.7	6.7
	Agree	-	-	-	-
	Uncertain	8	13.3	13.3	20.0
	Agree	20	33.3	33.3	53.3
	Strongly Agree	28	46.7	46.7	100.0
	Total	60	100.0	100.0	

From the above table 9, 6.7% strongly disagree, 13.3% uncertain, 33.3% agree and the remaining 46.7% of the respondents strongly agree on the presences of separate procedure used for managing project procurement in Mapna Group Company. Based on the data gathered using interview with the program contract managers, they confirmed that the company follow separate procedure and process which is different from corporate sourcing mainly on the nature of the contract, monitoring and controlling procedure, level of flexibility, and on the number of participant for approval.

*Table 10: Aggregate Mean and Standard Deviation for Project Procurement Planning Process*

Items	N	Mean	Std. Deviation
There is a separate procedure to be followed for managing project procurement	60	4.13	1.13
Make-or-buy analysis is made before deciding to buy from outside vendors	60	3.80	0.94
Expert judgment is used for planning	60	4.27	0.70
Market research is conducted.	60	3.93	1.34
There is consideration of past procurement documents for making future decision	60	4.00	1.19
Activity resource and cost estimation is ensured	60	4.07	0.70
Associated risks and mitigation plan is identified while planning procurement	60	3.40	1.24
Overall procurement need of the project is identified at the end of planning.	60	3.60	1.35
<b>Aggregate Mean and Standard Deviation</b>		3.9	1.07

As shown in table 10, the respondents overall mean regarding to the project procurement planning scores 3.9 which implies project procurement planning practice were high. Individual items mean also lied between 3.41 and 4.2 which indicates most of respondents agree on the above listed items. The

SD for presence of separate procedure, conduction of market research, consideration of past project procurement document, identification of risk and mitigation plan, and identification of overall need of the project lies between 1.13 and 1.35 in which the variables have highest SD which indicates the individual response were a little over 1 point away from a mean. For the remaining items the standard deviation is less than one and the individual response did not deviate at all from the mean.

## CONCLUSIONS

This study aims to assess project procurement practice of Mapna Group Company. To accomplish the objectives of the research, the researcher applied descriptive approach and both quantitative and qualitative data were collected through questionnaire, semi structured interview and document review. The practice of project procurement management in Mapna Group Company shows a deviation with that of theoretical aspect of the knowledge area. On which the company should recognize and give greater emphasis to the identified gaps and ensure the effective management of its project procurement practice. The company should provide adequate training on project and project procurement management area for project team members since it increases their knowledge and skill. The training also help them for better understanding of the three constraints of project while they make decision.

## REFERENCES

- Dimitri, N., Piga, G., & Spagnolo, G. (2006). *Handbook of procurement*: Cambridge University Press.
- Karlsson, P. (2011). Project Management in Sweden and Ethiopia-Potential improvements in Project Management methods. *TVBP*.
- Kerzner, H. (2017). *Project management: a systems approach to planning, scheduling, and controlling*: John Wiley & Sons.
- Kovács, A. (2011). *Enhancing procurement practices: Comprehensive approach to acquiring complex facilities and projects*: Springer Science & Business Media.
- Laby, N. C., Arokiaprakash, A., Indira, M., & Manivel, S. (2016). Analysis of factors influencing procurement process and proposing a decision making module for construction projects on multi-site context. *International Journal of Applied Engineering Research*, 11(9), 6689-6693.
- Morris, P. W., & Pinto, J. K. (2010). *The Wiley guide to project technology, supply chain, and procurement management*: John Wiley & Sons.
- Neuman, L. W. (2007). *Social research methods, 6/E*: Pearson Education India.
- Seife, M. (2015). *Effective Public Procurement Management in Implementation of Successful Public Projects in Ethiopia: A Case Study of Addis Ababa City Government Housing Development Project offices*. ADDIS ABABA UNIVERSITY,
- Wysocki, R. K. (2011). *Effective project management: traditional, agile, extreme*: John Wiley & Sons.



## **ENTREPRENEURSHIP ECOSYSTEM WITHIN THE CONCEPT OF SOCIETY 5.0**

**Dragan Čočkalović**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

**Mihalj Bakator**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

E-mail: [mihalj.bakator@uns.ac.rs](mailto:mihalj.bakator@uns.ac.rs)

**Sanja Stanisavljević**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

**Edit Terek Stojanović**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

**Milan Nikolić**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

**Mila Kavalić**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

### **ABSTRACT**

This paper aims to analyze the domestic entrepreneurship environment within the framework of Society 5.0 in Serbia, a concept characterized by the integration of advanced technologies and high levels of collaboration between government, academia, and the private sector. The study addresses the challenges and opportunities brought by Society 5.0 for entrepreneurship and investigates factors that can improve the entrepreneurial ecosystem and national competitiveness of Serbia. The study suggests that factors such as finance, knowledge, government policies, culture, social responsibility, technologies, and evaluation play a crucial role in enhancing entrepreneurship ecosystems and national competitiveness. By addressing the challenges and leveraging opportunities brought by Society 5.0, Serbia can foster an environment that encourages innovation, economic growth, and sustainable development.

**Keywords:** Entrepreneurship ecosystem, Society 5.0, competitiveness, Serbia

### **INTRODUCTION**

Society 5.0, also known as the "super smart society," is a term used to describe the future of human civilization in which advanced technologies such as artificial intelligence, the Internet of Things, and robotics are fully integrated into society. Within the concept of Society 5.0 entrepreneurship plays an important role in driving innovation and economic growth (Fukuyama, 2018). Entrepreneurship ecosystems in Society 5.0 are characterized by a high level of collaboration and cooperation between different actors, including government, academia, and the private sector. Governments can support the creation of an enabling environment for entrepreneurship by providing funding and other forms of support for startups and small businesses (Fukuda, 2020). Governments also work closely with the private sector to develop policies and regulations that promote innovation and growth.

Furthermore, academia also plays an important role in entrepreneurship ecosystems in Society 5.0. Universities and research institutions provide the necessary knowledge and expertise to support the development of new technologies and business models. They also serve as a source of talent and human capital for startups and small business. Many universities have established incubator and accelerator programs to support the development of new ventures. Other enterprises, both large and small, play a vital role in driving innovation and economic growth by providing funding, resources, and support to startups and small businesses, they also collaborate with government and academia to

develop new technologies and business models (Khurana et al., 2022). Furthermore, private sector actors also play a role in the development of new markets and industries.

The entrepreneurship ecosystem in Society 5.0 is also characterized by a high level of collaboration and cooperation between different actors (Ellitan, 2020). This is particularly true in the field of technology, where startups, small businesses, government, academia, and the private sector all work together to develop new technologies and business models. The current body of literature addresses this topic in multiple variations, however, studies that address entrepreneurship ecosystems within the framework of Society 5.0 in Serbia are scarce. This paper aims to fill this knowledge gap by analyzing the domestic entrepreneurship environment, the attitudes of potential entrepreneurs, and by developing a theoretical model for improving entrepreneurial ecosystems and national competitiveness of Serbia.

The main research questions that guide this study are:

1. What challenges and opportunities are brought by the concept of Society 5.0 in the context of entrepreneurship?
2. How can entrepreneurship in Serbia be improved? What factors play a role in this improvement?

This paper consists of three main sections (excluding the Introduction and Conclusion sections). First the changes and challenges of the Society 5.0 concept are noted. Next, the entrepreneurship ecosystems and Society 5.0 are discussed. In addition, the developed theoretical model for improving the entrepreneurial environment in Serbia and the research questions are discussed. Finally, suggestions and guidelines for improving national competitiveness and entrepreneurship ecosystems are noted.

## **CHANGES BROUGHT BY SOCIETY 5.0**

As noted earlier Society 5.0, also known as the "super smart society, incorporates advanced technologies like artificial intelligence (AI), the Internet of Things (IoT), and robotics into everyday life (Shiroishi et al., 2018). This integration has already begun to transform various sectors, including healthcare, education, and transportation. It has also led to significant changes in how businesses work, giving rise to new trends that shape the future of the business world (Narvaez Rojas et al., 2021).

One major trend is the increased use of automation and artificial intelligence in businesses. These advanced technologies allow enterprises to automate repetitive tasks, such as data entry and analysis, which leads to better efficiency and cost savings. Automation also frees up human employees to focus on more strategic and creative tasks, thereby increasing overall productivity (Aquilani et al., 2020). Furthermore, businesses can use artificial intelligence to analyze large amounts of data, enabling them to understand and predict customer needs and preferences (Bakator et al., 2021). This results in improved customer satisfaction through personalized marketing and tailored product offerings. As AI and automation technologies continue to advance, this trend is likely to persist and expand, with companies aiming to use advanced technologies to stay competitive in a constantly changing business environment (Haefner et al., 2021).

Another key trend is the focus on innovation. As technology keeps evolving at a fast pace, businesses need to constantly innovate and create new products, services, and business models to stay competitive. This involves investing in research and development, fostering a culture of innovation within the organization, and staying informed about emerging technologies and market trends. Putting emphasis on innovation is important for businesses to stay relevant in the market and adapt to changing customer needs. Moreover, innovation helps create new industries and markets, offering new opportunities for businesses and contributing to economic growth (Pereira et al., 2020).

Collaboration and partnerships are also important in the business landscape of Society 5.0. Enterprises need to work together to share resources, knowledge, and expertise to remain competitive. This collaboration can take different forms, such as partnerships between enterprises in complementary industries, collaborations between the government and the private sector to develop new infrastructure or address societal challenges, and open innovation initiatives that involve sharing ideas and resources with external stakeholders. Digital platforms and tools, including cloud computing and communication software, make it easier for businesses to collaborate with partners and customers across geographical boundaries, leading to a more connected and integrated business ecosystem (Cozzolino et al., 2021).

Additionally, focusing on sustainability and social responsibility has become essential for doing business in Society 5.0. As people become more aware of the impact of business activities on the environment and society, there is growing demand for enterprises to adopt sustainable practices, such as reducing waste, using renewable energy sources, and implementing circular economy principles. This focus on sustainability can also lead to cost savings and new market opportunities for businesses. At the same time, enterprises need to address social issues like poverty and inequality by promoting fair labor practices, supporting community development projects, and ensuring equal opportunities for all employees (Thacker et al., 2019). Enterprises can build a positive brand image, increase customer loyalty, and ensure their long-term success through taking responsibility for their actions and implementing sustainable and socially responsible business practices.

## **ENTREPRENEURSHIP ECOSYSTEMS AND SOCIETY 5.0**

Entrepreneurship ecosystems encompass various elements that facilitate establishing and expanding new businesses, such as government policies, financing options, and the presence of talent and resources. These ecosystems are essential for increasing economic growth and innovation as they establish the conditions for entrepreneurs to initiate and scale new ventures. As a result, a robust entrepreneurship ecosystem can lead to increased job creation, higher rates of innovation, and overall economic development within a region or country (Djordjevic et al., 2021).

A primary component of an entrepreneurship ecosystem is access to finance. Capital availability is essential for entrepreneurs, allowing them to finance their development and growth. Financial support can be venture capital, angel investments, or government grants and loans. Additionally, the emergence of alternative financing methods, such as crowdfunding and peer-to-peer lending, has expanded capital access for entrepreneurs (Holroyd, 2022). Finally, a vibrant investment community and supportive financial institutions also contribute to a healthy entrepreneurship ecosystem.

Another crucial element in entrepreneurship ecosystems is the availability of talent and resources, encompassing human capital—such as skilled workers and managerial expertise—and physical capital, including office space and equipment. Universities and research institutions can also contribute significantly to talent and resource availability, often as sources for innovative ideas and advanced technologies. Furthermore, incubators, accelerators, and co-working spaces can provide entrepreneurs valuable resources, mentorship, and networking opportunities to help grow their businesses. Government policies and regulations play a pivotal role in shaping entrepreneurship ecosystems. Governments can support entrepreneurship by offering tax incentives and research and development funding while fostering a supportive legal and regulatory environment. Moreover, governments can invest in infrastructure, training, and education programs to encourage entrepreneurship (Cohen & Tubb, 2018). Developing innovation hubs, technology parks, and special economic zones can also contribute to a thriving entrepreneurial environment.

Cultural and societal attitudes also critically influence entrepreneurship ecosystems. For example, a culture encouraging risk-taking and innovation can create a more conducive environment for entrepreneurs to establish and grow businesses. This can be fostered through promoting role models, establishing entrepreneurial communities, and initiatives that celebrate entrepreneurial success. Media coverage and public awareness of entrepreneurial achievements can also contribute to shaping a positive entrepreneurial culture.

Lastly, the presence of successful businesses can strengthen an entrepreneurial ecosystem. Established companies can provide mentorship, resources, and clientele for new ventures, fostering a culture of innovation and entrepreneurship. These successful businesses can also offer learning opportunities for aspiring entrepreneurs, sharing best practices and lessons from their experiences. Society 5.0's incorporation of advanced technologies has the potential to enhance entrepreneurship ecosystems considerably. For instance, the Internet of Things and artificial intelligence can empower entrepreneurs to collect and analyze vast amounts of data to identify business opportunities and discern customer behavior. This can lead to the creation innovative business models, products, and services.

In addition, the integration of advanced technologies can also lead to improved communication and collaboration tools, making it easier for entrepreneurs to connect with partners, customers, and mentors. Furthermore, new technologies can enable remote work and distributed teams, allowing entrepreneurs to access global talent and resources and promoting entrepreneurship in underdeveloped regions with limited resources and talent access. The increasing availability of online learning platforms and resources. The theoretical model for improving entrepreneurial ecosystems and national competitiveness is presented on Figure 1.

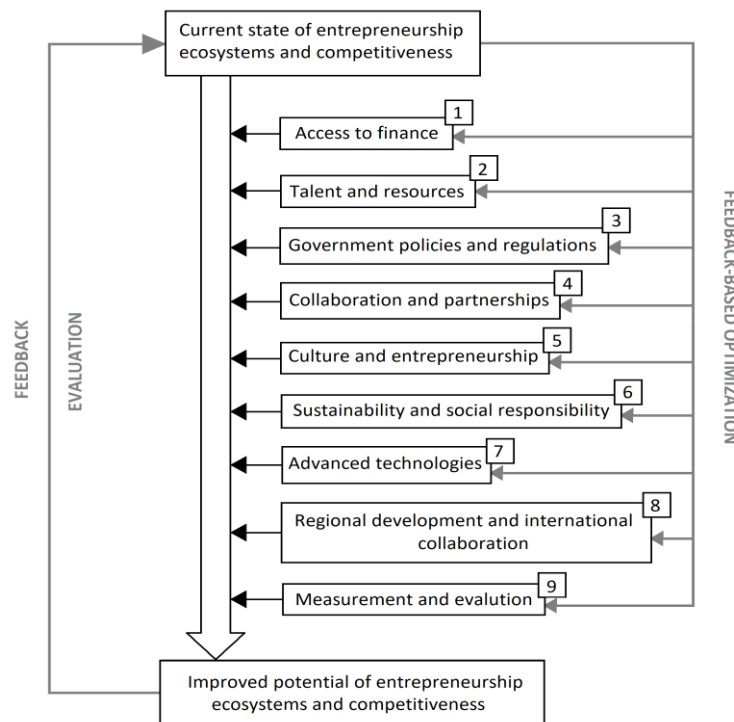


Figure 1: Model for improving the entrepreneurial ecosystem and national competitiveness in Serbia

Based on the developed model it is evident that there are 9 key factors. Access to Finance (1), represents the availability of financial resources for entrepreneurs, including venture capital, angel investments, government grants and loans, crowdfunding, and peer-to-peer lending (Ellitan & Anatan, 2020). Talent and Resources (2), represents human and physical capital, including skilled workers, managerial expertise, office space, equipment, and the presence of universities and research institutions that provide a source of innovation and advanced technologies (Nurani & Kirana, 2021). Government Policies and Regulations (3), includes the role of the government in fostering a supportive legal and regulatory environment, providing tax incentives, funding for research and development, infrastructure investments, and training and education programs (Kadarisman et al., 2022).

Collaboration and Partnerships (4) refers to the importance of cooperation among businesses, government, and academic institutions, including partnerships, open innovation initiatives, and the use of digital platforms and tools for communication and collaboration (Cozzolino et al., 2021). Culture and Entrepreneurship (5), represents the societal attitudes and values that encourage risk-taking, innovation, and entrepreneurship, promoted through role models, entrepreneurial communities, and media coverage of entrepreneurial success stories (Djordjevic et al., 2021). Sustainability and Social Responsibility (6) emphasizes on sustainable practices and social responsibility in business operations, addressing environmental concerns and social issues such as poverty and inequality (Potočan et al., 2020). Advanced Technologies (7) notes the integration of advanced technologies such as AI, IoT, and robotics into businesses, enabling new opportunities for innovation, efficiency, and competitiveness (Fukuda, 2020). Regional Development and International Collaboration (8) indicates the importance of regional development and international collaboration in fostering a vibrant entrepreneurial ecosystem and enhancing national competitiveness. Finally, measurement and Evaluation (9) represents the continuous monitoring and evaluation of the entrepreneurial ecosystem's performance, enabling data-driven decision-making and the identification of areas for improvement (Veshneva et al., 2021).

Based on the theoretical model, a theoretical diagram curve of future development of entrepreneurship ecosystems and national competitiveness is developed. The curve presents potential scenarios and different factors affecting the scenarios. The diagram is presented in Figure 2.

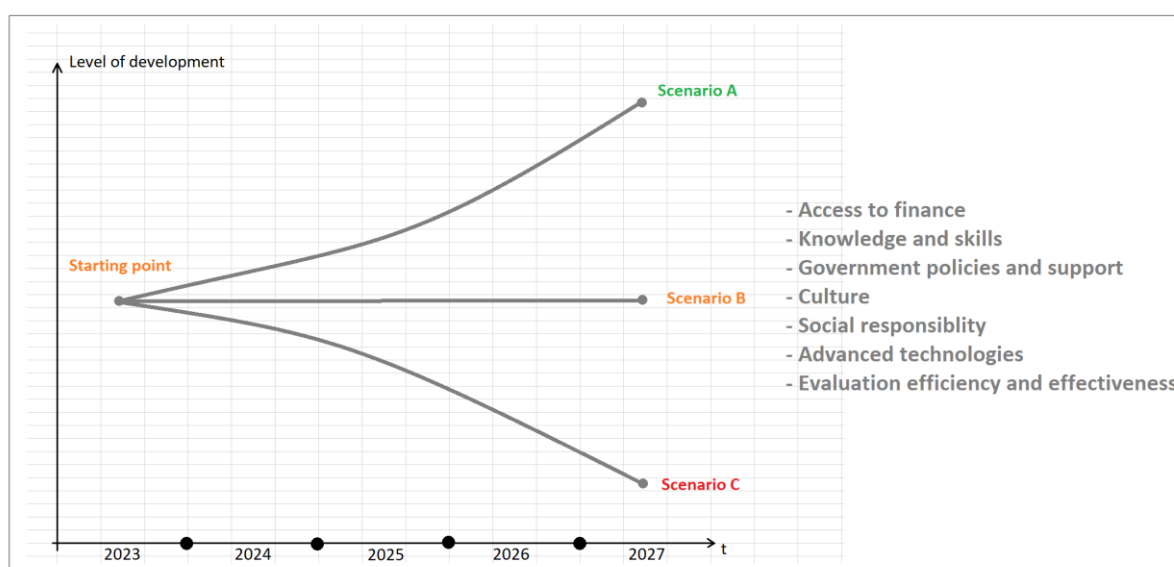


Figure 2: Potential development scenarios

The main suggestion on Figure 2. is that the level of development of entrepreneurship ecosystems and competitiveness includes the role of finance, knowledge, government policies, culture, social responsibility, technologies, and evaluation. For scenario A to occur, improvements across all the noted factors is expected. For scenario B, a status quo or a minor improvement of the noted factors is necessary. If there is no improvement or worsening of the noted factors, the scenario C can occur, which indicates decrease in development of entrepreneurship ecosystems and national competitiveness.

Further, the research questions noted earlier are addressed.

1. What challenges and opportunities are brought by the concept of Society 5.0 in the context of entrepreneurship?

The concept of Society 5.0 brings both challenges and opportunities for entrepreneurship development. Opportunities include the integration of advanced technologies which can enable entrepreneurs to collect and analyze large amounts of data, identify new business opportunities, and



understand customer behavior. This can lead to the development of innovative business models and the creation of new products and services.

Challenges brought by Society 5.0 include the rapid pace of technological change, making it difficult for entrepreneurs to keep up and stay competitive. The emergence of automation and advanced technologies may lead to job displacement and create difficulties for entrepreneurs to find skilled workers

2. How can entrepreneurship in Serbia be improved? What factors play a role in this improvement?

Encouraging the growth of venture capital and alternative financing methods can provide entrepreneurs with the necessary capital to start and scale their businesses. Investing in education, skills development, and research institutions can help create a skilled workforce and provide entrepreneurs with access to innovative ideas and advanced technologies. Implementing supportive government policies, such as tax incentives, research and development funding, and a favorable legal and regulatory environment, can encourage entrepreneurship. Fostering a culture that encourages risk-taking, innovation, and entrepreneurship can create a more conducive environment for starting and growing businesses. Encouraging the growth of established companies that can provide mentorship, resources, and clientele for new ventures can strengthen the entrepreneurial ecosystem and foster a culture of innovation and entrepreneurship.

## **SUGGESTION AND GUIDELINES**

Based on the analyzed literature and the developed model, the following suggestions and guidelines for improving entrepreneurship ecosystems and national competitiveness:

- Governments and financial institutions should work together to create more accessible financing options for entrepreneurs, including grants, loans, and tax incentives. This can be achieved by simplifying the application processes, reducing bureaucratic hurdles, and providing targeted support for specific sectors or technologies.
- Encouraging collaboration between enterprises, government entities, and research institutions to drive innovation and share resources, knowledge, and expertise. This can be facilitated through the creation of industry clusters, technology parks, and innovation hubs, as well as by promoting open innovation initiatives and public-private partnerships.
- Governments should prioritize education on developing entrepreneurial skills and fostering a culture of innovation.
- Implementing policies and initiatives that attract and retain skilled workers and management expertise within the country. This can be achieved by offering incentives to hire and train local talent, investing in research institutions and universities, and creating visa programs to attract international talent.
- Governments should review and update policies and regulations to ensure they are conducive to entrepreneurship and innovation.
- Encouraging businesses to adopt sustainable practices and socially responsible policies by offering incentives, such as tax breaks and financial support.
- Governments and businesses should collaborate to harness the potential of advanced technologies to enhance entrepreneurial ecosystems. This includes investing in digital infrastructure, supporting technology transfer, and promoting the adoption of new technologies.
- Establishing benchmarks and key performance indicators to monitor the effectiveness of policies and initiatives aimed at improving entrepreneurial ecosystems. Regular evaluation and feedback will help identify areas for improvement and ensure that the ecosystem remains dynamic and responsive to the evolving needs of entrepreneurs and businesses.

Overall, the complexity of entrepreneurship ecosystems and achieving competitiveness doesn't allow to simply improve them through strictly defined strategies. The key is continuous evaluation and modification in accordance with new opportunities and challenges. This indicates that strategies both on a national/government level and enterprise level have to be flexible and adaptable in the modern business environment.

## CONCLUSION

In conclusion, the emergence of Society 5.0 and its integration of advanced technologies such as AI, IoT, and robotics has significantly impacted the landscape of entrepreneurship ecosystems. This transformation presents both opportunities and challenges for businesses and policymakers alike. To harness the potential of Society 5.0 and foster a thriving entrepreneurial ecosystem, it is crucial to address the various elements that contribute to its success. Moreover, fostering a strong entrepreneurial ecosystem will contribute to economic growth, job creation, and overall societal well-being. Ultimately, adapting to the rapidly evolving business landscape and addressing the challenges presented by Society 5.0 will be key to ensuring sustainable development and prosperity for all.

The main limitation of the paper is the lack of empirical research. However, the main focus was developing a theoretical model, thus this limitation is not severe. For future research, it is suggested to address individual aspects of improving entrepreneurship ecosystems and factors that affect national competitiveness.

## ACKNOWLEDGEMENT

This paper has been supported by the Provincial Secretariat for Higher Education and Scientific Research of the Autonomous Province of Vojvodina, number: 142-451-2706/2021-01.

## REFERENCES

- Aquilani, B., Piccarozzi, M., Abbate, T., & Codini, A. (2020). The role of open innovation and value co-creation in the challenging transition from industry 4.0 to society 5.0: Toward a theoretical framework. *Sustainability*, 12(21), 8943.
- Bakator, M., Đorđević, D., Čočkalo, D., Čeha, M., & Bogetić, S. (2021). CRM and customer data: Challenges of conducting business in digital economy. *Journal of Engineering Management and Competitiveness (JEMC)*, 11(2), 85-95. ISSN 2217-8147 (Online) ISSN 2334-9638 (Print)
- Cohen, M. A., & Tubb, A. (2018). The impact of environmental regulation on firm and country competitiveness: a meta-analysis of the porter hypothesis. *Journal of the Association of Environmental and Resource Economists*, 5(2), 371-399.
- Cozzolino, A., Corbo, L., & Aversa, P. (2021). Digital platform-based ecosystems: The evolution of collaboration and competition between incumbent producers and entrant platforms. *Journal of Business Research*, 126, 385-400.
- Djordjevic, D., Cockalo, D., Bogetic, S., & Bakator, M. (2021). Predicting Entrepreneurial Intentions among the Youth in Serbia with a Classification Decision Tree Model with the QUEST Algorithm. *Mathematics*, 9(13), 1487. ISSN: 2227-7390 <https://www.mdpi.com/2227-7390/9/13/1487>
- Ellitan, L. (2020). Competing in the era of industrial revolution 4.0 and society 5.0. *Jurnal Maksipreneur: Manajemen, Koperasi, dan Entrepreneurship*, 10(1), 1-12.
- Ellitan, L., & Anatan, L. (2020). Achieving business continuity in Industrial 4.0 and Society 5.0. *International Journal of Trend in Scientific Research and Development (IJTSRD)*, 4(2), 235-239.
- Fukuda, K. (2020). Science, technology and innovation ecosystem transformation toward society 5.0. *International Journal of Production Economics*, 220, 107460.
- Fukuyama, M. (2018). Society 5.0: Aiming for a new human-centered society. *Japan Spotlight*, 27(5), 47-50.
- Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda. *Technological Forecasting and Social Change*, 162, 120392.
- Holroyd, C. (2022). Technological innovation and building a 'super smart' society: Japan's vision of society 5.0. *Journal of Asian Public Policy*, 15(1), 18-31.

- Kadarisman, M., Wijayanto, A. W., & Sakti, A. D. (2022). Government Agencies' Readiness Evaluation towards Industry 4.0 and Society 5.0 in Indonesia. *Social Sciences, 11*(8), 331.
- Khurana, I., Dutta, D. K., & Ghura, A. S. (2022). SMEs and digital transformation during a crisis: The emergence of resilience as a second-order dynamic capability in an entrepreneurial ecosystem. *Journal of Business Research, 150*, 623-641.
- Narvaez Rojas, C., Alomia Peñafiel, G. A., Loaiza Buitrago, D. F., & Tavera Romero, C. A. (2021). Society 5.0: A Japanese concept for a superintelligent society. *Sustainability, 13*(12), 6567.
- Nurani, N., & Kirana, S. (2021). Development Of Millennials Human Resources in Bandung Through Creative Digital Copyrights in An Effort to Deal with The Challenges of Society 5.0. *Review of International Geographical Education Online, 11*(5).
- Pereira, A. G., Lima, T. M., & Santos, F. C. (2020). Industry 4.0 and Society 5.0: opportunities and threats. *International Journal of Recent Technology and Engineering, 8*(5), 3305-3308.
- Potočan, V., Mulej, M., & Nedelko, Z. (2020). Society 5.0: balancing of Industry 4.0, economic advancement and social problems. *Kybernetes, 50*(3), 794-811.
- Shiroishi, Y., Uchiyama, K., & Suzuki, N. (2018). Society 5.0: For human security and well-being. *Computer, 51*(7), 91-95.
- Thacker, S., Adshead, D., Fay, M., Hallegatte, S., Harvey, M., Meller, H., ... & Hall, J. W. (2019). Infrastructure for sustainable development. *Nature Sustainability, 2*(4), 324-331.
- Veshneva, I., Chernyshova, G., & Bolshakov, A. (2021). Regional competitiveness research based on digital models using Kolmogorov-Chapman equations. In *Society 5.0: Cyberspace for Advanced Human-Centered Society* (pp. 141-154). Cham: Springer International Publishing.

## **ANALYSIS AND FORECASTING OF INNOVATION PROCESSES IN THE LEADING RUSSIAN REGIONS**

**Larisa Nikitina**

Voronezh State University, Voronezh, Russian Federation

E-mail: [nikitina@econ.vsu.ru](mailto:nikitina@econ.vsu.ru)

**Anna Kosobutskaya**

Voronezh State University, Voronezh, Russian Federation

**Anton Prachenko**

Moscow State University of Sports and Tourism, Moscow, Russian Federation

**Yuriy Treshchevskiy**

Voronezh State University, Voronezh, Russian Federation

### **ABSTRACT**

The paper is devoted to identifying trends and forecasting the innovation development of Russian leading regions. Our method includes cluster, comparative, correlation, and regression analysis. We propose the composition of innovation development indicators of Russian regions for 2010-2021 to eliminate the influence of cost factors on the results of innovation activity. As a result, we distinguish five homogeneous groups (virtual clusters) of regions with a different combination of values of individual indicators and the overall level of innovation development. We identify representative regions of each cluster to provide correlation and regression analysis. In particular, we perform calculations for St. Petersburg as the representative region of the most developed cluster. The study showed that two indicators "the share of organizations implemented technological innovations in the total number of surveyed organizations" and "the number of advanced production technologies used" are statistically reliable. This allows us to provide several forecasts for the development of innovation activity in the representative region. The remaining indicators do not form trends, which does not allow us to make a definite forecast of their changes in the medium-term perspective.

**Keywords:** Innovative activity, Forecast of innovative development, Region, Analysis, Virtual cluster

### **INTRODUCTION**

The innovative component is an absolute priority of the socio-economic development of countries and their administrative-territorial entities. In Russia, such a goal was set by federal authorities in 2011 in the Strategy of Innovative Development of the Russian Federation for the period up to 2020 (Decree of the Government of the Russian Federation, 2011). Currently, several documents have been adopted that define specific tasks in this area and in related processes (Decree of the Government of the Russian Federation, 2014; Decree of the Government of the Russian Federation, 2022; List of instructions, 2020; List of instructions, 2022).

Baburina (2015) notes that there have been no significant changes in recent years in the innovative development of the national economy and its regional subsystems, which determines the preservation of the irrational structure of exports and imports. The main problem remains the raw materials orientation of production and export.

Marchenko & Yakubovich (2021) note minor changes in the export parameters of high-tech technologies, despite the fact that the IT sector shows good dynamics in the domestic market. We also noted this circumstance in collaboration with other researchers (Treshchevskiy et al., 2021).

Tegetaeva et al. (2015) note that there are some positive changes in the geographical orientation of the export of natural resources and the re-orientation of exports and imports of a wide range of products

previously concentrated in the EU countries and hindered the maneuvering of resources (Kovalerova, 2015). At the same time, Vertakova et al. (2015) believes that most of the imports are goods which production can be established on the territory of the country with appropriate modernization of production. Kozlov et al. (2015) write that the transition from targeted sanctions to their widespread application against entire sectors of the Russian economy requires the activation of import substitution policy and export development. Note that this cannot be done based on outdated technologies.

Of course, the reorientation of regional producers to domestic suppliers and consumers will require a sufficiently long period and the activation of various aspects of innovation activity. Kudryakov et al. (2016) rightly notes that the development of import substitution can be effective only with the integrated use of internal and external factors of innovative development (an increase in the rate of renewal of fixed assets, a decrease in inflation, a decrease in the ruble exchange rate, an increase in the level of manufacturability of the production sector, improved logistics, etc.). Alekseeva (2016) notes that enterprises of the real and financial sectors of the economy carry out maneuvers in building legal schemes for the transformation of logistics flows of both domestic and foreign companies. This significantly changes the trajectory of export-import relations, which determines the feasibility of spatial and functional diversification of production on a new or modernized technological basis. In this regard, Logvinenko's statement about the need to achieve a fundamentally new level of development of high-tech industries is justified (Logvinenko, 2020)

Special attention should be paid to studies noting the paradoxical fact that the share of Russian enterprises that are not ready to abandon the import of equipment and components has not only not decreased, but even increased due to low quality domestic engineering products (see for example Andriyanov et al. (2021)).

In connection with the above, it is necessary to establish quantitative parameters of innovative development of various socio-economic systems of the Russian Federation. One of the directions of analysis and forecasting is the spatial and functional distribution of innovation processes, in which the region acts as a spatial unit, the functional one is a certain parameter of innovation activity reflecting its significant component.

## **RESEARCH METHODS**

Taking into account the problems outlined above and in order to eliminate the influence of cost factors on the results of innovation activity, we have proposed within the framework of this study a set of indicators characterizing various aspects of innovative development of regions: the level of innovative activity of organizations, % (var1); the proportion of organizations implementing technological innovations in the total number of surveyed-organizations, % (var2); the share of innovative goods, works, services in the total volume of goods shipped, works performed, services, % (var3); the share of innovation activity costs in the total volume of goods shipped, works performed, services, % (var4); advanced production technologies used, units (var5).

Given the significant number and high level of differentiation of Russian regions in various parameters of socio-economic, including innovation activities, it is advisable to combine them into sufficiently homogeneous groups. One of the productive methods of forming homogeneous virtual groups is cluster analysis. The method was proposed by Hartigan & Wong (1979) and was further developed by Oldenderfer & Bleshfield (1989), and a number of other scientists. Applied to the innovative development of Russian regions, this method was developed by Golichenko & Schepina (2008).

As a result of the analysis, five virtual clusters were formed, differing in the general level and nature of innovation activity (Table 1).

Table 1: Average values of normalized indicators of innovation activity of clusters 2014-2021

Indicator	cluster «A»	cluster «B»	cluster «C»	cluster «D»	cluster «G»
Var1	0,774990	0,527671	0,310176	0,389125	0,194303
Var2	0,823853	0,544738	0,321333	0,416223	0,199217
Var3	0,562187	0,347433	0,164270	0,144382	0,052773
Var4	0,589178	0,371734	0,347811	0,101433	0,073995
Var5	0,538206	0,263024	0,167730	0,076829	0,042457
Total	3,288414	2,054599	1,311320	1,127991	0,562744

Variance analysis showed high statistical significance of the calculated values (Table 2)

Table 2: Variance analysis of clusters 2014-2021

Indicator	Analysis of variance					
	Between	df	Within	df	F	P-value
Var1	2,187589	4	0,872277	77	48,27722	0,000000
Var2	2,466732	4	0,671443	77	70,72017	0,000000
Var3	1,818610	4	1,116050	77	31,36800	0,000000
Var4	2,298859	4	1,068980	77	41,39743	0,000000
Var5	1,614624	4	1,586666	77	19,58919	0,000000

A graphical interpretation of the average values of the normalized indicators of clusters is shown in Figure 1.

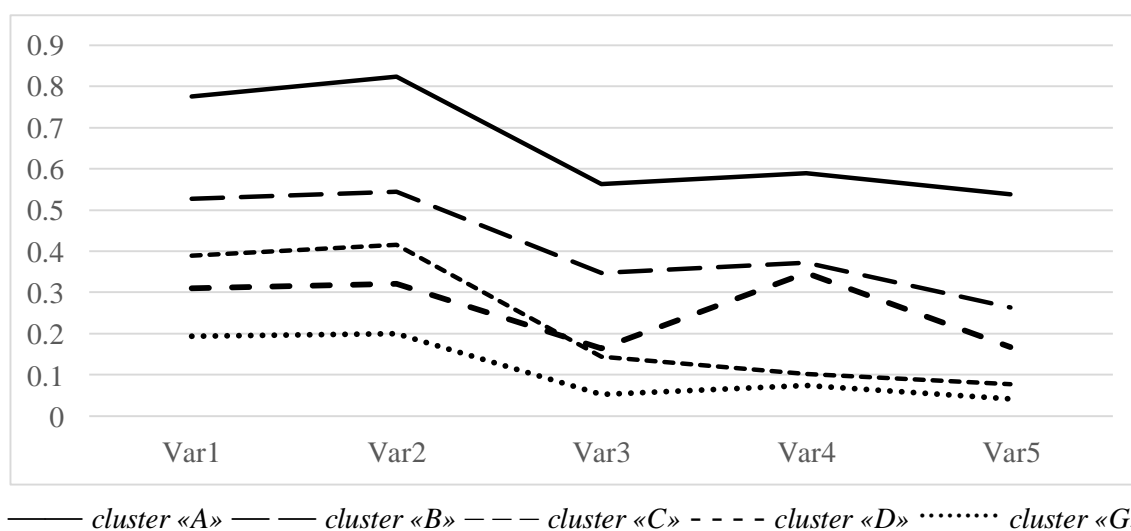


Figure 1: Average values of normalized cluster indicators 2014-2021

The most developed cluster "A" was selected for further research. Cluster "A" according to calculations for the period 2014-2021 included seven regions: Moscow Region, Moscow, St. Petersburg, the Republic of Mordovia, the Republic of Tatarstan, the Chuvash Republic, the Nizhny Novgorod Region.

Assessment of the state and forecasting of innovation activity indicators were carried out for the model region (representative region) of this cluster. The selection of the model region was carried out according to the smallest distance of indicators from the virtual center of the cluster. The region closest to the virtual center of the cluster was St. Petersburg.

To assess the indicators of innovation activity of the model region, the period was extended to cover 12 years: from 2010 to 2021. This makes it possible to obtain statistically significant results for a period of up to 4-5 years with stable trends. The construction of trends based on correlation and regression analysis was carried out using linear, power, logarithmic (natural logarithm), polynomial (second degree polynomial), exponential functions.

Studies of wide range of researchers, including the authors of the presented article, have shown good results of using the totality of these functions for analyzing and predicting the dynamics of socio-economic processes (Treshchevskiy et al., 2021; Treshchevskiy et al., 2018).

The initial data were obtained in official statistical sources.

## RESULTS AND DISCUSSION

Indicators of innovation activity of St. Petersburg for the period 2010-2021 are presented in Table 3.

*Table 3: Indicators of innovation activity in St. Petersburg*

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
var1, %	13,0	18,9	18,8	18,0	18,9	17,2	14,8	16,1	28,3	15,4	15,9	15,9
var2, %	10,9	16,1	16,6	16,2	16,8	14,8	13,8	14,5	37,1	33,7	35,3	34,7
var3, %	8,0	9,0	12,1	12,2	12,0	7,3	8,7	9,1	9,9	10,5	10,6	11,1
var4, %	1,9	2,6	2,7	3,6	4,4	2,4	3,1	2,8	2,5	2,8	3,0	2,8
var5, units	4584	5122	6539	7128	7924	8099	9026	8933	9553	9972	9399	10839

As we can see, the values of a number of indicators vary in a wide range, which does not allow predicting their dynamics with a sufficient degree of accuracy even for the medium term.

We evaluated the dynamics of innovative activity of organizations (var1) in the model region using polynomial and power functions. The analysis showed that no function has a coefficient of determination sufficient for its use for predictive purposes. The maximum values of the coefficients of determination for the polynomial and power functions:

$$y = -0.107x^2 + 1.4671x + 13.859 \quad (1); R^2 = 0.0997;$$

$$y = 15.922x^{0.0492} \quad (2); R^2 = 0.0375.$$

As we can see, the dynamics of innovative activity of organizations in the model region changes abruptly, which does not allow us to present a sufficiently reliable forecast.

The dynamics of the share of organizations that implemented technological innovations in the total number of surveyed organizations (var2) is significantly characterized by three functions:

$$y = 2,2759x + 6,9152 \quad (3); R^2 = 0,6582;$$

$$y = 0,2569x^2 - 1,0634x + 14,707 \quad (4); R^2 = 0,7356;$$

$$y = 9,8026x^{0.4216} \quad (5); R^2 = 0,523;$$

Acceptable values of determination coefficients with the revealed sufficient significance of statistical characteristics (F and p) allow us to make a number of forecasts (Table 4).

*Table 4: Forecast values of the proportion of organizations that have implemented technological innovations in the total number of surveyed organizations (var2, %)*

Functions	2022	2023	2024
polynomial	44,3	50,2	56,5
exponential	37,7	41,6	46,0
linear	36,5	38,7	41,0

As can be seen, the polynomial and exponential functions allow to build an optimistic forecast. The linear function most likely demonstrates a realistic and, at the same time, quite optimistic forecast based on smoothing the sharp drop in values in the period 2017-2018.

The dynamics of one of the most important indicators of innovative development of regions – the share of innovative goods, works, services in the total volume of goods shipped, works performed (var3) is

unstable. The coefficients of determination of all functions do not exceed 0.06. As we can see, forecasting this indicator is not possible.

The coefficients of determination of all functions describing the dynamics of the share of innovation activity costs in the total volume of goods loaded, work performed in the model region (var4) do not exceed 0.2.

The dynamics of the advanced manufacturing technologies used in the model region (var5), describing its functions are presented in the formulas:

$$y = 515,41x + 4743 \quad (6); R^2 = 0,9266;$$

$$y = 5005,1e^{0,0693x} \quad (7); R^2 = 0,8757;$$

$$y = 2495,6\ln(x) + 3936,4 \quad (8); R^2 = 0,9546;$$

$$y = -35,965x^2 + 982,96x + 3652 \quad (9); R^2 = 0,9687;$$

$$y = 4393,6x^{0,3486} \quad (10); R^2 = 0,9742;$$

As we can see, the values of the coefficients of determination, with sufficient significance of the statistical characteristics of all five functions used, are very high. This allows to make various and fairly reliable forecasts of the dynamics of indicators up to 2024 (Table 5).

*Table 5: Forecast values of the number of advanced production technologies used in the model region, (var5, units)*

Functions	2022	2023	2024
polynomial	12321	13205	14153
exponential	11443	11958	12474
linear	10352	10364	10304

The data in Table 5 quite clearly demonstrate three different forecasts: an optimistic forecast is exponential, a pessimistic one is polynomial, and a realistic one is linear.

## CONCLUSIONS

The task of activating innovation processes in Russia and its regions has become particularly relevant at the moment. Researchers investigate the state and factors of the development of innovation activity in the country and its administrative-territorial entities in different ways. The problem of studying innovation processes at the regional level is complicated by the high variability of indicators proposed by the authors of scientific papers. The total number of proposed indicators and factors reaches several dozen. This determines the inconsistency of the results obtained.

In our study we proposed only six of the most significant natural indicators to analyze the state of innovation activity in Russian regions. It allows us to obtain a foreseeable amount of data and eliminate the influence of price factors.

Given the significant number of regions forming the Russian Federation, we used cluster analysis to form relatively homogeneous virtual groups. The results of the analysis demonstrated the presence of five such groups.

For a detailed analysis and forecasting of the further development of innovation activity in Russian regions, a group of seven administrative-territorial entities with the highest values of indicators was selected. The most typical in this group is the city of St. Petersburg, for which a correlation and regression analysis was performed over 12 years. This made it possible to predict their changes quite definitely for the medium-term period – up to 2024 inclusive.

The results of the calculations showed that the actual dynamics of two important indicators of innovation activity is statistically reliably described by functional dependencies: "the share of organizations



implementing technological innovations in the total number of surveyed organizations" and "the number of advanced production technologies used". The nature of the dependencies allows us to make optimistic, although qualitatively different forecasts. The indicators "the level of innovative activity of organizations", "the share of innovative goods, works, services in the total volume of goods shipped, works performed, services", "the share of costs for innovative activities in the total volume of goods loaded, works performed, services" change abruptly, which does not allow predicting their dynamics.

## REFERENCES

- Alekseeva T. O. (2016). Peculiarities of customs tariff regulation in the conditions of economic sanctions against Russia. *Financial analytics: problems and solutions*, 13 (295), 51-60.
- Andriyanov I. N., Kolomaitsev S. V., & Lesina T. V. (2021). Ambiguous influence of sanctions and import substitution on the development of the Russian economy: some conclusions and estimates. *Trends in science and education*, 80(1), 12-16.
- Baburina O. N. (2015). Sanctions and Russia's foreign economic strategy through the prism of the Washington and Beijing consensus. *National Interests: Priorities and Security*, 23 (308), 48-58.
- Decree of the Government of the Russian Federation no. 2227-p of December 8, 2011. On approval of the Strategy for Innovative Development of the Russian Federation for the period up to 2020. URL: <https://digital.gov.ru/ru/documents/3622/>
- Decree of the President of the Russian Federation no. 252 of May 3, 2022. On the application of retaliatory special economic measures in connection with the unfriendly actions of certain foreign states and international organizations. URL: <http://kremlin.ru/acts/news/68347>
- Decree of the President of the Russian Federation no. 560 of August 6, 2014. On the Application of Certain Special Economic Measures to Ensure the Security of the Russian Federation. URL: <http://base.garant.ru/70711352/>
- Golichenko O. G., & Schepina I. N. (2008). Regions of Russia: diffusion processes and the impact of innovation on the socio-economic development of the country. *Chernozem almanac of scientific research*. 1 (7), 49-80.
- Hartigan J. A., & Wong M. A. (1979). Algorithm AS 136: A K-Means Clustering Algorithm. *Journal of the Royal Statistical Society Series C (Applied Statistics)*, 28(1), 100-108
- Kovalerova L. A. (2015). Influence of financial sanctions on the development of export and import of Russia in the conditions of restriction of budgetary resources. *Bulletin of Bryansk State University*, 1, 307-310.
- Kozlov L. E., Ivanov A. A., Tkachuk Y. O., Savchenko A. V., Didik E. A., & Stepanova A. V. (2015). State support of export in Russia in the conditions of sanctions. *International Journal of Applied and Fundamental Research*, 8(3), 545-547.
- Kudryakov V G., Artemova E. I., & Plotnikova E. V. (2016). State regulation of regional food security in the conditions of the sanctions regime. *Polythematic network electronic scientific journal of Kuban State Agrarian University*, 123, 2042-2057.
- List of instructions following a State Council Presidium meeting held on May 25, 2022. URL: <http://kremlin.ru/acts/assignments/orders/68659>
- List of instructions following the Presidential address to the citizens of Russia, approved by the President of the Russian Federation on July 8, 2020, no. Pr-1081. URL: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_356812/](http://www.consultant.ru/document/cons_doc_LAW_356812/)
- List of instructions following the results of the XXV St. Petersburg International Economic Forum held on June 15–18, 2022. URL: <http://kremlin.ru/acts/assignments/orders/69045>.
- Logvinenko M. V. (2020). Development of IT-industry in Russia in the context of sanctions. *Economics and Business: Theory and Practice*, 3-2 (61), 129-132.
- Marchenko L. N., & Yakubovich O. V. (2021). Statistical Analysis of Information Technology Exports in the EAEU Countries. *Epoch of Science*, 28, 209-213.
- Oldenderfer M. S., & Bleshfeld R. K. (1989). Factor, cluster and discriminant analysis. *Finance and statistics*, 139-210.
- Tegetaeva O. R., Karyaeva S. T., & Tsinoyeva D. R. (2015). Import and export of oil and gas in Russia under applied sanctions. *Problems of Modern Economics (Novosibirsk)*, 23, 67-72.
- Treshchevskiy Y. I., Garin L. K., Bolgov A. Y., & Zotova E. Y. (2021). Dynamics of the tertiary sector of Russia's regions in the period of economic optimism. *Region: Systems, Economy, Management*, 4 (55), 37-46.
- Treshchevskiy Y., Papin S., & Penina E. (2018). Structural changes of the consumer market of Russia: from post crisis development to the sanctions period. *Atlantis Press. Series: Advances in Economics, Business and Management Research, vol. 39. «Proceedings of the International Scientific Conference «Competitive, Sustainable and Secure Development of the Regional Economy: Response to Global Challenges» (CSSDRE 2018)»*. P. 449-452, Doi: 10.2991/cssdre-18.2018.92.
- Treshchevskiy Y. I., Kosobutskaya A. Y., Opoikova E. A. & Tsebekova E. P. (2021). Spatial and Functional Aspects of Russian Foreign Economic Activity: Paradigm Shift. *Proceedings of the 37th International Business Information Management Association (IBIMA)*, 30-31 May 2021, Cordoba, Spain, 9682-9691.
- Vertakova Y. V., Polozhentseva Y. S., & Klevtsova M. G. (2015). Sanctions in the context of globalization and their impact on Russia's economic development. *Economics and Management*, 10 (120), 24-32.

## PHYGITAL EXPERIENCES IN LOGISTICS

László Szabó

Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary

E-mail: [szabo.laszlo4@uni-bge.hu](mailto:szabo.laszlo4@uni-bge.hu)

### ABSTRACT

The Covid pandemic has accelerated the global shift towards online shopping, we are seeing the emergence of a hybrid retail environment, the so-called phygital. This combines physical and digital solutions and is now used as a unique way of making products available. In the future, retailers will use artificial intelligence, machine learning and cognitive computing to deliver personalised 'moments' to consumers, improving the shopping experience. This is particularly important in the area of supply chain dynamics, where companies previously focused on manufacturing excellence are focusing their efforts on improving the customer experience through greater flexibility, real-time information sharing and closer collaboration.

**Keywords:** Phygital, Logistics, Marketing, Supply chain

### INTRODUCTION

The phygital term is also becoming increasingly important for companies seeking to maximise conversions and meet changing customer needs as a result of the pandemic. The biggest e-commerce players, such as Amazon, have been building their technologies to deliver a checkout-free shopping experience for years. Amazon Go and similar phygital solutions offer a so-called "just walk out" sales solution with an invisible payment solution. Most supermarket chains, such as Tesco, Sainsbury's and Aldi, have already tested these systems in 2022 in their stores in the US and the UK. (Fintechzone, 2022) Blending of the physical and digital also means incorporating digital experiences where there were previously none—injecting digital into the physical. So, an obvious catalyst for the uptick in interest in phygital marketing is the pandemic. During COVID-19, consumers were avoiding in-store interactions and executing whatever tasks they could online. As a result, brands were forced to speed up their timelines to incorporate digital channels. In a 2020 report from McKinsey, they stated, "Digital adoption has taken a quantum leap at both the organizational and industry levels." In the aftermath of the pandemic, brands aren't flipping a switch and reverting back to the way things were in 2019. (Iterable, 2022)

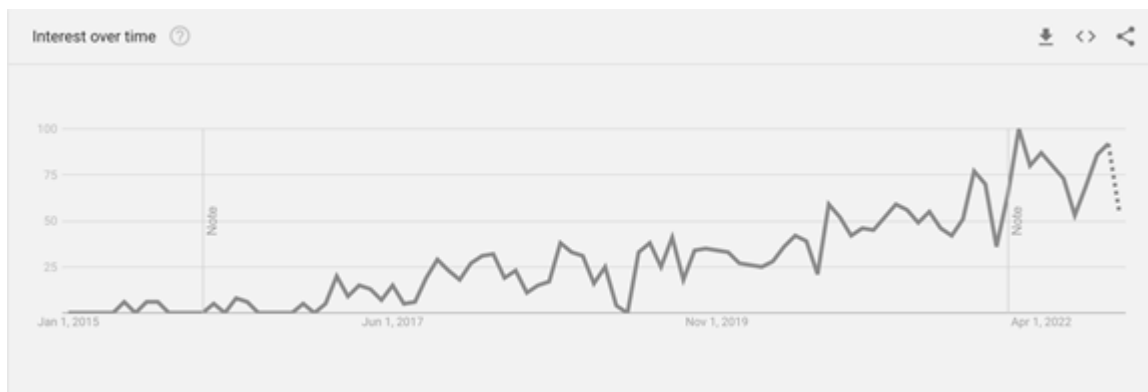


Figure 1: The term "phygital" started to gain more traction in early 2020 and continues through today

## PHYGITAL

Phygital (physical plus digital) is a marketing term that describes blending digital experiences with physical ones. As the channels of customer interaction and communication proliferate, companies aim to make combining these channels frictionless and seamless, enabling a customer to make a phone call, then communicate in a social media platform, then send an email, without the company losing the thread of the communication or a sense of the customer issues associated with the customer account record. Sometimes referred to as an omnichannel customer experience, companies now have a mandate to bridge this gap to reduce customer friction, frustration and churn. Phygital experiences can add value by enhancing physical experiences with information but augmenting digital experiences with human connections or physical enhancements. (Horwitz, 2016)



Figure 2: Phygital marketing

**The benefits of phygital marketing** - There are many reasons why marketers are looking towards phygital marketing strategies. Improving the user/consumer experience is just one of them. Below are some other benefits you can attain with phygital campaigns:

- *Measuring engagement:* By working with a mobile measurement provider (MMP), you will be able to measure physical interactions to resulting in-app digital activity and analyze the impact of your marketing efforts.
- *Mitigate churn:* Keep your customers coming back through phygital marketing techniques. By providing your customers with a unique experience that makes them feel valued, you will keep them coming back for more.
- *Enhances physical experiences with information:* Provide more information about your product or service by overlaying your physical space with digital content. When customers walk into your store they can receive information about certain products via an app or webpage. Scannable quick response (QR) codes offer a great mechanism to digitally engage visitors in a physical context.
- *More opportunities to sell products:* If you are solely an eCommerce store, consider creating a pop-up experience to attract new customers who might not have interacted with your product in its original form.
- *Provide a seamless experience:* Phygital marketing helps businesses both recognize areas that need improvement and provide solutions to improve those areas so that the customer journey is seamless from start to finish.

- *Produce personalized content:* Overlapping marketing channels allows for a better understanding of your customers needs, habits, and patterns. This helps you predict future interactions and serve your customers with content or products that they actually want.

These are just a few of the many ways that phygital marketing can benefit your business. An MMP can help you identify how to best measure the impact of these experiences. (Scott, 2022)

## PHYGITAL EXPERIENCES IN LOGISTICS

From digital twin to building information modeling (BIM), the blending of the physical with the digital is nothing new in the manufacturing world. What is new, however, is a growing expectation among customers across the industrial landscape that their suppliers deliver a smoother and more reliable “phygital” experience. A term that originated in the retail space, phygital lately has taken on new importance for B2B (and B2B2C) manufacturing enterprises. It’s especially relevant in the area of supply chain dynamics, where companies that have historically focused on manufacturing excellence are shifting their efforts to improving the customer experience through greater flexibility, more real-time information sharing and tighter collaboration. (Scholze, 2022)

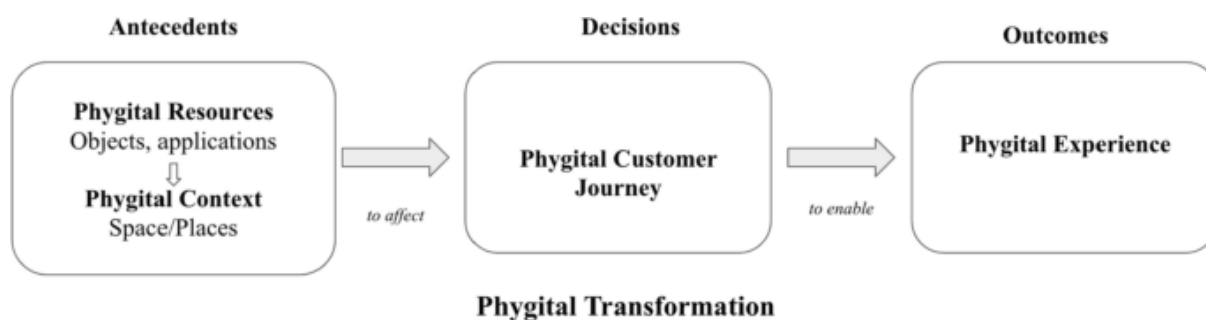


Figure 3: Antecedents, decisions, and outcomes of phygital transformation

Smart technologies are “new realities”, and they are potentially changing and disrupting several industries and influencing customers during their decision-making journey. Managers must not be afraid of change, but rather must design their new business models to focus on inspiring innovations and co-creating memorable experiences with customers. Starting from this, practitioners should take into consideration how phygital resources (antecedents) are used and how the phygital context (antecedents) develops to influence the entire customer journey (decisions). (Mele et al., 2023) All of this means that it is vital for brands to forge the same type of relationships with last-mile delivery customers that they would with shoppers in retail outlets. Doesn’t matter if you choose an hybrid approach or you go all in-one building, brand value still depends on connection. (Milkmantechologies, 2023)

The phygital model, which combines physical and digital experiences, emphasizes key aspects like ease of use, speed, convenience, and support. Under this, brands and businesses go all out to promote products/services online. After trying the products virtually, customers buy them online but take the delivery from physical stores. Phygital is mutually beneficial for both seller and end-user. It enables sellers to save on various variable expenditures while reaching out to a broader audience. It allows customers to make purchases from the comfort of their own homes. (Maxicus, 2023)

**Present and future.** The bricks and mortar part of retail will become 'phygital,' combining physical experiences with digital technologies such as AR and VR, driven by AI, to create much more personalized, immersive experiences in stores. Virtual reality dressing rooms will superimpose outfits on customers, while smart mirrors will make recommendations on fit and style (and recommend other related products). These interactions will generate insights to help retailers provide personal advice to

customers, reduce returns and make smarter inventory decisions. Products will be created on-demand by 3D printers and delivered by autonomous vehicles or drones. (KPMG, 2023)

## CONCLUSION

The digital and physical world are merging more than ever before. As the supply chain becomes more 'phygital,' innovative ways of sharing data – like using verifiable credentials – are helping to build more trust with data along the supply chain. (Sertl and Jackson, 2022) In a phygital world, online and offline channels play complementary roles instead of being substitutes for one another. We see retail evolving further as brands explore modern technologies such as AR and virtual reality (VR) on the pathway to a new world of opportunity - the metaverse.

However, phygital design can revolutionise online commerce not only in marketing and branding, but has already made inroads into modern logistics. It is a little known fact that Google Glass, considered by many to be just a vaporware, despite its huge failure as a consumer electronics product, is still being manufactured by the search giant. Smart glasses capable of displaying augmented reality are enjoying a second renaissance, thanks in part to their use in warehousing and logistics. (Jóbi, 2018)

## REFERENCES

- Fintechzone (2022). Már nem a digitális, hanem a figitális az új kulcsszó a pénzügyi szektorban is. Retrieved from <https://fintechzone.hu/mar-nem-a-digitalis-hanem-a-figitalis-az-uj-kulcsszo-a-penzugyi-szektorban-is/>
- Goh, J. (2022). Enhancing Customer Experience in a 'Phygital' Future. Retrieved from <https://www.epam.com/insights/blogs/enhancing-customer-experience-in-a-phygital-future>
- Horwitz, L. (2016). Definition phygital. Retrieved from <https://www.techtarget.com/searchcustomerexperience/definition/phygital>
- Iterable (2022). Let's Get Phygital: A Look at Phygital Marketing. Retrieved from <https://iterable.com/blog/lets-get-phygital-a-look-at-phygital-marketing/>
- Jóbi, A. (2018). Figitális tervezés – a digitális vásárlás élménye a fizikai térben. Retrieved from <https://kosarertek.hu/technologia/figitalis-tervezes-a-digitalis-vasarlas-elmanye-a-fizikai-terben/>
- KPMG (2023). Phygital experiences will redefine retail. Retrieved from <https://kpmg.com/ca/en/home/market-insights/predictions/economy-and-markets/phygital-experiences-will-redefine-retail.html>
- Maxicus (2023). The Future is Phygital: Physical and Digital. Retrieved from <https://maxicus.com/the-future-is-phygital-physical-and-digital/>
- Mele, C., Spena, T.R., Marzullo, M., Di Bernardo, I. (2023). The phygital transformation: a systematic review and a research agenda. *Ital. J. Mark.* <https://doi.org/10.1007/s43039-023-00070-7>
- Milkmantechnologies (2023). The imperative is a seamless omnichannel experience Retrieved from <https://www.milkmantechnologies.com/lets-get-phygital/>
- Scholze, J. (2022): 'Phygital' Fitness: Melding Physical and Digital to Improve Supply Chain Outcomes. Retrieved from <https://blogs.sap.com/2022/05/12/phygital-fitness-melding-physical-and-digital-to-improve-supply-chain-outcomes/>
- Scott, S. (2022). What is Phygital Marketing? Retrieved from <https://www.kochava.com/what-is-phygital-marketing/>
- Sertl, L., Jackson, R. (2022). The Phygital Future of the Supply Chain Retrieved from <https://next-level-supply-chain-with-gslus.podcastpage.io/episode/the-phygital-future-of-the-supply-chain>

## **THE INFLUENCE OF INSTAGRAM ON PURCHASE DECISION GEN Z**

**Bruno Završnik**

University of Maribor, Faculty of Economics and Business, Slovenia

E-mail: [bruno.zavrsnik@um.si](mailto:bruno.zavrsnik@um.si)

### **ABSTRACT**

Social media marketing proved to be advantageous for any kind of industry. If we consider the huge number of users of social networks and all the advantages they have, as well as their popularity, the fact arises that these networks provide significant business opportunities. Therefore, social media is a great tool for communicating, informing, educating, and connecting with buyers. Social media platforms, such as Instagram, Facebook, YouTube, and Pinterest, are the most popular places for posting and advertising different content. The main aim of our research was to find out how social media such as Instagram influence the purchasing decisions on Generation Z and do they use it as a research tool before buying. We proved that a social media platform, Instagram, has a significant impact on Generation Z purchase decisions.

**Keywords:** Social media, Instagram, Instagram influencers, Generation Z

### **INTRODUCTION**

Today, Generation Z is the first completely digital generation and that means marketers, influencers. Brands, business owners, and content creators need to better understand their behavior on social media as well as their needs. Because Gen Z has been immersed in technology and social media, they are also driven by the latest trends. Unlike Baby Boomers and Generation X, Generation Z use social media for more than just entertainment or to communicate with friends and family (Wise, 2023).

Nowadays, fashion businesses are investing more time and resources into crafting social media strategies that will further customer loyalty, spread advertising messages, and raise brand awareness. Besides that, social media has a significant impact when it comes to advertising, spreading information, promoting, and selling brands.

Young consumers were more likely to pay attention to marketing information from their friends than anywhere else, due to trust concerns, which often motivated them to purchase (Chen, 2018).

This paper aims to advance the buying habits of generation Z using Instagram, what they buy most often and which factors most influence their purchase decisions.

### **GEN - Z**

Generation Z is the generation after Millenials, and the generation before Generation Alpha. Generation Z (also called Gen Z, zoomers or iGeneration) is the name for people who grew up spanning both sides of the millennium transition. Although there isn't an exact date range, Generation Z includes those born between the mid-1990s to the early 2010s.

Generation Z is often described as a more well-educated generation that are more stressed but more depressed compared to previous generations. They often have high expectations of themselves that are often not met (Djafarova & Boves, 2021).

Generation Z, often considered ‘digital natives’, is the first generation to have grown up surrounded by digital communication (Smith, 2017).

Generation Z has been called the most critical consumer group until now and has a different view of shopping and consuming than previous generations. They are the latest to enter the workforce and have strong purchasing power. With a bigger demand for higher-quality items and monitoring their spending more closely, brands must earn their place in Generation Z’s wallets (Voyado, 2023).

Gen Z use of social media is much different from other generations. However, they are young, and their habits will continue to change as they mature. The time to understand them is right now, as they are four times more likely to convert on social media than Millennials. Plus, 95% of Gen Z owns a smartphone and will spend up to 10 hours a day online.

Gen Z is definitely impacted by social media—in fact, I would argue that they’re the first “true” generation to be so. They’ve never known a world without social media, and as such it’s always been a part of their lives. It’s shaped how they communicate, how they think about themselves, and how they interact with others (Salamander, 2022).

## **INSTAGRAM**

Instagram is a social sharing platform for photography, which started in 2010, and which is two years later, for a billion dollars, it bought not Facebook, thus taking ownership of it. As of September 2015, this app allows global advertising (Aslam, 2022).

Instagram has grown into one of the largest social networks in the last few years. Its founders, Kevin Systrom and Mike Krieger worked in early 2010 on a project initially named Burbn.

Instagram is a popular social networking app with a focus on sharing photos and videos. It's been around since 2010 and has maintained a high level of popularity by adding innovative new features, such as Instagram Stories, shopping, Instagram Reels, and more (Moreau 2022).

Instagram is particularly important for fashion brands, given the essential role of the visual element in promoting fashion products (Jin & Ryu, 2020).

## **EMPIRICAL FINDINGS**

To achieve the goal of exploring the different ways in which social media platform - Instagram, can influence the consumer decision-making process, we used the inductive quantitative research approach. A questionnaire was made in 1KA - a one-click survey. There have been 13 questions that were sent mainly through social media platforms.

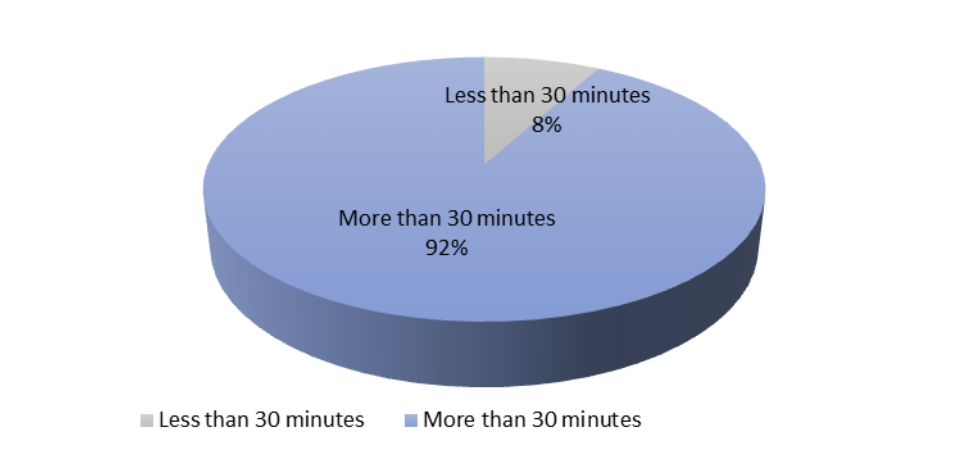
The total number of respondents for carrying out a market survey was 75 of this, 54 (72%) were women and 21 (28%) were men.

We first obtained data on the age structure of the respondents Generation Z. Therefore, a total of 35 respondents were in the age of 18-21 age group and 40 of them were 22-25 years old (Table 1).

Table 1. Age of the respondents

Age (Years)	Frequency	Percent
13 - 17	0	0%
18 - 21	35	53%
22- 25	40	47%
<b>Total</b>	<b>75</b>	<b>100%</b>

We were interested in the next question how much time spend respondents on Instagram per day. Most of them (92%) answered that they spend more than 30 minutes on Instagram daily.



Picture 1. Time spend on Instagram per day

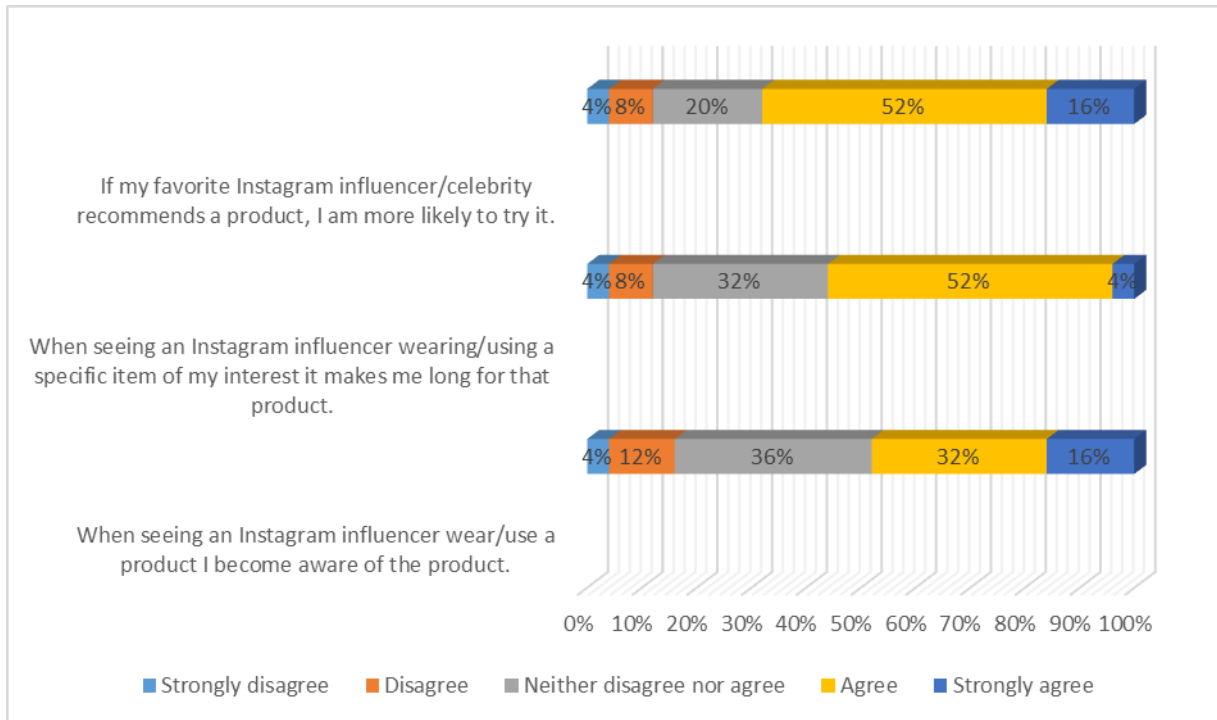
We also wanted to find out which are the most important topics followed on Instagram. They are most interested in fashion, followed by lifestyle, food, and travel.

Table 2. Instagram topics

Topics	Frequency	Percent
<b>Fashion</b>	<b>19</b>	<b>27%</b>
<b>Lifestyle</b>	<b>15</b>	<b>20%</b>
<b>Food</b>	<b>13</b>	<b>17%</b>
<b>Travel</b>	<b>13</b>	<b>17%</b>
<b>Sport</b>	<b>7</b>	<b>9%</b>
<b>Art</b>	<b>6</b>	<b>8%</b>
<b>Other (medicine)</b>	<b>2</b>	<b>2%</b>
<b>Total</b>	<b>75</b>	<b>100%</b>

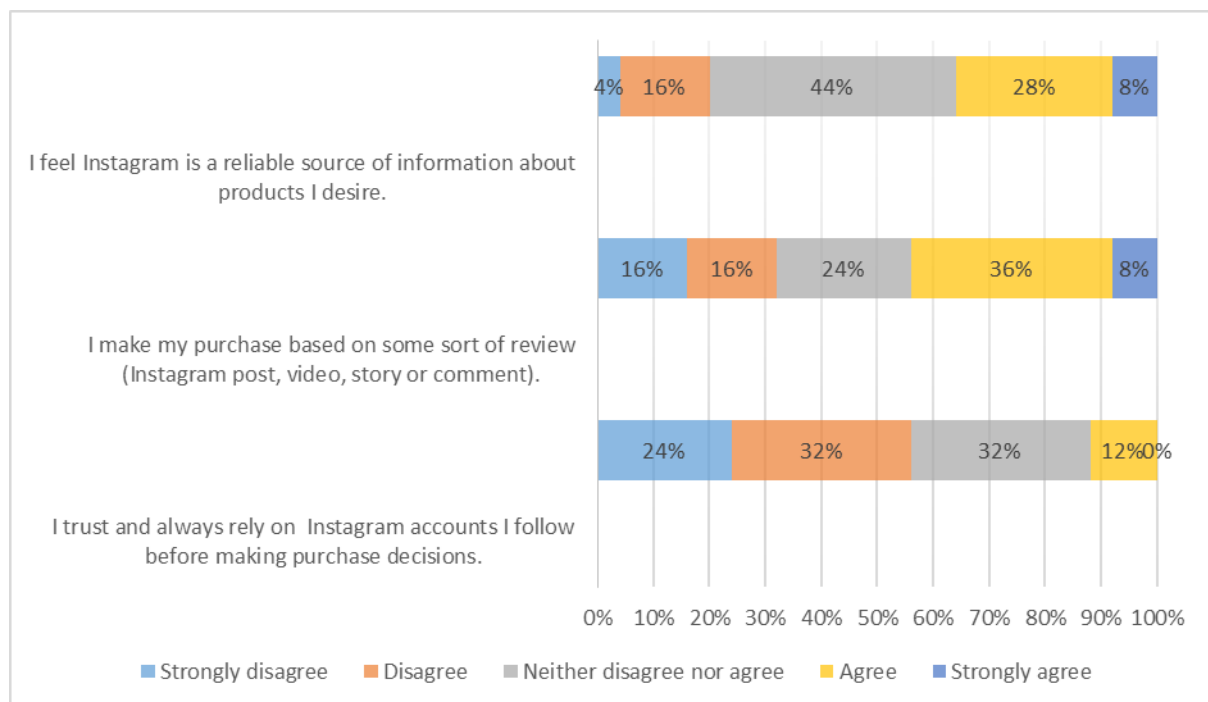
For the next section of questions, we used the Likert scale. As shown in the Picture 2 below, most of the respondents agreed to being influenced or in some kind of way affected by the content that Instagram influencers post on their accounts. Respondents also agreed that when they see Instagram influencer wear or use a specific item of their interest it makes them long for that product. Precisely, 52 percent of them agreed with that statement. The same percent of people who answered the questionnaire agreed that when their favourite Instagram influencer/celebrity recommends a product, they are more likely to try it.





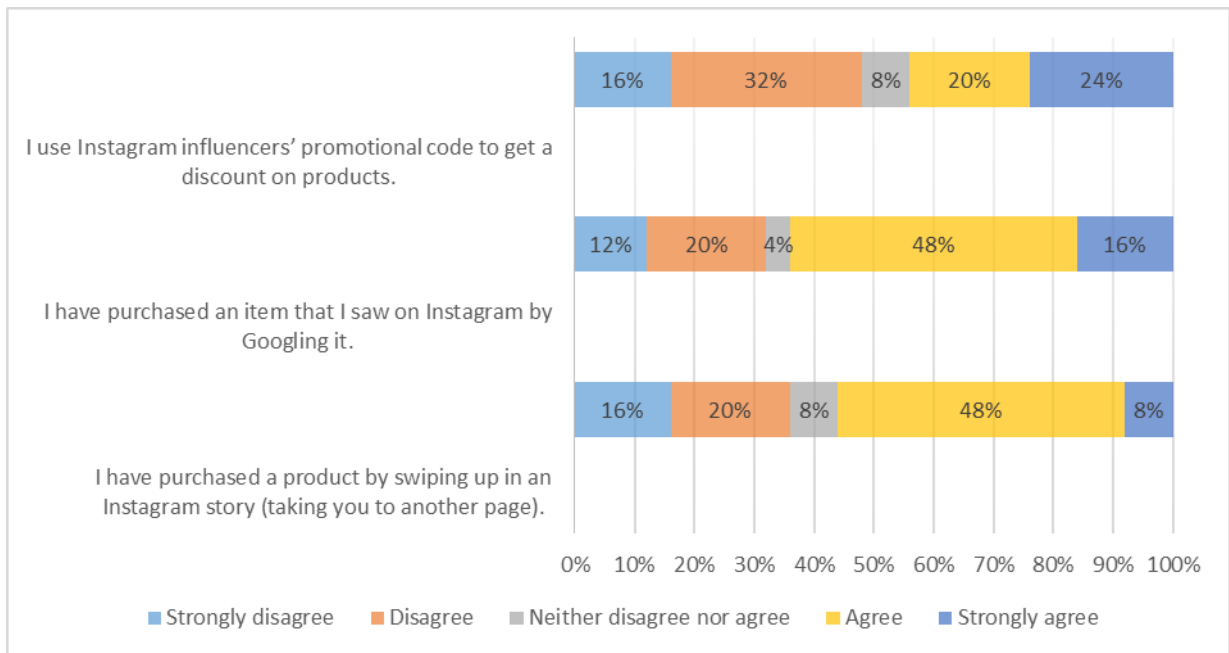
Picture 2. Recent shopping on Instagram

Although people do not completely trust and rely on Instagram to make their purchase decisions, they do visit it before making any purchases which indicates that Instagram’s influence is genuine and substantial. The evidence presented is sufficient to reject the claim. (Picture 3)



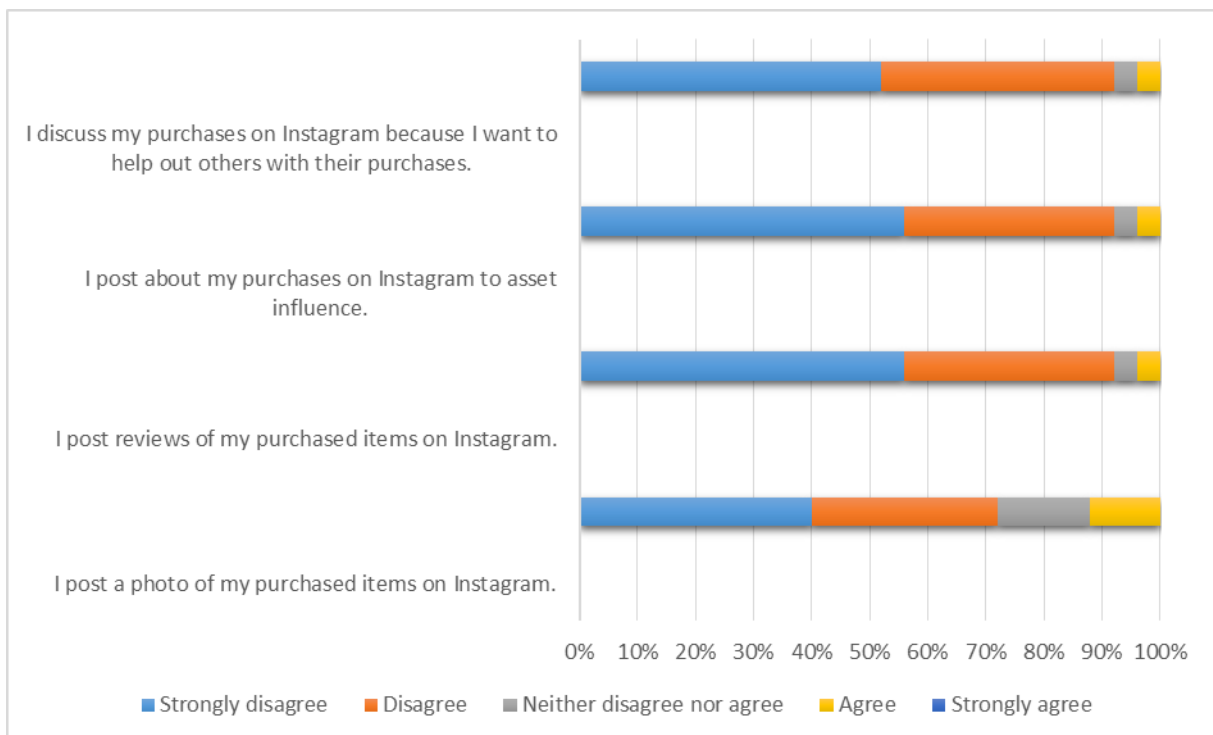
Picture 3. Trust in Instagram

We were also interested if they used the Instagram’s “swipe up” feature to buy products. This is the most direct way of buying from Instagram and 48 percent of respondents agreed that they used this feature to purchase products. The second statement is also positive, with the same percentage agreeing to indirectly purchasing from Instagram, which means seeing a product and googling it or searching it on some other source.



Picture 4. Purchases on Instagram

The last question of our research referred to user-generated content. The results showed that respondents do not post either reviews or photos of their purchased items on Instagram. This was quite expected since none of the respondents are influencers and they do not have popular accounts.



Picture 5. User-generated content on Instagram

## CONCLUSION

Instagram was found to be the social media that most affects impulse purchasing within any industry, mainly due to the importance of the visual aspect in promoting. Generation Z is accepting that social media is an important part of marketing these days (Aragoncilo, Orus, 2022).

Instagram has been around for a while and has developed in a way that can be useful to both consumers and sellers. The big advantage that Instagram, and social media in general, poses over traditional media is niche advertising. It is quite simple to target a specific audience on Instagram. We can monetize this specification by showing the product to the specified audience.

Our research indicates that Generation Z likes subtle marketing messages, and this was replicated in the findings of this research as respondents preferred seeing brand generated content. Although Instagram has not reached the perfect customer trust phase, as seen in our research, it has a huge impact on how people perceive products. This means that when Generation Z goes through the purchase decision process, they will most likely use Instagram to either see how the product looks, performs, or feels. The research showed that this will lead to the consumer either purchasing directly or indirectly from Instagram. Furthermore, a big percentage of Gen Z will go directly to Instagram to purchase the product.

To summarize everything that has been stated so far, Instagram has a significant impact on Generation Z purchase decisions. If they want to increase profits, the company should target Generation Z mainly through digital media. Instagram has proven to be the biggest and most profitable medium for businesses to capitalize upon.

## REFERENCES

- Aragoncillo, L., Orus, C., (2018). Impulse buying behaviour: an online-offline comparative and the impact of social media. *Spanish Journal of Marketing* 22 (1), 42–62.
- Aslam, S. (2023). *Instagram by the Numbers: Stats, Demographics & Fun Facts*. Retrieved from Omnicore: <https://www.omnicoreagency.com/instagram-statistics/>.
- Chen, H., (2018). College-aged young consumers' perceptions of social media marketing: the story of Instagram. *Journal of Current Issues and Research in Advertising*. 39 (1), 22–36.
- Djafarova, E., Bowes, T., (2021). Instagram made Me buy it': Generation Z impulse purchases in fashion industry. *Journal of Retailing and Consumer Services*. Vol. 59. March 102345.
- Jin, V., Ryu, E., (2020). "I'll buy what she's #wearing": the roles of envy toward and parasocial interaction with influencers in Instagram celebrity-based brand endorsement and social commerce. *Journal of Retailing and Consumer Services*. Vol. 55, July 102121.
- Moreau, E. (2022). What Is Instagram, and Why Should You Be Using It? <https://www.lifewire.com/what-is-instagram-3486316>
- Salamander, G. (2022) Gen Z and Social Media: 3 Ways Their Use is Different. <https://eclincher.com/gen-z-and-social-media-use/>
- Smith, K. (2019). Mobile advertising to Digital Natives: preferences on content, style, personalization, and functionality, *Journal of Strategic Marketing*, 27:1, 67-80,
- Voyado. (2023). How is Generation Z shopping? <https://www.apptus.com/blog/generation-z-online-shopping-habits/>
- Wise, J. (2023). Gen Z Social Media Usage Statistics 2023: The Latest Trends, Facts & Data. <https://earthweb.com/gen-z-social-media-usage-statistics/>

**Session A: MANAGEMENT AND OPERATION MANAGEMENT**

---

**Papers (pp. 37-92):**

Ali Reza Afshari, Farzad Ghaderi Bafti CONSTRUCTION PROJECT PROCUREMENT MANAGEMENT	...37
Ali Reza Afshari, Niloofar Ghayeni ENERGY MANAGEMENT IN RESIDENTIAL BUILDINGS WITH EMPHASIS ON CONSUMABLES IN NORTH KHORASAN PROVINCE	...43
Aleksandra Božović, Milena Cvjetković SIX SIGMA AND TQM CONCEPT IN THE FUNCTION OF IMPROVING BUSINESS PERFORMANCE	...49
Spasoje Erić, Aleksandar Rajić, Ivan Palinkaš DIAGNOSTICS OF AIR CONDITIONER FAILURES AS A DIGITAL SYSTEM	...54
Goran Janačković, Dejan Vasović, Bojan Vasović, Violeta Milićević, Zoran Jovanović KEYBOARDS AS INPUT DEVICES: STANDARDIZATION AND FUTURE TRENDS	...60
Nikola Milicevic, Nenad Djokic, Ines Djokic INTENTIONS TO USE BICYCLES AND ENVIRONMENTAL CONCERNS	...66
Slavica Prvulovic, Ivica Micic, Jasna Tolmac, Milos Josimovic, Slobodan Juric, Milica Josimovic SELECTION OF WATER PRESSURE BOOSTER PLANTS IN THE FIRE HYDRANT NETWORK FOR A WAREHOUSE FACILITY	...71
Sanja Puzović, Jasmina Vesic Vasović, Vladan Paunović INDUSTRY 5.0 AN EMERGING PARADIGM: INCEPTION, CONCEPT AND CHALLENGES	...77
Marija Stanojeska, Robert Minovski, Bojan Jovanoski THE MOST INFLUENTIAL POLICY AND INFRASTRUCTURES FACTORS IN QMS – PRACTICES FROM THE FOOD PROCESSING INDUSTRY	...83



## **CONSTRUCTION PROJECT PROCUREMENT MANAGEMENT**

**Ali Reza Afshari**

Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran

E-mail: [afshari@mshdiau.ac.ir](mailto:afshari@mshdiau.ac.ir)

**Farzad Ghaderi Bafti**

Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran

### **ABSTRACT**

This study aims to identify the key aspects of procurement in the Project Management context and their relation to project success. Particularly, the effects of selection criteria, supplier integration and the dynamics of acquisitions are investigated. This study contributes to the literature by analyzing in depth a large sample of articles that deal with procurement in the Project Management context. This study also presents implications for practice by exploring how procurement management affects project success. The methodological approach is a systematic literature review, combining bibliometric and content analysis. The results show that academic literature focuses on the dynamics of acquisitions, lacking studies on the spectrum of supplier integration and supplier selection criteria. A strong relationship between the dynamics of acquisitions and project success dimensions could be established. Several insights into this relationship can be pointed out, as the effect of synergy with suppliers on the success dimension related to impact on the team. The study contributes by identifying the relationship between the selection criteria, levels of supplier integration and dynamics of acquisitions with project success. Possible research gaps and trends are presented for future research.

**Keywords:** Project Procurement Management; Project management; Construction Management.

### **INTRODUCTION**

In turbulent and complex environments, companies are making even more efforts for greater supply chain collaboration (Zhang & Cao, 2018). Well-managed partnerships between buyers and suppliers are useful for achieving collaboration fluency and improving procurement effectiveness (Grudinschi et al., 2014). Companies have a vital role to play in the overall performance of a project. Select the most suitable supplier (San Cristobel, 2022), and evaluate are relevant procurement processes for a project's success (Araujo et al., 2017), which contributes to the effective management of the supply chain (Rao et al., 2017). However, the selection of a supplier requires considerable effort in any organization (Zolghadri et al., 2021). Zolghadri et al. (2021) state that supplier selection has been studied as a procurement department issue; however, in order to take advantage of collaboration in the supply chain, the suppliers' integration is both necessary and complex. Collaborative advantages are achieved by sharing information, synchronizing decisions, sharing complementary resources, and aligning incentives with suppliers' costs and risks (Cao & Zhang, 2010). Therefore, company-supplier integration requires appropriate safeguards and coordination mechanisms to succeed. The higher the level of integration, the greater the role of suppliers in project decision-making, and different levels of integration will have distinct impacts on the project's success (Petersen et al., 2005). The interest in the relationships between companies and suppliers has increased in many industries, however, there is still a lack of comprehensive conceptual frameworks. There is a need for practices that allow for a detailed and systemic understanding of how suppliers are integrated into project-based supply chains (Eriksson, 2015).

This study seeks to narrow the gap by investigating the key aspects of procurement in the project management context and their relationship with a project's success. To achieve this goal, a systematic literature review was conducted, combining bibliometric and content analysis techniques. The following research questions guide this research:

(RQ1) What are the key aspects in the literature on procurement in project management?

(RQ2) What is the relationship between procurement management and a project's success?

## **PROCUREMENTS IN PROJECTS**

Companies are seriously exploring the potential of supply chain management (Gunasekaran et al., 2018). The procurement process is an area of interest to organizations responsible for project delivery for better performance in product quality, cost, cycle time, and responsiveness (Sanderson & Cox, 2018). The procurement process is composed of different stages, each one requiring a specific and careful design capable of guaranteeing the best possible results (Baldi et al., 2016). Besides, the literature suggests that supplier performance should be monitored and controlled regularly so that any failures can be identified and corrected (Ng et al., 2002). The evaluation of the supplier's performance throughout the project's implementation is important to ensure the success of the project (Araújo et al., 2017). Designing a supply chain and selecting suppliers to take considerable effort in any organization. The company needs to understand what is important for it in the selection of a particular supplier or, in other words, it needs to define the evaluation criteria (Zolghadri et al., 2021). The selection of a supplier is one of the main activities of the procurement area. Without an adequate and precise method to select the most appropriate supplier, the performance of the whole project may be affected (Cheng & Li, 2004). This task is difficult and challenging, replete with many uncertainties. It is a complex process, which requires individuals to make judgments and decisions and trade-offs between competing goals and limited resources. The selection of one supplier over another depends largely on the company's preferences in terms of evaluation criteria and weights used, and the commitments the supplier is willing to make (Watt et al., 2019).

Another relevant issue in procurement management is the company-supplier dyad and the form of its relationship. The literature points out that, to obtain collaborative advantages, the integration of a supplier into the company is complex (Zolghadri et al., 2021) and involves appropriate guarantees to be successful, which implies that different levels of responsibility and integration need to be agreed between the company and the supplier (Petersen et al., 2005). The degree of supplier integration can range from none to three different levels. These levels can be described as being three boxes, white, grey and black. In the white level, the supplier is consulted informally on the project, with discussions on specifications and requirements, but the purchasing company makes all the decisions. In the grey level, the project is a formalized joint activity, which may include information and technology sharing and joint decision-making concerning design specifications. Finally, at the black level, the project is a supplier-driven design based on the company's specifications, with only a review and agreement of the specification (Petersen et al., 2005).

## **PROCUREMENT MANAGEMENT AND A PROJECT'S SUCCESS**

Araújo et al. (2017) highlight the importance of suppliers in the success or failure of the project. The selection and evaluation of the performance of the supplier play an essential role in the development of the project. Several researchers have developed decision charts to investigate the criteria for the selection and success rate of suppliers in terms of time, cost and quality. Over the years, however, the selection process has become increasingly complex, mainly as a result of the continued proliferation of different procurement methods, the increasing technical complexity of projects (Agarchand & Laishram, 2017), and the need for greater value for money. Therefore, the classic criteria of time, cost and quality alone are considered very simplistic in the context of complex project environment and, so, decision frameworks need to be updated (Naoum & Egbu, 2015, 2016). The current vision of a project's success is considered multidimensional (Carvalho & Rabechini Junior, 2015; Shenhar & Dvir, 2007), and this comprehensive view should also be considered in a procurement management environment. Aiming to minimizing the gap between what is hired and delivered, the supplier have to fully understand the company's needs in the procurement process through extensive information sharing and constant communication. Only when a binding mechanism motivates information sharing is it possible to achieve a balanced relationship between the company and the supplier. As the company-supplier mechanism works, risk-averse suppliers are more likely to collaborate to define project scopes (Cheng & Carrillo, 2012).

The integration of product and process design decisions made together by companies and suppliers in the supply chain has been studied from various theoretical perspectives, including transaction cost savings, relational theory, organizational design, and network governance models. All these theories make clear that the company-supplier spectrum of supplier integration requires appropriate safeguards and coordination mechanisms to succeed (Petersen et al., 2005). Cao & Zhang (2010) suggest four components of the advantages of collaborating in the supply chain: (1) collaborative advantages are achieved through supply chain partnering activities, such as sharing information, synchronizing decisions, sharing complementary resources, and aligning incentives with partners' costs and risks; (2) the benefits are greater when acting together rather than independently; (3) there are some leverage effects or synergistic results; and (4) it is not just about collaborative transactions: it involves the joint creation of knowledge and innovation. Based on this, the authors point to five dimensions of the advantages of supply chain collaboration: process efficiency, flexibility, business synergy, quality, and innovation.

## RESEARCH METHODS

Aligned with the objective of this study, a systematic literature review was carried out. A systematic literature review aims to comprehensively identify and synthesize research on a specific topic (Carvalho et al., 2023) and differs from traditional narrative reviews (Tranfield et al., 2013) because they use structured, organized, transparent and replicable procedures at each stage of the process (Carvalho et al., 2023; Littell et al., 2018). One of the main benefits of using this approach is to minimize bias by completing an exhaustive literature search. There are different ways of conducting a literature review, including bibliometric analysis, meta-analysis and content analysis (Carvalho et al., 2023).

To obtain an overview of the literature on the topic of interest, procurements in project management, the ISI Web of Knowledge and Scopus databases were consulted. The Web of Science database was selected because it contains a variety of world-class research literature linked to a core of rigorously selected journals; in addition, articles published in indexed journals and with impact factor calculated by Journal Citation Reports are located on this database. The Scopus database was chosen as the largest database of abstracts and citations of peer-reviewed literature. The data collection phase was performed, with the use of the following logical strings and connectors: "procurement" AND "project management". These strings were searched in the fields "Topic" and "Article Title, Abstracts, Keywords". Initially, 301 results were returned from the Main Collection and 2,314 from Scopus. Then, the results were refined in the following order: first, the document type was refined to "Article" or "Review" and "Article", "Review" or "Article in Press"; second, the language was filtered to "English"; and third, only literatures from the areas of management, business and operations were considered. For this latter filter, the results were refined to "Management", "Operations Research Management Science", "Business" or "Business Finance" and "Business, Management and Accounting". The result of these refinements was a database composed of 52 Web of Science articles and 440 Scopus articles.

## RESULTS

Among the most cited articles, three articles are related to public-private partnerships (PPP). The study by Bing et al. (2005) focuses on risk allocation in PPP contracts in the United Kingdom and aims to identify the preference for the allocation of specific risks between the public and private sector and both. Osei-Kyei & Chan (2015) systematically review the literature on critical success factors for PPP contracts, in which they present a list containing 37 critical success factors identified from the analysis of 27 articles. The research by Zhang (2015) also deals with critical success factors for PPP contracts. Zhang (2015) present five critical success factors composed of 47 success sub-factors. The other most cited studies are related to the dynamics of acquisitions. Kadefors (2004) discusses factors that influence the development of trust and cooperation between company and supplier. Eriksson & Westerberg (2011) propose a model for analyzing how procurement impacts project performance criteria, considering the cooperative environment as a mediating and moderating variable. A recurrent topic of the analyzed articles is PPPs. The database contains papers about the critical success factors for PPPs contracts



(Hwang et al., 2013; Li et al., 2005; Osei-Kyei & Chan, 2015; Yuan et al., 2019; Zhang, 2015), the preference for risk allocation in PPPs (Abednego & Ogunlana, 2016; Bing et al., 2005; Hwang et al., 2013), relationships that are established in a PPP contract (Smyth & Edkins, 2007) and key performance indicators for PPPs contracts (Yuan et al., 2019). The two most co-cited studies have as their central theme partnership in the construction industry. Black et al. (2020) analyze the success factors and benefits of partnerships. Bresnen & Marshall (2020) study the link between partnerships and cultural changes within the industry.

## **TRENDS AND GAPS**

The engineering procurement construction (EPC) and PPP methods are highlights in the discussions, with many articles taking these approaches and reinforcing the value of developing partnerships. The increasing importance of partnership relationships in the procurement process and supply chain management stands out in the most recent articles found in the literature. Aspects such as collaboration and trust are increasingly being considered important issues in procurement management. In EPC studies the partnership strategy to integrate stakeholders into the project is highlighted as it significantly facilitates not only design management and risk management, but also improves project performance and creates strategic long-term benefits (Wang et al., 2016). Other recent issues on EPC procurement are related to suppliers' claims (Shen et al., 2017) and procurement processes (Thangavel & Yogananth, 2016).

In PPPs studies, collaborative procurement and trust building mechanisms (Challender, 2017) are highlighted. Trust issues are proving to be an integral part of stakeholder experiences in procurement environments, with recognized benefits (Strahorn et al., 2017). In the procurement process, it may be necessary to consider new perspectives for supplier selection and evaluation, owing to the importance of having partnerships with suppliers that meet organizational needs (Araújo et al., 2017). Recent studies on what are known as social procurements, in which the procurement process is used to leverage extra social benefits and create social value for local communities, could also be a new research stream. Social procurements differ from traditional procurements by specifying products in projects that promote or require suppliers to employ disadvantaged groups in society (ethnic minorities, disabled, long-term unemployed, ex-offenders, etc.). However, numerous changes would need to be made to the current procurement process, and this could be addressed in a future research agenda to understand the barriers to social procurement and the potential role that social enterprises, clients, governments, and other stakeholders could play (Loosemore, 2016). However, in times of crisis, the effects of the economic situation on collaborative work with an emphasis on trust in these relationships mean that organizations return to conventional methods of competitive procurement, seeking to reduce risks and maintain control (Challender et al., 2016). PPPs studies evaluate whether a project pipeline is an effective tool for proposal development by suppliers (De Clerck & Demeulemeester, 2016). The effect of corruption is analysed in procurement management, as it aggravates cost, time, performance, and the benefits delivered. However, there are different types of corruption and different project characteristics that are most likely to suffer from it (Locatelli et al., 2017).

## **CONCLUSION**

This study contributes to the literature by analyzing in-depth, a large sample of articles that deal with procurement in the context of project management. Based on the analysis, it was possible to answer the two research questions proposed. First, it shows that the academic literature focuses on the dynamics of acquisitions and lacks studies on the spectrum of supplier integration and supplier selection criteria. Moreover, the research is concentrated on the construction industry and infrastructure projects, lacking researches related to other types of projects. Second, the relationship between the dynamics of acquisitions and success dimensions is well covered by the literature; however, the relationship between the spectrum of supplier integration and supplier selection criteria with success dimensions is poorly explored. This study presents implications for practice by exploring how procurement management affects the project's success. Several insights of this study have managerial implications, as it shows that more synergy with suppliers can lead to a positive impact on the team. Besides, focusing more on the

learning process with the supplier can positively affect the future impact on the company and positively impact on the customer. Cooperation with suppliers also has a positive effect on the product/service, has a positive future impact on the company and a positive social and environmental impact.

Furthermore, the study shows the main trends and gaps in the literature. The emerging trend on topics regarding procurement management appears to be social procurement. There is a lack of studies with a focus on the relationship between the spectrum of supplier integration, supplier selection criteria, and success dimensions. These are areas that can be explored in-depth in future researches. The content analysis also shows that the research in this field is mainly qualitative, through case-based research, so there is room for future confirmatory studies. In particular, following the research variables and relationships explored in this study would be helpful in future field researches.

This paper has inherent limitations in the research methods adopted. First, the databases and research strings selected might lead to limitations in the studied sample. Relevant studies could be missed in our search mechanisms. The inherent subjectivity of the content analysis process performed by the researchers also presents limitations, although the selection criteria and the use of three researchers in the analysis minimize this issue.

## REFERENCES

- Abednego, M. P., & Ogunlana, S. O. (2016). Good project governance for proper risk allocation in public-private partnerships in Indonesia. *International Journal of Project Management*, 24(7), 622-634.
- Agarchand, N., & Laishram, B. (2017). Sustainable infrastructure development challenges through PPP procurement process: Indian perspective. *International Journal of Managing Projects in Business*, 10(3), 642-662.
- Araújo, M. C. B., Alencar, L. H., & Miranda Mota, C. M. (2017). Project procurement management: a structured literature review. *International Journal of Project Management*, 35(3), 353-377.
- Baldi, S., Bottasso, A., Conti, M., & Piccardo, C. (2016). To bid or not to bid: that is the question: public procurement, project complexity and corruption. *European Journal of Political Economy*, 43, 89-106.
- Black, C., Akintoye, A., & Fitzgerald, E. (2020). Analysis of success factors and benefits of partnering in construction. *International Journal of Project Management*, 18(6), 423-434.
- Bresnen, M., & Marshall, N. (2020). Partnering in construction: a critical review of issues, problems and dilemmas. *Construction Management and Economics*, 18(2), 229-237.
- Cao, M., & Zhang, Q. (2010). Supply chain collaborative advantage: a firm's perspective. *International Journal of Production Economics*, 128(1), 358-367.
- Carvalho, M. M., & Rabechini Junior, R. (2015). Impact of risk management on project performance: the importance of soft skills. *International Journal of Production Research*, 53(2), 321-340.
- Carvalho, M. M., Fleury, A., & Lopes, A. P. (2023). An overview of the literature on technology road mapping (TRM): contributions and trends. *Technological Forecasting and Social Change*, 80(7), 1418-1437.
- Challender, J. (2017). Trust in collaborative construction procurement strategies. *Proceedings of the Institution of Civil Engineers: Management, Procurement and Law*, 170(3), 115-124.
- Challender, J., Farrell, P., & Sherratt, F. (2016). Effects of an economic downturn on construction partnering. *Proceedings of the Institution of Civil Engineers: Management, Procurement and Law*, 169(4), 159-167.
- Cheng, E. W. L., & Li, H. (2004). Contractor selection using the analytic network process. *Construction Management and Economics*, 22(10), 1021-1032.
- Cheng, L., & Carrillo, E. E. (2012). Assessing supplier performances under partnership in project-type procurement. *Industrial Management & Data Systems*, 112(2), 290-312.
- De Clerck, D., & Demeulemeester, E. (2016). An ex ante bidding model to assess the incentive creation capability of a public-private partnership pipeline. *International Journal of Project Management*, 34(1), 117-131.
- Eriksson, P. E. (2015). Partnering in engineering projects: four dimensions of supply chain integration. *Journal of Purchasing and Supply Management*, 21(1), 38-50.
- Eriksson, P. E., & Westerberg, M. (2011). Effects of cooperative procurement procedures on construction project performance: A conceptual framework. *International Journal of Project Management*, 29(2), 197-208.
- Grudinschi, D., Sintonen, S., & Hallikas, J. (2014). Relationship risk perception and determinants of the collaboration fluency of buyer-supplier relationships in public service procurement. *Journal of Purchasing and Supply Management*, 20(2), 82-91.
- Gunasekaran, A., Lai, K., & Edwincheng, T. (2018). Responsive supply chain: a competitive strategy in a networked economy. *Omega*, 36(4), 549-564.

- Kadefors, A. (2004). Trust in project relationships-inside the black box. *International Journal of Project Management*, 22(3), 175-182.
- Li, B., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). Perceptions of positive and negative factors influencing the attractiveness of PPP/PFI procurement for construction projects in the UK. *Engineering, Construction, and Architectural Management*, 12(2), 125-148.
- Littell, J. H., Corcoran, J., & Pillai, V. (2018). *Systematic reviews and meta-analysis* New York: Oxford University Press.
- Locatelli, G., Mariani, G., Sainati, T., & Greco, M. (2017). Corruption in public projects and megaprojects: There is an elephant in the room! *International Journal of Project Management*, 35(3), 252-268.
- Loosemore, M. (2016). Social procurement in UK construction projects. *International Journal of Project Management*, 34(2), 133-144.
- Naoum, S., & Egbu, C. (2015). Critical review of procurement method research in construction journals. *Procedia Economics and Finance*, 21, 6-13.
- Naoum, S. G., & Egbu, C. (2016). Modern selection criteria for procurement methods in construction: a state-of-the-art literature review and a survey. *International Journal of Managing Projects in Business*, 9(2), 309-336.
- Osei-Kyei, R., & Chan, A. P. C. (2015). Review of studies on the critical success factors for public-private partnership (PPP) projects from 1990 to 2013. *International Journal of Project Management*, 33(6), 1335-1346.
- Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2005). Supplier integration into new product development: coordinating product, process and supply chain design. *Journal of Operations Management*, 23(3-4), 371-388.
- Rao, C., Xiao, X., Goh, M., Zheng, J., & Wen, J. (2017). Compound mechanism design of supplier selection based on multi-attribute auction and risk management of supply chain. *Computers & Industrial Engineering*, 105, 63-75.
- San Cristobel (2022). Contractor selection using multi criteria decision-making methods. *Journal of Construction Engineering and Management*, 138(6), 751-758.
- Sanderson, J., & Cox, A. (2018). The challenges of supply strategy selection in a project environment: evidence from UK naval shipbuilding. *Supply Chain Management*, 13(1), 16-25.
- Shen, W., Tang, W., Yu, W., Duffield, C. F., Hui, F. K. P., Wei, Y., & Fang, J. (2017). Causes of contractors' claims in international engineering-procurement-construction projects. *Journal of Civil Engineering and Management*, 23(6), 727-739.
- Shenhar, A. J., & Dvir, D. (2007). *Reinventing project management: the diamond approach to successful growth and innovation* Boston: Harvard Business Review Press.
- Smyth, H., & Edkins, A. (2007). Relationship management in the management of PFI/PPP projects in the UK. *International Journal of Project Management*, 25(3), 232-240.
- Strahorn, S., Brewer, G., & Gajendran, T. (2017). The influence of trust on project management practice within the construction industry. *Construction Economics and Building*, 17(1), 1-19.
- Thangavel, N., & Yogananth, S. (2016). Dynamic role of company standards for executing projects in petrochemical industries. *International Journal of Applied Business and Economic Research*, 14(4), 2461-2464.
- Tranfield, D., Denyer, D., & Smart, P. (2013). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207-222.
- Wang, T., Tang, W., Qi, D., Shen, W., & Huang, M. (2016). Enhancing design management by partnering in delivery of international EPC projects: evidence from Chinese construction companies. *Journal of Construction Engineering and Management*, 142(4), 04015099.
- Watt, D. J., Kayis, B., & Willey, K. (2019). Identifying key factors in the evaluation of tenders for projects and services. *International Journal of Project Management*, 27(3), 250-260.
- Yuan, J., Zeng, A. Y., Skibniewski, M. J., & Li, Q. (2019). Selection of performance objectives and key performance indicators in public-private partnership projects to achieve value for money. *Construction Management and Economics*, 27(3), 253-270.
- Zhang, Q., & Cao, M. (2018). Exploring antecedents of supply chain collaboration: effects of culture and inter-organizational system appropriation. *International Journal of Production Economics*, 195, 146-157.
- Zhang, X. (2015). Critical success factors for public: private partnerships in infrastructure development. *Journal of Construction Engineering and Management*, 131(1), 3-14.
- Zolghadri, M., Amrani, A., Zouggar, S., & Girard, P. (2021). Power assessment as a high-level partner selection criterion for new product development projects. *International Journal of Computer Integrated Manufacturing*, 24(4), 312-327.

## **ENERGY MANAGEMENT IN RESIDENTIAL BUILDINGS WITH EMPHASIS ON CONSUMABLES IN NORTH KHORASAN PROVINCE**

**Ali Reza Afshari**

Department of Construction Management, Shirvan Branch, Islamic Azad University, Shirvan, Iran

E-mail: [afshari@mshdiau.ac.ir](mailto:afshari@mshdiau.ac.ir)

**Niloofer Ghayeni**

Department of Construction Management, Shirvan Branch, Islamic Azad University, Shirvan, Iran

### **ABSTRACT**

The purpose of this research is energy management in residential buildings with emphasis on consumables in North Khorasan province. For this purpose, in the qualitative part of the research, by studying valid articles, effective indicators in energy management in residential buildings were extracted and approved by experts in this field. And a questionnaire based on them was distributed among 25 engineers, contractors and specialists of construction projects in North Khorasan province. The data obtained using AHP technique with the help of EXPERT CHOICE software, effective indicators in energy management in the residential buildings of North Khorasan province have been evaluated and ranked in two levels. Based on the research literature, a total of 18 factors were identified, and these factors are divided into three main factors: cooling, heating and electrical facilities. The general results of this research showed that among the main factors, the factor of electrical facilities with a relative weight of 0.460 is in the first place, and among the secondary factors, the factor of standardization of facilities is in the first place with a relative weight of 0.117.

**Keywords:** Analytic Hierarchy Process (AHP), Energy management, Residential buildings, Construction Management.

### **INTRODUCTION**

The heat losses of the building in the walls and roof are more important than the floor because the building floor is generally placed on the ground, piles, parking lot or cat roads and the heat transfer through the floor is much less than the walls and the building (Ahmad, 2019). The shell of the building should be built according to the rules of topic 19 of the National Building Regulation to minimize its energy consumption. Many of the currently constructed buildings have much higher consumption compared to the energy standards due to the wear of their shell and lack of insulation (Nizami, 2019). Suitable topography and the conditions in which the building is built can also help to improve its energy consumption, for example, the presence of a hill or the height around the building helps to reduce the intensity of the wind and reduce the penetration of air in the building (Lork, 2020). The placement of trees in the vicinity of the building prevents the summer sun from hitting the wall of the building, and in winter when the trees lose their leaves, the building is protected from the winter sun to help with heating (Zamanloo, 2021).

Energy management in the building and energy consumption of the building depends on the amount of heating, cooling, ventilation and lighting (Antipova, 2016). The building shell affects all these parameters directly and indirectly. Also, the energy consumption in the building depends on the geographical and climatic conditions of the region and what season of the year or what time of the day it is the ceiling and the current market demand for glass wool and moisture and thermal insulation shows the unfavorable situation of insulation, soundproofing and design in the automotive and building industry (Diakaki, 2018). Every day, urban households bear large amounts of air pollution, noise pollution, and the cost of fuel and electricity consumption, with cars and motorcycles causing 70% of air pollution and 90% of noise pollution (Grigoroudis, 2017). The growth rate of consumption

of energy carriers during the years 1980 to 2006 was 11.98% in the world and 6.3% in Iran, in other words, during the mentioned period, the growth rate of consumption of energy carriers in Iran was more than three times the It has been universal(Fathalian,2018). The intensity of energy consumption in our country is estimated to be more than four times the global average. Thus, to continue the current trend in energy consumption in the country, in the perspective of 1404, Iran will change from a net exporter of energy to an importing country and will lose the relative advantages of abundant incomes from energy exports (Sepehr, 2018).

Therefore, the necessity of managing energy consumption is something that cannot be ignored. The correct management of energy consumption requires knowing the current situation and the consumption pattern, planning and applying control to optimize and modify the consumption pattern (Allahyari, 2020). The purpose of energy management is to reduce and rationalize energy consumption in a way that has economic justification and at the same time does not lead to negative effects on the level of well-being and comfort. The world's required energy is consumed in sectors such as transportation, industries, residential, commercial, services, etc. According to the available statistics, Iran's residential buildings are the biggest energy consumers in this country (Fei, 2019). On the other hand, not only the energy saving potential in the construction and housing sector is generally more than other sectors, but the reduction of energy consumption in this sector is easier and accessible with less investment than other sectors (Diakaki, 2018). Therefore, in order to reduce energy consumption in the world and especially in Iran, one of the effective policies can be the reduction of energy consumption in the residential sector, reducing the energy consumption of residential buildings in Iran, especially on a large scale, has a significant effect (Moosavi, 2022). In the whole energy consumption of the country, in this regard, the clustering of energy consumption behavior of residential buildings will be very effective.

Therefore, considering the importance of the subject, this research deals with energy management in residential buildings with emphasis on consumable materials in North Khorasan province and it answers the question that how is it possible to manage energy in residential buildings with an emphasis on consumables in North Khorasan Province?

## **METHOD**

In terms of practical purpose, because the research results can be used in the research community and can be tested in other communities. From the point of view of the method, it is descriptive, because the variables are analyzed in their existing state without manipulation, and from the point of view of data collection, it is field (survey), because we take a sample from the community. It is a survey, the questionnaire is used as a research tool. In this research, a questionnaire based on the components of the research model was used to measure the research variables. In this research, the identification and evaluation of energy management indicators in residential buildings with emphasis on consumable materials in North Khorasan province was done according to AHP technique using EXPERT CHOICE software. The target population of this research is the engineers working in the field of construction and contractors and professionals active in the construction sector in construction projects in North Khorasan province, numbering 25 people. It is considered to be equal to the population and the whole population sampling method is used. In this research, 18 indicators were obtained and in total 3 important and effective factors in energy management indicators in residential buildings with an emphasis on consumable materials in North Khorasan province, which include cooling, heating and electrical facilities, based on the analysis we have categorized hierarchically.

## **FINDINGS**

**Extracting the main factors and secondary factors of energy management in residential buildings: analysis of research data:** First, according to the review of previous literature and research, and using the opinions of research experts, and in order to identify and rank the factors

affecting energy management in residential buildings, with an emphasis on consumable materials, a hierarchical decision tree should be designed. The result of this step is 18 effective factors in the form of 3 main factors, which are presented and categorized in Table 1.

*Table 1: Main factors and secondary factors of energy management in residential buildings*

Main factors	Secondary factors
Cooling agent	Wall insulation
	Double glazing of windows
	Energy optimization in the engine room
	Building floor insulation
	Optimization of building materials for cooling
Heating agent	Optimization of materials for heating
	Energy meter for heating
	Thermal energy recovery device
	Double glazing of windows
	Using the package in the building
	Energy Management
Electrical installation operator	Energy optimization in the electricity sector
	The ability to transfer information through the Internet
	Software and hardware optimization
	Energy management in the rural sector
	Using modern equipment
	Standardization of facilities
	Ability to update facilities

**Calculating the weight of the main factors:** In the second step, to calculate the relative importance (weight) of each of the main factors, a questionnaire was prepared and distributed according to the format of the AHP questionnaire (pair by pair comparison) to obtain experts' opinions. This questionnaire includes a matrix for pairwise comparison of factors. So there are as many comparisons. Considering that level one had 3 factors, the number of comparisons or questions is equal to 3. After completing the questionnaires, the inconsistency rate of each of them was examined separately. Finally, 25 questionnaires were analyzed and people's opinions were combined using EXPERT CHOICE software. This software has extensive facilities for obtaining the matrices of pairwise comparisons of individuals and then combining the matrices of various individuals and converting them into a single matrix which is obtained through the geometric mean of individual elements of the matrices of individuals.

*Table 2: Combined matrix (geometric) of level one group pairwise comparisons*

Main factors	A	B	C	weight	rating
<b>A (cooling agent)</b>	1	0.600	0.466	0.207	3
<b>B (heating agent)</b>	1.664	1	0.700	0.333	2
<b>C (electrical installations)</b>	2.143	1.428	1	0.460	1
<b>IR=0.00&lt;0.1(incompatibility rate)</b>					

The results of the analysis of Table 2 calculated the weight of the main factors show that the factor of electrical facilities with a relative weight of 0.460 is in the first place, the heating factor is in the second place with a relative weight of 0.333, and the cooling factor is in the third place with a relative weight of 0.207. After calculating the geometric mean of experts' opinions, we first normalize the decision-making matrix of the problem. The linear average method is used to calculate the weighting of surface components. The results of the calculations are shown in Table 3.

*Table 3: Normalized matrix of pairwise comparisons*

	A	B	C	Summation	Weights	Rank
<b>A</b>	0.208	0.198	0.215	0.621	0.207	3
<b>B</b>	0.346	0.330	0.323	0.999	0.333	2
<b>C</b>	0.446	0.472	0.462	1.380	0.460	1

**Calculating the weight of level two elements (local weights):** The third step is to calculate the weight of the effective sub-factors in each subgroup, and the results are as described in Table 4:

*Table 4: Pairwise comparison matrix of sub-factors of the cooling factor*

Cooling agent A	A1	A2	A3	A4	A5	weights	rank
A1	1	0.839	2.698	2.277	1.108	0.265	2
A2	1.192	1	2.180	2.489	1.436	0.291	1
A3	0.371	0.459	1	0.828	0.606	0.114	5
A4	0.439	0.402	1.207	1	0.643	0.125	4
A5	0.902	0.696	1.650	1.556	1	0.205	3
IR=0.00<0.1							

The results of the analysis of table 4 calculated the weights of sub-cooling factors show that the factor of double-glazing windows with a relative weight of 0.291 is in the first place, followed by the factor of insulation of walls with a relative weight of 0.265 in the second place and the factor of optimizing materials. The cooling building is ranked third with a relative weight of 0.205, and the insulation factor of the building floor is ranked fourth with a relative weight of 0.125, and the energy optimization factor in the engine room is ranked fifth with a relative weight of 0.114. Finally, the inconsistency rate of the desired matrix is equal to (IR=0.00) and because this value is less than 0.1, therefore, there is consistency in the judgment of the experts in the pairwise comparisons of the desired matrix.

*Table 5: Pairwise comparison matrix of sub-factors of the heating factor*

Cooling agent B	B1	B2	B3	B4	B5	B6	weights	rank
B1	1	2.510	1.891	0.852	1.724	1.069	0.219	2
B2	0.398	1	1.010	0.438	0.655	0.522	0.098	6
B3	0.529	0.990	1	0.486	0.718	0.480	0.105	5
B4	1.174	2.282	2.058	1	1.944	1.212	0.241	1
B5	0.580	1.526	1.392	0.514	1	0.735	0.138	4
B6	0.935	1.916	2.081	0.825	1.360	1	0.199	3
IR=0.00<0.1								

The results of the analysis of Table 5 calculated the weights of sub-factors of heating shows that the factor of double glazing windows has a relative weight of 0.241 in the first place, followed by the factor of optimizing materials for heating with a relative weight of 0.219 in the second place and the factor of energy management. The relative weight of 0.199 is in the third place, and the factor of using the package in the building is in the fourth place with a relative weight of 0.138, and the factor of thermal energy recovery device is in the fifth place with a relative weight of 0.105, and the factor of energy meter for heating is in the sixth place with a relative weight of 0.098. Finally, the inconsistency rate of the desired matrix is equal to (IR=0.00) and because this value is less than 0.1, therefore, there is consistency in the judgment of the experts in the pairwise comparisons of the desired matrix.

*Table 6: Pairwise comparison matrix of sub-factors of electric facilities*

Cooling agent C	C1	C2	C3	C4	C5	C6	C7	weights	rank
C1	1	2.421	2.393	2.332	0.701	0.550	0.997	0.165	3
C2	0.413	1	0.919	1.185	0.476	0.316	0.534	0.080	6
C3	0.418	1.088	1	1.393	0.438	0.315	0.703	0.087	5
C4	0.429	0.844	0.718	1	0.426	0.376	0.584	0.076	7
C5	1.427	2.102	2.281	2.346	1	0.789	1.648	0.200	2
C6	1.817	3.162	3.171	2.662	1.267	1	1.874	0.255	1
C7	1.003	1.872	1.423	1.713	0.607	0.534	1	0.137	4
IR=0.01<0.1									

The results of the analysis of table 6 calculated the weights of sub-factors of electrical facilities show that the factor of standardization of facilities has a relative weight of 0.255 in the first place, followed

by the factor of using modern equipment with a relative weight of 0.200 in the second place and the factor of energy optimization in the electricity sector is The relative weight of 0.165 in the third place and the facility update factor with a relative weight of 0.137 in the fourth place and the software and hardware optimization factor with a relative weight of 0.087 in the fifth place and the factor of the ability to transfer information through the Internet with a relative weight of 0.080 The sixth rank and the factor of energy management in the rural sector is ranked seventh with a relative weight of 0.076. Finally, the inconsistency rate of the desired matrix is equal to (IR=0.01) and because this value is less than 0.1, therefore, there is consistency in the experts' judgments in the pairwise comparisons of the desired matrix.

**The final weight of the indicators:** The final weight of the elements of each group is equal to the product of the local weight of the elements in the weight of the group head (main factors) and the final rank of each of the effective factors in energy management in residential buildings is determined. The results of this step are shown in Table 7.

*Table 7: Ranking of the effective factors in energy management in residential buildings*

Main Factors	Weight	Secondary Factors	Secondary Factors Weight	Final Weight	Rank (Priority)
A (Cooling)	0.207	A1	0.265	0.055	9
		A2	0.291	0.060	8
		A3	0.114	0.024	17
		A4	0.125	0.026	16
		A5	0.205	0.042	11
B (Heating)	0.333	B1	0.219	0.073	5
		B2	0.098	0.033	15
		B3	0.105	0.035	14
		B4	0.241	0.080	3
		B5	0.138	0.046	10
		B6	0.199	0.066	6
C (Electrical installations)	0.460	C1	0.165	0.076	4
		C2	0.080	0.037	13
		C3	0.087	0.040	12
		C4	0.076	0.035	14
		C5	0.200	0.092	2
		C6	0.255	0.117	1
		C7	0.137	0.063	7

It should be noted that economic justification and investment restrictions are the most important effective factors in any energy replacement program. Therefore, in the first step, all renewable energy sources should be carefully examined and the energy potential and density determined in different locations. In short, replacing energy requires decision-making, thinking and planning, and finally investment. It is also necessary for international institutions to provide appropriate financial support for new energy conversion programs. Apart from this, development requires more technological progress and this goal can be achieved through increasing research programs and also through extensive technical cooperation at the world level, and this requires intelligent thinking and correct ideas. Due to the change in the exploitation techniques of reserves and energy supply sources, the prices of energy extracted from different sources are fluctuating. Having up-to-date information, especially with the high speed of information transmission through the Internet, it is possible to choose optimal solutions and suitable sources of energy supply and to change the type of energy for efficient use in the building. The use of solar energy, wind, ground heat, etc. can be used not only individually but also in combination at the same time. Finally, fossil fuel subsidies are a global obstacle in the development of renewable systems. Currently, the gradual removal of this subsidy has been accepted in our country and is being gradually implemented. According to the existing records in the field of energy management, this is in the form of regulations on how to control energy in the housing, industry and transportation sectors, incentive policies and the use of energy labels in energy-consuming devices, and in addition, the imposition of double taxes on Fossil fuels have been used in



some countries. Gilani and Mohammad Kari (2017), in order to use the passive solar system, simulated the performance of the solar greenhouse in Ardabil city as a cold climate and determined the most suitable direction for this system. They did the use of solar thermal cells has also been studied as a necessary energy supplier. Of course, the efficiency of solar systems depends a lot on environmental parameters, and in areas where the air temperature is higher and the amount of radiation is higher, the efficiency and the amount of cooling produced by active solar air conditioning systems are higher.

## CONCLUSIONS

In order to know the sources of energy loss in residential and commercial buildings, it is necessary to conduct a general energy audit (energy audit) in them and compare the results with a relatively ideal model of a general example of the building in order to determine the sources of energy loss and Necessary measures should be taken to fix it. If the energy audit is done correctly and according to a specific and calculated instruction, it can be a guide line for those who are responsible for controlling energy consumption and guide them in the direction of their responsibility. In order to provide a suitable and relatively ideal model for buildings in terms of energy consumption, it is necessary to pay attention to the building from all angles or to determine the important points from the point of view of energy loss in buildings in order to be able to find the desired model in based on these parameters.

## REFERENCES

- Ahmad, S., Naeem, M., & Ahmad, A. (2019). Low complexity approach for energy management in residential buildings. *International Transactions on Electrical Energy Systems*, 29(1), e2680.
- Allahyari, F., Behbahaninia, A., Rahami, H., Farahani, M., & Khadivi, S. (2020). Development of a model for energy management in office buildings by neural networks (case study: Bandar Abbas). *International journal of environmental science and technology*, 17(6), 3279-3288.
- Antipova, E., Boer, D, Guillen-Gosalbez, G., Cabeza, L.F. & Jimenez, L. (2016). Multi-objective optimization coupled with life cycle assessment for retrofitting building. *Energy and Buildings*, 82, 92-99.
- Diakaki, C., Grigoroudis, E. & Kolokotsa, D. (2018). Towards a multi-objective optimization approach for improving energy efficiency in buildings. *Energy and Buildings*, 40(9), 1747-1754.
- Fathalian, A., & Kargarsharifabad, H. (2018). Actual validation of energy simulation and investigation of energy management strategies (Case Study: An office building in Semnan, Iran). *Case studies in thermal engineering*, 12, 510-516.
- Fei, X., Xuejun, R., & Razmjoo, N. (2019). Optimal configuration and energy management for combined solar chimney, solid oxide electrolysis, and fuel cell: a case study in Iran. *Energy sources, part A: Recovery, utilization, and environmental effects*, 1-21.
- Grigoroudis, E. & Kolokotsa, D. (2017). Performance study of a multi-objective mathematical programming modelling approach for energy decision-making in buildings. *Energy*, 59, 534-542.
- Lork, C., Li, W. T., Qin, Y., Zhou, Y., Yuen, C., Tushar, W., & Saha, T. K. (2020). An uncertainty-aware deep reinforcement learning framework for residential air conditioning energy management. *Applied Energy*, 276, 115426.
- Moosavi, L., Alidoost, S., Norouzi, F., Sattary, S., & Banihashemi, S. (2022). Trombe wall's thermal and energy performance—A retrofitting approach for residential buildings in arid climate of Yazd, Iran. *Journal of Renewable and Sustainable Energy*, 14(4), 045101.
- Nizami, M. S. H., Hossain, M. J., & Fernandez, E. (2019). Multiagent-based transactive energy management systems for residential buildings with distributed energy resources. *IEEE Transactions on Industrial Informatics*, 16(3), 1836-1847.
- Sepehr, M., Eghtedaei, R., Toolabimoghadam, A., Noorollahi, Y., & Mohammadi, M. (2018). Modeling the electrical energy consumption profile for residential buildings in Iran. *Sustainable cities and society*, 41, 481-489.
- Zamanloo, S., Abyaneh, H. A., Nafisi, H., & Azizi, M. (2021). Optimal two-level active and reactive energy management of residential appliances in smart homes. *Sustainable Cities and Society*, 71, 102972.

## **SIX SIGMA AND TQM CONCEPT IN THE FUNCTION OF IMPROVING BUSINESS PERFORMANCE**

**Aleksandra Božović**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [aleksandra.bozovic@tfzr.rs](mailto:aleksandra.bozovic@tfzr.rs)

**Milena Cvjetković**

College of Academic Studies "Dositelj", Belgrade, Republic of Serbia

### **ABSTRACT:**

Uncertain business conditions and the struggle for survival in the market force organizations to improve their business processes and build their competitive advantage on that basis. When it comes to the achieved degree of business improvement and competitiveness of companies, there is a difference between developed countries and developing countries. The process of globalization has enabled market conditions for the development of companies in developed countries. On the other hand, companies from developing countries, due to inadequate productivity, low quality, outdated equipment and technology and inadequate application of modern management methods and tools, face difficult challenges to fight for their place in the international market. The paper shows the role of the Six Sigma method and the TQM concept in improving the business performance of the company. Based on the application of the mentioned concepts companies create favorable frameworks for improving the quality and competitiveness of business, by improving their business.

**Keywords:** Six Sigma, TQM concept, quality, competitiveness.

### **INTRODUCTION**

Organizations face many market challenges in today's business environment. The struggle for a market position and for its further development is difficult due to increasing competition. Success in the market is guaranteed to those who have satisfied users who remain loyal to them. In order to satisfy their users, they must provide them with a satisfactory level of quality of their products and services. Quality is a factor by which organizations achieve a competitive advantage in the market. Organizations use different methods and tools to improve the quality of business, while reducing costs and achieving the highest possible level of product and service quality. The paper shows the effects of applying Six Sigma and TQM concepts in different companies, with a focus on the key benefits brought by their application in business. While the Six Sigma concept focuses on error reduction and business improvement, the TQM concept represents the most general quality management concept that takes into account the interests of all stakeholders of the organization.

### **SIX SIGMA CONCEPT**

The concept of Six Sigma is an increasingly frequent subject of research, both in the academic and business fields, due to its financial impact and the impact it has on the level of customer satisfaction. The application of the concept of Six Sigma in business leads to an increase in financial performance in the short term (Thomas, Barton et al. 2009), leads to a reduction in costs (Anchanga, 2006), achieves an improvement in customer satisfaction and cost savings (Sharma 2003). In service organizations, the application of the Six Sigma concept enables the achievement of operational excellence, cost reduction and the application of quality standards (Barrios, Jimenez, 2016).

The modern business environment imposes the need for managers responsible for quality assurance to often combine the Six Sigma approach with the Lean concept and thus the Lean Six Sigma approach appeared (Drohomeretski et al., 2014). Therefore, it has become imperative for organizations to implement six sigma and lean approaches in order to improve the quality of their goods and services and to achieve a competitive advantage in the market by reducing costs (Sujovala et al., 2016).

Lean Six Sigma is recognized as a business strategy for improving the competitiveness of companies through customer delight and improved results (Sordan et al., 2020). This approach can fit well into the DMAIC (Define, Measure, Analyze, Improve, Control) phases for effective project implementation, both in the manufacturing and service industries. This approach uses tools from the Lean Thinking and Six Sigma methodologies to increase speed and accuracy (Gijo et al., 2019), but also to achieve competitive advantages (Bhat et al., 2021). One of the principles on which the Six Sigma method is based refers to a maximum of 3 to 4 product defects per million manufactured products (Drohomeretski, et al., 2014). Six Sigma is complementary with ISO standards and companies that have implemented ISO standards in their business achieve better results with Six Sigma concept than is the case with non-certified companies.

A survey (Ertürk et al., 2016) conducted among white goods companies in Turkey indicated that the implementation of the Six Sigma approach contributed 20-39% to new technology development, 40-59% to new product development, 20-39% to the number of innovations, 80-100% to costs in productivity and profitability, 60-79% in competitiveness and customer satisfaction, 40-59% in employee satisfaction and 60-79% in market share. Through the conducted research, it can be concluded that defining the approach to measurement, analysis, improvement and control of the Six Sigma approach refers to the ability of organizations to improve the cost effectiveness of its quality, such as prevention costs, evaluation costs, internal failure costs and external failure costs (Prashara, 2014).

## **TQM CONCEPT**

Organizations strive to improve their competitiveness in the market by applying various quality improvement strategies. It strives towards to continuously improve quality in all phases of production and processes related to the provision of services in order to achieve user satisfaction, with efficient doing of jobs and achievement of economic excellence (Alzoubi, Ahmed, 2019).

The research results (Yanamandra, Alzoubi, 2022) showed that maximum value, minimum waste and continuous improvement are related to the ability of these organizations to improve the effectiveness of their quality-related costs - prevention costs, evaluation costs, internal failure costs and external failure costs (Alkunsol et al., 2019).

TQM is a systemic approach to management that aims to continuously increase customer value (Ulevicz, Skovron-Novicka, 2017), design and continuous improvement of organizational processes and systems. TQM is a way of thinking about goals, organizations, practices and people to ensure that they are doing the right things (Bajaj et al., 2019; Eniola et al., 2019). TQM is focused on quality awareness through all organizational processes (Siviec, Pacana 2019). TQM is a way of life and part of the culture of an organization. The implementation of this concept requires radical changes in the organizational culture and structure, which implies redefining the connections within the company and between the company and its stakeholders. TQM is a corporate culture characterized by increasing customer satisfaction provided by continuous quality improvement involving all employees. In the era of increasing competition, the fight for customers on the market is provided by companies that set above-average criteria for the quality of their products and services (Kumar, Sharma, 2018).

Organizational performance is directly related to investment in human capital. The result of the research (Yusr, 2016) showed that TQM practices have a superior role in strengthening innovative

capabilities. This claim is supported by the RBV theory, where the theory emphasizes the role of valuable resources that a company can possess in building certain salient capabilities.

The research (Obeidat et al., 2018) aimed to investigate the relationship between human resource management, total quality management and competitive advantage. The impact of human performance management in the implementation of the TQM concept gave the following results: training and development have the greatest impact on TQM practice, followed by recruitment and selection of employees, performance appraisal and finally compensation and rewards. The results indicated the existence of a statistical impact of total quality management practices on competitive advantage, where strategic management has the strongest effect in achieving competitiveness, then employee empowerment and continuous improvement, and finally customer satisfaction and leadership.

The results show that the TQM concept is still used by many organizations around the world and that it successfully helps the organization improve its competitiveness, business growth and sustainability, as well as increase employee morale (Permana et al., 2021).

There is no specific agreement on the elements that make up TQM and still the elements differ among different researchers around the world (Corredor, Goni, 2011). There are a total of eight heterogeneous TQM elements after similar elements are combined into one category of elements that make up leadership, strategic planning, total quality management, process management, product and service design, employee management, customer relationship management, and information and analysis (Yeng et al., 2018).

The concept of TQM is a key element for achieving excellent organizational performance, a key indicator of a company's ability to compete in the market, and a key factor for achieving competitive advantage. Therefore, the TQM concept has a great impact on customer satisfaction, competitive power and innovation of the company (Yousif et al., 2017).

The research (Kisel'áková et al., 2020) showed that the size of the company has a statistically significant influence on the use of the TQM concept, while among obstacles for the application of this concept, the most common workforce and lack of financial resources stand out. This study determined the relatively frequent use of the TQM concept in developed countries, while its application affects sustainable growth and competitiveness in the market environment around the world.

## **APPLICATION OF SIX SIGMA AND TQM CONCEPTS IN COMPANIES IN SERBIA**

Good QM practice in Serbia is being improved, both in the organizational (IMS) and technical (Six Sigma) aspects, and a good basis is being created for the adoption of TQM in manufacturing companies from different sectors. It can be expected that these results will facilitate the adoption of the overall TQM culture in Serbia and influence its future sustainability (Majstorovic, Sibalija, 2015). Research results (Stojiljković, 2013) indicate that the majority of foreign companies operating in the territory of the Republic of Serbia apply the Six Sigma concept. Regarding the use of the Lean concept and Six Sigma, Serbia is still inferior compared to developed countries. However, an increasing number of managers in domestic companies successfully promote these principles and indicate the possibility of increasing the performance of business processes and reducing waste, without large investments (Stojanović, Milovanović, 2020).

The subject of the research was the impact of total quality management on the creation of value for customers and owners, where the relationship between the key factors of total quality management and the marketable, i.e. financial performance of the company's operations was analyzed on a sample of 141 companies operating in the territory of the Republic of Serbia. Regarding financial performance, TQM factors of focusing on employees, continuous improvement and socially responsible business showed a statistically significant positive impact on ROE (Return on Equity), while the factors of customer orientation, commitment of top management, process approach, continuous improvement,

information and analysis, and corporate social responsibility showed a statistically significant positive impact on ROS (Robot Operating System) (Milovanović, Janošević, 2019).

Based on the TQM philosophy, the family of international standards ISO 9000 is defined to guide companies towards continuous improvement of business quality. Given that TQM is considered a kind of business philosophy, these standards represent a certain form of its materialization. Ineffective implementation may be the result of unrealistic expectations, deficiency of belief in success, deficiency of motivation and inability to implement change. Unclear priorities and conflicting goals of companies most often result in a negative impact on the attitude of employees towards quality.

## CONCLUSION

The research results presented in the paper indicate the importance of the application of Six Sigma and TQM concepts in business. The concept of Six Sigma leads to increased financial performance, reduced costs and increased customer satisfaction. This concept has a positive impact on the development of new technologies and innovations. By applying the TQM concept, organizations achieve business excellence and greater customer satisfaction through continuous quality improvement. Organizations that use these two concepts ensure a higher level of product and service quality, as well as the entire business, while the effect of applying these concepts is very pronounced when it comes to achieving a competitive advantage in the market. The results of the research indicated that companies in Serbia increasingly recognize the importance of applying the Six Sigma concept as an effective tool for improving business processes and reducing costs and defects. Domestic companies implement the philosophy of the TQM concept through the implementation of the ISO 9000 standard, where the effects are noticeable in improving the financial and market performance of the business. Future trends in the implementation of these concepts in the business of domestic companies can expect their greater application, which will result in competitive and sustainable business.

## REFERENCES

- Alkunsol, W. H., Sharabati, A. A., AlSalhi, N. A., & ElTamimi, H. S. (2019). Lean Six Sigma effect on Jordanian pharmaceutical industry's performance, *International Journal of Lean Six Sigma*, 10(1), 23-43. <https://doi.org/10.1108/IJLSS-01-2017-0003>
- Alzoubi, H., & Ahmed, G. (2019). Do Total Quality Management (TQM) Practices Improve Organizational Success? A case study of electronics industry in the UAE. *International Journal of Economics and Business Research*, 17(4), 459-472. <https://doi.org/10.1504/IJEER.2019.099975>
- Anchanga, P. (2006). Critical success factor for lean implementation within SMEs. *Journal of Manufacturing Technology Management* 17(4), 11. <https://doi.org/10.1108/17410380610662889>
- Bajaj, S., Garg, R., Sethi, M., & Dey, S. (2019). Classification and positioning of TQM practices for implementation in steel industries. *International Journal of Quality & Reliability Management*. 36 (9), 1556-1573. <https://doi.org/10.1108/IJQRM-07-2018-0196>
- Barrios, M. A. O., & Jiménez, H. F. (2016). Use of six sigma methodology to reduce appointment lead-time in obstetrics outpatient department. *Journal of Medical Systems*, 40(10), 293-302. <https://doi.org/10.1007/s10916-016-0577-3>
- Bhat, S., Gijo, E. V., Rego, A. M., & Bhat, V. S. (2021). Lean Six Sigma competitiveness for micro, small and medium enterprises (MSME): an action research in the Indian context. *The TQM Journal*, 33(2), 379-406. <https://doi.org/10.1108/TQM-04-2020-0079>
- Corredor, P., & Goñi, S. (2011). TQM and performance: Is the relationship so obvious? *Journal of Business Research*, 64(8), 830-838. <https://doi.org/10.1016/j.jbusres.2010.10.002>
- Drohomeretski, E., Gouvea da Costa, S. E., Pinheiro de Lima, E., & Garbuio, P. A. D.R. (2014). Lean, Six Sigma and Lean Six Sigma: an analysis based on operations strategy. *International Journal of Production Research*, 52(3), 804-824. [doi:10.1080/00207543.2013.842015](https://doi.org/10.1080/00207543.2013.842015).
- Eniola, A. A., Olorunleke, G. K., Akintimehin, O. O., Ojeka, J. D., & Oyetunji, B. (2019). The impact of organizational culture on Total Quality Management in SMEs in Nigeria. *Heliyon*. 5 (8). <https://doi.org/10.1016/j.heliyon.2019.e02293>

- Ertürk, M., Tuerdi, M., & Wujiabudula, A. (2016). The effects of six sigma approach on business performance: A study of white goods (home appliances) sector in Turkey. *Procedia-Social and Behavioral Sciences*, 229, 444-452. <https://doi.org/10.1016/j.sbspro.2016.07.154>
- Gijo EV., Antony, J., & Sunder M, V. (2019). Application of Lean Six Sigma in IT support services—a case study. *The TQM Journal*, 31(3), 417-435. <https://doi.org/10.1108/TQM-11-2018-0168>
- Kiselić, D., Gallo, P., Čabinová, V., & Onuferová, E. (2020). Total Quality Management as managerial tool of competitiveness in enterprises worldwide. *Polish journal of management studies*, 21. [10.17512/pjms.2020.21.2.14](https://doi.org/10.17512/pjms.2020.21.2.14)
- Kumar, V., & Sharma, R. R. K. (2018). Leadership styles and their relationship with TQM focus for Indian firms: An empirical investigation. *International Journal of Productivity and Performance Management*, 67 (6), 1063-1088. <https://doi.org/10.1108/IJPPM-03-2017-0071>
- Majstorovic, V., & Sibalija, T. V. (2015). From IMS and six sigma toward TQM: an empirical study from Serbia. *The TQM Journal*, 27(3), 341-355. <https://doi.org/10.1108/TQM-12-2013-0130>
- Milovanović, V., & Janošević, S. (2019). Total quality management in the function of value creation: View from the strategic management perspective. *Ekonomika preduzeća*, 67(5-6), 319-333. DOI:10.5937/EKOPRE1906319M
- Obeidat, D., Yousef, B., Tawalbeh, H. F., & Masa'deh, R. E. (2018). The relationship between human resource management (HRM) practices, total quality management (TQM) practices and competitive advantages. *Total Quality Management (TQM) Practices and Competitive Advantages* (December 12, 2018). *Modern Applied Science*, 12 (11). <https://ssrn.com/abstract=3300265>
- Permana, A., Purba, H. H., & Rizkiyah, N. D. (2021). A systematic literature review of Total Quality Management (TQM) implementation in the organization. *International Journal of Production Management and Engineering*, 9(1), 25-36. DOI: <https://doi.org/10.4995/ijpme.2021.13765>
- Prashar, A. (2014). Adoption of Six Sigma DMAIC to reduce cost of poor quality. *International Journal of Productivity and Performance Management*, 63(1), 103-126. <https://doi.org/10.1108/IJPPM-01-2013-0018>
- Sharma, U. (2003). Implementing Lean principles with the Six Sigma advantage: How a battery company realized significant improvements. *Journal of Organizational Excellence* 22 (3), 9. <https://doi.org/10.1002/npr.10078>
- Siwicz, D., & Pacana A. (2019), The Use Of Quality Management Techniques To Analyse The Cluster of Porosities on the Turbine Outlet Nozzle, *Production Engineering Archives*. 24, 33-36. <https://doi.org/10.30657/pea.2019.24.08>
- Sordan, J.E., Oprime, P.C., Pimenta, M.L., Chiabert, P., & Lombardi, F. (2020), Lean Six Sigma in manufacturing process: a bibliometric study and research agenda, *The TQM Journal*, 32 (3), 381-399. <https://doi.org/10.1108/TQM-08-2019-0207>
- Stoilković, V. (2013). *Lean u zdravstvu [Lean in Health]*. Niš: Despot book.
- Stojanović, J., & Milovanović, G. (2020). The importance of lean manufacturing and six sigma concept for quality management of supply chain business processes. *Facta Universitatis, Series: Economics and Organization*, 285-297. <https://doi.org/10.22190/FUEO200118021S>
- Sujova, A., Simanova, L., & Marcinekova, K. (2016). Sustainable Process Performance by Application of Six Sigma Concepts: The Research Study of Two Industrial Cases, *Sustainability*, 8, 260. <https://doi.org/10.3390/su8030260>
- Thomas, A., R. Barton, et al. (2009). Applying lean six sigma in a small engineering company - a model for change. *Journal of Manufacturing Technology Management* 20 (1), 16. <https://doi.org/10.1108/17410380910925433>
- Ulewicz, R., & Skowron-Nowicka, M. (2017), Total Quality Management in the Practice of Polish Metallurgical Enterprise, 26th International Conference On Metallurgy And Materials, 2338-2343
- Yanamandra, R., & Alzoubi, H. M. (2022). Empirical investigation of mediating role of six sigma approach in rationalizing the COQ in service organizations. *Operations and Supply Chain Management: An International Journal*, 15 (1), 122-135. <https://doi.org/10.31387/oscm0480335>
- Yeng, S. K., Jusoh, M. S., & Ishak, N. A. (2018). The impact of total quality management (TQM) on competitive advantage: a conceptual mixed method study in the Malaysia luxury hotel industries. *Academy of Strategic Management Journal*, 17(2), 1-9.
- Yousif, A. S. H., Najm, N. A., & Al-Ensour, J. A. (2017). Total quality management (TQM), organizational characteristics and competitive advantage. *Journal of Economic & Financial Studies*, 5(04), 12-23. <https://doi.org/10.18533/jefs.v5i04.293>
- Yusr, M. M. (2016). Innovation capability and its role in enhancing the relationship between TQM practices and innovation performance. *Journal of Open Innovation: Technology, Market, and Complexity*, 2(1), 1-15. <https://doi.org/10.1186/s40852-016-0031-2>

## **DIAGNOSTICS OF AIR CONDITIONER FAILURES AS A DIGITAL SYSTEM**

**Spasoje Erić**

Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia

E-mail: [erics@ptt.rs](mailto:erics@ptt.rs)

**Aleksandar Rajić**

Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia

**Ivan Palinkaš**

Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia

### **ABSTRACT**

The paper presents the diagnosis of air conditioner malfunctions. The air conditioner as a digital system works according to the established algorithm, i.e. in the sequence of actions that start one after the other. Parts of the air conditioner can be in working condition (1) or in failure (0), so malfunctions can be easily diagnosed. The aim of the paper is to present the work algorithm and the procedure for detecting failure and its elimination.

**Keywords:** Air conditioner, Fault diagnosis, Digital system.

### **INTRODUCTION**

Technical maintenance of the system (machines and plants) is a set of procedures and activities whose purpose is to prevent the occurrence of failure (or downtime), as well as to return the system to a working condition, in the shortest possible time and with the lowest possible costs, under the given conditions of the environment and work organization. (Adamović, Lazić & Petrović, 2007)

The air conditioner is a device used for indoor regulation of the temperature. These devices, depending on the version, have the purpose of cooling or heating the air in the room. They are made as one-part (window air conditioner, portable - penguin air conditioner...), two-part - split system (indoor and outdoor unit) or multi (one outdoor and several indoor units). During operation, the air conditioner also purifies the air, as well as dehumidifies the air in the cooling mode. (Erić, Rajić & Stojanović 2022)

The most commonly recognized benefits associated with successfully detecting and diagnosing faults in air conditioning systems are (1) reducing energy consumption and (2) reducing maintenance costs. The fault detection and diagnosis benefit the occupant and homeowner through reliable comfort and reduced maintenance cost, but also can benefit many other entities. The dealer, installer, and service company could also pay for access to the fault detection and diagnosis data, in order to receive feedback about their services and to improve air conditioning systems in following areas: reduced maintenance cost; reduced electricity cost; improved commissioning; reduced peak demand; reduced carbon emissions and electricity cost. (Rogers, Guo & Rasmussen, 2019)

Split-type air conditioners are getting more popular because of an ease of installation on existing buildings and high energy efficiency (Donghyuk, Sukkyung, Jaisuk, Dong-Kwon & Baek, 2021). Currently, split systems, due to their greater prevalence and longer appearance and operation as ON/OFF systems (compared to newer inverter devices), have a greater occurrence of failures, but also an easier and faster way to detect the failure and eliminate it.



The paper presents a general approach without detailed measurements. The measurements performed during diagnostics are measurements with a unimeter, where resistance, amperage, capacitance and current voltage are measured. Measurements with a manometer, fluid pressure measurements during cooling mode and heating mode are also performed. Using a thermometer, the ambient temperature and the output air temperature are measured. We measure the weight of gas according to manufacturer's specifications when filling the air conditioner or refilling, using a digital scale.

## TECHNICAL DIAGNOSTICS AND AIR CONDITIONER

The structure of Technical Diagnostics includes two interconnected directions:

- The theory of finding (recognition), and
- Trait control theory.

The theory of recognition is used to establish diagnostic models of observed object, and also to develop a recognition algorithm and correct understanding of the solution. The theory of property control includes the development of means and methods for obtaining diagnostic information, control of the object technical condition and finding malfunctions. (Adamović, 2007)

A basic view of the structure of the air conditioner can be given through the classic feedback loop of automatic control, (see also Figure 1).

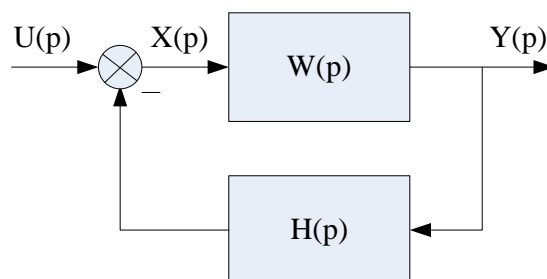


Figure 1: Automatic control feedback loop

A working subsystem can be shown as:

$$F(p) = W(p) \cdot X(p) \quad (1)$$

While the transfer control function of the system can be given as:

$$W_s(p) = \frac{W(p)}{1 + W(p) \cdot H(p)} \quad (2)$$

Air conditioners (ON/OFF) are intended primarily for cooling, but they can also be used for heating. They have less application in heating compared to inverter devices due to the consumption of electricity. Electricity consumption is lower in heating mode compared to cooling.

The split system (ON/OFF) consists of one external and one internal unit, which contains the electronics that control the operation of the air conditioner (see also Figure 2).





Figure 2: Split air conditioner

The internal unit of the air conditioner consists of the following parts: plastic casing, honeycomb, electronics, power cable, turbine, turbine motor, probes (ambient and pipes), transformer and air guide motor (blades). The outdoor unit consists of the following parts: casing (metal or plastic), honeycomb, compressor, fan, four-way valve, spool, and in some cases probe. The units are connected with two pipes (liquid and gas) as well as a five-wire communication cable, and in the case with an external probe, a two-wire cable was added. The presented parts are applied in the most common cases.

## TYPES OF FAILURE DIAGNOSTICS

Types of failure diagnostics can be divided into two groups:

- diagnostics based on error display i
- diagnostics of the algorithmic approach.

Diagnostics based on error display means detecting a failure based on what the indoor unit signals. This signaling can be in two ways depending on the model and age of the device. Older devices signaled by a combination of flashing lights (number of flashes and on/off), which was interpreted for each device, depending on the manufacturer, from the given error tables. Newer devices use error code display in a combination of letters and numbers. This is shown in Table 1.

Table 1: List of faults of the Volt air conditioner

Display	Problem description
E1	Indoor unit air sensor error
E2	Indoor unit suction pipe temperature sensor error
E3	Outdoor unit pipe temperature sensor failure
E4	Leakage or failure of the refrigerant system
E6	Poor indoor unit fan motor operation
E7	Outdoor unit suction temperature sensor failure
E0	Indoor and outdoor unit communication error
E8	Outdoor unit discharge temperature sensor failure
E9	IPM outdoor unit inverter compressor failure
EA	Outdoor unit current overload
EE	Outdoor unit inverter PCB EEPROM error
EH	Outdoor unit fan motor failure
EF	Outdoor unit suction temperature sensor failure

The diagnosed error that the electronics of the air conditioner displays is an error based on the parameters that the device collects during operation, but quite often, for some reason, those parameters are disturbed, so the error is not found somewhere else.

Algorithmic approach diagnostics is fault detection by monitoring the operation of the device step by step. This procedure can be applied for the reason that the start and operation of the air conditioner is done in a patterned manner, so the detection of the fault can be performed by monitoring the moment of the error occurrence.

The first method gives an error display, and also in the troubleshooting instructions it also gives a proposal of the algorithm for detecting it. Combining these two methods will get to the cause of malfunction.

Table 2: Algorithm of fault finding and elimination

Action	Device response and possible malfunction	Error finding and removal
Power on	No sound signal	Checking the voltage in the socket Dismantle the indoor unit Checking the voltage on the board at the points of arrival of the power cable Checking the fuse Checking the transformer Replacement or repair of electronics
	Error message or flashing lights	Measure the resistance of the indoor unit probes
	The air deflector blades are not moving	Replace the stepper motor of the router
	Error message or flashing lights	Turn on the fan mode Replace the turbine motor
Switching on the air conditioner in the cooling mode	Sound signal Wing opening Starting the turbine engine Error display	Check the probe of the outdoor unit if there is one Check the connections of the communication cable on the outdoor and indoor units
	The fan on the outdoor unit does not start	Check the fan capacitor Replace the fan motor
	Fuse blowing	Check the compressor capacitor Check the communication cable Check the cables on the compressor
	The compressor does not start	Check the compressor capacitor Check the cables on the compressor Measure the resistance of the compressor connections
	The compressor turns off	Check the freon pressure Check the ambient probe
	Icing of indoor unit	Check the freon pressure
	The set temperature is not achieved	Check the freon pressure Check the dirtiness of the filter, turbine and comb
Switching on the air conditioner in the heating mode	Sound signal Wing opening Error display	Check the probe of the outdoor unit if there is one Check the connections of the communication cable on the outdoor and indoor units
	No spool sound is heard	Check and replace the spool Defective four-way valve
	Fuse blowing	Check the compressor capacitor Check the communication cable Check the cables on the compressor
	The compressor does not start	Check the compressor capacitor Check the cables on the compressor Measure the resistance of the compressor connections
	The compressor turns off	Check the freon pressure Check the ambient probe
	The set temperature is not achieved	Check the freon pressure Check the dirtiness of the filter, turbine and comb

## DIAGNOSTIC OF MALFUNCTIONS USING ALGORITHMIC APPROACH

The air conditioner is a digital system made up of parts that are connected into one unit and function according to the (ON/OFF) principle, and therefore the application of the algorithmic method of fault detection is a convenient solution for diagnostics. Algorithmic representation can be given schematically or tabularly. In the presented table, procedures are given, i.e. starting of device elements in sequence, possible error and its elimination. This is shown in Table 2.

In the table 2, the actions carried out by the user or service technician are presented in the first column. The second column represents the answer, i.e. response to the action not performed according to the order that the air conditioner carries out according to the memory in the electronics of the air conditioner. The third column is the diagnosis of the error, the procedure of the necessary measurements and the necessary replacement of parts.

Each listed problem also contains a separate work algorithm for solving and repairing. Algorithms for monitoring the workflow, detecting errors and repairs are provided by manufacturers according to a list of printed errors that may appear on the device screen or flashing lights. The presentation of the problem solving algorithm can be seen individually on Midea's example for models with LEDs (see also Figure 3).

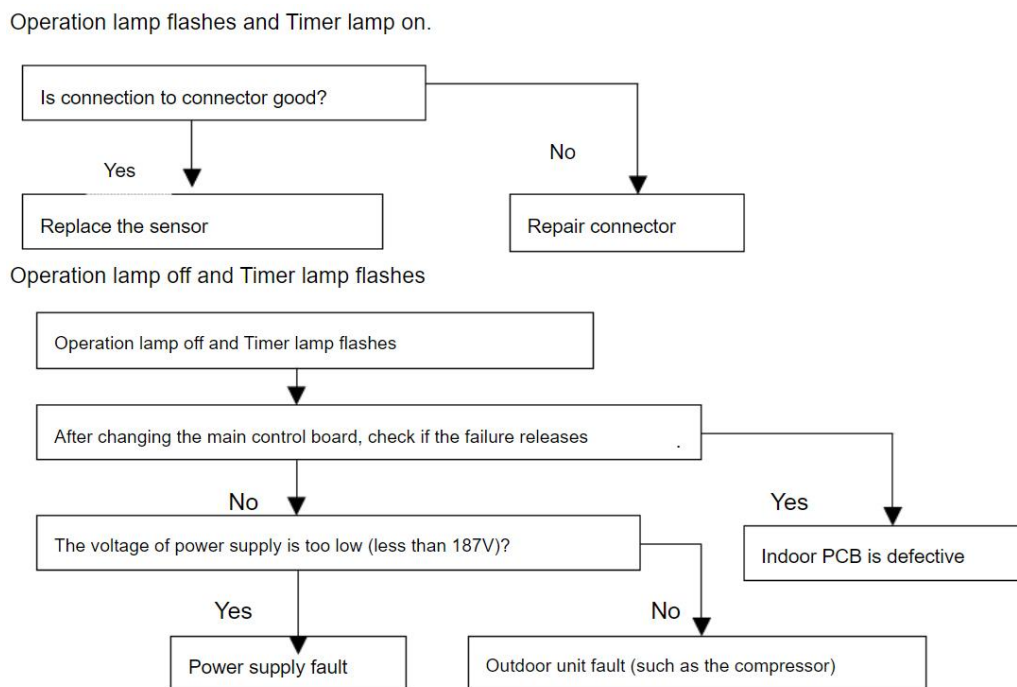


Figure 3: Layout of the algorithm as indicated by the lights of the manufacturer Midea

## CONCLUSION

The paper presents an overview of the air conditioner with a description of the working principle, the starting order of the parts, and fault diagnosis. Also, presents a theoretical approach to the problem with a practical implementation for troubleshooting. The work is divided into several segments that are parts of a more complex process, and each segment could be approached individually and in more detail in the elaboration and elimination of malfunctions and problems in the operation of air conditioners.

## REFERENCES

- Adamović Ž., Lazić Lj., Petrović S. (2007), *Održavanje tehničkih sistema*, Beograd, Akademija inženjerstva održavanja.
- Adamović, Ž., (2007), *Pouzdanost hidrauličkih sistema*, Beograd, Srpska Akademija inženjerstva održavanja.
- Donghyuk K., Sukkyung K., Jaisuk Y., Dong-Kwon K., & Baek Youn. (2021). A study on the quantitative single and dual fault diagnosis of residential split type air conditioners in static operation using support vector machine method. *International Journal of Refrigeration*. 131, 206-217.
- Erić S, Rajić A., Stojanović Ž. (2022), *Dijagnostika stanja i tehničko održavanje klima uređaja*, Zrenjanin, DIT broj 37, 33-38.
- <https://cdn.vanguardngr.com/wp-content/uploads/2019/01/air-conditioners.png>, (Accessed on 17.05.2022).
- <https://www.manualslib.com/manual/537652/Midea-Msh-07crn1-Msh-07hrn1-Msh-09crn1-Msh-09hrn1-Msh-12crn1-Msh-12hrn1.html?page=31#manual>, (Accessed on 28.10.2022.).
- Raičević, Z. (2009), *Servisiranje i montaža Split klima uređaja*, Regionalni centar za obrazovanje odraslih Tehnička škola "Novi Beograd", Beograd.
- Raičević, Z. (2009), *Servisiranje kućnih rashladnih uređaja*, Beograd, Regionalni centar za obrazovanje odraslih Tehnička škola "Novi Beograd".
- Rogers, A.P., Guo, F., Rasmussen, B.P. (2019). A review of fault detection and diagnosis methods for residential air conditioning systems. *Building and Environment*. 161, 106236.

## **KEYBOARDS AS INPUT DEVICES: STANDARDIZATION AND FUTURE TRENDS**

**Goran Janačković**

University of Niš, Faculty of Occupational Safety, Niš, Republic of Serbia

E-mail: [janackovic.goran@gmail.com](mailto:janackovic.goran@gmail.com)

**Dejan Vasović**

University of Niš, Faculty of Occupational Safety, Niš, Republic of Serbia

**Bojan Vasović**

Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia

**Violeta Milićević**

Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia

**Zoran Jovanović**

Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia

### **ABSTRACT**

Although computer systems have been significantly improved in recent years, basic means of human-computer communication on desktop or portable devices has not changed a lot. The most common input devices are still keyboards. The existence of touch screens on smaller laptops and mobile devices made it possible to replace the physical keyboard with a virtual one, but the communication process itself remained almost unchanged. Numerous standards have been defined for the keyboard as an important input device, which describe its desirable characteristics from the point of view of functionality and ergonomics. Often, these characteristics can have a significant impact on the way of use, and directly or indirectly on the user's health. The adaptability of the keyboard and the properties of the switches can greatly improve the user experience, eliminate non-physiological positions of users and decrease load on the joints of fingers and hands. This paper presents representative ISO standards that refer to keyboards as input devices and their most important characteristics.

**Keywords:** Keyboard, Standardization, Requirements, Safety, Ergonomics

### **INTRODUCTION**

The development of computer systems, especially expressed during the 1970s and 1980s and the microcomputer revolution, led to their indispensable application not only in the work environment, but also outside it. The majority of employees use desktop or portable devices every day, and almost all of them have mobile devices. According to Hedge (2017), this caused a technological shift from paper to computer, but there was also a significant need to consider the ergonomic aspects of such an adapted work environment, as well as to consider computer components, their characteristics and impact on users. A number of influential factors in the work environment initiated the need to use certain approaches, such as the systemic approach, or method, such as systemic risk analysis (Savić et al., 2021). This led to the identification of various desirable characteristics that should be possessed by a computer system and its components, as well as the development of various standards in the domain of human-computer interaction and user interfaces (Hedge, 2017; Norman and Kirakowski, 2018; Janačković et al., 2022).

Despite the significant development of computers and peripheral devices, the most common form of communication with these systems is using a keyboard. Depending on the type of system, they can be physical or virtual. In both cases, the communication process is carried out by entering text, numbers or special characters, that is, by executing certain special functions displayed on the keys, physical or virtual. This paper presents the representative ISO standards that refer to these input devices and some of

the characteristics important for their functionality, that is, the potential impact of these characteristics on users.

## **LITERATURE REVIEW**

Often the consideration of safety and productivity in the work environment is reduced to physical aspects, such as designing the thermal environment for comfort, indoor air quality, psychoacoustics and vibrational effects, as well as lighting (Hedge, 2017). These are indispensable influencing factors when using computers at work, but also at home, where inappropriate work postures and insufficient lighting are even more common, which affect the health of users, but also the results of their work and sustainable productivity. In addition, the aspect of interaction is particularly important (Norman & Kirakowski, 2018), so special efforts have been made to standardize human-system and human-computer interaction (ISO, 2018), principles of interaction and user interfaces (ISO, 2020; Janačković et al., 2022), as well as physical characteristics of input devices (ISO, 2007). A software-defined user interface must be coupled with appropriate hardware components that support that interaction. Thus, the dominant way of entering text on desktop and laptop computers is by using a physical keyboard, with a certain shape, dimensions, size and number of available keys. The widespread use of smart phones and tablet devices has made it possible to remove physical keyboards, but interaction is carried out in a very similar way using their virtual representatives.

The standardization of such a commonly used input device has a dual significance. This ensures that the functionalities provided by keyboards as input devices are clear to all users regardless of the language they use. Furthermore, it enables the creation of a safer work environment for users (Bretschneider-Hagemes et al., 2018; Emerson et al., 2021; Green, 2020) and supports the efforts made to develop system standards in the field of occupational safety and health (Mušicki et al., 2020; Mušicki et al., 2021). There are numerous challenges before the development of these standards, which should include different requirements and ideas (Kuhn, 2007), and there are different ideas about how to optimize and adapt the existing layout (Nivasch & Azaria, 2022), that is, how to improve existing solutions (Nacheva, 2020).

## **METHOD**

In the process of searching and selecting initial material for research purposes, materials available in the KoBSON database of full-text scientific journals and e-books were used. By searching the content provided by individual publishers and aggregators, using appropriate phrases and keywords as inclusion criteria for selection, without a specially defined time limit, initial material was obtained that included both original and overview content. In this step, a standard search protocol was applied, which enabled identification, screening, significance checking and inclusion. By analyzing the initial material, applying the analytical-synthetic model of research, key aspects and directions of research were identified, on which a special focus was directed when considering the standards.

In order to generate relevant results, based on the available data, research questions were defined, which relate to the importance and impact of standardization, the most significant standards on human-computer interaction and keyboard functionality, as well as the impact on the effective and healthy use of these devices, while identifying and supporting modern trends in development. Based on the defined research questions, the identification and analysis of available international ISO standards and/or their local versions made available by the Institute for Standardization of Serbia was undertaken.

## **RESULTS**

Despite considerable effort invested in the last thirty years in the development of alternative input devices, the keyboard in combination with the mouse on desktop devices, with an additional touchpad on portable devices, is still basic input device enabling efficient interaction with the user interface and data entry. The development and proliferation of mobile and portable devices with touch screens has made it possible to replace physical keyboards with virtual ones, since the development of conversational

interfaces based on spoken language or the use of special gestures for executing commands and entering text (Janačković et al., 2022) has not yet reached the desired level.

There are numerous standards that relate to keyboards and their features. Table 1 shows some representative standards for different types of keyboards, both physical and virtual. This includes human-system interaction, different types of user requests and keyboard shapes, as well as a formal description. A short description, classification and stage are shown for each standard.

*Table 1: Some representative standards for different types of available physical and virtual keyboards*

<b>Standard</b>	<b>Description</b>	<b>Classification</b>	<b>Stage</b>
ISO 3791:1976	Keyboard layouts for numeric applications (office machines and DPE)	35.180	Confirmed (90.93)
ISO/IEC 9995-1:2009	Numeric and alphanumeric keyboard layouts, shape and section placement	35.180	Confirmed (90.93)
ISO/IEC 14755:1997	Character entering methods using keyboards or other input devices	35.180	Under review (90.60)
ISO/IEC 15411:1999	Specific properties of segmented keyboards and keyboard areas	35.180	Under review (90.60)
ISO/IEC 15412:1999	Layouts of keyboards for portable computers	35.180	Under review (90.60)
ISO/IEC TR 15440:2016	User requirements (layout and ergonomics) for future keyboards	35.180	Published (60.60)
ISO/IEC 22121-2:2023	On-screen keyboard layouts with a direct touchscreen interface	35.180	Published (60.60)
ISO/IEC 24757:2008	Standardized formal keyboard description format	35.180	Under review (90.60)

The oldest of the presented standards, ISO 3791, defines the basic keyboard layouts, images and symbols on keyboards, for numerical applications, that is, office machines and other DPEs, taking into account as a reference what is defined by ISO 1092. The working framework for keyboard layout is defined by ISO /IEC 9995 series of standards, which classifies functions into three categories. They define three basic working sections, and the basic standard, ISO/IEC 9995-1, defines the shape and layout of the sections, spacing of keys, as well as placement of symbols on the keys.

Segmented keyboards, with adjustable and fixed angle alphanumeric segments, are subject to consideration in the ISO/IEC 15411 standard. Due to the specifics of portable computers, layouts of keyboards for these computers are discussed in more detail in ISO/IEC 15412, that is, in ISO/IEC 9995 and ISO 9241-4 standards. When it comes to virtual keyboards, the ISO/IEC 22121-2 standard defines on-screen keyboard layouts that are used directly with a touchscreen interface. The standardized formal keyboard description format, defined in the ISO/IEC 24757 standard, enables the description of current and future functionalities.

The specific characteristics of keyboards are shown in the ISO/IEC 9995 series of standards. Table 2 shows the standards belonging to this series of standards, as well as their basic characteristics related to the content, classification and current status of the standards. These standards primarily relate to defining certain unified characteristics of the basic parts and zones on the keyboard, unambiguously describing their functions and how specific functions are indicated on the keyboard. The initial standard, ISO/IEC 9995-1, defines layouts, shape and section placement, and it was supplemented by the ISO/IEC 9995-2 standard, which describes zones and key locations, and the ISO/IEC 9995-3 standard, in which describe complementary layouts. Standards ISO/IEC 9995-4 and ISO/IEC 9995-5 define zones in different sections of the keyboard. Special attention is paid to the alphanumeric, numeric and functional sections. Other standards describe the symbols on the keys that represent the corresponding functions, the allocation of letters on the keys, including graphic characters, the functionality of dead keys, as well as

different mechanisms for selecting between different groups, and more detailed explanations are presented in the next section.

*Table 2: The structure of the ISO/IEC 9995 standard*

Standard	Description	Classification	Stage
ISO/IEC 9995-1:2009	Numeric and alphanumeric keyboard layouts, shape and section placement	35.180	Close of review (90.60)
ISO/IEC 9995-2:2009, Amd 1:2012	Alphanumeric section number of keys, zones and key locations; emulation	35.180	Close of review (90.60)
ISO/IEC 9995-3:2010	Alphanumeric zone complementary layouts	35.180	Confirmed (90.93)
ISO/IEC 9995-4:2009	Numeric section and different function zones	35.180	Close of review (90.60)
ISO/IEC 9995-5:2009	Division of editing and function section into different zones	35.180	Close of review (90.60)
ISO/IEC 9995-7:2009, Amd 1:2012	Symbols on keys representing corresponding functions	35.180	Confirmed (90.93)
ISO/IEC 9995-8:2009	Allocation of letters to the keys of a numeric keypad	35.180	Close of review (90.60)
ISO/IEC 9995-9:2016, Amd 1:2019	Location of a set of graphic characters, on full-sized and miniature keyboards	35.180	Close of review (90.60)
ISO/IEC 9995-10:2013	Conventional representation of graphic characters	35.180	Confirmed (90.93)
ISO/IEC 9995-11:2015	Dead keys functionality and representing characters	35.180	Confirmed (90.93)
ISO/IEC 9995-12:2020	Different mechanisms for selection between keyboard groups	35.180	Published (60.60)

## DISCUSSION

Human-computer interaction is a complex process whose characteristics are described by numerous standards (Norman and Kirakowski, 2018; Green, 2020; Karwowski et al., 2021; Janačković et al., 2022). The user interface needs to satisfy various requirements to enable effective and unambiguous communication. The ISO 9241 series of standards, among other things, considers interaction processes and physical input devices, principles and usability of interaction, and gives recommendations for different types of tactile, haptic and gesture interactions (ISO, 2007; ISO, 2018; ISO, 2020; Green, 2020; Janačković et al., 2022). The ISO 3791 standard, which determines basic keyboard layouts, images and symbols on keyboards, for numerical applications, that is, office machines and other DPEs, and periodic reviews confirm its correctness and importance. Segmented keyboards are described in the ISO/IEC 15411 standard, in the context of adjustable and fixed angle alphanumeric segments, and five keyboard areas are considered (alphanumeric, text editing, cursor control, numeric, and function). Their characteristics and layout significantly affect the effectiveness of using the keyboard, not taking into account portable computers, which contain a screen and an attached keyboard and work on battery power, since the layouts of keyboards for these computers are discussed in ISO/IEC 15412, i.e. in ISO/IEC 9995 and ISO 9241-4 standards. A special aspect of these considerations are, in addition to the layout characteristics, the ergonomic-physical characteristics of the devices and their keyboards. Similarly, ISO/IEC TR 15440 defines user requirements, related to layout and ergonomics, for future keyboards.

There is an increasing number of mobile and portable devices that do not have a physical keyboard. This led to a reduction in the size of devices and the use of touch-sensitive screens for communication with these devices. With them, virtual keyboards are used instead of physical keyboards for entering characters and numbers. The main advantage is the ability to dynamically change the keyboard for the needs of the user by changing the software being executed, as opposed to physically changing the keyboard itself. This simplifies device localization by shifting the localization process from hardware development to software development. The ISO/IEC 22121-2 standard defines on-screen keyboard



layouts, and only for direct use of the touchscreen interface. It defines the way virtual keyboards are displayed, as well as the ways of interaction and audio feedback when using them. A common problem, especially in industrial applications, is a formal, machine-readable format that describes keyboards in terms of current and future functionality. It is defined by the ISO/IEC 24757 standard, which aims to simplify the development of suitable drivers, that is, connecting the physical layout of the keyboard as a hardware part of the computer system and a logical interface that defines the software part of the computer system (system and application software). The description is based on the ISO SGML format. The keyboard definition format should primarily be used by the operating system during system startup, driver configuration, or screen display.

The ISO/IEC 9995-1 describes numeric and alphanumeric keyboard layouts, the shape and layout of specific keyboard sections. It describes, among other things, the key numbering system, physical characteristics and spacing of keys. These are very important characteristics of keyboards for those users who enter a lot of text, because they affect the stress on the finger joints when reaching the individual keys that are far from the standard position of the keys (keys F and J). The specifics of individual sections and their division into zones for alphanumeric affect the functionality of keyboards. The ISO/IEC 9995-2 standard specifies the locations of control functions in the alphanumeric section, as well as the division of that section into zones, that is, allocation guides, since the layout of this zone is defined nationally. The set of graphic characters that enables the entry of the minimum set of characters defined in the ISO/IEC 10646 standard, is determined by ISO/IEC 9995-3. An important element of every classic keyboard is the numeric section, and the allocation of keys and zones is defined by ISO/IEC 9995-4. Special attention is paid to the numeric zone (ZN0) for standard everyday business and private applications that involve text and data processing, or ZN1 for data entry and general office environment. ISO/IEC 9995-5 goes a step further in dividing the editing and function section, which defines their zones, such as the cursor key zone (ZEF0) and the editing and function zone (ZEF1), by suggesting how to allocate the necessary keys functions, i.e. which symbols denote those functions. It is further defined by the ISO/IEC 9995-7 standard for all functions, with special emphasis on the fact that the symbols must be of a universal character and unrelated to the names of the functions themselves.

Significant aspects of keyboard standardization refer to the allocation of letters to the keys of the numeric keypad, that is, the location of the set of graphic characters, which is defined by the ISO/IEC 9995-8 and ISO/IEC 9995-9 standards, respectively. The first determines the allocation of letters to the keys of the ZN0 zone of the keyboard. The second, taking into account the standard typographic characters, punctuation marks and symbols defined in ISO 8859-1, proposes the allocation of a set of graphic characters on the keyboard. Also, to some extent, specific scripts other than Latin are considered, as well as specific keyboards, such as mini-keyboards on mobile devices. In addition to the standard alphanumeric and numeric symbols, keyboards contain a number of other symbols and functions. ISO/IEC 9995-10 defines the conventional representation of various graphic characters. Certain keys on the keyboard do not cause visual symbols to appear on the screen, but instead initiate some functionality. The ISO/IEC 9995-11 standard precisely determines the functionality of these dead keys, as well as representing characters. The existence of different keyboard groups requires defining the possibilities for their selection, which is determined by the ISO/IEC 9995-12 standard, and can be useful to users if there is a possibility of dynamic display.

As the authors point out in (Kafae et al., 2022), the further development of keyboards can be linked to the Collingridge dilemma. Despite the identified shortcomings, which affect the functionality and potentially the health of users, the potential improvements are such that users do not accept them to a large extent for various reasons, justifying themselves by difficult changes in habits that affect productivity reduction or economic reasons due to expensive ergonomic solutions.

## **CONCLUSIONS**

Keyboards, along with mice, are still the most commonly used input devices in computer systems. The development of tablets and mobile phones led to the introduction of virtual instead of physical keyboards, but the process of communicating with the system remained almost identical. This paper

presents some representative standards related to keyboards as input devices. Although strict limitations were not defined in the search process, the obtained results showed that keyboards as input devices, both physical and virtual, were not given the attention that these devices deserve due to their wide daily use. The focus of research is most often focused on specific setups and the improvements they provide, while standards mostly refer to physical devices and less to their virtual equivalents, which has been gradually changing in recent years. By introducing standards, user requirements are primarily identified, that is, they meet the needs of users, with the aim of providing the best possible interface for communication with the system.

## ACKNOWLEDGMENT

The paper is done under the auspices of the Ministry of Education, Science and Technological Development of the Republic of Serbia (contract no. 451-03-47/2023-01/200148).

## REFERENCES

- Bretschneider-Hagemes, M., Korfmacher, S., & von Rymon Lipinski, K. (2018). The role of standardization for occupational safety and health (OSH) and the design of safe and healthy human-computer interaction (HCI). In Duffy, V. (ed) *Digital human modelling - applications in health, safety, ergonomics, and risk management*, DHM 2018, Lecture notes in computer science (LNISA), 10917, Cham: Springer, 19-28.
- Emerson, S., Emerson, K., & Fedorczyk, J. (2021). Computer workstation ergonomics: Current evidence for evaluation, corrections, and recommendations for remote evaluation. *Journal of Hand Therapy*, 34(2), 166-178.
- Green, P. (2020). ISO Human-computer interaction standards: finding them and what they contain. Proc. of the HFES 64th international annual meeting, 400-404.
- Hedge, A. (ed) (2017). *Ergonomic workplace design for health, wellness, and productivity*. Boca Raton, FL: CRC Press.
- ISO (2007). *ISO 9241-400: Ergonomics of human-system interaction-Part 400: Principles and requirements for physical input device*. International Organization for Standardization, Geneva: Switzerland.
- ISO (2018). *ISO 9241-11: 2018, Ergonomics of human-system interaction - Part 11: Usability: definitions and concepts*. International Organization for Standardization, Geneva: Switzerland.
- ISO (2020). *ISO 9241-110:2020, Ergonomics of human-system interaction - Part 110: Interaction principles*. International Organization for Standardization, Geneva: Switzerland.
- Janačković, G., Vasović, D., & Vasović, B. (2022). On standardization in the field of user interfaces. 12th International Symposium Engineering Management and Competitiveness 2022 (EMC 2022), Zrenjanin, Serbia, 272-277.
- Kafae, M., Daviran, E., & Taqavi, M. (2022). The QWERTY keyboard from the perspective of the Collingridge dilemma: lessons for co-construction of human-technology. *AI & Society*, 1-13. <https://doi.org/10.1007/s00146-022-01573-1>.
- Karwowski, W., Szopa, A., & Soares, M. M. (2021). *Handbook of standards and guidelines in human factors and ergonomics. 2nd ed.* Boca Raton: CRC Press.
- Kuhn, M. (2007). Future keyboard standards: some requirements, ideas, challenges. Open Brainstorming Session on Keyboards, CEN/ISSS Cultural Diversity Focus Group, CEN Meeting Centre, Brussels, 2007-06-12.
- Mušicki, S., Janačković, G., & Vasović, D. (2020). Standardization and system standards usage in the field of occupational and environmental safety. 10th International Symposium Engineering Management and Competitiveness 2020 (EMC 2020), Zrenjanin, Serbia, 89-92.
- Mušicki, S., Janačković, G., & Vasović, D. (2021). OHS management: development perspectives defined by ISO 45000 series of standards. Proc. of the XI International Symposium Engineering management and Competitiveness 2021 (EMC 2021), Zrenjanin, Serbia, 102-107.
- Nacheva, R. V. (2020). Standardization issues of mobile usability. *International Journal of Interactive Mobile Technologies*, 14 (7), 149-157.
- Nivasch, K., & Azaria, A. (2022). Keyboard layout optimization and adaptation. *International Journal on Artificial Intelligence Tools*, 1-9. <https://doi.org/10.1142/S0218213023600023>
- Norman, K. L., & Kirakowski, J. (2018). *The Wiley handbook of human computer interaction (Vol. 1)*. Hoboken, NJ: John Wiley & Sons Ltd.
- Savić, S., Stanković, M., & Janačković, G. (2021). *Teorija sistema i rizika – sistemnost u kontekstu menadžmenta rizikom*. Beograd: Akademska misao; Niš: Fakultet zaštite na radu u Nišu.

## **INTENTIONS TO USE BICYCLES AND ENVIRONMENTAL CONCERNS**

**Nikola Milicevic**

University of Novi Sad, Faculty of Economics in Subotica, Republic of Serbia

E-mail: [nikola.milicevic@ef.uns.ac.rs](mailto:nikola.milicevic@ef.uns.ac.rs)

**Nenad Djokic**

University of Novi Sad, Faculty of Economics in Subotica, Republic of Serbia

**Ines Djokic**

University of Novi Sad, Faculty of Economics in Subotica, Republic of Serbia

### **ABSTRACT**

One of the problems that affect most countries in the world relates to air pollution. This issue is particularly pronounced in densely populated urban areas. Transport is most often mentioned as a significant cause of air pollution in cities. Through the emission of gases that contain harmful elements such as nitrogen oxides and particulate matter, motor vehicles endanger not only people's health but also cause global warming. In order to decrease these negative effects, attention should be paid to the greater use of bicycles as a greener mode of transportation. Hence, in this paper, the focus was on the analysis of the intention to use bicycles. For this purpose, a number of studies related to this topic were presented. By identifying and examining factors that influence the intention to use bicycles, deeper insight into customer behavior can be obtained. This can be used as a basis for taking certain actions that may encourage people to shift to cycling.

**Keywords:** intention, bicycles, theory of planned behavior, environment

### **INTRODUCTION**

The development of the economy, besides many benefits, can be followed by numerous environmental issues. One of them relates to air pollution, a problem that affects most countries in the world. According to Wood (2022), only 4% of the urban population in Europe breathes air that is safe towards the standards of the World Health Organization; moreover, this problem was linked to 238 thousand of premature deaths in the EU in 2020. As stated in the research of Li and Managi (2021), air pollution, especially that related to particulate matter (PM<sub>2.5</sub>), impacts both physical and mental health, well-being, and human mortality.

The main source of air pollution in cities is considered to be the transport sector; following the reports of the European Environmental Agency (EEA), this sector is responsible for about 13% of particulate matter and 47% of nitrogen oxide emissions over 33 EEA countries (Vichova et al., 2021). In order to decrease the negative effects of air pollution, especially in urban areas, attention should be dedicated to the greater use of bicycles as environmental-friendly means of transportation. Therefore, in this paper, the emphasis is on factors that influence the intention to use bicycles. Through their analysis, more detailed insight into customer behavior can be obtained. In this regard, a number of models, including different variables, were presented.

### **TRANSPORTATION AND ENVIRONMENTAL CONCERNS**

Although transport can be considered an essential everyday activity, it is associated with many risks, among which the significant one is related to the environment; exhaust gases from motor vehicles negatively affect human health and induce global warming (Vichova et al., 2021). As can be seen in

Figure 1, the contribution of the transport sector to total emissions of the main air pollutants is the highest in the case of nitrogen oxides (NO<sub>x</sub>), followed by carbon monoxide (CO) and PM<sub>2.5</sub>.

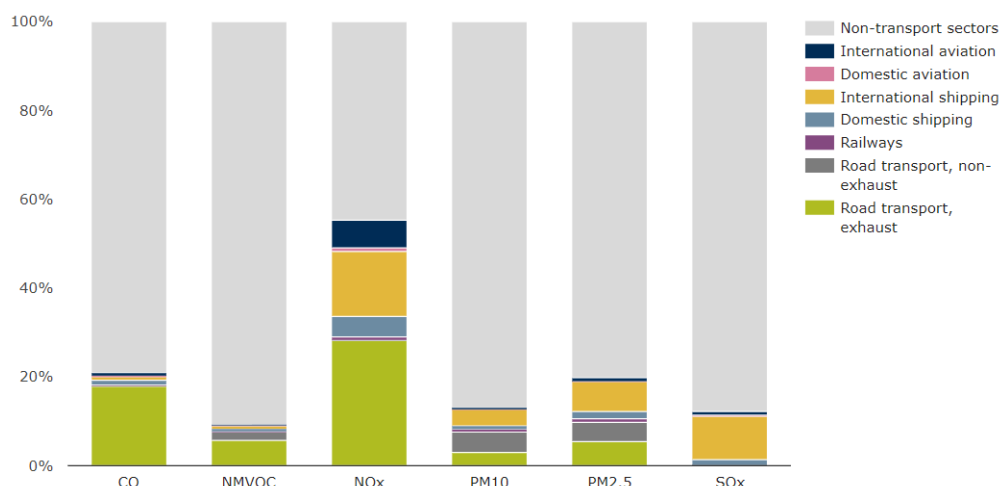


Figure 1: Transport sector and total emissions (European Environmental Agency, 2021)

The reduction of harmful gas emissions can be achieved by switching to greener modes of transport, such as bicycles. This was supported by the results of several studies.

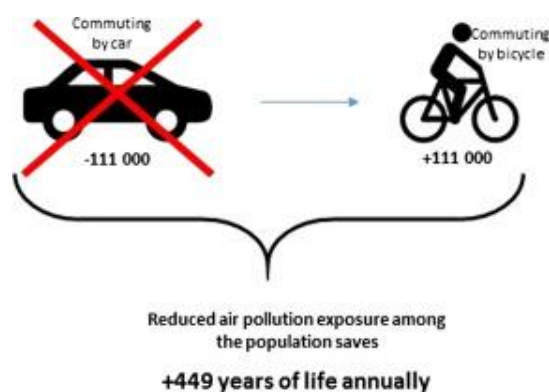


Figure 2: Commuting change from car to bicycle (Johansson et al., 2017)

The analysis of Johansson et al. (2017) showed that if all car drivers in County Stockholm, who live within a 30-minute bike ride from work, would switch to commuting by bicycle, the total number of cyclists would increase by 111,000; this would lead to 7% reduction in population exposure for both nitrogen oxides and black carbon in the inner city of Stockholm. Considering people's lives, this change would save 449 years of life annually in this county.

Similarly to the previously mentioned study, the research of Lindsay et al. (2011) also pointed to the potential benefits of switching from light vehicles to bicycles, taking into account the urban setting in New Zealand. According to their findings, a shift from 5% of vehicle kilometers to cycling would result in an annual reduction of 223 million kilometers traveled by a vehicle. This change would save 22 million liters of fuel, and decrease the greenhouse emissions associated with transport by about 4%. The authors also pointed to the health effects of this shift, manifested in fewer deaths due to increased physical activity, local air pollution caused by vehicle emissions, and road crashes.

## INTENTION TO USE BICYCLES

In many papers, the intention to use bicycles was examined in the context of the theory of planned behavior. In addition to norms (descriptive and prescriptive), attitude, and behavioral control, as

classical TPB variables, Baeli et al. (2022) included two more factors: daily commuting habits and financial incentives. Their research, conducted among Italians, has shown that habits had the strongest effect on the intention to use a bicycle, followed by attitudes, incentives, norms, and control. Irawan et al. (2022) implemented an integrated model of the theory of planned behavior and technology acceptance model (Figure 3) in order to analyze the pandemic impacts on the intention to use bicycles in the post-COVID-19 period. Among the others, their findings pointed to positive and significant effects of subjective norms and perceived behavior control on the intention.

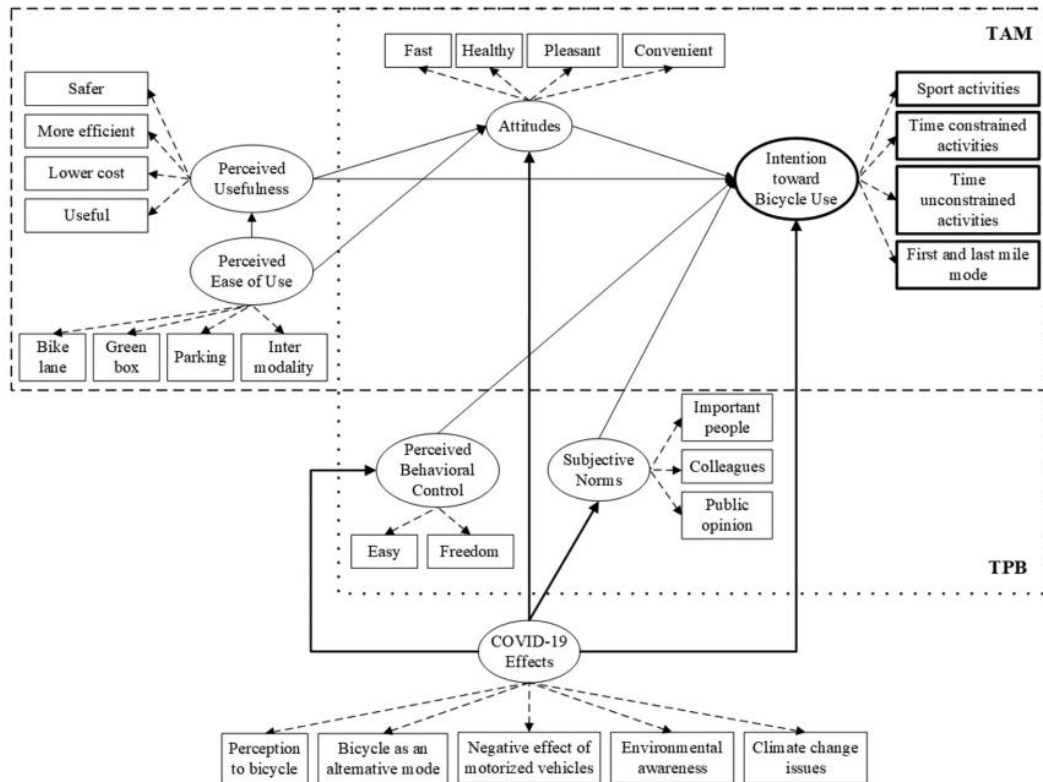


Figure 3: Conceptual model – Intention toward Bicycle Use (adjusted to Irawan et al., 2022)

The subject of the research was also the intention toward bicycle sharing. Zhu et al. (2020) investigated relations between environmental concern, attitude, subjective norm, perceived behavior control, and the intention to adopt bicycle-sharing (Figure 4). Environmental concern positively and significantly influenced all three TPB predictors, which, on the other hand, positively and significantly influenced the intention to adopt bicycle-sharing.

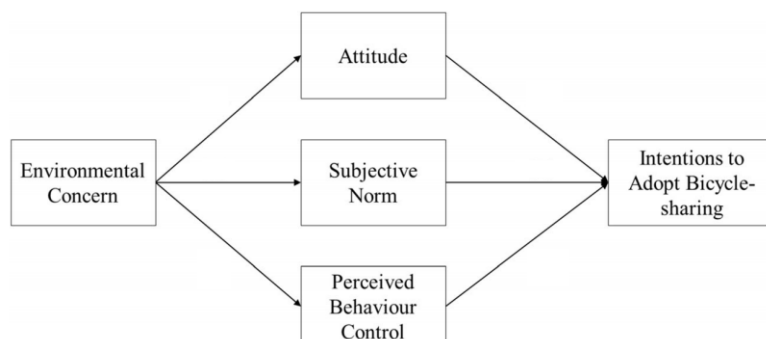


Figure 4: Research model - Intentions to adopt bicycle-sharing (adjusted to Zhu et al., 2020)

When analyzing the intention and behavior toward sustainable usage of bike sharing, Si et al. (2020) extended the theory of planned behavior with two additional variables: moral obligation and awareness of consequences (Figure 5). Hence, by sustainable usage behavior, the authors mean

“normal and standard usage throughout the use process, including normative unlocking and locking, normative parking, using the equipment in a clean manner, refraining from damage and theft, submitting prompt requests for repair and safe riding” (2020, p. 2). Their findings revealed the positive and significant effects of perceived behavioral control and sustainable usage intention on sustainable usage behavior, as well as positive and significant effects of attitude, subjective norms, perceived behavioral control, and moral obligations on sustainable usage intention.

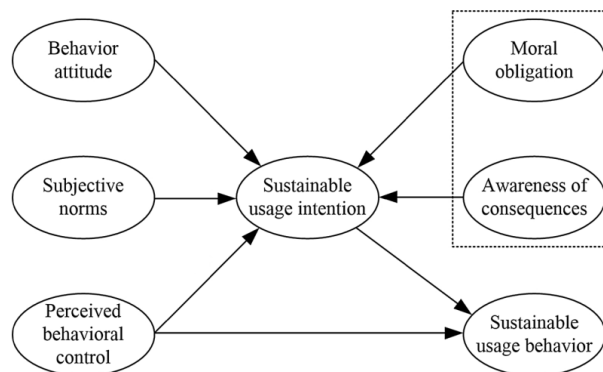


Figure 5: Extended TPB model (adjusted to Si et al., 2020)

In some studies, the focus was on electric bicycles (e-bikes). Li et al. (2021) examined the intention to use shared electric bicycles, with the application of an extended TPB model. Similarly, Yasir et al. (2022) extended the theory of planned behavior with six novel factors (perceived relative advantage, real-time camera, speed capacity, mileage capacity, price differentiation, and cost-saving) in order to analyze e-bike adoption intentions.

## CONCLUSIONS

Although it represents an activity without which economy and everyday life couldn't be normally performed, transport can bring many issues, including those that affect the environment. There are researches that point to the adverse effects of motor vehicle use, especially in densely populated urban areas. Its main consequence refers to the emission of air pollutants, such as nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and particulate matter (PM<sub>2.5</sub>). Those pollutants are harmful to health and cause global warming problems, because of which there is a need for shifting to more environmentally friendly modes of transport. As presented in this paper, switching from cars to bicycles can bring many potential benefits – ecologically, economically, and health-wise.

In order to better understand customer behavior, attention should be paid to the analysis of the intention to use bicycles. For this purpose, many authors relied on the theory of planned behavior. Hereby, in addition to attitudes, subjective norms, and perceived behavior control, their models included variables, such as daily commuting habits, financial incentives, perceived usefulness, etc. In some papers, the focus was on bicycle sharing, while in others, the emphasis was on e-bikes. Following the obtained results of the presented studies, it can be concluded that besides TPB predictors, an important role in encouraging people to use bicycles belongs to financial incentives. Therefore, different levels of government should be actively involved in this process.

## REFERENCES

- Baeli, V., Hichy, Z., Sciacca, F., & De Pasquale, C. (2022). Comparing the Relative Importance of Predictors of Intention to Use Bicycles. *Frontiers in Psychology*, 13, 1-12.
- European Environmental Agency. (2021). Emissions of air pollutants from transport. Available at <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-air-pollutants-8/transport-emissions-of-air-pollutants-8>

- Irawan, M.Z., Bastarianto, F.F., & Priyanto, S. (2022). Using an integrated model of TPB and TAM to analyze the pandemic impacts on the intention to use bicycles in the post-COVID-19 period. *International Association of Traffic and Safety Sciences Research*, 46, 380-387.
- Johansson, C., Lövenheim, B., Schantz, P., Wahlgren, L., Almström, P., Markstedt, A., Strömgren, M., Forsberg, B., & Sommar, J.N. (2017). Impacts on air pollution and health by changing commuting from car to bicycle. *Science of the Total Environment*, 584–585, 55-63.
- Li, C., & Managi, S. (2021). Contribution of on-road transportation to PM<sub>2.5</sub>. *Scientific Reports*, 11(1), 1-12.
- Li, J., Shen, J., & Jia, B. (2021). Exploring Intention to Use Shared Electric Bicycles by the Extended Theory of Planned Behavior. *Sustainability*, 13, 1-13.
- Lindsay, G., Macmillan, A., & Woodward, A. (2011). Moving urban trips from cars to bicycles: impact on health and emissions. *Australian and New Zealand Journal of Public Health*, 35(1), 54-60.
- Si, H., Shi, J., Tang, D., Wu, G., & Lan, J. (2020). Understanding intention and behavior toward sustainable usage of bike sharing by extending the theory of planned behavior. *Resources, Conservation & Recycling*, 152, 1-10.
- Vichova, K., Veselik, P., Heinzova, R., & Dvoraceket, R. (2021). Road Transport and Its Impact on Air Pollution during the COVID-19 Pandemic. *Sustainability*, 13, 1-15.
- Wood, J. (2022). How much of Europe’s urban population is exposed to poor air quality? Available at <https://www.weforum.org/agenda/2022/12/air-pollution-european-cities-urban-population-health-threat/>
- Yasir, A., Hu, X., Ahmad, M., Alvarado, R., Anser, M.K., Işık, C., Choo, A., Ausaf, A., & Khan, I.A. (2022). Factors Affecting Electric Bike Adoption: Seeking an Energy-Efficient Solution for the Post-COVID Era. *Frontiers in Energy Research*, 9, 1-13.
- Zhu, M., Hu, X., Lin, Z., Li, J., Wang, S., & Wang, C. (2020). Intention to adopt bicycle-sharing in China: introducing environmental concern into the theory of planned behavior model. *Environmental Science and Pollution Research*, 27, 41740–41750.



## **SELECTION OF WATER PRESSURE BOOSTER PLANTS IN THE FIRE HYDRANT NETWORK FOR A WAREHOUSE FACILITY**

**Slavica Prvulovic**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

**Ivica Micic**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

**Jasna Tolmac**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

E-mail: [jasna.tolmac@tfzr.rs](mailto:jasna.tolmac@tfzr.rs)

**Milos Josimovic**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

**Slobodan Juric**

High school "CEPS-Center for Business Studies", Kiseljak, Bosnia and Herzegovina

**Milica Josimovic**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

### **ABSTRACT**

The paper presents an analysis of the required amount of water for fire extinguishing and the required water pressure in the fire hydrant network for the warehouse facility, and based on this, the most optimal plant for the water pressure booster in the hydrant network that can meet the obtained requirements was selected. In practice, it often happens that there are resources with a sufficient amount of water, but it cannot be used for effective fire extinguishing, since the water pressure in the fire extinguishing installations is not within the prescribed values, i.e. is lower than the minimum required. In order to ensure reliable operation and proper functioning of fire extinguishing systems and installations, whether it is systems with compact jet, sprayed water or water mist, it is necessary to use adequate fire fighting facilities. This paper can be used as an example when choosing a plant for increasing the pressure and flow of water in the hydrant network and for other facilities that require the installation of a hydrant network.

**Keywords:** plant for water pressure booster , hydrant network, water pressure, water flow

### **INTRODUCTION**

The available water pressure in water supply systems is often not sufficient to cover the needs of individual users or entire parts of the settlement. The reason for this can be either a too large geodetic height difference among individual users or large pressure losses in the pipelines (Khan, et al., 2017; Ferrarese, et al., 2021). For this reason, plants are used to boost the water pressure in the network. The basic purpose of these plants is to provide the necessary water pressure with the required amount of water, i.e. flow, in facilities where the required pressure cannot be provided by direct connection to the city network or another source of water supply (Hyun, et al., 2010; Tarjuelo, et al., 2016). Plants for water pressure booster serve individual buildings, groups of buildings or smaller settlements. A fire protection plant is a plant in which there are devices for water pressure booster in residential buildings, hospitals, schools and other public buildings, warehouses, as well as in commercial and industrial buildings. The main task of these plants is to provide the appropriate pressure with the required amount of water for fire extinguishing (Bujandrić, 1996; Rulebook on technical norms for the installation of hydrant network for fire extinguishing, 2018).

In the fire protection system of buildings, water forms the basis, as a means of extinguishing fire, so the role of pumps in fire fighting technology is very large. Of the water pumps for fire protection, only centrifugal pumps, horizontal or vertical type, single-stage or multi-stage, are considered. The number



of pump stages determines the pressure. As a rule, multi-stage pumps that can provide higher pressures are used in plants for water pressure boosters in the hydrant network (Spasić, et al., 2000; Rulebook on technical norms for the installation of hydrant network for fire extinguishing, 2018).

## MATERIAL AND METHOD

Determining the required amount of water and pressure of the hydrant network for fire extinguishing for the warehouse facility

When determining the required water pressure in the hydrant network, it is necessary to take into account pressure losses in pipes and reinforcement bars. Due to the friction of water particles against the walls of the pipeline and among themselves, the pressure level decreases. The pressure loss increases with the length of the pipeline, increasing friction against the walls of the pipeline, increasing the amount of water flow and decreasing the diameter of the pipe ((Hyun, et al., 2010; González et al., 2014).

Determination of the required fire resistance of the warehouse is done on the basis of Table 1, which is an integral part of the Rulebook on Technical Norms for the Protection of Warehouses against Fire and Explosions. Given that the warehouse for which the selection of the plant for the water pressure booster in the hydrant network is made is a large warehouse with medium fire load, the required level 4 of fire resistance is adopted.

Table 1: The degree of resistance of the warehouse to fire

	Small warehouses			Medium warehouses			Large warehouses		
	Fire load								
	low	medium	high	low	medium	high	low	medium	high
The degree of resistance to fire, according to the standard SRBS U.J1.240	II	II	III	II	III	IV	III	IV	V

It is anticipated that non-combustible building materials of appropriate fire resistance will be used for the construction of the warehouse facility. According to the Rulebook on Technical Norms for the Installation of Hydrant Network for Fire Extinguishing, the category of the technological process in the building is K2.

K2 - facilities in which flammable liquids of category 3 are used, produced or processed, facilities in which explosive dusts with a smoldering temperature over 350°C or an ignition temperature over 450°C are generated by processing, pumping plants for liquids whose flash point is between 60 °C and 100 °C , plants that generate coal dust, wood shavings, flour, powdered sugar, synthetic rubber powder, etc., large warehouses, medium warehouses of rubber products, buildings over 30 m high, buildings with more than 500 people and similarly (Rulebook on technical norms for the installation of hydrant network for fire, 2018).

The volume of the warehouse is greater than 20 000 m<sup>3</sup> and less than 50 000m<sup>3</sup>. On the basis of the Rulebook on Technical Norms for the Installation of Hydrant Network for Fire Extinguishing, the required amount of water for extinguishing fires in industrial and other facilities is determined, depending on the degree of resistance of the facility to fire and the category of the technological process according to table 2. Figure 1 shows the dependence of the amount of water on the volume of the object and the technological process.

Table 2: Dependence of the amount of water on the volume of the object and the technological process

Category of technological process according to fire hazard	Degree of fire resistance of the building	Volume of the object to be protected [10 <sup>3</sup> m <sup>3</sup> ]						
		to 2	from 2 to 5	from 5 to 20	from 20 to 50	from 50 to 200	from 200 to 400	More than 400
		The amount of water for the installation of external and internal hydrant networks for fire extinguishing for one building [l/s]						
K1, K1E	V	10	10	15	20	30	35	40
	IV	10	15	20	25	30	35	40
K1, K1E, K2	III	10	15	20	25	30	35	40
K2	IV, V	10	10	15	20	30	35	35
	I, II	15	15	20	25	30	35	40
K3	IV, V	10	10	15	20	30	35	35
	III	10	15	20	25	30	35	40
	I, II	15	20	25	30	35	35	40
K4, K5	IV, V	10	10	10	15	20	25	30
	III	10	10	15	20	25	30	35
	I, II	10	15	20	25	30	35	40

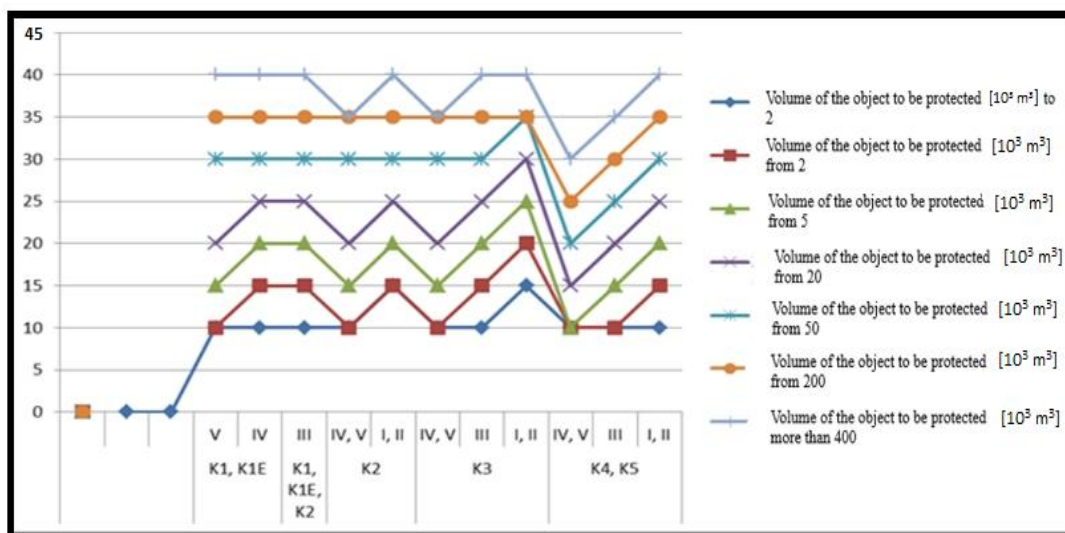


Figure 1: Dependence of amount of water on the volume of the object and the technological process

Based on the above table of technological process category K2, the volume of the building 20 000 m<sup>2</sup> and the level 4 of fire resistance of the building, the required amount of water for extinguishing the fire of 20 l/s is determined. Table 3 and Figure 2 show the pressure drop in the hydrant network.

Table 3: Pressure drop in the hydrant network

Section from	Section to	Amount of water l/s	Pipe diameter DN	Route length m	Resistance in the pipe	Total resistance
PPH6	PPH5	5.0	100	62.0	0.07	4.34
PPH5	PPH4	10.0	100	55.0	0.07	3.85
PPH4	PPH7	10.0	100	30.0	0.07	2.10
PPH7	PPH3	20.0	100	63.0	0.07	4.41
PPH3	PPH2	20.0	100	14.50	0.07	1.01
PPH2	PPH1	20.0	100	75.50	0.07	5.28
PPH1	Well reservoirs	20.0	100	25.50	0.07	1.78
Network loss						22.77
Loss at geodetic height						0.8
Loss at connection and water meter						5.00
Total losses						28.57

Available network pressure 7.0 bar; Total losses 2.86 bar; A free overpressure of 4.14 bar remains; The required pressure in the network is provided with the help of a pressure booster plant.

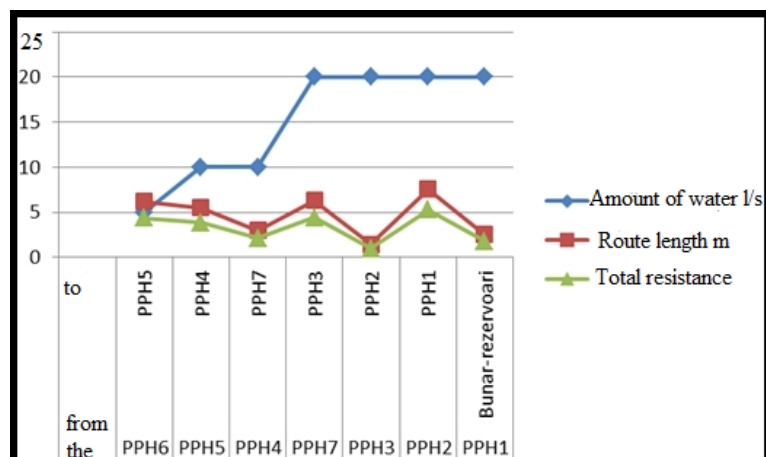


Figure 2: Pressure drop in the hydrant network

### SELECTION OF THE APPROPRIATE PLANT FOR WATER PRESSURE BOOSTER IN THE HYDRANT NETWORK

On the basis of the performed analysis, the plant for the water pressure booster in the hydrant network is selected. The plant must meet the requirement that a pressure of 7 bar is required, with a minimum water flow of 20 l/s.

Based on the analysis, the Pedrollo device (Figure 3) for the water pressure booster in the hydrant network, type F 50/125A, with a water flow of 300 to 1200 l/min, with a power of 4kW, is selected (<https://elvissabac.com/>, 2023). The device is made of stainless steel collectors. All the necessary valves, manometers, pressure switches (if necessary and a pressure transmitter) are installed on it, as well as two vertical hydrophore vessels of 24 l each on the pressure part. The pumps are located on a common, hot-dip galvanized base, with rubber anti-vibration feet, which can be adjusted to achieve the correct leveling of the plant. The plant is supplied with water by direct connection to the city's water supply network or by connection to special tanks intended for the supply of such devices. The plant is managed via control cabinets, which also provide all the necessary protection (<https://elvissabac.com/>, 2023).

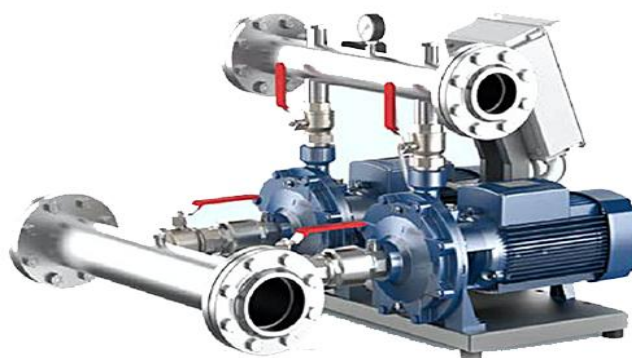


Figure 3: Pedrollo plant for water pressure booster in the hydrant network [<https://elvissabac.com/>, 2023]

The plant for the water pressure booster in the hydrant network is controlled by a programmable logic controller (PLC). The operation program of the plant is defined by the conditions and requirements harmonized with the technical conditions defined by the calculation of the required operating mode. This type of plant has all the necessary protections and restrictions, so that the device works independently and with minimal involvement of the human factor. Pumps work by receiving an analog signal in the case of a pressure sensor or digital signals in the case of pressure switches. The switch-on pressures are set so that if one pump cannot reach the appropriate pressure, the other pump starts switching on, in order to keep the pressure constant and to minimize fluctuations in the network, as well as to satisfy the pressure defined by the regulation for the hydrant network. The plant has operation and error signaling on the cabinet doors in the form of LED bulbs.

If the maximum allowable pressure is reached, the control cabinet shuts off the plant until the pressure drops below the set maximum pressure, which is very important in order to prevent hydrant hoses from bursting.

The influence of transient phenomena in the water supply network on the operation of the plant is prevented by a microprocessor with a factory-regulated shutdown and start-up delay of the plant during dry running.

In case of incorrect connection of the order of phases or change of direction of rotation, the microprocessor switches off the plant with a signal notification and thus prevents the occurrence of mechanical damage.

Figure 4 shows the characteristic curves and performance data of the Pedrollo plant type F 50/125A (<https://elvissabac.com/>, 2023).

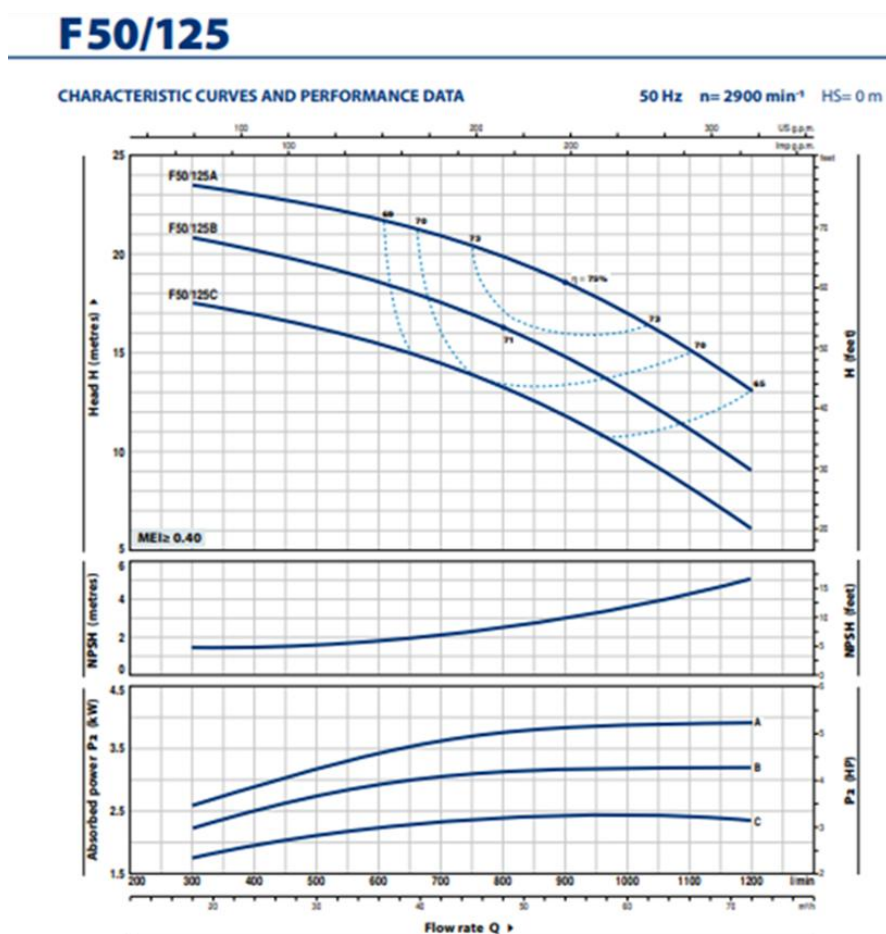


Figure 4: Characteristic curves and performance data of the Pedrollo plant type F 50/125

## CONCLUSION

In practice, it often happens that there are resources with a sufficient amount of water, but it cannot be used for effective fire extinguishing because the water pressure in the fire extinguishing installations is not within the prescribed values, i.e. is lower than the minimum required. In order to ensure reliable operation and proper functioning of fire extinguishing systems and installations, whether it is systems with compact jet, sprayed water or fog water, it is necessary to use adequate fire fighting facilities (Bujandrić, 1996; Spasić et al., 2000). The required amount of water and the required pressure in the hydrant network for extinguishing the fire in the warehouse were calculated. Given that the city's hydrant network does not meet the needs in terms of the amount of water and the pressure obtained by the calculation, a plant for the water pressure booster in the hydrant network with appropriate characteristics must be installed. This paper presents the selection of the optimal solution that will meet the needs of the calculation while simultaneously optimizing costs in terms of sizing the appropriate plant for the water pressure booster in the hydrant network.

This paper can serve as an example when choosing a plant for increasing the pressure and flow of water in the hydrant network and for other facilities that require the installation of a hydrant network.

## REFERENCES

- Bujandrić, V., Bujandrić, N. (1996). *Projektovanje protivpožarne zaštite*, Beograd [Fire protection design, Belgrade].
- Ferrarese, G., Pagano, A., Fratino, U., Malavasi, S. (2021). Improving Operation of Pressurized Irrigation Systems by an Off-grid Control Devices Network, *Water Resources Management*, 35(9), 2813-2827.
- González Perea, R., Camacho Poyato, E., Montesinos, P., Rodríguez Díaz, J.A. (2014). Critical points: Interactions between on-farm irrigation systems and water distribution network, *Irrigation Science*, 32(4), 255-265.
- Hyun, I.H., Khishigjargal, S., Chang, Y.W., Kim, D.H., Dockko, S. (2010), Analysis of flushing-path effects in water-distribution networks, *Water Science and Technology: Water Supply*, 10(5), 740-74.5
- Khan, A., Orozco, R., Khattab, M., Alqahtani, F. (2017). Design of a Workflow Optimization System for urban water utility maintenance, Systems and Information Engineering Design Symposium, SIEDS 2017, pp. 318-323
- Pravilnik o tehničkim normativima za zaštitu skladišta od požara i eksplozija ("Službeni list SFRJ, broj 24/1987)[ Rulebook on technical norms for the protection of warehouses against fire and explosions ("Official Gazette of the SFRY, number 24/1987).]
- Pravilnik o tehničkim normativima za instalacije hidrantske mreže za gašenje požara ("Sl. glasnik RS", No 3/2018)[ Rulebook on technical norms for the installation of hydrant network for fire extinguishing ("Official Gazette of RS", No 3/2018)].
- Spasić, S., Jovanov, R., Pavlović, A., Očokoljić, D., Injac, J., Jovanović, G. & Trkulja M. (2000). *Preventivna zaštita od požara I eksplozija*, Beograd [Preventive protection against fire and explosion, Belgrade].
- Tarjuelo, J.M., Moreno, M.A. (2016). Pumping station regulation in on-demand irrigation networks using strategic control nodes Córcoles, *Agricultural Water Management*, 163, 48-56.  
<https://elvissabac.com/> (accessed 20.03.2023.)

## **INDUSTRY 5.0 AN EMERGING PARADIGM: INCEPTION, CONCEPT AND CHALLENGES**

**Sanja Puzović**

University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia

E-mail: [sanja.puzovic@ftn.kg.ac.rs](mailto:sanja.puzovic@ftn.kg.ac.rs)

**Jasmina Vesić Vasović**

University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia

**Vladan Paunović**

University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia

### **ABSTRACT**

Due to the rapid development of technologies in the era of digitization, the industry has experienced a rapid transformation, increasing process efficiency; however, humans with their intellect, social values, and environmental priorities remain outside the current paradigm of industry development. In response to these challenges, a new initiative known as Industry 5.0, or the fifth industrial revolution, was conceived to emphasize symbiosis among humans and machines for greater involvement of human critical thinking in a cyber-physical production system. This emerging manufacturing paradigm encourages the refocusing of technological progress toward social well-being, sustainable development, and resilience. The paper makes a systematic review of this socio-technological phenomenon, discussing its inception, conception, implementation challenges, and features of new business models for companies operating in the Industry 5.0 environment.

**Keywords:** Industry 5.0, Value-driven industrial revolution, New business model.

### **INTRODUCTION**

A revolution of IT-enabled smart manufacturing known as Industry 4.0 undoubtedly influenced the enormous increase in process efficiency; nevertheless, increasingly loud criticism that it ignores current social and environmental priorities and that humans, with their intellect and creativity, remained outside this idea, gave birth to an initiative for creating a sustainable, resilient, and human-centered industry and refocusing technological progress toward socio-ecological development. This new initiative begins with the premise that humans and machines possess unique abilities; establishing their synergistic interaction encourages evolution towards a symbiotic ecosystem that tends to bridge the gap between production and social needs. This initiative, today conceptualized as a value-driven industrial revolution known as Industry 5.0, is aimed at overcoming one of the global economy's most pressing challenges: how to increase productivity through automation without eliminating human workers from production, how to return humans to the core of production systems, and how to redirect technological progress towards social and environmental priorities as the ultimate goal.

Although a considerable research effort has been spent on the reasoning behind this concept, Industry 5.0 is still a nascent paradigm that is still not considered well understood, which will make its implementation elusive instead of persuasive. The paper attempts to contribute to the body of knowledge on Industry 5.0 and make this socio-technological phenomenon more perceive among industry practitioners. In this context, the paper analyzes the inception and conception of Industry 5.0, as well as its business impact and implementation challenges. Initially, the paper provides a referential analysis and synthesis of the definitions and characteristics of the fifth industrial revolution from the perspectives of various authors, which can contribute to a better comprehension of this phenomenon; it also provides an overview of the enabling technologies and considers the key challenges in the system adaptation to Industry 5.0; further, it provides a discussion on the perceptions of Industry 5.0 compared to the Industry

4.0 industrial revolution, discovering their intersections. Finally, it provides an overview and key features of new business models in the Industry 5.0 environment.

## **RELATED WORK**

The broad Industry 5.0 literature identified several current research perspectives. The first among them, and currently still dominating, pertains to the clarification of the concept, key components, and enabling technologies of this paradigm. For instance, based on a thorough analysis of existing conceptualizations, Tiwari et al. (2022) outline the definition of Industry 5.0, its key components, and the paradigm's scope. Lu et al. (2022) deal with the concept, reference model, enabling technologies, and system frameworks of human-centered manufacturing. Ghobakhloo et al. (2022), on the other hand, defined a reference model of Industry 5.0 that describes its technical and functional properties. In addition, there are significant research efforts in the field of Industry 5.0's potential applications. For example, Javaid and Haleem (2020) consider 17 key elements of Industry 5.0 and the possibilities of their application in the field of production. Maddikunta et al. (2022) conducted similar analyses in domains such as cloud manufacturing, supply chain management, intelligent healthcare, smart education, etc. Leng et al. (2022) broadly discuss the potential applications and challenges of real-world Industry 5.0 scenarios. One of the actual research perspectives is related to analyzing the correlation between the perceptions of Industry 4.0 and Industry 5.0 and discovering their intersections. In this regard, Xu et al. (2021) provide a comparative view of the conception and perception of the Industry 4.0 and Industry 5.0 paradigms, attempting to better illuminate their intersections. On the other hand, Golovianko et al. (2023) provide a more analytical approach to this issue, discussing the relationship between these two paradigms through three key perspectives: co-existence, transition, and hybridization.

Future research is anticipated to be increasingly focused on developing the architecture for Industry 5.0 implementation and its enabling technologies. So far, there have been few studies in this area; for instance, Leng et al. (2022) developed a three-dimensional system architecture for Industry 5.0 implementation, including a technical dimension, an application dimension, and a reality dimension. Skobelev and Borovik (2017) discuss a set of modern technologies, from IoT to emergent intelligence, whose convergence can ensure the transformation from Industry 4.0 to the new initiative Industry 5.0. Rožanec et al. (2022) contribute to this research area as well by defining a human-centric artificial intelligence (AI) architecture for industry 5.0 implementation that integrates AI, simulated reality, decision-making, and user feedback in a way that effectively supports human-machine interactions.

## **THE CONCEPT OF THE INDUSTRY 4.0**

The phrase Industry 4.0 refers to the fourth industrial revolution, a new stage of progress in organizing and managing processes along the whole value chain of the manufacturing industry (Finance, 2015). In actuality, it is a novel value chain organization concept. (Hermann et al., 2015). Despite being enabled by technical advances, the Industry 4.0 initiative was business-oriented. It arises from the need to connect and integrate production and service systems in order to ensure effectiveness, flexibility, cooperation, coordination, and efficiency. Compared to traditional production systems, Industry 4.0 brings dramatic changes to creating industrial value. Namely, the intensive incorporation of information and communication technologies led to the blurring of the border between the real and the virtual world, creating the so-called cyber-physical production system, which forms a smart network of machines, IT systems, smart products, and individuals, encompassing the entire value chain (Finance, 2015). This is frequently related to the introduction of IoT technology into the industrial value creation process, allowing producers to utilize completely digital, intelligent, and decentralized value chains (Prause and Atari, 2017). According to Wang et al. (2016), the four key features that must be achieved for a successful transformation towards Industry 4.0 include horizontal system integration across a real-time optimized global value chain; vertical networking of smart production and service systems; end-to-end engineering of the entire value chain; accelerating individualized solutions; increasing flexibility; and reducing costs through exponential technologies. The broad Industry 4.0 literature identified twelve enabler technologies for digital transformation and Industry 4.0, including: embedded systems (cyber-physical infrastructure); additive manufacturing; cloud technologies; virtualization technologies; simulation; data analytics and AI; communication and networking; cyber security; sensors and actuators; and mobile technologies.



The new technological breakthroughs that emerged as a product of Industry 4.0 undoubtedly influenced the development of flexible and adaptable business structures as well as the creation of the ability for internally initiated evolutionary development in order to adapt to changes in the environment (Koether, 2018). However, the impact on the company's strategies and operations still largely remains in the domain of the technical perspective. It is evident that Industry 4.0 is exclusively a technology-driven revolution, whereby the issue of dehumanization is emphasized due to the drastic reduction of the share of human labor in industrial plants. On the other hand, it does not provide an appropriate framework that is in line with current environmental priorities. In actuality, the current technological advancement does not fundamentally integrate social and environmental goals. All this has resulted in a re-examination of the principles underlying Industry 4.0 as well as the need to refocus future technological progress towards social needs and values as ultimate goals.

## **THE CONCEPT OF THE INDUSTRY 5.0**

Industry 5.0 was formally initiated through several officially published documents. The Japanese government provides the initial vision, promoting the term Society 5.0, which describes the ideal society of the future that attempts to connect real and cyberspace using the potential of modern technologies to efficiently collect personalized data for more efficient problem-solving and value creation (Government of Japan, 2015). Following this notion, the European Economic and Social Committee (EESC) defines Industry 5.0 as a concept that fuses human creativity and skills with robot productivity (EESC, 2018). The EU Commission (2021) describes this concept as a supplement to Industry 4.0, which emphasizes social needs and values that are insufficiently emphasized in Industry 4.0. In this regard, they specify the essential values around which the Industry 5.0 idea is founded.

- Human-centric – an approach that focuses on the needs of people, places them at the core of production processes, and addresses how technologies can be useful for humans.
- Sustainable – the emphasis is placed on the reuse, purpose, and recycling of natural resources, reducing the negative impact on the environment.
- Resilience – creating flexible processes and adaptable production capacities by introducing robustness into industrial production.

Xu et al. (2021) emphasize that Industry 5.0 is not a technology-driven revolution but a value-driven initiative that drives technological transformation with a particular purpose, which is, according to Villani et al. (2020), related to the economy (profitability, scalability, business models); ecology (CO<sub>2</sub> reduction, circular economy); society (societal challenges, human-centricity); and policy (agility interrelations and system view).

In particular, it is becoming clear that sustainable and resilient processes require people to return to the core of production systems. According to the ideas of Industry 5.0, a high degree of automation would not affect the reduction of human value in the industry but its strengthening thanks to the interaction of people and machines. According to Javaid and Haleem (2020), Industry 5.0 provides the possibility of accelerating industrial automation thanks to human resources' critical thinking and aims to establish a synergistic interaction between machines and humans in order to boost productivity in the industry while sustaining workplaces (Rožanec et al., 2022). Additionally, it is possible to better incorporate social and environmental concerns into technological innovation, which includes encouraging technological innovation in the field of environmental sustainability, relying on specific technologies and functional principles to extend the scope of corporate responsibility to entire value chain, and also empowering human workforce through a new people-centered approach to technological development. Thanks to production processes supported by cognitive capabilities in combination with efficient, intelligent, and precise machines, Industry 5.0 enables creation of customized products and services.

### **Industry 5.0 enabling technologies**

According to Müller (2020), the core enabling technologies for Industry 5.0 include the following:

- Individualized human-machine interaction technologies.
- Artificial intelligence (AI)
- Bio-inspired technologies and smart materials allow materials with embedded sensors and enhanced features to be recyclable.
- Digital twins and simulation to model entire systems.
- Data transmission, storage, and analysis technologies.



- Technologies for energy efficiency, renewables, storage, and autonomy.

### **Industry 5.0 implementation challenges**

The most noteworthy challenges in adapting systems to the concept of Industry 5.0 are the development of human-centric AI architecture and the adoption of complex technologies such as digital twins, bio-inspired technologies, smart materials, AI, individualized human-machine interaction technologies, etc. Consequently, the Industry 5.0 initiative necessitates a sizeable investment in supporting technologies as well as the training of highly skilled personnel, which significantly slows down the implementation process. The issue of ethics is also often mentioned in the context of a potential challenge in the implementation of Industry 5.0. In particular, it is necessary to consider how autonomous systems can incorporate ethical principles. According to Maddikunta et al. (2022), this refers to the use of AI in a way that minimizes negative social impact. This is accompanied by concerns about privacy and ethics in the accumulation of data, on the basis of which users are offered personalized products and predictable services. Another challenge that the industry will have to face in its efforts to evolve toward Industry 5.0 is a security vulnerability, which largely arises from the use of AI and automation. The challenges of adapting engineering education to the changes in the nature of work resulting from Industry 5.0 to eliminate essential competence gaps in future managerial and executive roles are often discussed, and according to Mitchell and Guile (2022), the basic characteristics that the future concept of engineering education must take on are interdisciplinarity and transdisciplinarity. It is clear that knowledge in the fields of data science, machine learning, and AI is becoming fundamental competencies for the engineers of the future, however, there is a growing demand to integrate disciplines such as life sciences, social sciences, and the humanities.

### **INDUSTRY 4.0 VS. INDUSTRY 5.0**

Industry 4.0 addresses the issues of human-centeredness, sustainability, and resilience only from a consequential perspective and with an emphasized technological perspective, while Industry 5.0 aims to highlight essential social needs and values and enable better integration of social and environmental priorities into future technological progress in order to provide prosperity for the sustainable development of all mankind. Ghobakhloo et al. (2022) conclude that Industry 5.0 differs from the fourth industrial revolution in the sense that it represents a socio-technological phenomenon that initiates the overcoming of classical economic models driven by profit and consumption and the transition to new resilient, sustainable, and circular economic models. Müller (2020) argues that Industry 5.0 shouldn't be considered a substitute for Industry 4.0 but rather as a logical continuation or next evolution stage of the current Industry 4.0 initiative, which drives future technological progress toward fostering socio-ecological development. Industry 5.0 cannot be considered in the context of a new technological leap forward; in fact, it provides an opportunity to comprehend Industry 4.0 in a broader context, adding a regenerative purpose and a focus on people, the planet, and prosperity (European Commission, 2021). Unlike previous initiatives, Industry 5.0 shifts the emphasis from individual technologies to a systemic approach that places emphasis on the development of digital twins of the entire system and combines the strengths of humans and machines (Rožanec et al., 2022).

There are frequent debates in the current literature about how these two paradigms interact, and while some are inclined to believe that we are in the midst of an era of transition from Industry 4.0 to Industry 5.0, others tend to be more comfortable with the idea of their coexistence or mutual hybridization (figure 1). The idea of transition is actually the idea of technological transition focused on key social issues, which focuses on three areas of development, namely: human-centeredness, sustainability, and resilience, relying mainly on the principles of sustainable development and quality of life (Saniuk et al., 2022).

On the other hand, Xu et al. (2021) are of the opinion that Industry 5.0 does not appear in the role of a substitute for Industry 4.0 or its new evolutionary phase, but rather it is about two coexisting paradigms, we can actually talk about a kind of techno-social revolution as the outcome of this coexistence, with technologies as a driving mechanism and social needs as the ultimate goal. According to Golovianko et al. (2023), it is actually a hybridization of Industry 4.0 and Industry 5.0 artifacts. While Industry 4.0 is biased toward automation, Industry 5.0 is human-oriented, with their hybrid model biased toward both, relying on collaborative intelligence that combines AI and human knowledge and skills. This

communication and collaborative intelligence, according to (Rožanec et al., 2022), enables the development of coevolutionary relationships between humans and machines.

Industry 4.0	Industry 5.0
Technology-driven	Value-driven
Digital manufacturing	Digital society
Mass customization	Mass personalization
Human-out-of-the-loop system	Industrial processes with human intelligence in the loop
Economic models driven by profit and consumption	Resilient, sustainable, and circular economic models
Emphasis to individual technologies	Systemic approach
System-centric manufacturing driven by efficiency and quality improvement	Human-centric manufacturing
Human-machine competition	Human-machine compassion and coevolution
Internet of Things (IoT)	Internet of Everything (IoE)

*Figure 1: Comparison of concepts in Industry 4.0 to 5.0*

## BUSINESS MODELS IN THE ERA OF INDUSTRY 5.0

The new paradigm of industry development known as Industry 5.0 will result in a change in management paradigms and the need for new business models capable of meeting the demand for personalized products, which are built up on digitized resilient processes. Considering the key elements of the business models in the Industry 5.0 environment, Grabowska (2022) has made several assumptions, on which the following analysis is based.

Personalized products that support sustainable consumption will be the primary value provided by new business models, and enterprises will be pushed to include personalized services in their offerings as well. The key activities through which companies will create these values will be customer-centric automated manufacturing supported by adaptable production capacities and digitized resilient processes. One of the most important premises of these business models is partnering with customers throughout the entire product lifecycle using digital platforms and advanced technologies. Furthermore, it is assumed that the channel through which companies will reach consumers will be the digital news channel.

As one of the main building blocks of their business models, the companies will use partnerships generated through cyber-physical cooperation networks. Also, as the main premise of Industry 5.0 is the greater involvement of human knowledge and competencies in a cyber-physical production system, key resources for generating added value in the Industry 5.0 environment will be humans cooperating with robots and forming coevolutionary relations. In addition, knowledge of customer preferences is becoming a resource of the future, this is based on the use of AI technologies for the accumulation of data, on the basis of which users are offered personalized products and predictable services.

## CONCLUSION

This review and analysis provide insight into Industry 5.0's inception, concept, and implementation challenges; the study also included a discussion of Industry 5.0's influence on the reconfiguration of business models. Undoubtedly, Industry 5.0 is changing the paradigm and bringing a shift from the IT-enabled smart manufacturing system focused on efficiency, quality improvement, and cost reduction to a sustainable, resilient, and human-centered industry. This new paradigm will decrease the emphasis on technology and promote the idea that potential progress is based on human and machine collaboration. It will also cause a huge turnaround from the economic models driven by profit and consumption to resilient, sustainable, and circular economic models. Industry 5.0 will result in a change in management paradigms and the need for new business models capable of meeting the demand for personalized products, which are built up on digitized resilient processes.

## ACKNOWLEDGMENTS

This work was supported by the Ministry of Science, Technological Development and Innovations, Republic of Serbia, Grant 451-03-47/2023-01/200132 with University of Kragujevac, Faculty of Technical Sciences Čačak.

## REFERENCES

- Council for Science, Technology and Innovation Cabinet Office, Government of Japan. Report on the 5<sup>th</sup> Science and Technology Basic Plan. 2015. Available online: <https://www8.cao.go.jp>
- European Commission. (2021). Industry 5.0: Industry 5.0 - Towards a sustainable, human-centric and resilient European industry; Publications Office of the European Union: Luxemburg.
- Finance, A. T. C. C. (2015). Industry 4.0 Challenges and solutions for the digital transformation and use of exponential technologies. *Finance, audit tax consulting corporate: Zurich, Swiss*, 1-12.
- Ghobakhloo, M., Iranmanesh, M., Mubarak, M. F., Mubarak, M., Rejeb, A., & Nilashi, M. (2022). Identifying industry 5.0 contributions to sustainable development: A strategy roadmap for delivering sustainability values. *Sustainable Production and Consumption*, 33, 716-737.
- Golovianko, M., Terziyan, V., Branytskyi, V., & Malyk, D. (2023). Industry 4.0 vs. Industry 5.0: Co-existence, Transition, or a Hybrid. *Procedia Computer Science*, 217, 102-113.
- Grabowska, S. (2022). Key components of the business model in an Industry 5.0 environment. *Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska*.
- Hermann, M., Pentek, T., & Otto, B. (2015). Design principles for Industrie 4.0 scenarios: a literature review. *Technische Universität Dortmund, Dortmund*, 45.
- Javaid, M., & Haleem, A. (2020). Critical components of Industry 5.0 towards a successful adoption in the field of manufacturing. *Journal of Industrial Integration and Management*, 5(03), 327-348.
- Koether, R. (Ed.). (2018). *Taschenbuch der Logistik*. Carl Hanser Verlag GmbH Co KG.
- Leng, J., Sha, W., Wang, B., Zheng, P., Zhuang, C., Liu, Q., & Wang, L. (2022). Industry 5.0: Prospect and retrospect. *Journal of Manufacturing Systems*, 65, 279-295.
- Lu, Y., Zheng, H., Chand, S., Xia, W., Liu, Z., Xu, X., & Bao, J. (2022). Outlook on human-centric manufacturing towards Industry 5.0. *Journal of Manufacturing Systems*, 62, 612-627.
- Maddikunta, P. K. R., Pham, Q. V., Prabadevi, B., Deepa, N., Dev, K., Gadekallu, T. R., ... & Liyanage, M. (2022). Industry 5.0: A survey on enabling technologies and potential applications. *Journal of Industrial Information Integration*, 26, 100257.
- Mitchell, J., & Guile, D. (2022). Fusion skills and industry 5.0: conceptions and challenges. *Insights Into Global Engineering Education After the Birth of Industry 5.0*, 53.
- Müller, J. (2020). Enabling Technologies for Industry 5.0. Results of a Workshop with Europe's Technology Leaders. *Directorate-General for Research and Innovation*.
- Prause, G., & Atari, S. (2017). On sustainable production networks for Industry 4.0. *Entrepreneurship and Sustainability Issues*, 4(4), 421-431.
- Rožanec, J. M., Novalija, I., Zajec, P., Kenda, K., Tavakoli Ghinani, H., Suh, S., & Soldatos, J. (2022). Human-centric artificial intelligence architecture for industry 5.0 applications. *International Journal of Production Research*, 1-26.
- Saniuk, S., Grabowska, S., & Straka, M. (2022). Identification of Social and Economic Expectations: Contextual Reasons for Transformation Process Industry 4.0 into Industry 5.0 Concept. *Sustainability*, 14(3), 1391.
- Skobelev, P. O., & Borovik, S. Y. (2017). On the way from Industry 4.0 to Industry 5.0: From digital manufacturing to digital society. *Industry 4.0*, 2(6), 307-311.
- Tiwari, S., Bahuguna, P. C., & Walker, J. (2022). Industry 5.0: A macroperspective approach. In *Handbook of Research on Innovative Management Using AI in Industry 5.0* (pp. 59-73). IGI Global.
- Villani, V., Sabattini, L., Barańska, P., Callegati, E., Czerniak, J. N., Debbache, A., ... & Fantuzzi, C. (2020). The INCLUSIVE system: A general framework for adaptive industrial automation. *IEEE Transactions on Automation Science and Engineering*, 18(4), 1969-1982.
- Wang, S., Wan, J., Zhang, D., Li, D., & Zhang, C. (2016). Towards smart factory for industry 4.0: self-organized multi-agent system with big data based feedback and coordination. *Computer Networks*, 101, 158-168.
- Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). Industry 4.0 and Industry 5.0—Inception, conception and perception. *Journal of Manufacturing Systems*, 61, 530-535.

## **THE MOST INFLUENTIAL POLICY AND INFRASTRUCTURES FACTORS IN QMS – PRACTICES FROM THE FOOD PROCESSING INDUSTRY**

**Marija Stanojeska**

UACS, School of Business Economics and Management, Skopje, Republic of North Macedonia

E-mail: [marija.stanojeska@uacs.edu.mk](mailto:marija.stanojeska@uacs.edu.mk)

**Robert Minovski**

Ss. Cyril and Methodius University in Skopje, Faculty of Mechanical Engineering, Skopje, Republic of North Macedonia

**Bojan Jovanoski**

Ss. Cyril and Methodius University in Skopje, Faculty of Mechanical Engineering, Skopje, Republic of North Macedonia

### **ABSTRACT**

Adopting the quality management system (QMS) as a direction of organizational progress with the use of quality improvement made it possible to achieve the overall organization's success. This potential has not yet been fully exploited, and it is suggested that improved policy and infrastructure, driven by top management, contribute to the development of the state of QMS towards the successful implementation of total quality management (TQM) practices. The main objective of this research is to assess the importance of each of the factors included in the set of policy and infrastructure factors, to enhance the state of QMS in business organizations. In that context, a survey of 82 companies from the Macedonian food industry was carried out, using a structured questionnaire. The results of the conducted study indicate similar rank of all identified influencing factors of policy and infrastructure. Nevertheless, the processed data indicates that Equipment and Maintenance (86%) and Documented Systems with clearly defined instructions (82%) are the most significant treated factors. In addition, the valuation of policy and infrastructure factors according to the size of the surveyed organization is presented in this article. The gathered results were used to create a dynamic model for policy and infrastructure improvement, as one of the prerequisites for further improvement of the state of QMS towards TQM, under the influence of employee motivation.

**Keywords:** Policy and infrastructures, Equipment and maintenance, Documented system with clearly defined instructions, QMS and TQM practices.

### **INTRODUCTION**

In a dynamic business environment, what is good for the organization and the customers come together and become a driving force. The evidence suggests that QMS provides a critical structure with the potential to create value for customers, contribute to the quality and operational performance (Kafetzopoulos et al., 2015). Thus, the quality management system (QMS) in organizations is widely accepted and indisputable because it adds value to the organizations (Gremyr et al., 2021). This potential, however, has not yet been fully exploited. Since the numerous influential factors and the dynamism of the complex process, the improvement of the QMS represents a vague area that is worth researching. Hence, various factors for successful QMS transition to more advanced levels are investigated (Respati & Ami, 2014; McLein et al., 2017; Oliveira et al., 2017). Importance of the factors like the commitment of the top management, customer focus, employee involvement, organizational learning, and continuous improvement..., remains a focus in numerous researches (Sisnuhadi, 2014; Koh & Low, 2010; Psychogios et al., 2009; Das et al., 2008; Tang & Wu, 2010; Chang, Chiu & Chen, 2010; Mardani & Kazemilari 2012; Andersson, 2011; McLein et al., 2017). Yet, the policy and infrastructures are among the reported influential factors (Neubeck et al. 2014; Kadam 2012; Plura, 2000; Hernad & Gayab, 2013), that can influence the development of QMS toward successful implementation of TQM practices. It is

well known that top management plays a key role in establishing quality policies and providing resources and infrastructure and stimulating employee involvement (Dubey et al., 2012). Speaking about the policy and infrastructure, several factors can be treated, such as documented system, equipment and maintenance, methods, availability of quality data, and information technology.

As one of the influential policy and infrastructure factors, the documented system with clearly defined instructions guides the development and implementation of TQM systems (Gremyr, 2021). It can be confirmed a documented quality system as part of a TQM strategy can contribute to TQM by consistently managing the processes. A quality system is defined as the organizational structure, procedures, processes, and resources needed to implement quality management (Poksinska, 2007). The documented system covers all stages of initial identification until satisfaction is finally reached for the interested parties (Suyitno, 2018).

Additionally, the evidence suggests that a lack of competence in quality improvement methods has a negative influence on the QMS. Using appropriate quality methods, organizations identify problems and implement the right solutions. Implementation and practicing suitable methods lead to the fulfillment of the quality requirements (Girmanova et al., 2022).

Moreover, the discussion regarding the initiatives to keep the availability of quality data at the appropriate level is vital in terms of sharing quality information and knowledge between employees or customers and it is one of the preconditions for the implementation of TQM. Basically, the available data and information collected are used to guide decisions, provide a means of learning, and keep processes in control which lead toward overall improvement of the state of QMS (Neubeck et al., 2014).

In terms of information technology, many researchers have demonstrated the positive impact that both quality management systems and information technology can have on organizational performance. Information technology is essential for ensuring successful TQM programs and can be used to support the leadership role of senior management; facilitate the dissemination of TQM values; and manage information on quality, which in turn facilitates TQM application and consequently promotes the benefits of TQM (Wai et al., 2011; Elg et al., 2021). As it is widely accepted, effective maintenance is critical to many operations.

As one of the influential factors, maintenance affects production by increasing production capacity and controlling the quality and quantity of output. It extends equipment life, improves equipment availability, and retains equipment in proper condition. Therefore, the maintenance function plays a critical role in a company's ability to compete based on cost, quality, and delivery performance (Al-Najjar, 2007).

The purpose of this paper is to assess the influence of each policy and infrastructure factor. This study focuses on ISO 9001, ISO 22000, and HACCP-certified food production organizations. The data was used to create a dynamic model for improving the status of QMS. In the next sections, the background is given, followed by findings, and a discussion of findings. Finally, conclusions are drawn in the last section of the paper.

## **LITERATURE REVIEW**

According to the research of Bibi and Aurangzeb (2021), the infrastructure has a positive influence on the improvement of the state of the QMS. Indeed, the QMS perspective must be vision-driven and strengthened by policy and standards. Following this viewpoint is also research presented by Neubeck et al., 2014; Solomon et al., 2017; Pérez & Gutiérrez, 2013; Fonseca et al., 2017; Respati & Ami, 2014; McLein et al., 2017; Oliveira et al., 2017; Kadam 2012; Plura, 2000; Hernad et al., 2013; Zu 2009. Additionally, the strong correlation between the top management and their commitment to establishing adequate policy and infrastructure as one of the means toward the development of QMS is confirmed in numerous research papers by many researchers like Soltani (2005), Talib et al. (2010), Kanji (2010), Saraph et al. (1989), Flynn et al. (1994), Anderson et al. (1995). On the other hand, the relationship between the policy and infrastructure and employee involvement in the direction to increase their

commitment to the development of the state of QMS is emphasized in the research papers of Choo et al. (2007), Kimutal et al. (2013) and Jaafreh (2013).

In this paper, research on policy and infrastructure factors is conducted. A documented system with clearly defined instructions, equipment and maintenance, methods, availability of quality data, and information technology, are significant determinants of the state of the QMS. The brief literature review related to each of the factors is following.

The availability of quality data as an element of quality information management originates from the principle of management by the fact (Flynn et al., 1994; Saraph et al., 1989; Yasamis et al., 2002; Black & Porter, 1996; Koh & Low, 2010; Burati et al., 1992). Mardani and Kazemilari (2012) noted that the information and analysis category focuses on how the organization selects, manages, and uses information and data to support key company processes and improve the state of QMS. According to Suyitno (2018), the documented system covers all stages of initial identification until satisfaction is finally reached for the interested parties. Gremyr et al. (2021) stated the documented system can increase the value of the QMS in the organization. In that direction, the documented system describes aspects of the QMS concerning a business's need to achieve quality at optimum cost, expand market share, and maintain long-term competitiveness (Poksinska, 2010; Maguad, 2006; Gustafsson et al. 2001). Many researchers have demonstrated the positive impact that both QMS and information technology can have on organizational performance (Pérez-Aróstegui et al., 2015; Sánchez-Rodríguez et al., 2006; Martínez-Lorente, 2004). In that sense, the connection between information technology and TQM can be described as positive as information technology can act as an enabler of the TQM facets (Elg et al., 2021). As reported by Dewhurst et al. (2003), in their research on applying TQM through information technology found that information technology methods are essential for ensuring successful TQM programs. To et al. (2018) found that the implementation of appropriate methods for quality improvement can contribute to the implementation of TQM practices. Besides that, a strong maintenance program is needed to provide reliable equipment maintenance and reduce equipment process variation (McKone et al., 2001). The importance of the maintenance function has increased, due to its role in keeping and improving availability, performance efficiency, and product quality (Maletič et al. 2012, Swanson, 1997: Swanson 2001; Al-Najjar, 2007; Riis et al., 1997; Alyouf, 2007; Waeyenbergh & Pintelon, 2002).

## **RESEARCH METHODOLOGY**

The applied research methodology is evolving from the need to collect the required data for the design of the dynamic model for improvement of the state of QMS towards TQM under the influence of the employee motivation, presented in Figure 1. Thus, the three main challenges that this research is faced with are (1) validation of the correlations between the policy and infrastructures with employee involvement and top management commitment – the section of the SD model presented in Figure 1 marked with a dotted line, (2) identification of influential factors of policy and infrastructures, and (3) assessment of the most influential factors.

To resolve the first challenge, an in-depth literature analysis was performed. These findings validated the correlation between policy and infrastructure (P&I) and top management commitment (TMC) and also, policy and infrastructure (P&I) and employee involvement (EI), (Stanojeska et al., 2016).

The second challenge, which refers to the identification of the most influential policy and infrastructure factors, was also performed through the literature research using the following keywords: QMS, policy, infrastructure, and TQM factors. Our survey showed five influential factors, whose importance is confirmed by various authors (Table 1).

The third challenge that this research is focused on is the assessment of the most influential factors was accomplished through the conducted survey. Actually, the third challenge is related to the functionality of the created dynamic model and limited resources, including time and human resources. Hence, the need for simplification and reduction of the number of included variables (factors) in the model, by

evaluating the significance and selecting the two most influential factors from the set of identified factors.

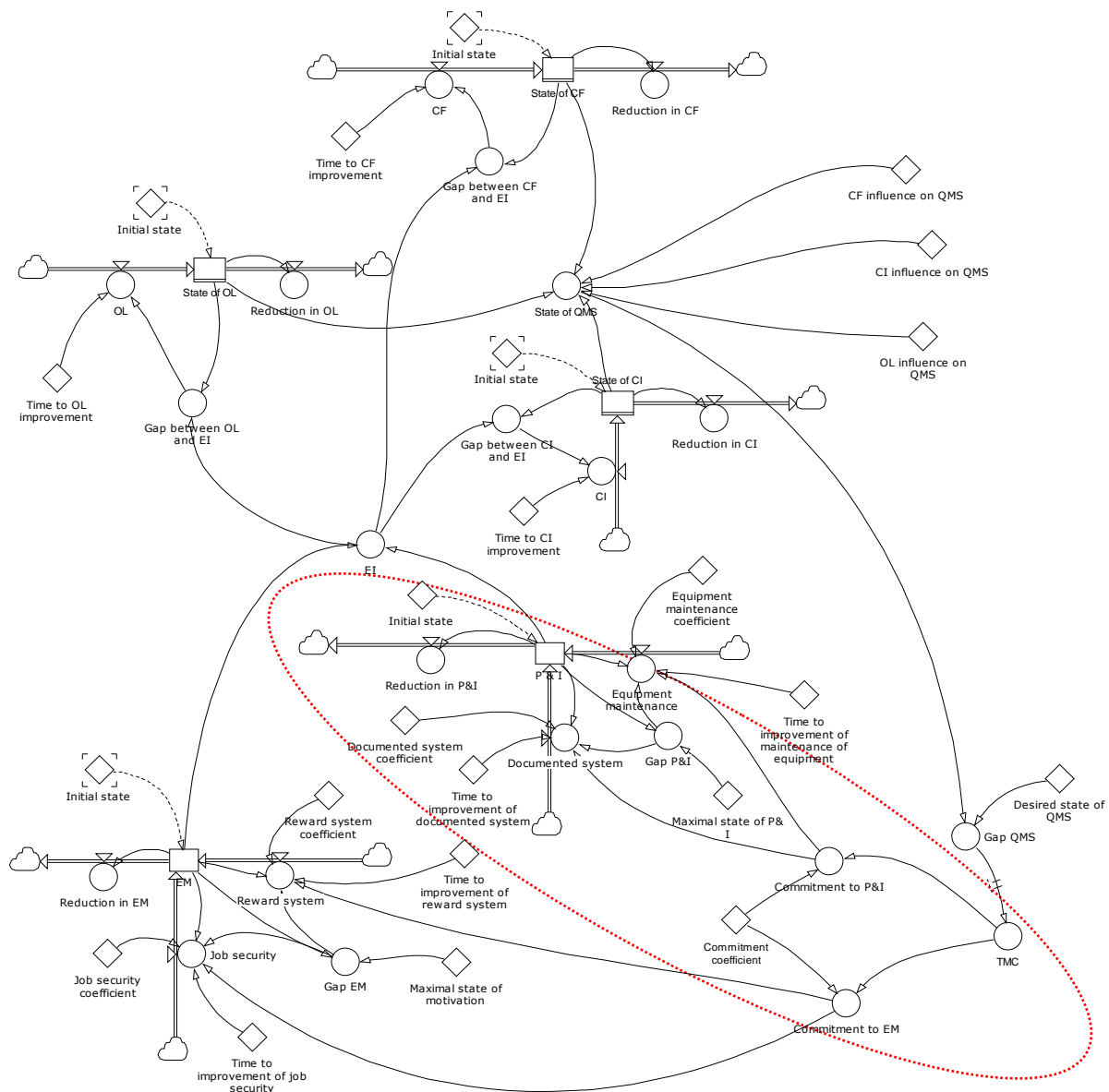


Figure 1: The structure of the designed SD model for improvement of the state of QMS towards TQM under the influence of the employee motivation

Technically, the survey was directed to the Macedonian food processing industry. The questionnaire was designed to gather data connected with the QMS, means of the influence of top management on the status of the QMS, policies and infrastructures, motivation of employees, and TQM factors. Responders were asked to indicate the level of significance of policies and infrastructures factors using the following five-point Likert scale: 1- poor significance, 2- below average significance, 3- average significance, 4- very good significance, and 5- excellent significance. In that sense, this paper draws on a questionnaire section focusing on the management’s perceptions regarding the importance of each of them.

As mentioned earlier, the initial pool of influential factors included equipment and maintenance, documented systems with clearly defined instructions, availability of quality data, information technology, and methods, as influential factors on policy and infrastructure. The gathered data was



processed in a direction to find out the importance of each of them. In other words, the goal of this research is:

*G: Assessment of the significance of the policy and infrastructure factors in direction of improvement of the state of QMS in Macedonian food processing industries.*

*Table 1. Identification of the most influential policy and infrastructure factors*

<b>Policy and infrastructure influential factors</b>	<b>Literary source</b>
Documented system with clearly defined instructions	Gremyr (2021); Suyitno (2018); Poksinska (2010); Maguad (2006); Gustafsson et al. (2001); Poksinska (2007).
Availability of quality data	Flynn et al. (1994); Saraph et al. (1989); Yasamis et al. (2002); Black & Porter (1996); Koh & Low (2010); Burati et al. (1992); Mardani & Kazemilari (2012); Neubeck et al. (2014).
Methods	Girmanova et al. (2022); To et al. (2018).
Information technology	Elg et al. (2021); Wai et al. (2011); Pérez-Aróstegui et al. (2015); Sánchez-Rodríguez et al. (2006); Martínez-Lorente (2004); Dewhurst et al. (2003).
Equipment and maintenance	McKone et al. (2001); Maletič et al. (2012); Swanson (1997); Swanson (2001); Al-Najjar (2007); Riis et al. (1997); Alsyof (2007); Waeyenbergh & Pintelon (2002).

## RESULTS AN DISCUSSION

### Data collection from the survey

According to the defined goals, an evaluation of the value of the set of policy and infrastructure factors was investigated, through a survey with the Macedonian food processing industry. The questionnaires were distributed to 112 registered food production organizations, with valid ISO 9001 (27%), ISO 22000 (32%), or HACCP certificates (41%). A total of 82 food-processing organizations participated in the survey, resulting in a response rate of 73%. The participation of surveyed organizations according to the criterion of number of employees was 43% of small organizations (number of employees less than 50), 44% of medium-sized organizations (number of employees 50-251), and 13% of large organizations (number of employees up to 251). The research covered various types of food production (beverages industry – 16%, baking industry -13%, fruit, and vegetables industry – 12%, dairy industry – 10%, meat industry – 10%, milling industry - 8%, etc.). The respondents of this study were quality managers (49%), production managers (26%), and directors (25%).

### Discussion of the results

The results of the processed data collected through the conducted survey are presented in Table 2.

*Table 2. Assessment of the importance of the policy and infrastructures factors*

<b>Policy and infrastructure factors</b>	<b>Assessment of the importance</b>
Documented system with clearly defined instructions	82 %
Availability of quality data	78 %
Methods	72 %
Information technology	78 %
Equipment and maintenance	86 %

Since the interval of 86% (value for evaluation of *Equipment and maintenance*) and 72% (value for evaluation of *Methods*) is relatively narrow, it is more than clear that the respondents are sufficiently aware of the vitality of each of the policy and infrastructure factors (Table 2). However, they have given the highest rating to *Equipment and maintenance*, as it plays a critical role in creating a capable



processes, with minimized number of defects. Consequently, the reduced number of defects and failures can increasingly improve the state of the QMS towards TQM.

In order to make an in-depth analysis, the collected data are processed according to the criteria of the number of employees in the surveyed organization or in other words, the size of the organization. The processed data are presented in Figure 2.

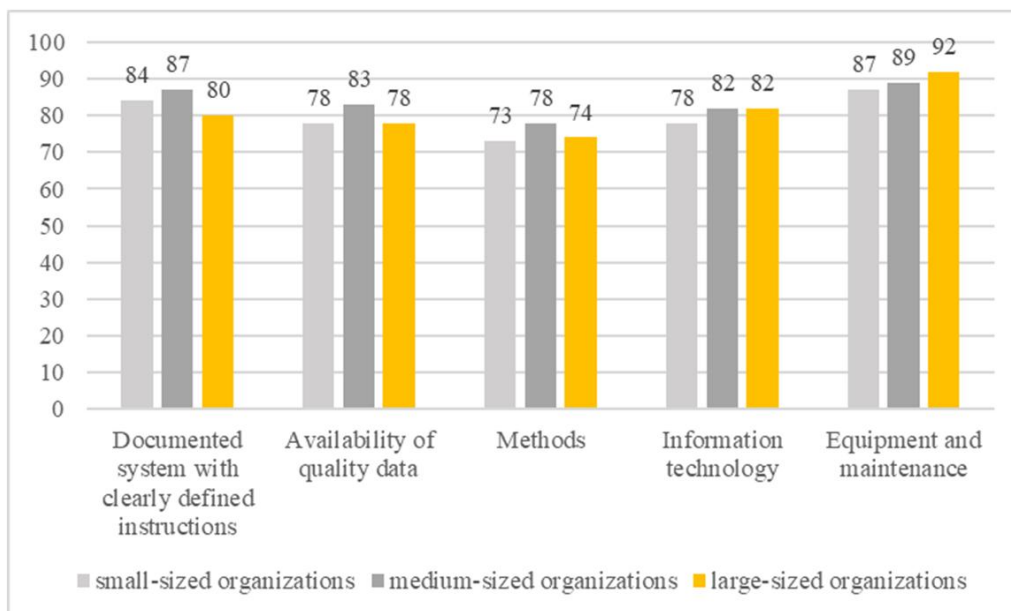


Figure 2: Evaluation of the importance of policy and infrastructures factors according to the criteria the organization size

The summary graph (Figure 2) displays that *Equipment and maintenance* are evaluated as the most impactful factor in the improvement of the state of the QMS in all types of organizations. In fact, the respondents from small organizations with less than 50 employees rated *Equipment and maintenance* at 87%. The respondents employed in medium-sized organizations, evaluated *Equipment and maintenance* with 92%, while the respondents of large-sized organizations, rated it at 87%. Interestingly, only by large-sized organizations *Information technology* is evaluated in the second position (82%), likely due to the widespread use of *Information technology* in large-sized organizations compared to smaller ones. Still the level of digitization in developing countries companies is at a relatively low level, as the implementation of digital technologies requires considerable investments, which, in turn, are unaffordable for smaller companies. This problem deserves an in-depth and more comprehensive analysis, and is worth considering in some further research. However, the lack of implementation of the information technology placed the *Documented system with clearly defined instructions* in the second position in both, the medium-sized and small-sized organizations. In that sense, it is worth it to underline that the *Documented system with clearly defined instructions* serves as a prerequisite guideline for further development of the state of the QMS. Therefore, the main goal of the research, which means to evaluate the importance of the factors regarding the policy and infrastructure, is accomplished. The results obtained in this research were used to create the presented dynamics model (Figure 1), for improving the state of QMS towards TQM, under the influence of employees' motivation (Stanojeska et al., 2020).

## CONCLUSION

The main goal of the presented research is to evaluate the most influential policy and infrastructure factors in a documented system with clearly defined instructions, equipment and maintenance, availability of quality data, methods, and information technology. This study was conducted in the Macedonian food processing industry. Our survey results indicate that all factors are almost equally important and have a considerable impact on policy and infrastructure.

However, the most influential factors for enhancing the policy and infrastructure are equipment and maintenance (82%) and documented system with clearly defined instructions (82%).

Additionally, we analyzed data according to the size of the organizations and found slight variation in the results. Equipment and maintenance was rated the most influential factor across all organizations sizes, indicating that proper maintenance and quality equipment are vital for design of the efficient process with minimum number of non-conformities. In small-sized and medium-sized organizations, documented system with clearly defined instructions was valued in the second position. On the other hand, information technology was rated as the second most influential factor in large-sized organizations. Explicitly, in large-sized organizations, information technology is fully integrated with the business operation and it is crucial for achieving overall organizational performance.

As mentioned earlier, due to limited resources (including time and personnel), the above research focused on identifying only the two most influential factors of policy and infrastructure. Yet, it is worth noting that there are other factors that can have an impact and should be considered in a more comprehensive model in the future (if there were more resources to build it...).

## REFERENCES

- Al-Najjar, B. (2007). The lack of maintenance and not maintenance which costs: A model to describe and quantify the impact of vibration-based maintenance on company's business. *International Journal of Production Economics*, 107 (1), 260–273.
- Alsyouf, I. (2007). The role of maintenance in improving companies' productivity and profitability. *International Journal of Production Economics*, 105 (1), 70-78.
- Anderson, J.C., Rungtusanathan, M., & Schroeder, R.G. (1994). A theory of quality management underlying the Deming management method. *Acad. Manage. Rev.*, 19, 472-509. DOI: 10.2307/258936
- Andersson, L. (2011). Barriers to organizational learning: A case study of a change Project. *Conference for Organizational Learning, Knowledge and Capabilities*, April 11-15, Hull, UK, 2011.
- Bibi, S., & Aurangzeb, W. (2021). Implementation of Quality Management System ISO 9001:2015 at Public and Private Sector Universities: Challenges and Prospects, *Ilkogretim Online - Elementary Education Online*, 20 (5), 7713-7721. DOI: 10.17051/ilkonline.2021.05.875
- Black, S.A., & Porter, L.J. (1996). Identification of the critical factors of TQM. *Decision Sciences*, 27(1), 1-21. DOI: 10.1111/j.1540-5915.1996.tb00841.x
- Burati, J.L., Matthews, M.F., & Kalidindi, S.N. (1992). Quality management organizations and techniques. *J. Constr. Eng. Manage.*, 118(1), 112-128. DOI: 10.1061/(ASCE)0733-9364(1992)118:1(112)
- Chang, C.C., Chiu, C.M., & Chen, C.A. (2010). The effect of TQM practices on employee satisfaction and loyalty in government. *Total Quality Management*, 21, 1299-1314. DOI: 10.1080/14783363.2010.530796
- Choo, S., & Bowley, C., (2007). Using training and development to affect job satisfaction within franchising. *Journal of Small Business and Enterprise Development*, 14, 339-352. DOI: 10.1108/14626000710746745
- Das, A., Paul, H., & Sweirczek F.W. (2008). Developing and validating total quality management (TQM) constructs in the context of Thailand's manufacturing industry. *Benchmarking: An International Journal*, 15 (1), 52–72.
- Dewhurst, F.W., Martinez-Lorente, A.R., & Sánchez-Rodríguez, C. (2003). An initial assessment of the influence of IT on TQM: a multiple case study, *International Journal of Operations and Production Management*, 23 (4), 348-74.
- Dubey, S.K., & Bansal, S. (2012). Barriers in implementing radical/incremental changes in manufacturing - based government organizations, *Australian Journal of Business and Management Research*, 2 (2), 48-59.
- Elg M., Birch-Jensen A., Gremyr I., Martin J., & Melin U. (2021). Digitalisation and quality management: problems and prospects, *Production Planning & Control*, 32 (12), 990-1003, DOI: 10.1080/09537287.2020.1780509
- Flynn, B.B., Schroeder, R.G., & Sakakibara S. (1994). A framework for quality management research and an associated measurement instrument. *J. Oper. Manage.*, 11, 339-366. DOI: 10.1016/S0272-6963(97)90004-8
- Fonseca, L.M., Domingues, J.P., Machado, P.B., & Calderón, M. (2017). Management System Certification Benefits: Where Do We Stand? *Journal of Industrial Engineering and Management*, 10 (3), 476-494.
- Girmanová, L., Šolc, M., Blaško, P., & Petřík, J. (2022). Quality Management System in education: Application of quality management system in educational organization – Case study from the Slovak Republic, *Standards*, 2 (4), 460-473. DOI: 10.3390/standards2040031
- Gremyr, I., Lenning J., Elg M., & Martin, J., (2021). Increasing the value of quality management systems, *International Journal of Quality and Service Sciences*, 13 (3), 381-349. DOI: 10.1080/09537287.2020.1780509
- Gustafsson, R., Klefsjö, B., Berggren, E., & Granfors-Wellemets, U. (2001). Experiences from implementing ISO 9000 in small enterprises – a study of Swedish organisations, *The TQM Magazine*, 13 (4), 232-246. DOI: 10.1108/09544780110366088
- Hernad, J.M.C., & Gayab, C.G. (2013). Methodology for implementing Document Management Systems to support ISO 9001:2008, Quality Management Systems. *Procedia Engineering*, 63, 29-35.
- Jaafreh, A.B. (2013). The Effect of Quality Management Practices on Organizational Performance in Jordan: An Empirical Study. *International Journal of Financial Research*, 4 (1), 93-109. DOI: 10.5430/ijfr.v4n1p93

- Kadam, R. (2012). Development and growth orientation of infrastructure policy in India. *International Journal of Advanced Research in Management and Social Sciences*, 1, 101-113.
- Kafetzopoulos, D., Gotzamani, K., & Gkana, V. (2015). Relationship between quality management, innovation and competitiveness. Evidence from Greek companies, *Journal of Manufacturing Technology Management*, 26 (8), 1177-1200.
- Kanji, G.K. (2010). Measure of business excellence, *Total Quality Management & Business Excellence*, 9, 633-644. DOI: 10.1080/0954412988325
- Kimutal, G., Gachunga, H., Wanjau, K., & Gichuhi, A.W. (2013). Influence of employee capacity on health workforce performance in Kenya's public health sector: A tale of ISO 9001:2008 certified hospitals. *European Journal of Business and Social Sciences*, 2, 134-152.
- Koh, T.Y., & Low, S.P. (2010). Empiricist Framework for TQM Implementation in Construction Companies., *Journal of management in engineering*, 26 (3), 133-143.
- Maguad, B.A. (2006). The modern quality movement: Origins, development and trends, *Total Quality Management and Business Excellence*, 17 (2), 179-203. DOI: 10.1080/14783360500450608
- Maletič, D, Maletič, M., Al-Najjar, B., & Gomišček, B. The role of maintenance regarding improving product quality and company's profitability: A case study. *2nd IFAC Workshop on Advanced Maintenance Engineering, Services and Technology*, Universidad de Sevilla, Sevilla, Spain. November 22-23, 2012.
- Mardani, A., & Kazemilari, M. (2012). Relationship between national culture and TQM implementation, Case study: Iranian multinational electrical manufacturing companies, *Asian Journal of Management Research*, 3 (1).
- Martínez-Lorente, A.R., Sánchez-Rodríguez, C. & Dewhurst, F.W. (2004). The effect of information technologies on TQM: an initial analysis. *International Journal of Production Economics*, 89 (1), 77-93.
- McKone, K.E., Schroeder, R.G. & Cua, K.O. (2001). The impact of total productive maintenance practices on manufacturing performance. *Journal of Operations Management*, 19 (1), 39-58.
- McLein, R.S., Antony, J., & Dahlgard, J.J. (2017). Failure of Continuous Improvement initiatives in manufacturing environments: a systematic review of the evidence, *Total Quality Management & Business Excellence*, 28 (3-4) 219-237.
- Neubeck, T., Elg, M., & Schneider, T. (2014). Managing the gap between policy and practice through Intermediaries for Quality Improvement. *Scandinavian Journal of Public Administration*, 18, 73-89.
- Oliveira, G.S., Correa, J.E., Balestrassi, P.P., Martins, R.A., & Turrioni, J.B. (2017). Investigation of TQM implementation: empirical study in Brazilian ISO 9001-registered SMEs. *Total Quality Management & Business Excellence*, 28 (5-6), 1-19.
- Pérez, V.F. & Gutiérrez L.G. (2013). External managerial networks, strategic flexibility and organizational learning: A comparative study among non-QM, ISO and TQM firms. *Total Quality Management*, 24, 243-258. DOI: 10.1080/14783363.2012.669558
- Pérez-Aróstegui M.N, Bustinza-Sánchez F., & Barrales-Molina V. (2015). Exploring the relationship between information technology competence and quality management. *BRQ Business Research Quarterly*, 18, 4-17.
- Plura, J. (2000). Continual improvement within the quality management systems. *Kvalitita Inovacia Prosperita*, IV (1), 13-22.
- Poksinska, B. (2007). Does standardization have a negative impact on working conditions?. *Human Factors and Ergonomics in Manufacturing*, 17 (4), 383-394. DOI: 10.1002/hfm.20080.
- Poksinska, B. (2010). When does ISO 9000 lead to improvements?. *International Journal of Productivity and Quality Management*, 5 (2), 124-136. DOI: 10.1504/IJPM.2010.030738
- Psychogios, A.G, Wilkinson, A., & Szamosia, L.T. (2009). Getting to the heart of the debate: TQM and middle manager autonomy. *Total Quality Management & Business Excellence*, 20, 445-466. DOI: 10.1080/14783360902781949
- Respati, H., & Ami, R. (2014). Research on Continues Mediation: Employee Behaviour and TQM Practice as ISO 9000 Strategy to Improve Performance of Manufacturing Company in East Java, Indonesia, *European Journal of Business and Management*, 6 (29), 125-136.
- Riis, J., Luxhoj, J., & Thorsteneinsson, U. (1997). A situational maintenance model. *International Journal of Quality and Reliability Management*, 14 (4), 349-366.
- Sánchez-Rodríguez, C., Dewhurst, F.W., & Martínez-Lorente, R.A. (2006). IT use in supporting TQM initiatives: an empirical investigation, *International Journal of Operations & Production Management*, 26 (5), 486-504. DOI: 10.1108/01443570610659874
- Saraph, J.V., Benson, P.G., & Schroeder, R.G. (1989). An instrument for measuring the critical factors of quality management. *Decision Sciences*, 20, 810-829. DOI: 10.1111/j.1540-5915.1989.tb01421.x
- Sisnuhadi, D. (2014). The relationship between soft factors and hard factors of TQM practices and organizational learning, *European scientific Journal*, 10 (7), 85-99.
- Solomon, N.P., Bester, A., & Moll, M. (2017). Diffusion of a quality management system: A case study, *South African Journal of Industrial Engineering*, 28 (2), 149-164.
- Soltani E. (2005). Top Management: A threat or an opportunity to TQM? *Total Quality Management & Business Excellence*, 16 (4), 463-476. DOI: 10.1080/14783360500078441
- Stanojeska, M., Minovski R. and Jovanovski B. Top Management role in improving the state of QMS through management of employee motivation, *VI International Symposium Engineering Management and Competitiveness, EMC*, June 17-18, Kotor, Montenegro, 2016.
- Stanojeska, M., Minovski, R., and Jovanovski, B. (2020). Top management role in improving the state of QMS under the influence of employee's involvement: Best practice from the food processing industry, *Journal of Industrial Engineering and Management, JIEM*, 13 (1), 73-89.
- Suyitno, S. (2018). The implementation of quality management system using ISO 9001:2008 based Total Quality Management Concept (Case Study at the First State Public Vocational Secondary School at Singosari, Malang Regency, East Java, Indonesia). *Journal of Social Sciences (COES&R/J-JSS)*, 7 (1), 15-27. DOI: 10.25255/jss.2018.7.1.15.27

- Swanson, L. (1997). An empirical study of the relationship between production technology and maintenance management. *International Journal of Production Economics*, 53, 191–207.
- Swanson, L. (2001). Linking maintenance strategies to performance. *International Journal of Production Economics*, 70, 237–244.
- Talib, F., Rahman, Z. & Qureshi, M.N. (2010), The relationship between total quality management and quality performance in the service industry: a theoretical model, *International Journal of Business, Management and Social Sciences (IJBMSS)*, 1 (1), 113-128.
- Tang, Z., & Wu, Z. (2010). Using behavior theory to investigate individual-level determinants of employee involvement in TQM. *Total Quality Management, Business Excellence*, 21, 1231-1260. DOI: 10.1080/14783363.2010.530794
- To, W.M., Yu, B.T.W., & Lee, P.K.C. (2018). How Quality Management System Components Lead to Improvement in Service Organizations: A System Practitioner Perspective. *Adm. Sci.*, 8 (73). DOI: 10.3390/admsci8040073
- Waeyenbergh, G. and Pintelon, L. (2002). A framework for maintenance concept development. *International Journal of Production Economics*, 77, 299–313.
- Wai L.S.M.D., Seebaluck A.K., & Teeroovengadum V. (2011). Impact of information technology on quality management dimensions and its implications, *European Business Review*, 23 (6), 592-608. DOI: 10.1108/09555341111175426
- Yasamis, F., Arditi, D., & Mohammadi, J. (2002). Assessing contractor quality performance. *Constr. Manage. Econom.*, 20, 211-223. DOI: 10.1080/01446190110113693
- Zu, X. (2009). Infrastructure and core quality & Reliability practices: how do they affect quality? *International Journal of Quality & Reliability Management*, 26, 129-149. DOI: 10.1108/02656710910928789



**Session B: HUMAN RESOURCE MANAGEMENT**

---

**Papers (pp. 95-134):**

Ali Reza Afshari, Saman Nejatpuor THE FUTURE OF SPORT MANAGEMENT RESEARCH IN IRAN	...95
Mihalj Bakator, Mila Kavalić, Edit Terek Stojanović, Verica Gluvakov, Dragan Čočkaló EDUCATION AND INTELLECTUAL CAPITAL MANAGEMENT IN SMEs AS MEANS OF IMPROVING COMPETITIVENESS	...100
Srdan Bogetić, Zorana Antić THE IMPACT OF MENTAL HEALTH AND PSYCHOSOCIAL RISKS ON A SAFE AND HEALTHY WORKPLACE	...106
Verica Gluvakov, Sanja Stanisavljev, Dragana Kovač, Stefan Ugrinov, Dejan Bajić THE ROLE OF LEADERSHIP IN KNOWLEDGE MANAGEMENT	...112
Dragana Kovač, Mihalj Bakator, Ivan Palinkaš, Maja Gaborov, Melita Čočkaló-Hronjec CREATIVE PROBLEM SOLVING IN MODERN ORGANIZATIONS	...118
Srdana Taboróši, Biljana Maljugić, Zoran Lajić, Jelena Rajković, Siniša Mitić EMPLOYEE TURNOVER DURING THE GREAT RESIGNATION	...124
Edit Terek Stojanović, Milan Nikolić, Predrag Mali, Jelena Rajković, Sinisa Mitić SOCIAL MEDIA AS A PR STRATEGY	...129



## **THE FUTURE OF SPORT MANAGEMENT RESEARCH IN IRAN**

**Ali Reza Afshari**

Islamic Azad University, Department of Construction Management, Shirvan Branch, Shirvan, Iran

E-mail: [afshari@mshdiau.ac.ir](mailto:afshari@mshdiau.ac.ir)

**Saman Nejatpuor**

Islamic Azad University, Department of Physical Education, Shirvan Branch, Shirvan, Iran

### **ABSTRACT**

Ongoing debates about appropriate foci and growth of sport management research, application, theory, and training are evidence of the field's growing pains. These growing pains also occur in other fields in which they function as a means to expand and elaborate the paradigms through which fields of inquiry grow and mature. In this study, a panel of 17 leading sport management scholars from around the globe responded to three iterations of a Delphi questionnaire probing their views about the status and future of the field. Panelists agreed that stronger research, additional cross-disciplinary research, a stronger link between theory and practice, enhanced infrastructure, and improved doctoral training are desirable objectives. They disagreed, however, about the appropriate academic home for sport management, what constitutes quality research, the roles of qualitative vs. quantitative research, and the relative value of basic vs. applied research. The results show that by actively engaging in debates over the issues identified in this study, sport management scholars can explore new ways of perceiving, thinking, and valuing that could enable proficient and constructive development of the field.

**Keywords:** Futures studies, Delphi Method, Sport Management, Sport Management Research,

### **INTRODUCTION**

In the past two decades, scholars have increasingly called for sport management researchers to include more critical social science in their work (Amis and Silk, 2005). Critical approaches are heavily employed in sport sociology, and scholars have further suggested that drawing on critical sociological perspectives in sport management can strengthen the field and our understanding of power in sport organizations (Knoppers, 2015). Alongside such calls for the use of more diverse research approaches, scholars have recently employed a variety of paradigmatic, methodological, and theoretical strategies in their work (McSweeney and Faust, 2019).

In fact, discussions and debates of this kind are useful for the advance of scholarly inquiry because they help to clarify needs, assumptions, possibilities, goals, and directions (Ulrich, 2001). Indeed, a great deal is now known about the relevant discourse surrounding discussions and debates regarding the status of academic fields. One of the important implications is that academic fields can be furthered through empirical analysis that establishes the parameters of the discussion and its implications. Because discussions and debates about the status, directions, and the future of a field are healthy and help scholarly work to advance, systematic inquiry into the parameters and implications of those discussions and debates can help a field to move itself forward. The Delphi technique is designed to overcome these deficiencies. It has proven useful when endeavoring to ascertain experts' views on the current status and future directions of a field. The technique is designed to "elicit and develop individual responses to the problems posed and to enable the experts to refine their views as the group's work progresses in accordance with the assigned tasks". As applied in the study that follows, the Delphi technique allows leading sport management scholars from around the globe to ascertain their points of agreement about the present status and future needs for sport management as an academic discipline, as well as to clarify their points of disagreement about the field and its future. On the basis of the foregoing review, the following research questions were derived: What characterizes an ideal future for sport management research?



## METHOD

Because the Delphi technique requires that panelists be experts in the field about which they are being queried, it was necessary to identify scholars who could arguably be considered experts. In order to identify experts, a three-step process was used. In Step 1, a panel of three sport management faculty with an aggregate of 36 years of experience in the field consensually identified the five most established and active research experts in the field. In Step 2, the five researchers identified in Step 1 were contacted. The purposes of this study were explained, and the researchers were asked to name the sport management scholars they felt should be included in the Delphi panel. Four of the five responded, yielding a list of 38 potential panelists. In order to retain the anonymity and independence required in a Delphi study, the three faculty from Step 1 were excluded from the list, even if mentioned in Step 2. Ten of the 38 potential panelists were chosen by at least two respondents. They were included in the Delphi panel. This number, however, was deemed inadequate. Although the optimal size of the Delphi panel depends on the purposes of the study and the expected heterogeneity of the target population, empirical examination of the Delphi technique suggests that a linear increase in accuracy occurs as the panel size increases to 11 members, and that 15–20 members might be optimal (Dalkey, 1969), unless a particularly heterogeneous sample is required. Therefore, in Step 3 the list of 28 scholars who were named only once in Step 2 was submitted to the three sport management faculty who had participated in Step 1. They independently indicated whether each of the 28 should be included on the panel. The seven on whom they agreed were included in the Delphi panel, bringing the panel to a total of 17 expert researchers. The Delphi technique consists of iterated rounds of survey questions, and each round builds on the preceding round. Findings from each round are feedback to the panelists who then respond. Responses can be both qualitative and quantitative. In successive rounds, panelists are encouraged to explain their responses and to indicate the bases for agreement or disagreement with other panelists. Research indicates that three iterations are typically sufficient to identify points of consensus and systematic points of difference, and that more iterations can bore panelists, thus reducing the validity of findings. Thus, three rounds were used in this study:

**Round 1.** The purpose of the first round was to elicit respondents' views about the future of sport management research. In order to formulate the Delphi questions, the authors and two experts in strategic management met to discuss the necessary content and probes. The experts were faculty in a large Iranian university business school who had extensive experience as strategic planning consultants and facilitators. The discussion was guided by principles of strategic management (Coulter, 2002) and appreciative inquiry (Quinn, 2004). The 4-hour discussion was undertaken in three phases. In the first phase, the focus and intent of questions was determined. In the second phase, the appropriate sequence for questions was identified. In the third phase, the language for each question was agreed upon. This yielded an instrument consisting of seven open-ended questions. In order to check the appropriateness of the questions for sport management, the questions were then submitted to the faculty who had participated in Steps 1 and 3 of the selection of Delphi panelists. The faculty endorsed the questions. The questions were then e-mailed to each of the 17 panelists, who were asked to provide detailed responses to each question. Their responses were collated and the content was analyzed independently by four analysts. The team of analysts consisted of the author, the two experts who had helped to formulate the questions, and one sport management scholar with experience in content analysis who had not participated in the study so far. Once the independent analyses had been completed, the analysts met to compare the themes each had identified. Initial agreement ranged from 84–92%, depending on the question being analyzed. Disagreements were resolved through consensual discussion. Eleven to 16 themes were identified for each question.

**Round 2.** In the second round, the thematic areas identified for each question were used to formulate items. Likert-type scales were used in Rounds 2 and 3 in order for Delphi Panel members to refine their responses. For Question, panelists were asked to rate the impact of each event and trend on a seven-point impact scale ranging from *no impact* to *critical impact*. For each theme under each question, panelists were also asked to provide explanations of the reasoning behind their ratings.

**Round 3.** The questionnaire in the final round consisted of the same items that had been asked in Round 2. In addition, panelists were shown the distribution of ratings from Round 2, including modes and frequencies. All qualitative comments and explanations that panelists had given to each theme under each

question in Round 2 were provided as well. Panelists were also reminded of their own rating for each item. They were asked to rate each item again, and to respond to panelists' comments from Round 2. Panelists were also instructed that they should explain their rating if they chose a rating that was more than two rating scale points from the mode, and they were instructed to explain any probability rating that deviated by more than 30% from the group mean.

## RESULTS

Question addressed the future of sport management research. Responses to the open-ended question in the first round yielded 11 themes that fully described the ideal qualities that panelists felt are necessary for sport management research. As a consequence of panelists' comments in the second round, it became clear that one theme had to be split into two. The resulting 12 ideal qualities for sport management research are listed, and comments from panelists that describe each quality are provided. Panelists' mean ratings of importance from the final Delphi round for each of the 12 research qualities were calculated. In addition, panelists' average ratings of the probability that those qualities would be attained during the next 5–7 years were also calculated. Mean ratings for importance and the 95% confidence interval for their subjective probabilities are shown in Table 1. Each of the 17 prospective panel members was then contacted. The purpose of the study was explained, the timetable for the study was presented, and each was asked whether he or she would participate. All agreed to participate. The panel consisted of 11 men and 6 women. Three panelists were located in business schools; the remaining 14 were located in departments specializing in sport studies (i.e., kinesiology, human kinetics, physical education, etc.). They ranged in age from 32–61 years ( $M = 46.06$ ,  $SD = 8.69$ ).

*Table 1: Importance and Probability of Qualities for an Ideal Future for Sport Management Research*

Item	Importance $M$ ( $SD$ )	Probability (95% confidence interval)
Adequate research resources	6.47 (0.74)	27.7–50.9
Sport management researchers professionally accepted, credible, and respected as scholars	6.30 (0.85)	44.4–62.2
Rigorous research designs, methodologies, analysis, and interpretation of data	6.29 (0.96)	46.9–66.5
High quality doctoral candidates	6.28 (0.39)	62.1–75.3
Research grounded in parent disciplines' theories	6.24 (0.83)	58.3–73.7
Research consistently of sufficient quality that it is readily publishable in first-tier sport management journals	6.20 (0.94)	54.0–77.4
Cross-disciplinary research	6.13 (1.13)	40.7–61.9
Sport management research consistently of sufficient quality that it is readily publishable in first-tier management journals	5.80 (1.15)	31.2–52.8
Theory developed/tested in sport management that impacts parent disciplines	5.73 (1.39)	24.0–48.0
Unique body of knowledge	5.67 (0.98)	36.0–57.4
Sport management research that is useful to management and that identifies best practice	5.47 (1.19)	35.4–59.2
Sport management research disseminated to the general public	4.87 (1.88)	27.7–53.7

Inspection of Table 1 shows that all 12 of the ideal qualities were deemed to be important, but that panelists were less than confident about the likelihood these could be attained. Panelists were most confident that high-quality doctoral students (Item 4) and high-quality research (Items 3, 5, and 6) could be attained. The upper boundary of their confidence that these could be attained, however, reached no higher than 77.4%, whereas the lower boundary for the same items was as low as 46.9%. Thus, even for those aspects of sport management's future about which they were most confident, the panelists felt that there was a reasonable likelihood that these could not reach ideal levels in the near term. The panelists were least confident about the impact of sport management beyond the community of sport management scholars (Items 8, 9, and 12) and about the adequacy of research resources that would become available (Item 1). For these items, the upper boundary of their confidence that these could be attained reached no higher than 53.7%, whereas the

lower boundary for the same items was as low as 24%. Panelists felt that it is unlikely that these can be attained in the near term.

## DISCUSSION

The panelists agreed that the field of sport management has made significant strides despite its youth as a field. They also agreed that stronger research, additional cross-disciplinary research, a stronger link between theory and practice, enhanced infrastructure, and improved doctoral training are objectives toward which the field should strive. Panelists, however, were at best only moderately confident about the field's ability to move in those directions, and they disagreed about the necessary means to do so. Their differences in opinion provide useful bases for considering the field's future development. One of the most fundamental differences had to do with the appropriate home for sport management: business or sport studies. This difference of opinion is, in fact, an outcome of the hybrid nature of sport management. It is simultaneously addressed the future of sport management research. Responses to the open-ended question in the about management and about sport. The appropriate concern, then, is not which academic unit should house the discipline, but the degree to which any home, whether business or sport studies, will facilitate the requisite interdisciplinary dialog between sport studies and the study of management, including its related disciplines, such as marketing, finance, and operations.

There are, of course, differences in the academic prestige accorded to colleges of business on the one hand, and departments of sport studies on the other. Although panelists seemed to agree that higher status is preferable to lower status, they disagreed about the means through which status is best achieved. If infrastructure is assumed to lead status, then the matter of the best home for sport management is readily determined; the best home would be the higher prestige location. On the other hand, if quality research is assumed to enable establishment of appropriate infrastructures, then the best home is whichever best facilitates quality research by sport management scholars. In fact, many of the debates about the best home for the discipline, the need for more journals or conferences, and the need for funding are actually grounded in opposing assumptions about which must come first status or infrastructure. Recognizing this issue clarifies the debate because it allows it to shift away from arguments about which or how many to a more fruitful discussion about the degree to which any particular policy or action will foster the co-development of status and infrastructure. Although there is likely to be some disagreement regarding particular policies or actions, the terms for appropriate debate are nonetheless clarified. In fact, the relevant question becomes a strategic and empirical one: How can we determine what the effects of particular policies and actions will be on both the field's status and its prestige?

Quality research is one indicator about which the panel agreed. There was no consensus, though, regarding what constitutes quality research. In fact, the debate among panelists about the degree to which research should be grounded in "home disciplines" or should be interdisciplinary in character reflects a difference in opinion about the degree to which the object of study is likely to make a difference in the nature of management. If sport makes a difference, then sport management research cannot remain grounded in studies that occur in non-sport settings, and the intermingling of disciplines might help to elaborate the unique effects of the sport context. On the other hand, if sport were merely another context for doing generalizable management inquiry, then it would make sense for it to remain grounded in disciplinary research. The important point to bear in mind is that the effect of sport on management is yet to be empirically determined. In other words, we cannot know *a priori* whether there is something unique or distinctive about managing sport. This is itself something we need to determine via research in the field. Thus, in the absence of empirical evidence regarding the unique or distinctive aspects of managing sport, any contention about the primacy of disciplinary versus interdisciplinary research is moot.

The related debate among panelists about the relative value of qualitative vs. quantitative research reflects a more subtle paradigmatic difference between those who feel that sport management research can be conducted in a strictly objective manner and those who feel that the management of sport is socially constructed. Similar debates continue to rage throughout the social sciences (Creswell, 2003; Frisby, 2005). The salutary feature of the debate, particularly among management scholars, is that it generates a substantial volume of useful research and theory. In other words, it matters less that one side is right and

one is wrong; what matters is that we conduct qualitative and quantitative research. In fact, the two can be profitably joined in a single research endeavor. Similarly, debates about the relative value of basic vs. applied research might, in fact, fail to appreciate the relative value that both kinds of research can have for one another. It has long been known that applied research can usefully inform theory if the applied researcher reflects on the conceptual implications of findings (Ulrich, 2001). Conversely, it has been argued that sport management practice will be most effective when the practitioner reflects on the theoretical foundations and conceptual implications of experience. In other words, application can inform theory, and application improves when it is theoretically informed.

Debates about theory vs. practice reflect a concern about whom the field should serve, and what it should seek to achieve. The same is true for debates about the appropriate diversity of topics the field should address. What we address determines whom we do and do not serve, as well as what we seek to achieve. Whether we seek to address global concerns or local ones and whether we concern ourselves with a wide array of topics or only a few depends less on what appropriately constitutes sport management than on whom we choose to include in our community of discourse. The question, then, is whether we conceive ourselves as broadly relevant or narrowly so. Again, there is no right or wrong choice here. Any healthy discipline will consist of multiple communities of discourse: some are widely dispersed, some are locally focused, some have narrow concerns, and some have broad agendas. Ultimately, what matters is how interesting the questions we ask about sport and its management are, not the content or focus of those questions (Ulrich, 2001). Interestingness is determined by communities of discourse, not *a priori* boundaries. These insights, and the debates from which they derive, have significant implications for the training of researchers for the field. Clearly, becoming a sport management scholar is not merely a matter of mastering particular research methods and analytic techniques. If the field is to advance, doctoral students will also have to come to grips with the matters identified by the panelists in this study. As Ulrich (2001) demonstrates, competency in both research and practice develops as a consequence of “sustained effort at learning and growth”. Ultimately, the issues the panelists identified provide a basis for new sport management scholars to determine what kind of researcher they will seek to become, and consequently, the outcomes to be achieved.

## CONCLUSION

This study began by noting that the emergence of research paradigms requires an expansion of perception, ways of thinking, and values. By actively engaging in debates over the issues identified in this study, students and established scholars can expand their perceptions of the field, explore new ways of thinking, and thereby enhance the values that guide their work. Discussion, debates, and research into these matters are not symptoms of sport management’s academic malaise; they are an indication of the field’s vibrancy and potential.

## REFERENCES

- Amis, J., and Silk, M. (2005). Rupture: promoting critical and innovative approaches to the study of sport management. *J. Sport Manag.* 19, 355–366.
- Coulter, M. (2002). *Strategic management in action* (2nd Ed.). New York: Prentice Hall.
- Creswell, J.W. (2003). *Research design: Qualitative, quantitative and mixed methods approaches*. Thousand Oaks, CA: Sage
- Dalkey, N.C. (1969). An experimental study of group opinion: The Delphi method. *Futures*, 2(3), 27-37.
- Frisby, W. (2005). The good, the bad, and the ugly: Critical sport management research. *Journal of Sport Management*, 19, 1-12.
- Knoppers, A. (2015). Assessing the sociology of sport: on critical sport sociology and sport management. *Int. Rev. Soc. Sport.* 50, 496–501.
- McSweeney, M., and Faust, K. (2019). How do you know if you don’t try? Nontraditional research methodologies, novice researchers, and leisure studies. *Leisure* 43, 339–364.
- Quinn, R.E. (2004). *Building the bridge as you walk on it: A guide for leading change*. San Francisco: Jossey-Bass.
- Ulrich, W. (2001). The quest for competence in systemic research and practice. *Systems Research and Behavioral Science*, 18(1), 3-28.

## **EDUCATION AND INTELLECTUAL CAPITAL MANAGEMENT IN SMEs AS MEANS OF IMPROVING COMPETITIVENESS**

**Mihalj Bakator**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [mihalj.bakator@uns.ac.rs](mailto:mihalj.bakator@uns.ac.rs)

**Mila Kavalić**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Edit Terek Stojanović**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Verica Gluvakov**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Dragan Čočkalović**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

### **ABSTRACT**

This study examines the role of education and intellectual capital management in enhancing the competitiveness of small and medium-sized enterprises (SMEs) in Serbia. Serbian SMEs, crucial for the country's economy, face challenges such as limited access to finance, markets, and a lack of technological and managerial skills. The paper proposes that education can positively impact these challenges, providing SMEs with the necessary knowledge and resources to compete globally. A theoretical model is developed to improve competitiveness, with suggestions and guidelines for domestic enterprises. The study identifies factors affecting competitiveness, including access to finance, markets, technological and managerial skills, and the overall business environment. It highlights the importance of a conducive business environment, skilled labor, a supportive innovation ecosystem, and market competition. The role of education and intellectual capital management, encompassing human, relational, and structural capital, is explored in fostering innovation, strategic decision-making, and operational efficiency. The paper concludes by emphasizing the need for SMEs to develop an intellectual capital management strategy aligned with organizational goals and addressing specific challenges and opportunities.

**Key words:** Education, Intellectual capital, Competitiveness, SMEs

### **INTRODUCTION**

Small and medium-sized enterprises (SMEs) are an important component of the Serbian economy, representing a significant portion of the country's GDP and employment. However, Serbian SMEs face a number of challenges when it comes to competitiveness, including a lack of access to finance, limited access to markets, and a lack of technological and managerial skills. Education a key factor of competitiveness, can positively affect these challenges and provide SMEs with the knowledge, skills, and resources they need to compete in the global marketplace (Djordjevic et al., 2021a). The lack of access to finance for SMEs is one of the key challenges in conducting business. Many SMEs struggle to secure the funding they need to invest in new equipment, expand their operations, or hire new employees. Education can help to address this challenge by providing SMEs with the knowledge and skills they need to create business plans and access financing from banks and other financial institutions. In addition, education and intellectual capital can help SMEs to identify new markets, understand the competitive landscape, and develop effective marketing strategies.

The lack of managerial skills and technological advancement can be addressed via education improvement of employees and managers as well. Thus, new technologies can be adopted, and processes and operations can be improved. Intellectual capital is also important for developing specialized training programs. The training programs can be tailored to the specific needs of SMEs

and can focus on areas such as business management, marketing, and technology (Djordjevic et al., 2021b). Additionally, education can support activities within business incubators and accelerators, which can help SMEs to develop their ideas and bring new products and services to market. Education can improve the competitiveness of the economy by cultivating an environment that encourages innovation and entrepreneurship. This can be achieved by offering students comprehensive curricula focused on these aspects while also motivating them to conceive original ideas and establish their own ventures (Drobyayko et al., 2019). Furthermore, expert networks, researchers, and fellow entrepreneurs can offer valuable guidance and assistance. The current body of literature addresses multiple factors of competitiveness across countries. However, concise studies that focus on education and intellectual capital in regards of competitiveness of domestic enterprises in Serbia are scarce. This current study aims to fill this knowledge gap by analyzing the importance of education and intellectual capital management in domestic SMEs. The goal is to develop a theoretical model for improving competitiveness. In addition, suggestions and guidelines for improving competitiveness of domestic enterprises are discussed.

The paper consists of three main sections (excluding the Introduction and Conclusion sections). The first section notes the competitiveness of domestic enterprises and how the globalized market affects conducting business. In addition, the research questions are noted. Next, education and intellectual capital for improving competitiveness are presented. Within this section, the theoretical model is presented. In the third section, suggestions and guidelines for improving competitiveness are noted.

## **COMPETITIVENESS OF DOMESTIC SMES**

The competitiveness of domestic SMEs is determined by a complex set of factors, including access to finance, access to markets, technological and managerial skills, as well as the overall business environment (Farhikteh et al., 2020). Access to finance is a critical factor for the competitiveness of SMEs. Without access to finance, SMEs struggle to invest in new equipment, expand their operations, or hire new employees. In Serbia, SMEs often face difficulties in accessing finance, as they lack the necessary collateral or credit history to secure loans from traditional financial institutions. To address this challenge, the government and financial institutions can create programs and policies that provide SMEs with access to alternative sources of finance, such as microfinance, crowdfunding, and venture capital. In the majority of enterprises productivity is low, product quality is low, and modern management methods and techniques are not implemented nor applied.

Many SMEs struggle to expand beyond their local markets, which can limit their growth potential. To address this challenge, SMEs need to be provided with the knowledge and skills to identify new markets, understand the competitive landscape, and develop effective marketing strategies (Martinez et al., 2020). Additionally, the government can create policies that support SMEs to enter new markets by reducing barriers to trade and investment, and by creating trade agreements with other countries. In addition, the government should focus on effectively regulating monopolies across industries. Next, to compete in the global marketplace, SMEs need to adopt new technologies, improve their processes and operations, and manage their businesses more effectively (Hasanah et al., 2022).

The overall business environment significantly affects the competitiveness of SMEs. A conducive business environment can help SMEs to start and grow their businesses, while an unfavorable environment can make it difficult for them to succeed (Dvorsky et al., 2020). The government can create policies and regulations that promote a favorable business environment by reducing bureaucratic barriers, creating a stable macroeconomic environment, and providing access to infrastructure and services such as transportation and energy.

In addition to these factors, other important factors that contribute to the competitiveness include the availability of skilled labor, the presence of a supportive innovation ecosystem, and the level of competition in the market. The availability of skilled labor is essential for SMEs to be able to adopt new technologies, improve their processes and operations, and manage their businesses more

effectively. A supportive innovation ecosystem, including access to funding, talent, and other resources that can help to drive innovation and quality development, can also help SMEs to compete in the global market. The level of competition in the market is also an important factor, as it can provide SMEs with the necessary pressure to improve their products and services, thereby making them more competitive.

The paper is guided by two main research questions:

1. What role and significance do education and intellectual capital management have in domestic enterprises?
2. Which business aspects can be improved with education and intellectual capital management?

## **EDUCATION AND INTELLECTUAL CAPITAL MANAGEMENT**

As noted above, education and skills are important factors for increasing the competitiveness of SMEs in today's globalized economy. SMEs play a vital role in the economy, representing a significant portion of GDP and employment in many countries. They reduce unemployment rates and increase the standard of living (Chege & Wang, 2020).

Education and intellectual capital management are instrumental in enhancing the competitiveness of SMEs. These two interconnected factors foster innovation, strategic decision-making, and operational efficiency, ultimately contributing to the growth and sustainability of SMEs in an increasingly competitive global market. Education has a fundamental role in equipping entrepreneurs and employees with the necessary skills, knowledge, and abilities to navigate the complexities of business operations. In addition, access to quality education and continuous training opportunities enables individuals to adapt to the ever-changing business landscape, thus facilitating the development of creative solutions and informed decision-making.

Intellectual capital management, comprising human, relational, and structural capital, can significantly affect competitiveness. Human capital includes an enterprise's workforce's collective knowledge, skills, and expertise (Pedro et al., 2020). Through investing in employee training and development, SMEs can use the full potential of their human capital, resulting in higher productivity, innovation, and overall performance. Relational capital refers to the networks, relationships, and collaborations that SMEs establish with various stakeholders, such as customers, suppliers, and strategic partners. Effective relational capital management allows SMEs to leverage external resources and knowledge, fostering innovation and creating synergies that enhance competitiveness. Building and maintaining solid relationships with stakeholders also contributes to a favorable reputation, which can lead to increased market opportunities and customer loyalty. Structural capital includes the internal systems, processes, and organizational structures that support the creation, storage, and sharing of knowledge within the organization. Structural capital involves optimizing organizational systems, implementing technology to facilitate knowledge sharing, and developing a culture that encourages collaboration and learning. SMEs can streamline their operations, reduce operational costs, and enhance their capacity to innovate and respond to market demands. Furthermore, intellectual capital can also contribute to organizational efficiency and effectiveness. Identifying and leveraging intellectual capital, SMEs can create more efficient and effective systems, processes, and relationships that support their operations. This can include developing new technologies, creating new business models, and providing unique customer experiences.

SMEs should develop an intellectual capital management strategy that aligns with their organizational goals and objectives, and that takes into account the specific challenges and opportunities they face. This can include identifying and developing their intellectual capital, creating systems and processes that support business processes, and creating a culture that values skills, knowledge, and experience (Januškaitė & Užienė, 2018). Based on the analyzed literature in this domain, a theoretical model for improving competitiveness is developed. The model is presented on Figure 1.

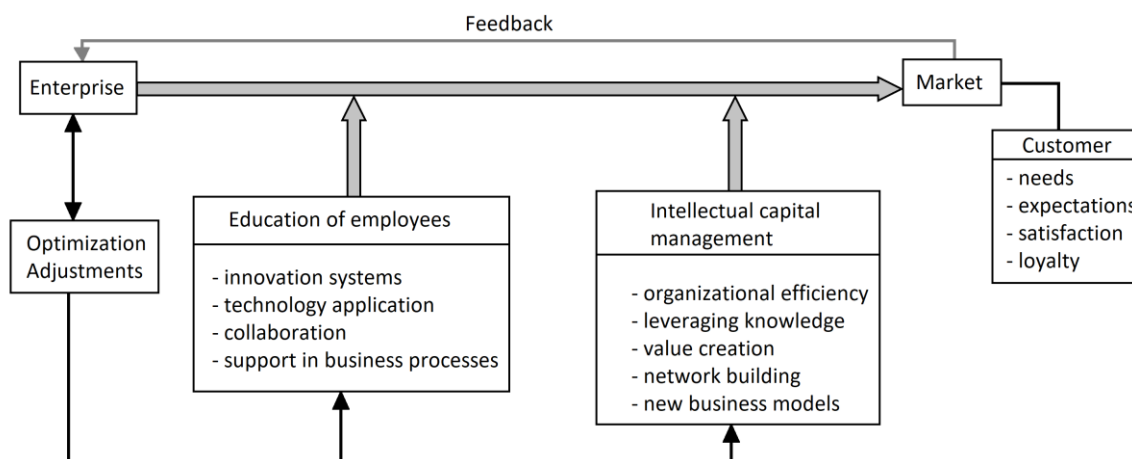


Figure 1: Model for improving competitiveness based on education and intellectual capital management

Based on the developed model it is evident that a key element of improvement is the feedback from the market (customers). The improvement of business activities is through optimization and adjustments in the domain of education of employees and intellectual capital management. In the domain of education of employees, enterprises can develop innovative ecosystems and through skilled employees they can apply modern technologies in their processes. In addition, with education and skilled employees collaboration is fruitful and support in business processes is encouraged. Further, in the domain of intellectual capital management, which is a broader concept compared to employee education, enterprises can achieve higher organizational efficiency, and knowledge can be leveraged for creating value for customers. In addition, intellectual capital management can support network building and can accelerate new business model development. The feedback contains information about customer needs, expectations, satisfaction, and loyalty. The presented model is generic in nature and depending on the industry, enterprise size, and specific business processes, it can be modified.

Now, the two research questions, which were noted earlier, are addressed.

1. What role and significance do education and intellectual capital management have in domestic enterprises?

Education of employees are an imperative in SMEs, especially if newer technologies are used in business processes. If no modern technologies implemented, then education can create an environment for future implementation. Employees that possess knowledge are not afraid from change and new technologies. Intellectual capital management is broader concept and the role of managers here is to nurture an environment where collaboration and knowledge sharing is accepted and supported by the employees. Intellectual capital management can contribute to the value creation and it is becoming a necessary business management aspect in the modern business environment.

2. Which business aspects can be improved with education and intellectual capital management?

The importance of education and intellectual capital management lies in their flexibility or better say, adaptability to business processes. As two generic terms, they can improve the effectiveness and efficiency of business processes such as, but not limited to, distribution, manufacturing, innovation, research and development, marketing strategy development, innovation development, collaboration between employees, and networking with other enterprises.



## **SUGGESTIONS FOR PRODUCTIVITY IMPROVEMENT IN DOMESTIC ENTERPRISES**

Based on the analyzed literature and the developed theoretical model the following suggestions and guidelines for improving competitiveness of domestic enterprises are noted:

- SMEs should invest in education and skills development for their employees. This can include providing education and training programs that focus on areas such as business management, marketing, technology, and intellectual capital management.
- SMEs can also invest in education and skills development by providing their employees with access to resources such as business incubators and accelerators, which can help them to develop their ideas and bring new products and services to market.
- SMEs should aim to create a culture of learning and development. Employees should be encouraged to take on new challenges, to experiment with new technologies, and to take calculated risks.
- SMEs could provide employees with the resources and support they need to develop their ideas and to bring new products and services to market.
- SMEs should identify and develop their intellectual capital create systems and processes that support intellectual capital and create a culture that values knowledge, skills, and education.
- External support can be looked for such as consulting services and intellectual capital management software.
- Enterprises should focus on talent management and to attract and retain employees who possess the knowledge, skills, and experience necessary to create value for the organization. This involves developing a strong employer brand, offering competitive compensation and benefits, and creating a positive work culture.
- Enterprises should drive towards networking and collaboration. This includes forming strategic partnerships with other organizations, such as universities, research institutes, and other SMEs. Enterprises can participate in industry consortiums, join accelerator programs, or attend networking events to share knowledge and best practices.

In sum, enterprises can apply knowledge and intellectual capital in accordance with their needs and capabilities. Often finances and infrastructure are not optimal for increasing the utility of existing intellectual capital. However, in those cases, enterprises should focus on financially less intensive intellectual capital development and that is acquiring knowledge from open access sources and platforms. Employees should be encouraged to develop their skills and knowledge so they can benefit from it, too.

## **CONCLUSION**

In conclusion, improving the competitiveness of SMEs hinges on the strategic enhancement of education, skill sets, and effective intellectual capital management. To achieve this, SMEs ought to prioritize investments in education and professional development, fostering a culture that values continuous learning and growth. This includes emphasizing intellectual capital management, the strategic deployment of talent management initiatives, and the promotion of networking and collaboration opportunities.

By allocating resources towards the enrichment of education and skill development, SMEs can better position themselves to recognize and assimilate novel technologies and innovations. This, in turn, facilitates the refinement of their operational processes, ultimately leading to heightened efficiency and productivity. Moreover, by cultivating an environment that champions learning and progress, SMEs can more effectively attract and retain top talent, further bolstering their intellectual capital and competitive edge. In addition to honing internal capabilities, SMEs must actively engage in networking and collaboration with external stakeholders. This serves to strengthen their relationships with various industry players, including suppliers, customers, and potential partners. By fostering

these connections, SMEs can gain access to valuable insights, resources, and opportunities that may otherwise remain inaccessible.

In essence, by proactively investing in the aforementioned areas, SMEs can significantly enhance their competitiveness within the global marketplace. This, in turn, increases their likelihood of achieving long-term success and resilience in an ever-evolving economic landscape.

## ACKNOWLEDGEMENT

This work is a part of the current project TR-35017 funded by Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

## REFERENCES

- Chege, S. M., & Wang, D. (2020). Information technology innovation and its impact on job creation by SMEs in developing countries: an analysis of the literature review. *Technology Analysis & Strategic Management*, 32(3), 256-271.
- Djordjevic, D., Cockalo, D., Bogetic, S., & Bakator, M. (2021a). Predicting Entrepreneurial Intentions among the Youth in Serbia with a Classification Decision Tree Model with the QUEST Algorithm. *Mathematics*, 9(13), 1487. <https://doi.org/10.3390/math9131487>
- Djordjevic, D., Cockalo, D., Bogetic, S., & Bakator, M. (2021b). Modelling youth entrepreneurship intentions: A ten-year research. *Journal of East European Management Studies*, 26(4), 617-760. <https://doi.org/10.5771/0949-6181-2021-4-617>
- Drobnyazko, S., Barwińska-Małajowicz, A., Ślusarczyk, B., Zavidna, L., & Danylovykh-Kropyvnytska, M. (2019). Innovative entrepreneurship models in the management system of enterprise competitiveness. *Journal of Entrepreneurship Education*, 22(4), 1-6.
- Dvorsky, J., Kliestik, T., Cepel, M., & Strnad, Z. (2020). The influence of some factors of competitiveness on business risks. *Journal of Business Economics and Management*, 21(5), 1451-1465.
- Farhikhteh, S., Kazemi, A., Shahin, A., & Shafiee, M. M. (2020). How competitiveness factors propel SMEs to achieve competitive advantage?. *Competitiveness Review: An International Business Journal*, 30(3), 315-338.
- Hasanah, A. U., Shino, Y., & Kosasih, S. (2022). The Role Of Information Technology In Improving The Competitiveness Of Small And SME Enterprises. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, 3(2), 168-174.
- Januškaitė, V., & Užienė, L. (2018). Intellectual capital as a factor of sustainable regional competitiveness. *Sustainability*, 10(12), 4848.
- Martinez, J. E. V., Serna, M. D. C. M., & Montoya, N. P. (2020). Dimensions of learning orientation and its impact on organizational performance and competitiveness in SMEs. *Journal of Business Economics and Management*, 21(2), 395-420.
- Pedro, E. D. M., Leitão, J., & Alves, H. (2020). Bridging intellectual capital, sustainable development and quality of life in higher education institutions. *Sustainability*, 12(2), 479.

## **THE IMPACT OF MENTAL HEALTH AND PSYCHOSOCIAL RISKS ON A SAFE AND HEALTHY WORKPLACE**

**Srdan Bogetic**

Belgrade Business and Arts Academy of Applied Studies, Belgrade, Republic of Serbia

E-mail: [sbogetic@yahoo.com](mailto:sbogetic@yahoo.com)

**Zorana Antić**

Belgrade Business and Arts Academy of Applied Studies, Belgrade, Republic of Serbia

### **ABSTRACT**

The authors of this paper have endeavoured to highlight the importance of mental health and psychosocial risks for a safe and healthy workplace. Due to the challenges that modern businesses are facing, employees are increasingly experiencing effects such as anxiety, depression, burnout syndrome, stress, etc. Business productivity decline, poor interpersonal relationships within the company, an unsafe and unfavourable work environment, etc. are all consequences of a company's inadequate response to mental health and psychosocial risk issues. The International Organization for Standardization has recognized the significance of this issue and has developed standards in the field of occupational safety and health (ISO 45001, ISO 45003), as well as other standards that take into account psychosocial risks in the workplace (ISO 9001, ISO 14001, ISO 22000, ISO 31000). The high-level structure (HLS) allows for an easier integration of the company's management system in practice.

**Keywords:** mental health, psychosocial risks, safe and healthy workplace, integrated management systems

### **INTRODUCTION**

The COVID-19 pandemic, its detrimental economic effects, accelerated technological development, and inadequate management of human resources in organizations are all contemporary business challenges that have an impact on the rise in stress and psychosocial risks that contribute to mental illness and potential employee mortality.

The stigma associated with mental illness still lingers, despite the rise in awareness of this issue in recent years, and it is becoming increasingly obvious that strategic measures are required in this area. Mental health is about how we think, feel and behave. Anxiety and depression are the two most common mental health issues, and although they can be triggered by difficult life events, they can also be brought on by problems at work. Finding fulfilment in your work can improve mental health and general well-being, whether or not employment is the root cause.

Safe and healthy working conditions are a prerequisite for a productive and healthy company workforce. Such a work environment is predicated on the idea that no aspect of the business should be impacted by accidents, injuries, or illnesses sustained at work, which is an important segment for the sustainability and competitiveness of an organization.

Employers have become aware of the fact that creating happier, healthier workplaces is no longer just a nice idea—it is essential. It is important to employees that workplaces deliver on promises that prioritize not just their physical health and safety, but their emotional well-being too, from experience-enhancing benefits to health and safety measures, support programmes and diversity, equity, and inclusion of best practices (Trowbridge Matthew, 2023).

When it comes to the prevention of psychosocial risks, the implementation of integrated management systems constitutes considerable support for companies. In particular, the International Organization for Standardization, by means of standards ISO 45001, ISO 45003, etc., provides businesses with a strategic tool that enables prevention in the field of employee safety and psychosocial risks. Nevertheless, in addition to these standards, the ISO 14001, ISO 31000, and ISO 2200 standards all address occupational safety and psychosocial risks in specific ways. In order to safeguard the health and welfare of employees, the integration of the management system is an excellent business practice.

## **THE ROLE OF MENTAL HEALTH IN A SAFE AND HEALTHY WORKPLACE**

Occupational safety and health are key aspects of decent work. Decent work is safe work. All employees should feel safe in their workplaces, certain that they are not exposed to unnecessary risks and dangers. Workplace physical and mental demands, as well as the overall work environment, have a significant impact on employees' well-being and living conditions. By making sure that every workplace is safe, we should strive to reduce the considerable human, societal, and financial costs associated with workplace accidents and occupational diseases (ILO, 2020, p. 5).

According to the survey (Ipsos, 2020, p. 9), the majority of respondents experienced the following difficulties: increased anxiety about job security (56%), stress due to changes in work routines and organization (55%), difficulties in finding a balance between work and private life (50%), and reduced productivity (46%). Many workers worldwide also saw a rise in overtime hours, illustrating the extent to which they had to adjust to different working practices in accordance with pandemic cycles and local policies in their countries. Just under half of all workers worldwide reported reduced productivity (46%) and working at odd hours, such as early mornings or late evenings (44%) (Boyon, 2020).

The European Commission's Report on Health in the EU for 2020 (OECD/EU, 2020) states that the COVID-19 pandemic and the ensuing economic crisis had an even greater detrimental effect on the citizens' mental well-being compared to indicators from 2018, as evidenced by consequences such as higher rates of stress, anxiety, and depression. Namely, the 2018 report states that although there is no detailed information on the prevalence of mental health problems across EU countries, all available evidence indicates that mental health problems affect tens of millions of Europeans every year - to be exact, more than one in six people in EU countries (17.3%) had a problem with mental health, i.e., nearly 84 million people (OECD/EU, 2018). In its 2020 health report, the European Commission points out that the prevention and early diagnosis of mental health problems have frequently been neglected in the past, and that the COVID-19 pandemic has increased the risk of developing various mental conditions, especially among young people and the population with lower incomes. In a study published in 2018, the European Commission pushed vehemently for preventive measures and emphasized the importance of resolving mental health concerns in Europe. In its most recent report from 2020, the Commission noted that this topic is becoming even more of a priority. The OECD Council's Recommendation on Integrated Mental Health, Skills, and Work Policy urges EU states to promote the provision of timely and comprehensive mental health services to improve social and labour market outcomes for people with mental health difficulties (OECD/EU, 2020).

The "Mental Health at Work" study, which was carried out in the US between May 21<sup>st</sup> and June 18<sup>th</sup>, 2021, on a sample of 1,500 respondents, showed that 76% of full-time US workers reported experiencing at least one mental health symptom in the previous year. This represents a 29% (59%) increase from the 2019 levels. Respondents singled out several other symptoms that have an impact on workers' mental health, such as burnout syndrome (56%), depression (46%), and anxiety (40%). (Mind Share Partners, 2021, p. 8).

A recent survey by Deloitte (Deloitte, 2022) which deals with the pandemic's impact on employee mental health and its effect on company costs aims to demonstrate how the pandemic has changed employees' attitudes toward mental health and what the implications for their work are. The findings indicate a 25% increase in the cost of poor mental health to employers, compared to 2019 (to £56 billion in 2020–21 compared to £45 billion in 2019), and show that 28% of employees either quit their jobs in 2021 or planned to do so in 2022, with 61% citing this as the cause.

Workers worldwide experienced the highest degree of stress ever in 2020, and this number increased even further in 2021. Those respondents who concurred with this statement might not have felt stressed because of their work, but they undoubtedly were. Employee stress invariably has an impact on their work. Yet even if anxiety, despair, and anger declined in 2021, they still remained above pre-pandemic levels. Daily increase in stress is present in 44% of employees today (Gallup, 2022).

The following are indicators of mental health among workers in the global labour market (Gallup, 2022): engagement at work (21%), feeling successful in life (33%), feeling anxious on a daily basis (40%), feeling stressed on a daily basis (44%), feeling angry (21%), or feeling sad every day (23%), being able to find a job (45%), being able to move (20%), and feeling satisfied with one's income (22%).

The mental health of the population, as illustrated by the research conducted among employees, shows signs of serious deterioration. There is an ongoing rise in negative emotions. The 2022 Global Emotion Report (Gallup, 2022) offers a snapshot of Gallup's most recent measurements of positive and negative daily experiences including the second year of the COVID-19 pandemic. The findings are based on data from 122 countries and indicate that negative emotions — the aggregate of stress, sadness, anger, worry and physical pain that people feel every day — have now hit a new high in the history of Gallup's tracking.

Untimely support for employees in the field of mental health has led to a new awareness among employees, who are increasingly taking their mental health into their own hands and leaving employers who do not support them. Knowledge workers from generation Z and the millennial generation, which constitute the majority of workers, are leading the way here.

However, there are companies that have recognized the new challenges in the field of employee health and safety protection and have created their own policies to support employees as a preventive measure in the field of mental health. According to research (Mind Share Partners, 2021, str. 6), since the pandemic, employers have made more resources available to their employees, including additional paid time off (up 55%), mental health days (up 41%), and mental health education (up 33%).

## **THE APPLICATION OF INTEGRATED MANAGEMENT SYSTEMS TO PREVENT PSYCHOSOCIAL RISKS**

It is evident that occupational health and safety management systems have gained relevance in recent years. In 2018, the International Organization for Standardization (ISO) developed the international standard ISO 45001 Occupational Health and Safety Management System. This standard was prepared by the experts of the Occupational Health and Safety Committee, while also taking into account other general management system approaches like ISO 9001 and 14001 during the preparation process. In addition, international conventions, national standards and labour standards issued by the International Labour Organization (ILO), have all also been incorporated into this management system to the greatest extent possible (Çalış et al., 2019, pp. 1509, 1061).

According to the international standard ISO 45001:2018 (Institute for Standardization of Serbia, 2018, pp. 8, 16), the organization is responsible for ensuring the safety and health at work for its workers and anybody else who may be impacted by its activities. This obligation includes promoting and protecting their physical and mental health. This document enables the organization to incorporate other areas of health and safety, such as good physical and mental health/well-being of workers, through the OH&S management system.

ISO 45001 shares a high-level structure (HLS), identical core text, terms and definitions with other recently revised ISO management system standards, such as ISO 9001:2015 and ISO 14001:2015. This framework is designed to facilitate the integration of fresh management ideas into the organization's established management systems. In addition, ISO 45001 is designed to follow ISO 14001 quite closely, as many organizations are known to combine their OH&S and environmental management functions internally. This will simplify the integration of ISO 45001, especially for those familiar with ISO 14001 (ISO, 2018, p. 3).

*Table 1* shows the international standards applied in the Republic of Serbia and countries in the region. As may be seen, of the countries from the former republics of the SFRY, the Republic of Serbia has the most certified companies according to the series of standards ISO 9001, ISO 14001, ISO 45001, and ISO 27001.

Yet, given the number of companies operating on the domestic market, this is insufficient to be able to talk about the competitiveness of domestic companies. Furthermore, the percentage of integrated management systems is low, which is an indicator of the level of business excellence in the home economy.

*Table 1: The number of international standards certificates in the Republic of Serbia and neighbouring countries*

Country	ISO Standard (2021)		
	9001	14001	45001
Serbia	3.461	1.794	1.365
Slovenia	1.956	557	165
Croatia	2.839	1.297	454
B&H	1.326	319	139
Montenegro	154	81	59
North Macedonia	708	434	258
Hungary	7.856	3.279	1.263
Romania	11.886	6.174	3.481
Bulgaria	6.402	2.166	1.627

Source: ISO, *The ISO Survey 2021*

The idea that a safer workplace is feasible with the aid of IMS is confirmed by a requirement in the international standards that relates to issues of a healthy and safe workplace. Certain standards such as ISO 9001:2015 (Institute for Standardization of Serbia, 2018, p. 28) in clause 7.1.4. The environment for the realization of the operational activities of the process says that "The organization shall determine, provide and maintain the environment necessary for the operation of its processes and achieve conformity of its goods and services". The note to this clause states that "A suitable environment can be a combination of human and physical factors, such as: a) social (e.g. non-discriminatory, calming, non-confrontational); b) psychological (e.g. reducing stress, burnout prevention, emotional protective); c) physical (e.g. temperature, heat, humidity, light, airflow, hygiene, noise)".

In practice, the above-mentioned factors differ significantly depending on the goods or services provided. The ISO 22000:2018 standard touches upon the issue of a safe and healthy working environment as one of its requirements. Clause 7.1.4. Work Environment (Institute for Standardization of Serbia, 2018, p. 13) states that "the organization shall determine, provide and maintain the resources needed for the establishment and maintenance of the work environment, as well as for the management of the work environment that are necessary to achieve compliance with the FSMA requirements". In the note to this clause, the suitable environment is described in the same way as in the ISO 9001:2015 standard.

The international standard ISO 45003:2021 was created with the aim of being applied in parallel with the ISO 45001 standard. The reason for their close coordination is the fact that within the ISO 45001:2018 standard there are requirements and instructions for planning, implementing, auditing, evaluating and improving the OH&S management system.

Addressing psychosocial risks is an integral part of ISO 45001, but until recently, the organization could not effectively create its own safety management system until ISO 45003:2021 was published in 2021. A partial list of ISO 45001 sections dealing with psychosocial risk management includes (EHS, 2020): 4.1. Understanding the organization and its context; 5.4. Consultation and participation of workers; 6.1. Actions to address risks and opportunities; 7.1. Resources; 7.4. Communication; 8.1.2. Eliminating hazards and reducing OH&S risks.

The guidelines of the ISO 45003:2021 standard require greater responsibility from organizations in identifying hazards and reducing the risks associated with them. As with other international standards, the involvement of all employees in the implementation of this standard is of key importance in the management of psychosocial risks. Most problems that cause psychosocial risks can be reduced by preventive action and effective management. Protecting workers from psychosocial risks is extremely important, but is also difficult to navigate because it is intertwined through all business processes. That is why the role of the executive leadership, which has the most power within the organization, is crucial and therefore it must respond adequately in order to foster a positive corporate climate.

The Technical Committee of the International Organization for Standardization ISO/TC 283 Occupational Safety and Health Management conducted a survey in 2021 on a sample of 500 companies that apply OH&S standards. Of the total number of surveyed companies, as many as 78% have or plan to apply the international standard ISO 45001. The largest number of companies (53%) that apply or plan to implement this standard is in the sector of small and medium-sized enterprises (ISO/TC 283, 2021).

Companies from the SME sector are usually the most advanced in the process of applying various management concepts and international standards. The reason may lie in the fact that SMEs have substantially shorter information-to-decision cycles than large corporations do. Also, we shouldn't disregard the fact that the SME sector, due to its characteristics, is more flexible, better understands market trends, and the attitude towards employees is different compared to large companies.

According to the report, the majority of questioned organizations have identified risks to psychological safety and health, but only 26.5% of them have applied the ISO 45003 principles. Another 40.4% have identified risks but have not yet implemented the guidelines. Furthermore, 33.1% of respondents said they took no action to ensure the psychological security and well-being of their staff at work. The focus of this study was the integration of psychological safety, health, and well-being management into the organizational management system for occupational health protection. Of the total number of surveyed companies, as many as 52.1% successfully completed the integration. However, the problem is that 28.5% of companies still do not formally engage in these activities, and 19.4% claim that it is not integrated into their OH&S management system (ISO/TC 283, 2021).

ISO data show that in 2021, 294,420 companies were certified according to the ISO 45001:2018 standard, which shows an increase compared to the previous year. Yet, businesses are still not very eager to respond to psychosocial risks and develop a work environment that will be secure, healthy, and abundant in well-being, and in many countries, these issues are still not adequately addressed. The following issues contribute to organizations' inadequate attitudes toward the integration of management of psychological safety, health, and well-being into the management system of health protection at work:

- The creation of a workplace that prioritizes safety, health, and well-being has not been a business priority for companies.
- Executive management's ignorance of the effects that an inadequate working environment has on employees' safety and health.
- A lack of knowledge among workers regarding the effects of an unhealthy and unsafe workplace.
- The under-active involvement of various institutions and non-governmental groups that deal with workers' rights in the promotion of a safe and healthy workplace and the effects of a poor working environment.

## **CONCLUSION**

Employees were under stress as a result of the Covid pandemic, which had an impact on their mental health. The most frequent problems they encountered included: increased anxiety about job security, stress due to changes in work routines and organization, difficulties in finding a balance between work and personal life, occasionally working more hours, etc. The 2020 European Commission report indicated an increase in mental health impairment compared to the previous report (2018). However, upon realizing the severity of the issues encountered by their workers, some companies have created their own employee assistance programmes as a preventive strategy in the area of mental health.

In addition to mental health, psychosocial risks are a key concern when discussing a safe and healthy workplace. Several international standards, including ISO 9001, ISO 14001, ISO 31000, ISO 45001, and specifically ISO 45003:2021, address the problem of psychological risk management. ISO research has shown that currently companies have not widely accepted this standard and its integration with ISO 45001:2018. The reason lies in the fact that most companies that have introduced ISO 45001 believe that it presently suffices when it comes to reducing psychosocial risks and that the possible adoption of ISO 45003 is not yet a priority. It is evident that efforts must be made to promote the ISO 45003 standard in business practice as far as feasible.

However, the management of psychosocial risks in the workplace is facilitated by the ISO organization, thanks to the High-Level Standards (HLS) framework and the integration of the management system, which is now much simpler and more efficient for the company. As a result, businesses utilizing IMS may address psychosocial risks from a variety of angles and create a safe and healthy work environment. The fact that the workers themselves have a new perspective on workplace safety and health issues, which is characterized by the need for a clear sense of protection and safety at work, as well as a better familiarization with the existing measures at their workplace, also plays a role in the issue of a safe and healthy workplace.

## REFERENCES

- Trowbridge Matthew. (2023). How to design the workplace for mental health. World Economic Forum, [weforum.org](https://www.weforum.org)
- ILO. (2020). *Quick guide on sources and uses of statistics on occupational safety and health*, International Labour Organization, Switzerland.
- Ipsos (2020). The Covid-19 pandemic's impact on workers' lives. [www.ipsos.com](https://www.ipsos.com)
- Boyon Nicolas, (2020). Anxiety, stress and loneliness: covid's toll on the lives of workers, [WWW.ipsos.com/en/covid-19-pandemics-impact-workers-lives](https://www.ipsos.com/en/covid-19-pandemics-impact-workers-lives)
- OECD/EU (2020), Health at a Glance: Europe 2020: State of Health in the EU Cycle, OECD Publishing, Paris, <https://doi.org/10.1787/82129230-en>.
- OECD/EU (2018), Health at a Glance: Europe 2018: State of Health in the EU Cycle, OECD Publishing, Paris. [https://doi.org/10.1787/health\\_glance\\_eur-2018-en](https://doi.org/10.1787/health_glance_eur-2018-en)
- Mind Share Partners, (2021), Mental Health at Work Report, 2021 Mental Health at Work Report—The Stakes Have Been Raised ([mindsharepartners.org](https://www.mindsharepartners.org))
- Deloitte, (2022), *Mental health and employers – The case for investment – pandemic and beyond*, str.8
- Gallup, (2022), State of the Global Workplace 2022 Report – the voice of the world's employee, preuzeto sa <https://www.gallup.com/workplace/349484/state-of-the-global-workplace.aspx>
- Çalış S., Yeşim Büyükkakıncı B., (2019), *Occupational Health and Safety Management Systems Applications and A System Planning Model*, Procedia Computer Science, Volume 158, pp. 1058-1066.
- SRPS ISO 45001 Sistemi menadžmenta bezbednošću i zdravljem na radu - Zahtevi sa uputstvom za korišćenje, Institut za standardizaciju Srbije, Beograd, 2018
- ISO 45001 - Occupational health and safety, (2018), International Organization for Standardization, Switzerland
- ISO, *The ISO Survey 2021*, <https://www.iso.org/the-iso-survey.html>.
- SRPS ISO 9001 Sistemi menadžmenta kvalitetom - Zahtevi sa uputstvom za korišćenje, Institut za standardizaciju Srbije, Beograd, 2018
- SRPS ISO 22000 Sistemi menadžmenta bezbednosti hrane - Zahtevi sa uputstvom za korišćenje, Institut za standardizaciju Srbije, Beograd, 2018
- How ISO 45001 can help manage psychosocial risks in the workplace, (2020), <https://www.ehs.com/2020/10/how-iso-45001-can-help-manage-psychosocial-risks-in-the-workplace/>
- ISO/TC 283, *ISO 45001 user survey 2021 results*, ISO-TC283\_N502\_2021\_ISO\_45001\_user\_survey\_-\_communique 1.pdf



## **THE ROLE OF LEADERSHIP IN KNOWLEDGE MANAGEMENT**

**Verica Gluvakov**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [verica.gluvakov@tfzr.rs](mailto:verica.gluvakov@tfzr.rs)

**Sanja Stanisavljev**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Dragana Kovač**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Stefan Ugrinov**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Dejan Bajić**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

### **ABSTRACT**

Since its development, leadership as a discipline occupies an important place in the entire theory and application of management in the organization and the people within it. In modern business conditions, achieving business excellence is a goal that most companies strive to achieve, and the effective implementation of the concept of leadership can enable this. In addition to the continuous and efficient improvement of all business factors, leadership must support the fact that knowledge is an imperative of modern business. Improving the productivity of knowledge is the most important resource for achieving success and competitiveness of companies, and knowledge productivity is achieved by applying the concept of knowledge management (KM) in all organizational levels. Therefore, it is necessary that leadership and KM achieve a joint action on the entire organizational culture that will support the development of existing and the acquisition of new knowledge in the entire organization. In addition to leadership, aspects of management and organization that should support knowledge management are organizational learning, organizational behavior and innovation. It is necessary to create a suitable intern environment in organizations that support learning and knowledge, effective communication systems and awareness of all organizational levels about the importance of applying knowledge.

**Key words:** Leadership, Knowledge, KM

### **INTRODUCTION**

One of the most important factors in the success of business organizations are people and their knowledge. Employees determine organizational goals which they achieve with the available resources. At the same time, people perform certain business functions for which they need responsible leadership in order for the organization to achieve high-level results. In modern business which is characterized by frequent market changes and business globalization, leadership as a discipline is important for achieving the competitive advantage of organizations (Trajković, 2014). Effective coordination of key business resources and employee abilities is achieved through leadership and knowledge as a primary business resource. The stability that companies strive to achieve is the stability of adapting to constants changes in the internal and external environment and, in such business conditions, knowledge is the most important resource (Sajfet, 2005). Knowledge represents a process that, in addition to information and data, includes experiences and values that enable a new approach to business processes.

Knowledge as a process is focused on people and includes psychological and sociological knowledge in the field of management. Knowledge as a process implies a set of dynamic skills and competencies, which implies evaluation, change, development and improvement of individual and group skills and behaviours (Adamović, 2005). Organizational knowledge is deeply collective and goes beyond the

discrete information that individuals may possess. Organizational knowledge creates a pattern formed within the company, significant for its operations. Organizational knowledge requires maximum judgment and is the reasoning ability of organization members based on a appreciation of a particular context and theories (Tsoukas, 2001). Knowledge becomes organizational when individuals act with their knowledge on the basis of generic rules set by the organization, and this is achieved by effective management disciplines such as leadership and knowledge management (KM). Natural resources, capital and workforce have become secondary sources of business effectiveness, while effective knowledge management has assumed a primary role. Knowledge management represents a challenge for management as a whole, especially on the domestic market and when a quality knowledge management system is established in companies, it represents a management revolution (Bakotić, 2012).

## **ASPECTS AND IMPORTANCE OF LEADERSHIP**

Leadership as a discipline represents the ability to motivate employees towards common business goal, which is an important factor in managing an organization in modern conditions. Focused not only on processes, leadership is concerned with the behaviour and atmosphere in the organization (Gavrilović). Leadership is a phenomenon that manifests itself at all organizational levels and as such represents a challenge for research. Leadership has a very broad domain of action and its influence on the creativity of employees in the organization is particularly emphasized. With the development of this management discipline, different approaches to leadership have also developed and most modern theories include creative concepts, properties and abilities (Stevanović, 2015). Different theories of leadership emphasize a certain leadership style that includes actions and characteristics of the way employees are managed. Therefore, leaders, in accordance with the organization policy, organizational tasks, but also their own personality, apply a certain leadership style or combine several styles. Many theories and research that analyzed leadership have a common fact that shows that leadership encourages the development of creativity, thinking abilities and knowledge among employees. For creating a suitable organizational climate and organizational behaviour, effective leadership is important because it directs the process of organizational changes and implements appropriate actions during that process (Babić, 2009).

The application of the concept of leadership enables employees to understand the goals of the organization and to be motivated to achieve them, to evaluate their own business activities, agree and implement them (Sajfert, 2012). Leadership brings possibility to avoid and minimize lack of communication between organizational levels, employees have a clear vision of the organizational future and share the same ethical norms and values. The concept of leadership includes employees in the decision-making process, where they are inspired and encouraged to develop and improve individually and as a team, creating key knowledge for achieving good business practise (Ciulla, 2020). It is necessary for top management of organizations to show commitment and support leadership development by providing (Gavrilović):

- The policy and goals of the management system aligned with the business strategy and organization context, whereby the leader understands the business environment and its impact on business.
- Resources necessary for the management system.
- A management system that achieves planned results.
- Involvement and support of employees who contribute to the effectiveness of the management system.
- Promotion of continuous improvement and innovation.
- That the responsibilities and authorization for certain management roles have been assigned, communicated and understood within the organization.

## ASPECTS AND IMPORTANCE OF KNOWLEDGE MANAGEMENT

The process of knowledge management (KM) includes the creation, acquisition, storage, sharing and application of knowledge, which represents the collective knowledge of a corporation whose goal is the effective application of knowledge when making organizational decisions (Sajfet, 2005). KM has the function of a significant business strategy, especially when it comes to the decision-making process. The result of this process is to obtain the necessary information in a relatively short period of time, which greatly facilitates the decision-making process. KM as a business concept brings many benefits for the organization, its employees and business performance. KM supports bipolarity in business, which results in the creation of innovative efficient business solutions. KM as a business strategy involves activities that create a learning organization, develop corporate culture and develop abilities of the employees. Benefits, i.e. improved business performance due to the application of KM are (Dimitrovski, 2010):

- Creativity and innovation through the free expression of ideas.
- Improvement of services and consumer satisfaction.
- Increase in income due to better placement of products and services on the market.
- Employee satisfaction, increased motivation and reduced turnover.
- Change in management style.
- Cost reduction by eliminating unwanted processes.

In order for organizational performance to be truly improved, the application of KM must be based on processes, people and information technologies. Therefore, it is necessary to develop a system in the organization that will complementarily use the strength and potential of information technologies and people. By developing such a KM system, it is possible to avoid dangers for the organization and to respond more easily to environmental changes (Mihajlović, 2014). The development of the organization and its performance through proper implementation and development of KM is reflected in the ability of the organization to understand economic and technological changes with the aim of constant adaptation, conducting business and building a competitive advantage in accordance with them. Also, KM is reflected in capabilities of continuous development of human resources and their learning, with monitoring of performance and changes in the internal and external environment (Čizmić, 2011).

KM can be used as a method to improve the innovation capabilities of the organization. Therefore, KM process focuses on recording data and their interpretation through teamwork and empowerment, promoting the development of innovation capabilities in organizations (Sanchez Ramirez, 2022). Effective KM in the organization significantly improves communication channels and the communication process as a whole. At the same time, relations and cooperation in the internal environment of the organization improve, which affects the strengthening of the corporate culture. Knowledge strategies that support learning organizations develop quality management and decision-making systems, resulting in increased overall organizational productivity. Therefore, understanding and accepting the principles of KM is necessary for organizations that want to ensure long-term survival and success. Until recently, the KM function belonged to the organizational domain whose task was to sell knowledge-based products. However, today KM is an integral business function, as organizations realize that their competitiveness depends on the effective management of intellectual resources (Grover, 2001). The concept of KM reached various functions and business processes relatively quickly, which represents its essence – implementation in other aspects of business instead of an independent concept.

The fact is that the world's organizations have accepted Industry 4.0 and that Industry 5.0 is now in developing phase and organizations need the resources to survive and move to information society. With the significant exchange of data, information and knowledge between humans and machines, organizations are becoming aware that knowledge is a key structural element for sustainable development (Smuts, 2022). The key aspects of KM in Industry 5.0 show that organizations can use their learning ability to successfully solve problems and respond to the unique demands of society, the environment and the goals of sustainable development.

## THE ROLE OF LEADERSHIP IN KNOWLEDGE MANAGEMENT

Leadership as a discipline is necessary for modern organizations, primarily due to the fact that leadership supports the implementation of organizational changes and the implementation of KM into the daily functioning of the organization represents a significant change in domestic business organizations and changing the status quo. It can be said that leadership as a concept represents a very important resource of business organizations and one of the critical success factors of modern organizational systems. One of the significant features of leadership as a discipline is its motivating influence on employees and raising their awareness of the benefits and well-being of their business activities, both for themselves and for the organization in which they work. Taking into account the fact that leaders lead the organization in the desired direction and occupy a significant role in the decision-making process, leadership is also a significant factor for the implementation of KM due to increased flexibility, acceptance of changes and competition on the market (Trajković, 2014).

An organization that implements KM processes in its business creates knowledge workers led by knowledge leaders. Such an organization possesses distinctive capabilities that provide it with a competitive advantage and within which special organizational values are developed. There is a significant connection between organizational culture and leadership, because it is leadership that develops a culture of knowledge among employees that they, with the leaders' motivation, accept. This develops significant organizational competencies. Leadership and KM are the foundation in building the organizational culture of the company, focused on the coordination activities, measurement and evaluation of achieved results and systematic planning and control of the entire business. Knowledge and learning represent an indispensable part of leadership, therefore leadership in the application of KM is a very important factor. The application of leadership in support of the implementation of KM in the organization implies the expression of mentoring, creativity, innovation, development of vision, acquisition and sharing of knowledge. Therefore, with the help of leadership, i.e. knowledge leaders, existing organizations focused on resources are transformed into organizations based on knowledge that surpass competitors with their organizational performance.

As there are different styles of leadership in literature and practice, different styles of knowledge leaders can be applied in the implementation of KM. Organizations will choose a certain style in accordance with their goals and desired effects, and each of the knowledge leadership styles should fulfill the success factors, i.e. the „7C“ of knowledge leadership (Mašić, 2010):

- Context – a knowledge leader should understand the nature and the complexity of the context within which he or she operates, as well as have the ability to inspire others.
- Competence – knowledge leaders support systematized learning frameworks that create knowledge-based competencies.
- Culture – knowledge leaders know the connection between psychological and sociological skills such as individual motivation and organizational culture, which creates a business vision.
- Community – knowledge leaders understand and create the value of the community, i.e. teams in order to realize the set vision.
- Conversation and Common language – knowledge leaders develop a common language in the organization and encourage dialogue among employees that affects organizational results.
- Communication – knowledge leaders understand the importance and develop communication processes within the organization due to the fact that developed communication facilitates learning processes and the exchange of organizational knowledge.
- Coaching – knowledge leaders are continuously trained and train employees with developed skills and vision.

Therefore, leadership represents the important activity of KM, which means that effective leadership processes enable the successful implementation of KM among employees and business processes of the organization. Knowledge leadership integrates KM with knowledge development, which creates new, useful organizational values and results such as increasing productivity, innovation, creativity of employees and strengthening the reputation of the organization. Leadership as a discipline has a

significant role in the realization of organizational learning and the transfer of organizational knowledge. Leadership know-how represents accumulated knowledge that is the result of learning from previous experiences. In the organizational environment, there is room for constant learning and improvement, and knowledge leadership is reflected in continuous training. Also, by applying different motivational mechanisms and unifying knowledge from different disciplines, leadership creates a positive atmosphere and working environment for business based on knowledge, with a focus on exchanging existing and creating new knowledge, instead of documents and procedures (Petković, 2011).

## CONCLUSION

Leadership and KM are closely connected and effective leadership is essential for successful KM initiatives. Joint application of leadership and KM ensures a high level of individual and collective knowledge important for achieving good organizational and economic performance. Knowledge leaders have the ability to recognize the talents and skills of employees which gives them the ability to guide and develop the potential of employees. They indicate to employees the benefit of knowledge-based work and remind them of the realization of the vision and the creation of value, by which employees are involved in the process of creating knowledge. By creating a culture that values knowledge sharing, providing the necessary resources and infrastructure, building trust among employees, encouraging learning and development and measuring results, leaders can help their organizations leverage their collective knowledge and expertise to achieve better outcomes. In order for the organization to achieve maximum results and high competitiveness, the employees should be in the focus of top management, the development of their physical and intellectual abilities. The implementation of knowledge leadership improves the quality of the entire business and high work productivity can be achieved.

## ACKNOWLEDGEMENT

This work is a part of the current project TR-35017 funded by Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

## REFERENCES

- Adamović, Ž. et al. (2005). Upravljanje znanjem. Zrenjanin: *Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“*.
- Babić, V., & Savović, S. (2009). Značaj liderstva za uspeh procesa preuzimanja. *Economic Themes*, 47(1).
- Bakotić, D. (2012). Menadžerski izazovi u funkciji vođenja radnika znanja u suvremenim poduzećima. *Ekonomika misao i praksa*, 21(1), 145-156. <https://hrcak.srce.hr/83766>
- Ciulla, J. B. & Ciulla, J. B. (2020). The importance of leadership in shaping business values. *The search for ethics in leadership, business and beyond*, 153-163.
- Čizmić, E., & Bilal, K. (2011). Primjena principa menadžmenta znanja kao katalizator organizacijskog poslovnog uspjeha. *Pregled: časopis za društvena pitanja/Periodical for social issues*, (2), 97-121.
- Dimitrovski, R. (2010). menadžment znanja kao poslovna strategija. *Škola biznisa*, (2), 80-88.
- Gavrilović, M., & Tepčević, I. Liderstvo i značaj sistemskog pristupa menadžmentu rizicima u poslovanju.
- Mašić, B., & Đorđević-Boljanović, J. (2008). Liderstvo i menadžment znanja u funkciji kreiranja konkurentske prednosti. Novi Sad: *Fakultet za Menadžment, ISBN 987-86-85067-29-7*, 2.
- Mihajlović, M. & Dašić, M. (2014). Menadžment znanja kao faktor povećanja efikasnosti organizacije. *Oditor, Belgrade, Serbia*, (9), 33-36.
- Petković, M., Mirić, A. A. & Božinović, I. (2011). Korporativno liderstvo i menadžment znanja. *Sociologija/Sociology: Journal of Sociology, Social Psychology & Social Anthropology*, 53(1).
- Sajfert, Z., Adamović, Ž. & Bešić, C. (2005). Menadžment znanja. Zrenjanin: *Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“*.
- Sajfert, Z., Adžić, S. & Cvijanović, J. M. (2012). Korporativno liderstvo. Zrenjanin: *Univerzitet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin“*.

- Sánchez Ramírez, S., Guadamillas Gómez, F., González Ramos, M. I., & Grieva, O. (2022). The Effect of Digitalization on Innovation Capabilities through the Lenses of the Knowledge Management Strategy. *Administrative Sciences*, 12(4), 144.
- Smuts, H., & Van der Merwe, A. (2022). Knowledge Management in Society 5.0: A Sustainability Perspective. *Sustainability*, 14(11), 6878.
- Stevanović, A. (2015). Teoretski aspekti liderstva i kreativnosti. *Škola biznisa*, (1), 111-128.  
<https://doi.org/10.5937/skolbiz1-9180>
- Trajković, S., Nikolić, M. & Antić, Z. (2014). Liderstvo i menadžment znanja. *International Journal Scientific and applicative papers V-4*, 45.
- Tsoukas, H. & Vladimirou, E. (2001). What is organizational knowledge? *Journal of management studies*, 38(7), 973-993.
- Varun Grover, T. H. D. (2001). General perspectives on knowledge management: Fostering a research agenda. *Journal of management information systems*, 18(1), 5-21.

## **CREATIVE PROBLEM SOLVING IN MODERN ORGANIZATIONS**

**Dragana Kovač**

University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia

E-mail: [dragana.milosavljev@tfzr.rs](mailto:dragana.milosavljev@tfzr.rs)

**Mihalj Bakator**

University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia

**Ivan Palinkaš**

Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia

**Maja Gaborov**

University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia

**Melita Čočkalo-Hronjec**

High school "Laza Kostic", Novi Sad, Republic of Serbia

### **ABSTRACT**

In the era of modern business, it is increasingly difficult to respond to the demands of the market. Today's organizations must have employees who are ready to provide non-traditional solutions to certain problems, in order to stand out from the crowd. For this reason, there is a need for creativity and creative problem solving. Thinking outside the box and using different creative problem solving techniques leads to more innovative solutions. Only such solutions provide organizations with a competitive advantage. In this paper, the concept of creative problem solving will be explained, some of the models of creative problem solving and some of the techniques of creative problem solving will be presented.

**Key words:** Modern business, Creativity, Creative problem solving, Creative problem solving techniques

### **INTRODUCTION**

The increasing globalization of business encourages organizations to find new ways to increase competitiveness through their employees, while operating in very different markets and cultural environments. One of the keys to success in international business is the creation of staff who will be able to respond to today's challenges in an innovative way. In addition to knowledge, creativity could also be mentioned as a key competence of employees (Stanley, Davidson & Matthews, 2014). Creativity represents the generation of new and useful ideas (Amabile, 1988) and if the creative potential of employees was not supported, there would be a loss of available resources (Runco, Shepard & Tadić, 2022).

Employees face many different types of problems in many jobs, and finding creative solutions to these problems can be key to gaining a competitive advantage. Creative problem solving requires extensive and effortful cognitive processing. It is necessary to define and construct a problem, search and find relevant information, generate and evaluate a set of alternative solutions and finally implement that solution (Reiter-Palmon & Illies, 2004). Creative problem solving allows managers freedom in the process of solving problems and gives them the opportunity to understand the problem beyond the conventional framework (Dhir, 2017). Research on creative problem solving originated in the behavioral sciences, and the Osborn-Parnes model is considered the model that contributed to the development of many other models of creative problem solving.

Creative problem solving largely depends on the ability of the team that solves the problem, but also on the technique it uses. There are numerous creative problem solving techniques. One of the most famous techniques, whose creator is Osborn, is brainstorming. In addition to this technique, one can use: mind-

mapping, gap analysis, random words, associations, storyboarding, role playing, what if, morphological box, etc.

## **CREATIVITY IN MODERN BUSINESS**

Modern business is characterized by constant changes. A number of internal and external factors affect the success of a company, as well as the ability of a company to respond to constant changes. In order to succeed in this, organizations must have employees who are ready to constantly learn and develop their abilities (Altagić & Macura, 2013). In addition to knowledge, which is the most important resource in modern business, employees must also be effective, efficient, highly productive and creative (Stanley, Davidson & Matthews, 2014). Precisely because of this, it could be said that the most successful organizations are those that employ people who think differently, look at problems from a different angle and come up with solutions to those problems in a new, creative way.

Creativity can be defined as the generation of new and useful ideas, which often requires employees to deviate from existing ways of working in order to propose new ideas, which they will further explore and experiment with (Liu, Pan & Zhu, 2021). According to Wang (2017), creativity represents the tendency to generate or recognize ideas, alternatives or possibilities that can be useful in solving problems, communicating with others, but also the ability to entertain ourselves and others. The creative work environment is the social environment of the organization that supports the generation of new ideas to the greatest extent. A creative work environment is influenced by a number of factors, from individual employee influences, to team dynamics, including the overall organizational culture and climate (Stanley, Davidson & Matthews, 2014). These factors can be grouped into four basic areas: job design (each job should suit the employed person, thereby contributing to the motivation and creative performance of employees) (Milosavljev, et al. 2022); leadership behavior (leaders should empower employees to take responsibility for their work, motivate them to propose new ideas, acquire new knowledge and improve skills) (Liu, et al., 2021); team climate and social interactions (healthy team relations contribute to creativity) and processes of communication and cooperation (it is important that communication in teams and among employees in general be open and direct because in this way the flow of knowledge and the generation of new ideas will be at a higher level) (Milosavljev et al., 2022).

Creativity or creative thinking is a skill that is exclusively human and no artificial intelligence can replace it (Balková, Lejsková & Ližbetinová, 2022). The originality of ideas that people can come up with differentiates products and services from the competition. Therefore, it is necessary to motivate and reward creative employees. Lack of motivation most often leads to insufficient effort by employees to generate new ideas, and inefficient use of talented employees can be considered a waste of resources, which leads to worse business results (Hitka, et al., 2019, Song, et al., 2020).

## **CREATIVE PROBLEM SOLVING**

### **What is creative problem solving?**

Problems have existed since mankind existed. In everyday life, individuals faced with problems usually solve them using ad hoc methods. With the advent of the enterprise, problems have evolved and affect different parts of the enterprise. In the beginning, these problems were solved using structured solutions, but as the problems became more complicated, unique solutions were required. For this reason, there was a need for creativity, i.e. creative problem solving (Dhir, 2017). Creative problem solving is a way of solving problems or identifying opportunities when conventional thinking fails. It encourages employees to find new perspectives and come up with innovative solutions, which will achieve the ultimate goal (MindTools, n.d.). The question arises: why is it necessary to solve creative problems in workplaces instead of traditional ones? Solving modern business problems in an agile and economical way requires thinking outside the box. Creative problem solving encourages managers to think outside the usual problem-solving framework and gives managers the freedom to express their abilities in solving them (Dhir, 2017).



Creative problem solving is based on the following principles (Boyles, 2022):

- balance between divergent and convergent thinking. Divergence generates ideas in response to a problem, while convergence narrows the choice of solutions. The balance of these two practices turns ideas into solutions;
- turn problems into questions. When problems are reformulated into questions, greater freedom is given in thinking about potential ideas and solutions;
- don't judge ideas. Do not judge and reject any idea too early, because often even the most incredible ideas can yield extraordinary innovations after further research and development;
- focus on YES, AND, instead of NO, BUT. Using negative words often discourages creative thinking. For this reason, it is necessary to use "positive" language to build and maintain a creative environment.

Developing creative problem solving skills requires constant improvement. It is considered a soft skill or personal strength. It involves analyzing the problem, defining the approach and implementing the solution. Like any other skill, it requires a strategic approach and practice to become better. Creative problem solving brings numerous benefits. First of all, it leads to more efficient and effective problem solving. Creative solutions can help organizations save time, money and resources. Then, creative problem solving leads to innovation, which often results in a competitive advantage. Also, creative problem solving leads to the development of teamwork (Khurana, 2023).

### **Models of creative problem solving**

Creative problem solving is the process of solving problems in a different, more innovative way. The essence of developing creativity and creative thinking is defining the basic phases or basic operations of the creative process, which is done through the model of creativity (Bojanović & Đurišić-Bojanović, 2016). Several models of creative problem solving have been defined, and some of these models are: Crutchfield system of developing creativity, Osborn-Parnes Creative Problem Solving Model, Basadur's Simplex model and The Learner's Model.

Crutchfield, Olton and colleagues have developed a strategy to encourage creativity, which is based on the theory of association, line theory and Gestalt theory. The authors of this strategy created thirty-two notebooks, and each notebook consisted of mystery and detective stories, which the respondents (participants in creative development) were supposed to solve. The main goal of this model was to develop the ability to formulate problems, new, unusual ideas and discover implicit facts (Rakas, 2008, Leovac, 2019).

Founder of the Foundation for Creative Education, Alex Osborn was the first to develop creative problem solving, along with the term brainstorming, in the 1940s. Together with Sid Parnes, he developed the Osborn-Parnes Creative Problem Solving Model (Creative Education Foundation, n.d.). This model includes six steps in solving a problem and represents a series of steps that lead from chaos to a final solution. Those steps are as follows (Petričević, n.d.):

1. Identifying the goal - that is, breaking everything that is still unknown into parts in order to reach the goal more easily. A good starting point for this step is to use the 5 WHY method. Once the goal is set, it is necessary to determine the criteria that will be used in the evaluation of the solution.
2. Search for facts - it is necessary to obtain all the information related to the achievement of the goal, so at this stage it is necessary to compile a list of questions to which one wants to get answers.
3. Defining the problem - this step refers to formulating the problem in a solvable sense, that is, in this step it is necessary to answer the following questions "In what ways could I solve the problem?" and "What are the possibilities for the future?". What is important is that evaluation criteria should not be included in this step.
4. Generating a large number of ideas - the goal of this step is to come up with as many ideas as possible. The techniques most often used in this step are brainstorming, combined lists, metaphors, stories, etc.

5. Creating a plan - this phase involves combining and evaluating ideas and searching for the best solution to the problem. It is often necessary to take a break before this step so that all impressions "settle down". The evaluation criteria depend on the problem itself, and some of them are: utility, sustainability, cost, time, aesthetics. The best solution would be obtained by finally adding up the scores.
6. Implementation of the solution - actions are taken in order to implement the obtained solution in the organization.

Min Basadur elaborated the Simplex model. This model represents a cyclical process, consisting of three phases and eight steps (Cardoso Sousa, Pardal Monteiro & Pellissier, 2009):

1. The first phase - defining the problem, involves the following steps:
  - problem finding – identifying problems and opportunities for change or improvement within or outside the organization;
  - fact-finding - all information is collected, nothing is rejected, because it can be useful later;
  - problem definition – selected facts are reformulated into creative opportunities and challenges. In this step, questions are asked, with which the problem will be worked out ("How could we?, What is blocking? Why?");
2. The second phase - solving the problem, includes the following steps:
  - generation of potential solutions - create as many potential solutions as possible for selected problems and challenges;
  - evaluation of potential solutions - generate as many criteria as possible for evaluation of potential solutions;
3. The third phase – implementation of the solution, includes the following steps:
  - action planning - choosing the best solution;
  - accepting ideas - overcoming resistance to changes and involving people in the implementation process;
  - taking action – this step also has a circular process. In this step, participants can make a decision why not to fully implement the idea, as a fear of failure, but also to generate new ideas that will bring them advantages.

The Osborn-Parens model was the inspiration for other models and tools. One of those tools was developed in 2011 by Gerard Puccio and Blair Miller and is called the CPS (Creative Problem Solving) Learner's model. This model involves four stages (Firestein, 2016, MindTools, n.d.):

1. Clarify – identify the challenge
2. Imagine - generate ideas
3. Develop - bring ideas to life
4. Implement - "give ideas legs", that is, put them into practice.

## **CREATIVE PROBLEM SOLVING TECHNIQUES**

A successfully solved problem in a creative way depends above all on the individuals and the team that solves the problem. In order to be as successful as possible in this, it is necessary to encourage different techniques of creative problem solving. Some of them are more suitable for a team, some for an individual, but certainly all of them influence the development of creativity of employees in the organization. The techniques of creative problem solving are numerous, and some of them will be presented in the following work.

Brainstorming - this technique was popularized by Osborn in 1953 in his book *Applied Imagination*. Brainstorming is a method of group problem solving, which involves the spontaneous contribution of creative ideas and solutions. This technique requires an intensive and free discussion in which each member of the group is encouraged to think aloud and propose as many ideas as possible. It is important to emphasize that during reflection, one should not criticize anyone's ideas, because "there are no incorrect answers". After the brainstorming phase, it moves to the evaluation phase, which involves analyzing and discussing all potential ideas (Bernstein, n.d.). According to Osborn (1953), brainstorming

has four basic rules: the greater the quantity, that is, that quantity gives birth to quality; refraining from criticism; "Crazy" ideas are welcome, because in the final stage they can lead to the best solution and the combination and improvement of ideas -  $1+1=3$ , that is, often by connecting two ideas you can come up with a new, third idea.

Mind-mapping – the creator of this revolutionary technique is Tony Buzan. A mind map is an expression of brilliant thinking and represents the natural function of the human mind. It is a powerful graphic tool that provides the universal key to unlocking the brain's potential. A mind map has four basic characteristics: the object of attention is located in the center of the image; the main subjects of the subject branch out from the central image; branches contain keywords on extended lines and branches are formed into a hub structure. Mind maps can be emphasized, enriched with colors, images, codes, and they will in turn improve creativity, memory and evocation of what is remembered (Buzan & Buzan, 1999).

Gap Analysis - a process that organizations use to compare their current performance with expected, desired. Using gap analysis, organizations recognize their "shortcomings" in terms of money, work, and time. By defining and analyzing these gaps, the management team can create an action plan for moving, implementing actions to fill these gaps. Gap analysis involves determining the current state, then determining the desired state, then determining the "gaps", evaluating the solution, implementing the change, and finally monitoring the state after the implemented changes (Hayes, 2022).

Storyboarding is a visual tool that creates a picture of a goal mapping and the path to reach that goal. First of all, it is necessary to divide the paper into 6 to 8 panels. In the last square, a picture of the desired, future state is drawn. In the first square, a picture of the current state is drawn. In the remaining squares it is necessary to draw pictures that represent the key steps that will lead to the desired state and under each picture it is necessary to write the phrase "how to overcome these challenges" (Forsha, 1995).

Associations/random words - is one of the simplest techniques for generating ideas. It is often used when it is necessary to create a new product. A list of random words, expressions or stories is compiled, which is written on the board or a large sheet of paper. Based on those words, it is necessary to think about the associations with them, analyze them and thus stimulate thinking about the solution to the problem (Logiclike, n.d.)

## CONCLUSION

Creativity is a trait that humans possess and that no artificial intelligence can take over. Therefore, it can be safely said that the creativity of employees is a key competence for the successful operation of modern organizations. There are numerous situations in which the desired solution cannot be reached by traditional problem solving. This is precisely why creative problem solving is resorted to. It focuses on developing new perspectives and encouraging creativity in the workplace. Some of the advantages that creative problem solving brings are: finding solutions to complex problems, precisely because of looking outside the box and beyond strict mathematical calculations; easier adaptation to changes and of course encouraging innovation. Often a new idea leads to the next new idea. For this reason, it could be said that the task of managers is to implement various techniques of creative problem solving in organizations. Every form of creativity should be encouraged and rewarded, and everyone's idea heard.

## REFERENCES

- Altagić, M. & Macura, M. M. (2013). Management: a learning organization and modern business [Menadžment: organizacija koja uči i savremeno poslovanje]. *CIVITAS*, (5), 160-177.
- Amabile, T.M. (1988) A Model of Creativity and Innovation in Organizations. *Research in Organizational Behavior*, 10, 123-167
- Balková, M., Lejsková, P., & Ližbetinová, L. (2022). The Values Supporting the Creativity of Employees. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.805153>
- Bernstein, C. (n.d.). Definition Brainstorming. *Whats.com*.  
<https://www.techtarget.com/whatis/definition/brainstorming>

- Bojanović, R., & Đurišić-Bojanović, M. (2016). Efekti vežbanja kreativnog rešavanja problema. [Effects of practicing creative problem solving]. *Andragoške studije, Institut za pedagogiju i andragogiju*, 1, 67-89. <https://doi.org/10.5937/andrstud1601067B>
- Boyles, M. (2022, February 1.). What is creative problem – solving & why is it important? *Harvard Business School*. <https://online.hbs.edu/blog/post/what-is-creative-problem-solving>
- Buzan T., & Buzan, B. (1999). *Mape uma: Brilijantno razmišljanje. [The Mind Map Book]*. FINESA, Beograd
- Cardoso Sousa, F., Pardal Monteiro, I., & Pellissier, R. (2009). Creativity and problem solving in the development of organizational innovation. *Discussion Papers - Spatial and Organizational Dynamics*, 1, 29-41.
- Creative Education Foundation (n.d.). *What is CPS?* <https://www.creativeeducationfoundation.org/what-is-cps/>
- Dhir, S. (2017). Practice-oriented Insights on Creative Problem Solving. *Journal of Management & Public Policy*, 7 (2), 5-7.
- Firestein, R. (2016). *What is the Creative Problem Solving Process?* <https://rogerfirestien.com/what-is-creative-problem-solving/>
- Forsha, H.I. (1995). *Show me: The complete guide to storyboarding and problem solving*. Milwaukee, WI: ASQC Quality Press.
- Hayes, A. (2022., October, 1.). What Is a Gap Analysis? *Investopedia*. [https://www.investopedia.com/terms/g/gap-analysis.asp?\\_ga=2.57426794.1326085876.1683214747-1460834231.1683214747](https://www.investopedia.com/terms/g/gap-analysis.asp?_ga=2.57426794.1326085876.1683214747-1460834231.1683214747)
- Hitka, M., Rózsa, Z., Potkány, M., & Ližbetinová, L. (2019). Factors forming employee motivation influenced by regional and age-related differences. *Journal of Business Economics and Management*, 20(4), 674-693. <https://doi.org/10.3846/jbem.2019.6586>
- Khurana, A. (2023., March, 27.). Creative Problem Solving at Workplace. *Linkedin*. <https://www.linkedin.com/pulse/creative-problem-solving-workplace-ananta-khurana>
- Leovac, S. (2019). Strategije podsticanja stvaralaštva u nižim razredima osnovne škole. [Strategies for encouraging creativity in the lower grades of primary school]. *Research in Pedagogy* 9(2), 203-215. <https://doi.org/10.17810/2015.102>
- Liu, X., Baranchenko, Y., An, F., Lin, Z., & Ma, J. (2021). The impact of ethical leadership on employee creative deviance: the mediating role of job. *Leadership & Organization Development Journal*, 42(2), 219-232. <https://doi.org/10.1108/LODJ-01-2020-0026>
- Liu, Z., Pan, X., & Zhu, T. (2021). Status-striving orientation, creative deviance engagement and employee creativity: perspective of structural strain. *Chinese Management Studies*, 15(4), 821-842. <https://doi.org/10.1108/CMS-09-2020-0413>
- Logiclike (n.d.). *Creative problem solving: basics, techniques, activities*. <https://logiclike.com/en/blog/creative-problem-solving>
- Milosavljev, D., Gluvakov, V., Kavalić, M., Čočkalohronjec, M., & Đorđević, L. (2022). The importance of creative potentials of employees in modern business. In Proceedings of the XII International Symposium *Engineering Management and Competitiveness 2022 (EMC 2022)*, 152-156.
- MindTools, (n.d.). *Creative Problem Solving*. <https://www.mindtools.com/a2j08rt/creative-problem-solving>
- Osborn, A. (1953). *Applied imagination: principles and procedures of creative thinking*. Scribner
- Petričević, M. (n.d.). CPS - Creative Problem Solving. *CiljniMarketing creative*. <http://www.ciljnimarketing.rs/blog/cps-creative-problem-solving>
- Rakas, S. (2008). Stvaralaštvo kao jeddan od faktora razvoja menadžmenta. [Creative work as one of factors of management development]. *Megatrend revija*, 5(2), 79-90.
- Reiter-Palmon, R., & Illies, J. J. (2004). Leadership and creativity: Understanding leadership from a creative problem-solving perspective. *Psychology Faculty Publications*, 31. <https://digitalcommons.unomaha.edu/psychfacpub/31>
- Runco, M. A., Shepard, A., & Tadik, H. (2022). How much creative potential is expressed at work? *Journal of Creativity*, 32. <https://doi.org/10.1016/j.yjoc.2021.100016>
- Song, Y., Gao, S., Zhao, Y., and Singh Gaur, S. (2020). What do we still need to know about employee creativity: a fsQCA approach. *Sustainability*, 12(3), 1140; <https://doi.org/10.3390/su12031140>
- Stanley, T., Davidson, P., & Matthews, J. (2014). Creative Work Environments and Employee Engagement: Exploring Potential Links and Possibilities. *Zeszyty Naukowe, Uniwersytet Ekonomiczny w Krakowie*, 9(933), 33-51. <https://doi.org/10.15678/ZNUEK.2014.0933.0903>
- Wang, H. (2017). What stops creative employees to implement ideas? Individual culture value orientation perspective. *Journal of Organizational Change Management*, 30 (6), 872-887. <https://doi.org/10.1108/JOCM-10-2016-0199>

## **EMPLOYEE TURNOVER DURING THE GREAT RESIGNATION**

**Srdana Taboroši**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [srdana.taborosi@gmail.com](mailto:srdana.taborosi@gmail.com)

**Biljana Maljugin**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Zoran Lajić**

Maran Tankers Management Inc., Fleet Performance Department, Kallithea, Greece

**Jelena Rajković**

University "Union Nikola Tesla", Faculty of Engineering Management, Belgrade, Republic of Serbia

**Siniša Mitić**

University of Novi Sad, Faculty of Technical Science, Novi Sad, Republic of Serbia

### **ABSTRACT**

Employee turnover can have negative consequences for companies, including high costs, low productivity, and low employee morale. To address this issue, companies should focus on increasing job satisfaction, organizational commitment, and competitive compensation, creating a healthy work culture, and promoting open communication. The COVID-19 pandemic has led to the emergence of the "great resignation" trend, prompting workers to reconsider their career choices and seek better job opportunities. Although its long-term effects are unknown, it has already led to labor shortages in some industries such as healthcare. Quiet quitting is another issue that can affect employee turnover, where employees intentionally do the bare minimum or lack motivation in their work. Companies must maintain open communication with their employees to prevent passive resistance such as quiet quitting. In summary, managing employee turnover is crucial for companies, and they must adapt to the evolving needs and expectations of their workforce to maintain a productive and motivated team.

**Keywords:** employee turnover, great resignation, quiet quitting, post-pandemic workforce.

### **INTRODUCTION**

Employee turnover represents the frequency with which workers leave a company and are replaced by new employees. High turnover rates can lead to many negative outcomes, such as high costs of training and recruitment, lost productivity, and low morale among employees. Companies should try to manage turnover rates to avoid this and should strive to increase job satisfaction, organizational commitment, provide competitive compensation, create healthy organizational culture and work environment, and create open lines for communication between management and workers. By doing this, they can create a positive atmosphere and motivated workforce that will be ready to do more and help the company grow.

Reducing employee turnover in times of great resignation and quiet quitting is essential. The current post-pandemic trend of employees quitting their jobs in large numbers is commonly referred to as "great resignation". This movement first emerged after the lockdowns during the COVID-19 pandemic and spread quickly, prompting many workers to reassess their careers and seek better and more fulfilling jobs. Predictions state that the trend will continue, as employees become more willing to take risks, however, the effects of this are uncertain. It is sure can lead to a labor shortage, as this trend started in healthcare, and there is a growing healthcare labor shortage. This is a clear sign that the workforce is evolving, and employers must adapt to meet these needs.

Some employees chose to join the great resignation, but others choose quiet quitting as a form of passive behavior in order to protect themselves from the toxic work environment but still keep their

job. When an employee purposely does the bare minimum and does not put their best effort into doing their job, this is quiet quitting. This kind of behavior indicates a lack of engagement and motivation and can lead to many negative consequences for the company and the employee. Companies have to develop and maintain good communication with their employees, so everyone can be able to address any issues inside the company.

## **EMPLOYEE TURNOVER**

Employee turnover is a term defined 1977 by Price (1977) and it was described as the ratio between the number of people who have departed from an organization within a certain period of time and the average headcount of that organization during the same period. Employees can decide to leave their job positions because of different factors that can be personal or professional, but it is sure that employee turnover is a great expense for the company and that every good manager should strive to minimize it. This is especially true for valuable employees whom every company values and should retain.

Ongori (2007) defines three different factors that can be the source of employee turnover, some can be in control of the management, but some cannot. They are:

1. *Job-related factors,*
2. *Voluntary and involuntary turnover, and*
3. *Organizational factors.*

Employees can decide to leave their jobs because their job position is stressful, they are not happy with their job position, have lost control of their job, but also because of economic reasons (Mano-Negrin and Tzafrir, 2004). When employees have inadequate guidance on how to perform their jobs effectively, encounter unfair methods of performance evaluation, face unclear expectations from their superiors, and experience a high level of job pressure, they might feel over engaged and have lower job satisfaction. All of these can present some job-related factors and can be avoided by having good and strong management that will define job clarity and manage their teams efficiently.

Naturally, some factors are outside of the management's control, usually personal factors that can lead to employee turnover. Those factors often include a need to provide care for a family member or even the death of the employee.

And lastly, high turnover can be linked to different organizational factors such as organizational instability. An unpredictable work environment and lack of stability in organizations can lead to employees leaving this environment. Lack of stability can be something such as no information sharing or unfair promotion but also pay-related. Employees who are not rewarded enough do not want to stay and work for the company.

Every company should strive to keep its employees. High organizational commitment can help companies to grow but also can help the company in time of crisis. Not every turnover in the company is negative since the vacant job position can be filled with a better and higher level performer, but every turnover is costly for the company. It is estimated that every turnover costs between 30%-150% of the annual cost for the position (Landry et al., 2017). Besides, additional costs can be work disruption, decreased productivity or customer service quality, and possible theft of trade secrets or losing organizational or strategic knowledge. Companies should try to identify factors that can lead to employee turnover and develop strategies to minimize them. It depends on the potential internal problem and what kind of strategy should be implemented.

## **GREAT RESIGNATION MOVEMENT**

“Great resignation” was first mentioned in 2021. in the after-pandemic United States, when 4.4 million employees in America quit their jobs, which was the biggest resignation recorded (Tessema et al., 2022). During the pandemic employees felt scared to lose their jobs because of the uncertainty, but after, in the recovery period, many chose to quit and look for better opportunities.

Allman (2021) finds that employees during the pandemic had time to think more about their lives and jobs in general, and many of them decided to look for more meaningful jobs. Having a fulfilling job became a priority for many, since people were in lockdowns for such a long time, and realized they would prefer to live their lives in accordance with their beliefs if they already can die at any moment (at the beginning of the pandemic it was unclear how lethal the COVID-19 pandemic was). Great resignation started in the health care industry in the USA during the pandemic since many frontline workers were faced with the fear of infection, working overtime, long working hours, and trauma of isolation and constant exposure to death, in already faulty systems (Fry, 2022). High levels of stress because of the pandemic and uncertain economic future lead people to think “Life is too short to hold back, let’s seize the moment”. That is also when teleworking became a normal way of day-to-day operations for many companies. Many choose to resign rather than get back to the office post-pandemic.

After the pandemic many things changed, especially in workforce mentality and HR practices. Economies started to recover and many job openings were open, especially in the IT industry (Cook, 2021). Many employees chose to quit and look for new jobs that will bring them job flexibility and more time for themselves with high pay. Also, employees started to be less tolerant of a lack of organizational support, insufficient work-life balance, and ineffective employee assistance (Tyler, 2021). Having all this in mind, it can be said that employees decided “they deserve better” after all the professional and personal stress they endured during the pandemic.

The effects of the great resignation movement are very similar to the effects of employee turnover. Companies have to cover costs of reduced effectiveness, paying overtime to the employees that have to cover the job temporarily, finding a new employee, advertising, interviewing, and job training. Besides financial costs, there are also non-financial costs as well. It is clear that employee resignation has to be avoided. There are different strategies that can be applied in order to minimize resignations.

Zielinski (2021) emphasizes the need for companies to provide flexible work arrangements after the pandemic. Teleworking provides many benefits to both company and employees (Taboroši et al., 2022). It has never been easier to work remotely than today with the constant development of communication tools and many software that allow real-time sharing and editing. Providing employees with the freedom to choose where and when to work can lead to greater job satisfaction and organizational commitment (Taboroši et al., 2020). Even though remote work declined slightly after the pandemic, many companies did continue to offer this option to their employees. According to Saad and Wigert (2021), 30% of employees working remotely will quit if their companies remove teleworking as an option. This is something that managers have to have in mind in today’s state of the workforce market.

Besides work flexibility, “standard” work benefits will have to be addressed in order for a company to retain its employees and avoid the great resignation wave. Types of compensation are one of the greatest motivations for work and it has to be at a high level all the time. This includes incentives, in an addition to the payment. Employees should also have proper support in their professional and personal challenges. This support may vary from professional development opportunities to paid leave, wellness programs, and work-life balance.

The disturbingly high levels of resignation in the after-pandemic era had and has a strong negative influence on the economy, and even now, when the world enters a recession-like era, employee

turnover has been high. Employees started “quiet quitting” in order to further protect themselves from toxic work environments. That shows that changes in all internal managerial procedures are urgently necessary at all levels.

## QUIET QUITTING

The term quiet quitting first started to emerge during the pandemic on social media. But the term is not new and was first introduced in 2009. by Mark Boldger (Arnet, 2022). Employees, usually the younger generation, started to be vocal about their reasons why they began to “quietly quit”. Employees were tired of the pressure of continual increases in the workload, particularly when they felt that their employers and supervisor do not value them. As a result, there seems to be a growing trend of “quiet quitters” who do the minimum necessary work to fulfill their job responsibilities. Loewy and Sprintge (2022) claim that at least 50% of the US workforce is quietly quitting, perhaps even more.

After the pandemic, quiet quitting continued to grow. The older generations view it as a lack of productivity and laziness, while employers saw it as a performance issue; however, younger Millennials and Generation Z saw it as refraining from exceeding their contractual obligations (Richardson, 2023). They were doing the bare minimum. Some employees supported this idea, and some were opposing it, but the reality is that quiet quitting evolved because employees were over-stressed, overworked, and underpaid. The ones who could afford joined the great resignation movement, but the ones that needed their paycheck every month, decided to quietly quit. They decided to do as little as they can, but still do as much to preserve their job.

It is very clear that quiet quitting is not good for any organization. Beside losses in productivity, companies fail to progress, grow, and share knowledge. They stagnate in the ever-changing economy, and that can lead to their final downfall. But, employees have to protect themselves in the toxic environment, and quietly quitting is a way for them to do that. In its core, quiet quitting is the answer to a bad relationship between the “boss” and the employee, between management and labor (Johnson, 2023).

The signs of quiet quitting are (Boy and Sürmeli, 2023):

- 1. Saying no to tasks outside of the job description,*
- 2. Not working and not responding to work-related calls outside of working hours, and leaving work on time, and*
- 3. Working without devotion.*

In today’s economy, it is vital to have highly motivated and committed workers, so it is easy to conclude that quiet quitting cannot help the company to grow and maintain its competitiveness. That is why it is crucial for management to develop efficient ways to fight this and make sure to develop good relations with employees and good organizational culture. The first objective for the managers should be to ensure that employees are knowledgeable about the appropriate actions and to motivate them to carry them out. Workers should be enthusiastic about their jobs, not just comply with the instructions.

## CONCLUSION

The key success for any business relies on its employees, and therefore it is vital to keep them satisfied and within the company. This is essential for a company to be competitive and in a long run, this investment in employees does pay off. Managers should identify the source of employee turnover and recommend the best approach to minimize it. Employees are the most valuable assets of every company and should be treated as such, especially in turbulent times and changes, as everyone is witnessing now, during the times of quiet quitting and high number of resignations in the after-



pandemic era. It is certain that the pandemic began to change the world's workforce market in a unique way. Companies will never be able to return to "the old ways" and should not strive for it. Every organization should strive to develop flexible strategies to retain their employees and reduce employee turnover. There are no "one size fits all" possibilities in the modern world, and every company should work hard to develop adequate procedures to keep their employees.

The key to overcoming these issues of waves of resignation and quiet quitting is to develop organizational culture that will be focused on employee appreciation. Companies have to genuinely value their workers, treat them with respect and professionalism, provide them with instruction, and once they are adequately trained, engage them in a collaborative dialogue regarding how to accomplish their work tasks as best as they can. This entails granting employees the right to voice their opinions and actively listen. Although this is not a new concept, it remains an important one. Especially today.

## REFERENCES:

- Allman, K. (2021). Career Matters: 'The Great Resignation' Sweeping Workplaces around the World. *LSJ: Law Society of NSW Journal*, 81, 46-47.
- Arnet, E. (2022). *The Ethics of Quiet Quitting*. Available at: <https://www.prindleinstitute.org/2022/09/the-ethics-of-quiet-quitting/>
- Boy, Y. & Sürmeli, M. (2023). Quiet quitting: A significant risk for global healthcare. *Journal of Global Health*, 13, 03014.
- Cook, I. (2021). Who Is Driving the Great Resignation?. *Harvard Business Review*, 56-57.
- Fry, E.T.A. (2022). Resigned to the "Great Resignation?". *Journal of the American College of Cardiology*, 79(24), 2463-2466.
- Johnson, R.J. (2023). What's New About Quiet Quitting (and What's Not). *Transdisciplinary Journal of Management*. 72079.
- Landry, A.T., Schweyer, A. & Whillans, A. (2017). Winning the war for talent: modern motivational methods for attracting and retaining talent. *Compensation and Benefits Review*, 49(4), 230-246.
- Loewy, J.V. & Spintge, R. (2022). Quiet quitting: Symptomatology and ramifications. *Music and Medicine*, 14(4)
- Mano-Negrin, R. & Tzafirir, S. (2004). Job search modes and Turnover. *Career development international*, (5): 442-446.
- Ongori, H. (2007). A review of the literature on employee turnover. *African Journal of Business Management*, 49-54.
- Price, J.L (1977). *The study of turnover, 1st edition*, Iowa state: University Press.
- Richardson, S.D. (2023). *Reimagining Quiet Quitting*. In: *Making the Entrepreneurial Transition*. Palgrave Studies in Equity, Diversity, Inclusion, and Indigenization in Business. Palgrave Macmillan, Cham.
- Saad, L., & Wigert, B. (2021). *Remote Work Persisting and Trending Permanent*. Gallup. Available at: <https://news.gallup.com/poll/355907/remote-work-persisting-trending-permanent.aspx>
- Taboroši, S., Strukan E., Poštin, J., Konjikušić, M. & Nikolić, M. (2020). Organizational commitment and trust at work by remote employees. *Journal of Engineering Management and Competitiveness*, 10(1), 48-60.
- Taboroši, S., Popović J., Poštin J., Konjikušić, M. & Nikolić, M. (2022). Job satisfaction in the conventionally employed and teleworkers: the impact of gender, age and education. *Anali Ekonomskog fakulteta u Subotici – The Annals of the Faculty of Economics in Subotica*, 58(48), 65-82.
- Tessema, M., Tesfom, G., Faircloth, M., Tesfagiorgis, M. & Teckle, P. (2022). The "Great Resignation": Causes, Consequences, and Creative HR Management Strategies. *Journal of Human Resource and Sustainability Studies*, 10, 161-178.
- Tyler, K. (2021). How Can HR Professionals Prepare for the Wave of Voluntary Employee Departures that Experts Are Predicting?. *HR Magazine*, 66, 26-31.
- Zielinski, D. (2021). Hybrid Work's Latest Challenge. *HR Magazine*, 66, 20-22.

## **SOCIAL MEDIA AS A PR STRATEGY**

**Edit Terek Stojanović**

University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia

E-mail: [edi.terek@tfzr.rs](mailto:edi.terek@tfzr.rs)

**Milan Nikolić**

University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia

**Predrag Mali**

University of Novi Sad, Faculty of Technical Science, Novi Sad, Republic of Serbia

**Jelena Rajković**

University “Union - Nikola Tesla”, Faculty of Engineering management, Belgrade, Republic of Serbia

**Sinisa Mitić**

University of Novi Sad, Faculty of Technical Science, Novi Sad, Republic of Serbia

### **ABSTRACT**

Dramatic changes in the field of public relations have taken place with the advancement of technology. New technologies have empowered PR professionals to strategically communicate with internal and external audiences. PR Managers have quickly embraced social media as the center of what they see as a new form of public relations. Creating an interesting message that contributes to improving the image of the organization's identity and achieves public relations and strategic goals management now requires digital literacy and a new kind of creativity.

**Keywords:** PR strategy, Public relations, Social media.

### **INTRODUCTION**

Internet is the most widespread indicator of the communication revolution, because almost all new media are based on the Internet. According to Gordon (2011), some characteristics of new media are: participation (encourage participation and exchange of information by the interested public), openness (openness to voting, giving comments and distributing information), conversation (two-way communication is enabled), togetherness (it is enabled fast and efficient communication between communities with similar interests), connectivity (connecting on social networks, blogs, podcasts, forums, etc.).

Online public relations is a part of public relations, which encourages internal and external target audiences to use the Internet, and aims to bring betterment to the organization (Gordon, 2011).

For PR managers, the new media environment brings three main challenges: (Broom, 2010)

1. Keep up with technological developments in new media.
2. Establish good relations with non-traditional "journalists".
3. To represent the organization in the new media environment

Internet provides PR managers with multiple forms of communication, including email messaging, information and persuasion via the World Wide Web, unlimited access to publics, etc. (Wilcox & Cameron, 2009). Contemporary public relations professionals create meaning and shape reality through interactive research and communication processes for the mutual benefit of individuals, groups, organizations, stakeholders, and the public with whom they have social, cultural, intellectual, economic, and communicative relationships (Lee & Kent, 2021).

## SOCIAL MEDIA

Social media can be defined as any tool or service that uses the Internet to facilitate communication (DiStaso & McCorkindale, 2012), or as blogs, social networking environments, person-to-person messaging, and other web applications (Palen, 2008). According to (Pew Internet & American Life Project, 2010), social media is a term used to denote a new era of web-enabled applications built around user-generated or user-manipulated content, such as wikis, blogs, podcasts and social networks. There are seven segments of social media: defining identity, realizing conversations, exchanging content, achieving presence, achieving relationships, achieving reputation, and working in collaborative groups (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). Figure 1 shows statistical data on the use of social media in April 2023.

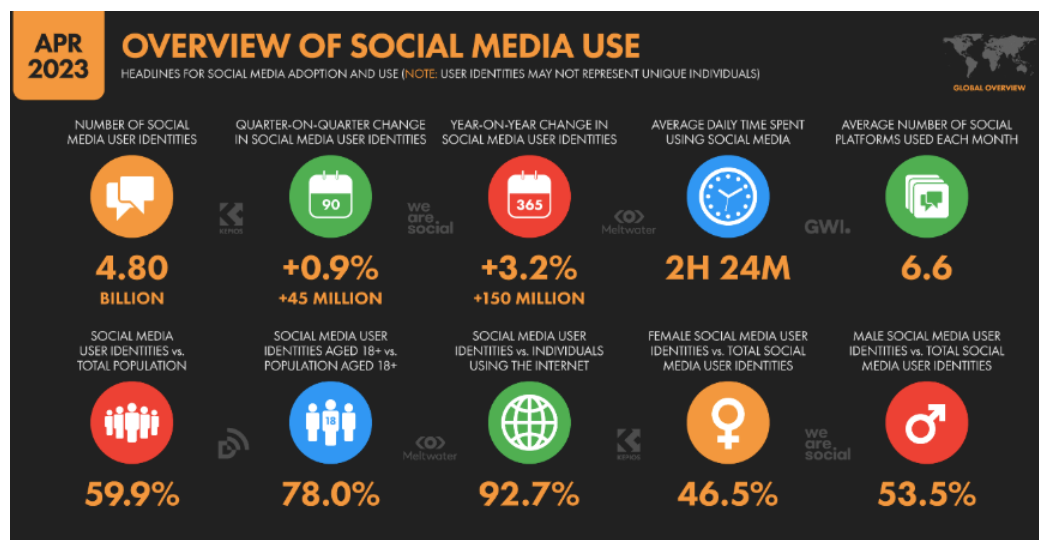


Figure 1. Statistical data on the use of social media in April 2023.

The first social network Geocities (used to create micro websites) was launched in 1994 (Shah, 2016). AOL Instant Messenger and Sixdegrees.com (a platform for collecting contacts, sorted according to certain "friendship levels") were founded in 1997 (Kamnoetsin, 2014). Furthermore, Friendster (uses the concept of "circles" of friends) were founded in 2002, LinkedIn (serves business networking of potential employers with employees) and MySpace (provides users with maximum freedom in creating the visual identity of their page) in 2003 (Kamnoetsin, 2014), Facebook (users can post comments, share photos, post, chat live, and watch short videos) in 2004, Reddit (is used to exchange and share information) in 2005, Twitter (Twitter is online news and social networks where people communicate in short messages called tweets) in 2006, Instagram (a photo-sharing site) and Pinterest (a visual "pin board") in 2010, Snapchat (a service for sharing videos with the concept of "stories" or serialized short videos and "filters", often used for location-based informational digital effects) in 2011. and TikTok (a short video sharing site) in 2016 (Shah, 2016).

The statistical evidence is therefore clear. A huge part of the world's population now has access to and uses social media, and the number of users in developing countries is increasing over time. Additionally, social media has made public relations globally applicable and forces organizations to think globally about their public relations practices. Public relations departments of organizations are responding quickly to adapt to this change in the media (Grunig, 2009).

## THE INFLUENCE OF SOCIAL MEDIA ON PUBLIC RELATIONS

It is increasingly obvious that the new and social media have reshaped the practice of public relations. The use and acceptance of social media is no longer a strategic business option, but a necessary and huge opportunity, and also an indispensable part of public relations and essential for the work of many

organizations (DiStaso & McCorkindale, 2012). Today, public relations is more about people and relationships, and PR professionals must focus on two-way communication and mutual understanding, as the monologue has changed to a dialogue, and bloggers are gaining recognition, as industry authorities, deserving the same respect and reach as traditional media. The industry will continue its quest to understand the online environment and how best to do so, integrating online tools with traditional PR (Comodromos, 2014).

Social media platforms allow public relations practitioners and their stakeholders to interactively communicate with each other in a variety of contexts, such as education, health, business, and crisis communication (Cheng, 2019). Valentini and Kruckeberg (2012) also emphasize the importance of using social media and point out that it must be at the center of public relations activities. According to these authors, social media can improve organizational and community relationships. The positive impacts of using social media in public relations have also been proven. The use of social media can lead to higher levels of engagement and a positive impact on employee behavior outside of social media use (Paek, Hove, Jung, & Cole, 2013). Smith (2013) argues that the use of social media enables the development of relationships between the marketing and public relations sectors, which further leads to a greater capacity for interaction between these two areas and to the cultivation of relationships.

According to (Avlonitis & Panagopoulos, 2010), incorporating the use of social media into customer interaction is a logical progression for companies to expand communication with their customers. Active use of social media can help companies in their communication with customers (Agnihotri, Kothandaraman, Kashyap, & Singh, 2012). Customers are often asked to "like" something related to a company on Facebook, to "follow" companies on Twitter, or to "connect" on LinkedIn. As a result of all this, users/customers become better connected with companies, have more knowledge about the company, its products and services. Although Facebook began by allowing friends and family to communicate with each other through Walls, messages, photos, private messages, live chats, pokes, and status updates, it has evolved into a major social media marketing platform (Holzner, 2009). Businesses can create a Facebook profile that is similar to a personal profile, in order to present and promote their products or services. In this way, through advertising and quality content, companies present their products and services to the market and gain Facebook friends and "likes". The main objective of Facebook marketing is to influence the "friends" of those who are already "fans" of the organization on the Facebook page, thereby reaching more potential consumers (Holzner, 2009).

The use of Twitter for professional purposes in the field of public relations is not an exception in relation to other social media, because as Grau and Ponte (2009) found, 36% of Twitter users say that they use it for strictly professional purposes. Alcatel started a blogging activity internally, and a top manager of Alcatel described blogging as an excellent way to have a direct dialogue with employees (Dutta, 2010). He believes that this type of communication has a positive effect on the motivation of employees and that the company supports them in this. Also, blogging helps in designing and executing a company's strategic plan.

Social media platforms such as Instagram, Facebook, TikTok, YouTube and Pinterest offer countless ways for brands to connect with customers (old and new). As of 2018, nearly 97 percent of all Fortune 500 companies use at least one social media platform to promote their initiatives and encourage positive communication with stakeholders. Additionally, as of 2021, there are approximately 3.78 billion social media users worldwide, a 5 percent increase from 2020.

(<https://www.entrepreneur.com/article/366240>)

## **SOCIAL MEDIA AS A PR STRATEGY**

Social media allows the organization to reach out to the general public and to strengthen relationships with current consumers/customers (Gordon, 2011). According to (Grunig, 2009), social media make the practice of public relations more global, strategic, two-way, interactive, symmetrical and socially

responsible. It is obvious that social media represent a new paradigm, which requires new forms of behavior and the development of different strategies. In the US, 38% of CEOs said they would use social media and online influencers as part of their main communication strategy in the future (USC Center for Public Affairs, 2019). For example, Coca Cola has a strategy called 4 R (reviewing, responding, recording, redirecting) and of social media, they use Facebook the most, where they have 5.7 million followers (Gordon, 2011).

It is important for businesses to recognize how they can use social media as part of their PR strategy. Below are six ways to use social media for public relations purposes:

(<https://www.uschamber.com/co/grow/marketing/using-social-media-for-public-relations>)

1. Using social media sharing in press releases. One of the easiest ways to incorporate social media into PR strategy is to add social sharing buttons to press releases. This allows clients and media to easily share press releases. However, just adding social sharing "buttons" is not enough. It is necessary to define how the press release will look when it appears on social networks. A good way to do this is to write a short blog post or social media post that leads to a press release.
2. Being a guest contributor. One of the best ways to create something for business and to build authority in your industry is to offer guest appearances on popular media outlets. This makes it possible to share knowledge with a new audience and get backlinks to the website. It is necessary to build good relations with journalists and popular media. When these kinds of professional relationships are built, the chance of getting the right kind of media exposure increases.
3. Communicativeness and focus on the community. One of the biggest benefits of social media is that it allows companies to talk to their customers and build a sense of community. When a community is created, customers become advocates for the company's business and spread the word about the company's brand. This can be achieved by creating and sharing useful content with audience members and then engaging with them by commenting.
4. Using hashtags for PR campaigns. Hashtags are used to track trending topics and conversations online and, when used strategically, can be a great way to promote a company. Creating a branded hashtag will allow the company to track customer engagement, monitor the overall reach of the campaign, and communicate with its customers. The important thing to remember about hashtags is that they must be memorable and relevant.
5. Crisis management plan. The list of ways social media is used in businesses is endless, but one of the downsides is that negative publicity can spread quickly. If a negative customer encounter goes viral online, it can quickly get out of hand and cause a lot of bad comments about the company's name. It is important to recognize that this can happen and have a crisis management plan. It is necessary to have a plan to avoid negative publicity, so that the company can maintain a positive reputation online.
6. Consistency in appearance. If a company wants social media to become an important element of its overall PR strategy, then it must be consistent with it. It is necessary to regularly publish information and provide answers to customers/users comments as soon as possible. Building and monitoring social media for your business may be slow at first, but if one stay consistent, the company's popularity will continue to grow over time.

PR managers, who work extensively with social media, believe that it will not make traditional public relations strategies obsolete. As the vice president of a large company, Jessica Maldonado, says (Byrnes, 2011): "I don't see how you can really separate public relations from social media; they complement each other. Use one and then the other, and vice versa." Getting positive publicity is no longer just the job of a PR representative, who engages or just traditional public relations. Using social media creates something much bigger and more successful (Byrnes, 2011). Nicoli and Komodromos (2013) state that the challenge for PR practitioners becomes trying to find the best ways to strategically incorporate social media into business.

An example of a successful PR strategy was implemented by Levi's. The goal was to re-engage and connect Generation Y with the Levi's brand in Australia and New Zealand. Combined teams from

Host and PR agency One Green Bean created an interactive campaign, which used Levi's website and Twitter. The campaign was called "I Spy Levi's". The trick was designed to have people follow clues given on Twitter to find the location and the person wearing the Levi's jeans. If a location seeker were to appear and ask the targeted person "Are those Levi's jeans?" and if that person confirmed it was, the person wearing the Levi's jeans had to take off their pants and hand them over on the spot. The campaign was held in Sydney, Melbourne, Auckland and Wellington. Through the "I Spy Levi's" campaign, 210 pairs of jeans were distributed, with over 1600 direct followers on Twitter. The campaign also resulted, with more than 1500 mentions, within other social media channels and managed to reach people outside of Twitter, through fashion and marketing blogs, newspapers, television and magazines. Kat Thomas, Managing Director at One Green Bean stated: "This initiative has two key elements, it's fun and there are free things to win" (B&T Magazine, 2009).

## CONCLUSION

The modern concept of public relations also includes the use of social media. This has already become common practice, and in the future expected can be the expansion of the use of digital technology within the functions of PR management. Digital technology enables production, distribution, storage and searching a large number of documents and information, regardless of whether it is about text, image or sound. At the same time, modern technology enables creation open systems in which continuous two-way communication can be maintained. New media have potential, very important for the modern model of public relations, to personalize the information, as well as to make the communication process interactive and two-way so that the participants in the process take turns they assume the roles of communicator and recipient.

Today, more than ever public relations include new forms of creativity, synchronization of various functions to achieve strategic certain goals, and a different attitude towards numerous target groups differentiated publics, especially the media. Modern PR Management becomes very responsible for achieving the organization's strategic goals and profiling the companies' images.

## ACKNOWLEDGEMENT

This work is a part of the current project TR-35017 funded by Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

## REFERENCES

- Agnihotri, R., Kothandaraman, P., Kashyap, R., Singh, R. (2012). Bringing "social" into sales: the impact of salespeople's social media use on service behaviors and value creation. *Journal of Personal Selling & Sales Management*, 32(3), 333–348.
- Avery, E. J. (2017). Public information officers' social media monitoring during the Zika virus crisis, a global health threat surrounded by public uncertainty. *Public Relations Review*, 43(3), 468–476
- Avlonitis, G., Panagopoulos, N. G. (2010). Selling and sales management: An introduction to the special section and recommendations on advancing the sales research agenda. *Industrial Marketing Management*, 39(7), 1045–1048.
- B&T Magazine, PR Strategy, 9/4/2009, Vol. 59 Issue 2700, p29-29. 2/5p.
- Broom, G. (2010). *Učinkoviti odnosi s javnošću*. Zagreb: Mate.
- Byrnes, M. (2011). The Snowball Effect. *Financial Planning*. 41(5), 81-82.
- Cheng, Y. (2019). The social-mediated crisis communication research: Revisiting dialogue between organizations and publics in crises of China. *Public Relations Review*, 46(1), 101769.
- Comodromos, M (2014). A study of pr practitioners' use of social media tools in Cyprus. *Journal of Developmental Entrepreneurship*, 19(2), 1450011 -1 - 1450011-9.
- Coombs, W. T. (2014). State of crisis communication: Evidence and the bleeding edge. *Research Journal of the Institute for Public Relations*, 1, 1–12.



- Coombs, W. T. (2019). *Ongoing Crisis Communication: Planning, Managing, and Responding* (5th ed.). Florida, USA: Sage.
- Dean, B. (2021). Social network usage & growth statistics: How many people use social media in 2021? Backlinko. <https://backlinko.com/social-media-users>. Pristupljeno: 02.03.2022.
- DiStaso, M. W., McCorkindale, T. (2012). Social media: uses and opportunities in public relations. *Global Communication Journal Canadian Edition*, 5(2), 75–82.
- Dutta, S. (2010). What's Your Personal Social Media Strategy? *Harvard Business Review*, 88(11), 127-130.
- Freberg, K. (2012). Intention to comply with crisis messages communicated via social media. *Public Relations Review*, 38(3), 416–421.
- Gordon, A. E. (2011). *Public Relations*. New York: Oxford Univeristy Press.
- Grau, F., Ponte, D. (2009). Twitter-vs-Facebook. In: <http://www.slideshare.net/FGrau/flash-research-twitter-vs-facebook>. Pristupljeno:01.04.2022.
- Gruning (2009). Paradigms of global public relations in an age of digitalisation. [https://www.researchgate.net/publication/46280145\\_Paradigms\\_of\\_Public\\_Relations\\_in\\_an\\_Age\\_of\\_Digitalization/download](https://www.researchgate.net/publication/46280145_Paradigms_of_Public_Relations_in_an_Age_of_Digitalization/download), Pristupljeno:05.04.2022.
- Holzner S. (2009). *Facebook marketing: leverage social media to grow your business*. Indianapolis, IN: Que Publishing.  
<https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/>  
<https://www.uschamber.com/co/grow/marketing/using-social-media-for-public-relations>
- Jin, Y., Liu, B. F., Austin, L. L. (2014). Examining the role of social media in effective crisis management: The effects of crisis origin, information form, and source on publics' crisis responses. *Communication Research*, 41(1), 74–94.
- Kamnoetsin, T. (2014). *Social media use: A critical analysis of Facebook's impact on collegiate EFL students' English writing in Thailand* (Unpublished doctoral dissertation). South Orange, NJ: Seton Hall University.
- Kietzmann, J. H., Hermkens K., McCarthy, I. P., Silvestre, B. S. (2011): Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, 54 (3), 241-251.
- Li, Ch., Kent, M.L. (2021). Explorations on mediated communication and beyond: Toward a theory of social media. *Public Relations Review*, 47, 102-112.
- Macnamara, J. (2018). Toward a theory and practice of organizational listening. *International Journal of Listening*, 32(1), 1–23.
- Nicoli, N., M Komodromos (2013). *Principles of Public Relations*. Nicosia: University of Nicosia Press.
- Noguti, V. (2016). Post language and user engagement in online content communities. *European Journal of Marketing*, 50(5/6), 695–723.
- Paek, Hye-Jin, Hove, Thomas, Jung, Yumi, Cole, Richard T. (2013). Engagement through three social media platforms: an exploratory study of a cause-related PR campaign. *Public Relations Review*, 39, 526–533.
- Palen, L (2008). Online social media in crisis events. *Educause Quarterly*, 3, 76–78.
- Pew Internet & American Life Project. (2010). Web 2.0. Preuzeto sa <http://www.pewinternet.org/topics/Web-20>.
- Philips, D., Young, P. (2009). *Online Public Relations: A practical guide to developing an online strategy in the World of Social Media* (2 nd. ed.), London: Kogan Page.
- Shah, S. (2016). The history of social networking. *Design Technica*. <http://www.digitaltrends.com/features/the-history-of-social-networking/>. Pristupljeno: 25.03.2022.
- Smith, B. G. (2013). Exploring social media empowerment of public relations: a case study of health communication practitioner roles and the use of social media. In H. Noor al-Deen, & J. A. Hendricks (Eds.), *Social media and strategic communications* (pp. 101–118). New York: Palgrave Macmillan.
- Tankovska, H. (2021). Number of monthly active Facebook users worldwide as of 4th quarter 2020. Statista. <https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/#:~:text=How%20many%20users%20does%20Facebook,the%20biggest%20social%20network%20worldwide>. Pristupljeno: 28.03.2022.
- Valentini, C., Kruckeberg, D. (2012). New media versus social media: a conceptualization of their meanings, uses, and implications for public relations. In S. Duhe (Ed.), *New media and public relations* (pp. 3–12). New York: Peter Lang
- Wilcox, D.L., Cameron, G.T. (2009). *Public Relations* (9th ed.). Boston: Allyn & Bacon.

**Session C: MARKETING MANAGEMENT**

---

**Papers (pp. 137-156):**

Valentina Bozoki FASHION, MARKETING AND FASHION MARKETING – ANALYSIS OF THE IMPACT ON BRAND SUCCESS IN THE FASHION INDUSTRY	...137
Vladimir Milošev, Dubravko Marić STRATEGY OF BRAND DEVELOPMENT AND MARKETING POSSIBILITIES OF APPEARANCE ON THE FOREIGN MARKET ON THE EXAMPLE OF THE COMPANY "JAFFA" CRVENKA	...143
Stefan Ugrinov, Verica Gluvakov, Mila Kavalić, Sanja Stanisavljev, Maja Gaborov ROLE OF DIGITAL MARKETING IN CREATING COMPETATIVE EDGE	...151





## **FASHION, MARKETING AND FASHION MARKETING – ANALYSIS OF THE IMPACT ON BRAND SUCCESS IN THE FASHION INDUSTRY**

**Valentina Bozoki**

University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, Republic of Serbia

E-mail: [valentina.bozoki@tfzr.rs](mailto:valentina.bozoki@tfzr.rs)

### **ABSTRACT**

Fashion is a dynamic industry that constantly evolves with the changing trends and customer preferences. Marketing plays a crucial role in promoting and selling fashion products, including clothing, footwear, accessories, and more. Fashion marketing refers to the process of creating and implementing marketing strategies specifically for the fashion industry. The goal of fashion marketing is to attract and engage potential customers, build brand awareness, and increase sales. This involves various activities, such as market research, creating marketing campaigns, selecting marketing channels and sales points, and implementing promotional activities. Branding is a critical aspect of fashion marketing. Creating a unique and recognizable brand image is essential for standing out from the competition and attracting customers. Influencers also play an important role in fashion marketing, as they can help increase brand awareness and generate interest among potential customers. The rise of e-commerce has also significantly impacted the fashion industry, and online sales have become increasingly important. Fashion brands need to have a strong online presence and utilize various digital marketing strategies to succeed in today's market. Overall, fashion marketing is a complex and dynamic process that requires understanding the target audience, adapting to changing trends and customer preferences, and utilizing various marketing channels and tactics to promote fashion products effectively.

**Key words:** Fashion, Marketing, Fashion marketing, Brands, Promoting

### **INTRODUCTION**

Fashion and marketing are two inextricably linked fields that together represent a dynamic industry that is constantly evolving. In today's world, when the market is constantly changing, fashion marketing becomes a key factor for success in this sector. Fashion marketing is the process of promoting and selling fashion products, and it includes many activities that are carried out in order to achieve the goal - to attract the attention of potential customers and motivate them to buy products (Kotler & Keller 2016). Many examples can be found of many successful campaigns as well as unsuccessful ones, such as fashion brands such as Chanel, Gucci and H&M. It is important to understand how fashion and marketing interrelate and how together they can influence the creation of a successful brand in the fashion industry.

This paper will first clarify the concept of fashion and its influence on society and the economy. Next, the role of marketing in the fashion industry will be analyzed and why marketing is important for success in this sector will be explained. Finally, the focus will be on the concept of fashion marketing, its role in the promotion of fashion products, and examples of successful brands in this sector.

### **FASHION AND ITS INFLUENCE ON SOCIETY AND ECONOMY**

Fashion has a great influence on society and economy around the world. Apart from being a way of expressing individuality and culture, fashion also has an economic impact, thus contributing to global economic growth. In this paper, we will consider various aspects of fashion and its impact on society and economy. Fashion is a way of expressing culture and individuality, and is often associated with

cultural and social movements. Fashion is also often used as a means of expressing social attitudes, such as political beliefs, social status, and group membership (Kang & Kim 2015).

Fashion has a significant impact on society and the economy. It is more than just clothing, as it is a way for people to express their identities and style. Fashion trends change from season to season, and are often the initiators of changes in society. For example, feminist movements have influenced fashion and created new trends such as "girl power" slogans and clothing that expresses a strong female figure. Similarly, trends that emphasize a healthy lifestyle and sustainable fashion are becoming increasingly popular. The fashion industry also has a significant economic impact. Also, fashion has a significant impact on tourism, as many destinations are known for their fashion scene. However, fashion also has negative effects on society and the economy, including environmental and ethical issues related to the workforce. Many fashion companies have been criticized for poor working conditions and insufficient wages for workers in developing countries. Also, fashion is the second most polluting industry in the world, due to the use of large amounts of water, chemicals and synthetic materials in the production of clothing as we can see in the example presented in Figure 1 (McKinsey & Company, 2019)

In addition, there is a trend in the fashion industry towards establishing more sustainable and ethical business practices, which includes reducing harmful impacts on the environment and society, as well as increasing transparency throughout the supply chain. These changes are reflected in an increasing number of brands that focus on sustainability, the use of recycled materials and the reduction of the use of chemicals in production. Among other things, there is a trend in the fashion industry towards establishing more sustainable and ethical business practices, which includes reducing harmful impacts on the environment and society, as well as increasing transparency throughout the supply chain. These changes are reflected in an increasing number of brands that focus on sustainability, the use of recycled materials and the reduction of the use of chemicals in production (Crane, 2000). The fashion industry is one of the largest industries in the world, with a huge impact on the global economy. One aspect of fashion is its role in creating social norms and stereotypes. Fashion and clothing are often associated with certain social groups, such as members of a certain class, culture, or social status. This can lead to social stereotyping and exclusivity, as well as pressure on people to dress in a certain way to fit into the social norm. However, fashion can also be a means of provoking change in society and encouraging discussion of social problems (Crane, 2000).



*Figure 1: Polluted running water from chemicals used in the fashion industry*

## **THE ROLE OF MARKETING IN THE FASHION INDUSTRY**

The role of marketing in the fashion industry is extremely important as it helps brands stand out in this competitive industry. Fashion marketing includes all marketing activities applied to a fashion product or service, including market research, creating a brand strategy, positioning the brand, defining the

target group, developing advertising campaigns and product promotions. The key goal of fashion marketing is to attract the attention and loyalty of consumers, creating a strong brand image and recognition. Fashion brands use different marketing channels to reach the target group, including fashion events, advertising campaigns, social media, influencers, sponsorships and PR activities (Kotler & Keller, 2016).

One of the most important aspects of fashion marketing is understanding the target group and its needs and wants. Based on this information, fashion brands create products and marketing campaigns that will attract potential customers. In addition, fashion marketing also has the task of creating a certain value in the eyes of consumers, often through emphasizing quality, brand image or status symbolism. Apart from influencing consumers, marketing also plays an important role in the internal processes of the fashion industry, including sales, distribution and inventory management. An effective marketing strategy can help brands properly manage inventory and sales, reduce costs and improve efficiency. In short, marketing plays a key role in the fashion industry as it helps brands stand out from the crowd, capture the attention of potential customers and create brand loyalty. Through market research, brand strategy creation and marketing campaign development, fashion brands can successfully position themselves in the market and achieve long-term success. (Kotler & Keller, 2016).

The influence of marketing in the fashion industry is reflected in the creation and maintenance of brands, the promotion of products and services, and the establishment of connections with target consumer groups. Fashion brands face increasing competition, and their goal is to create recognition and attract as many consumers as possible. In this sense, marketing in the fashion industry plays a key role in increasing sales and creating consumer loyalty. Fashion marketing encompasses a wide range of marketing activities, including market research, branding, product design, pricing, distribution, advertising and promotion. One of the most important elements of fashion marketing is promotion, which refers to activities aimed at increasing brand and product visibility. Promotion includes advertising, sales promotions, sponsorships, public relations and other marketing activities. (Kotler & Keller, 2016).

Nowadays, the fashion industry is facing increasing challenges, including changes in consumer habits, rapid development of technology, market globalization and other factors. In this context, marketing activities become even more important, as they allow fashion brands to adapt to changes and create long-term relationships with consumers. (Kotler & Keller, 2016).

Marketing has a huge impact on the fashion industry, not only in terms of creating brands and increasing sales, but also in creating trends and influencing culture. Nowadays, social media plays a key role in fashion marketing, allowing brands to communicate directly with consumers and create communities around their products. This connection with consumers allows brands to quickly adapt to their wants and needs. However, this influence of marketing on the fashion industry is not always positive. As the market focuses more and more on consumer trends, brands focus less on product quality and more on fast fashion that is quickly replaced by new trends. This leads to an increase in the amount of textiles produced and a faster pace of production, which has a negative impact on the environment. Also, marketing can be responsible for creating unrealistic beauty and body standards. In an effort to promote their products, brands often use images of perfect and thin models, which can lead to eating disorders and low self-esteem in consumers. However, marketing also has positive effects in the fashion industry, especially in the promotion of diversity and inclusiveness. Some brands have begun to include different body types and ethnic groups in their campaigns, which can help promote acceptance of diversity in society (Sljepčević, 2019).

Marketing has a significant impact on the fashion industry, both in the creation of trends and brands, and in the impact on society and the economy. However, it is important to be aware of the negative impacts that can arise from too much focus on consumer trends, unrealistic beauty standards and environmental impact. Here are some more facts about the influence of marketing in the fashion industry (Sljepčević, 2019):

- **Fast fashion and influencer marketing:** Fast fashion, which is based on the mass production of clothes at a low price, relies heavily on influencer marketing. Fast fashion companies hire social media influencers to promote their products and drive purchases.
- **Personalized experiences:** Over the past few years, brands have focused on creating personalized experiences for customers. This means tailoring products and marketing messages based on customer preferences and behavior. This can be achieved through technology, such as artificial intelligence, which enables the analysis of customer data and tailoring of marketing messages.
- **Social responsibility:** In recent years, the fashion industry has become more aware of its impact on the environment and society. Because of this, many brands have switched to more sustainable production and become involved in socially responsible campaigns. These campaigns often involve engaging influencers and promoting sustainability and social responsibility messages through social media.
- **Development of new technologies:** In the last few years, the fashion industry has adopted new technologies to improve marketing strategies. These include using virtual and augmented reality to create interactive experiences for customers, as well as using artificial intelligence technology to analyze customer data and tailor marketing messages.
- **Global Impact:** The fashion industry has become a global industry that impacts society and economy around the world. Fashion brands are expanding into new markets and adapting to local tastes and cultures. Also, the fashion industry employs a large number of people worldwide and has a significant impact on the global economy.

## SUCCESSFUL BRANDS IN THE FASHION INDUSTRY

In the fashion industry, marketing plays a key role in creating recognizable brands and successful business models. Some of the most successful brands in the industry have just achieved their success thanks to smart marketing. One example is the "Gucci" brand. This Italian brand has managed to return to the top of the fashion world thanks to its distinctive branding and innovative marketing approach. The creative director of the brand, Alessandro Michele, managed to reshape the image of the brand and attract a new audience, especially the younger generation, through innovative campaigns and collaborations with popular influencers.

Another example is the brand "Nike". This brand has become synonymous with sportswear and footwear, which was achieved through a long-term marketing strategy. Nike built its brand through campaigns that promoted an active lifestyle and sports values, then focused on a target group including athletes and sports fans around the world. Nike is also known for its innovative approach, which is reflected in campaigns that have used the latest technology and social media (Sljepčević, 2019).

Another example is the "Zara" brand. This brand has become known for its fast fashion trends and affordable prices. Zara manages to keep pace with the rapid changes in the fashion industry thanks to their innovative approach to marketing. Zara often changes its collections, adapting to trends and customer needs, while at the same time maintaining affordable prices. Their marketing approach is focused on interactivity with customers, especially through their app that allows customers to stay up-to-date with new collections and purchase them via phone as presented in Figure 2 (Sljepčević, 2019).

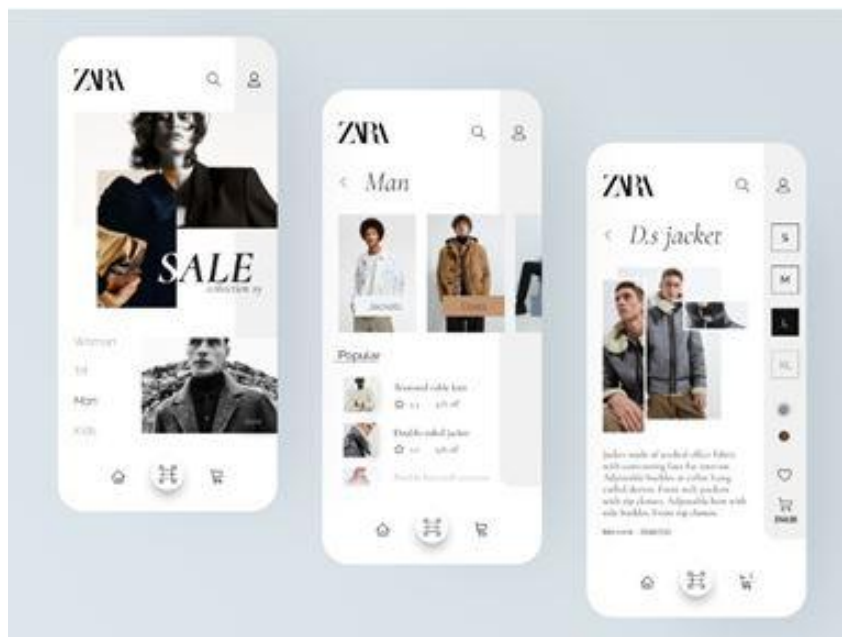


Figure 2: Zara application

These examples indicate that marketing is a key success factor in the fashion industry, and brands that manage to create a recognizable image and keep up with trends can achieve long-term success. Here are some interesting facts about fashion and marketing:

- In the 1930s, Coco Chanel launched a marketing campaign for her perfume Chanel No. 5 which included celebrities like Marilyn Monroe. Monroe once said that she only sleeps in Chanel No. 5, which led to even greater popularity of the perfume.
- In the 1980s, Levi's launched a marketing campaign called "501 Blues". This campaign included famous actors and singers, such as Bruce Springsteen and Tom Cruise, who wore Levi's jeans in their films and videos.
- In 2009 Burberry launched the "Art of the Trench" campaign which used social media to show people from all over the world wearing their trench coats. This campaign was the first to use social media as an advertising tool in the fashion industry.
- In 2018, the fashion brand Gucci launched a marketing campaign for its Gucci Ace sneakers, which was based on internet memes. This campaign was designed to attract a younger audience that is often active on social media.
- Victoria's Secret is known for its spectacular fashion shows held every year. These fashion shows are broadcast live and watched by millions of people around the world, which is an excellent marketing opportunity for the brand.
- In 2018, the fashion brand H&M launched a campaign called "Close the Loop" that promoted sustainable fashion. This campaign involved recycling old clothes and making new products from recycled materials. This campaign was the first step in H&M's long-term sustainability strategy.

These highlights show how fashion and marketing are constantly evolving and adapting to new trends and technologies to attract attention and retain customer loyalty.

In some cases, fashion brands pay celebrities to wear their products at public events, which is called "placement" or "product placement" in marketing. This tactic is popular because public events such as red carpets attract a lot of media attention, which can be useful for increasing brand visibility. In the modern digital age, influencers have become key players in fashion marketing. These individuals have large social media followings and use their influence to promote products and brands. In many cases, fashion brands will work with influencers to gain more visibility on social media. In some cases, fashion brands will create "limited collections" in collaboration with other brands or celebrities. This tactic is popular because it creates a sense of exclusivity and encourages consumers to make a quick

purchase decision so they don't miss out on the opportunity to own something unique. Fashion brands sometimes use "buy one, get one free" tactics to encourage consumers to buy more products. This tactic is effective because it increases the amount of product purchased by a single consumer and can attract new customers who are interested in receiving a free product. Many brands use emotional marketing to connect with consumers on an emotional level. This tactic involves creating ads that focus on feelings like happiness, nostalgia or excitement. In the fashion industry, emotional marketing is often used to create an impression of luxury and exclusivity (Keller, 2013)

## CONCLUSION

In this paper we looked at the impact of marketing on the fashion industry. We found that marketing plays a key role in the success of fashion brands, helping them create a recognizable and attractive brand strategy, connect with their target audience and build customer loyalty. Marketing campaigns change as trends and technologies change, and brands strive to stay relevant and stay on top of the latest trends to attract customers. Also, we have seen some brands achieve huge success thanks to a smart marketing strategy, like Gucci, Victoria's Secret and Levi's. Those brands managed to convey their messages and visions through their campaigns in a way that attracted the audience and piqued their interest. Furthermore, we discovered how social media has become a key channel for marketing in the fashion industry. Campaigns using social media have become increasingly popular, and brands are trying to create content that will attract a younger audience and generate a viral effect.

Finally, we discovered that fashion and marketing are constantly changing and adapting to new trends and technologies to attract customers. Responsibility and sustainability have also become important factors in the fashion industry, and some brands such as H&M have already embarked on campaigns that promote sustainability. Overall, marketing plays a key role in the fashion industry and without a smart marketing strategy, brands would struggle to survive in the market.

## REFERENCES

- Crane, D. (2000). *Fashion and its social agendas: Class, gender, and identity in clothing*, University of Chicago
- Kang, J., & Kim, E. Y. (2015). From Hanbok to Hallyu: A Brief Overview of Korean Fashion. *International Journal of Costume and Fashion*
- Keller, K.L. (2013). *Strategic Brand Management: Building, Measuring, and Managing Brand Equity*.  
Kotler & Keller, 2016; Stone & Desmond, 2007
- Kotler, P., & Keller, K. L. (2016). *Marketing Management*
- McKinsey & Company. (2019). *The state of fashion 2019*.
- Sljepčević M. (2019). *Fashion marketing – Modern trends as art*



## **STRATEGY OF BRAND DEVELOPMENT AND MARKETING POSSIBILITIES OF APPEARANCE ON THE FOREIGN MARKET ON THE EXAMPLE OF THE COMPANY "JAFFA" CRVENKA**

**Vladimir Milošev**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [vladimir.milosev@tfzr.rs](mailto:vladimir.milosev@tfzr.rs)

**Dubravko Marić**

High School of Sports and Health, Belgrade, Republic of Serbia

### **ABSTRACT**

The company "Jaffa" from Crvenka has been operating for many years and thanks to its innovative and high-quality products, they have built a tradition and a recognizable name all over the world. In recent years, the company has made an expansion both in the part of the production line and in the part of profit and market share that this company achieved on the world market. Presentation of the development strategy of the "Jaffa" brand and international marketing on the example of the candy factory "Jaffa" from Crvenka with a proposal for the improvement of marketing processes indicates the complexity and importance of international marketing in the company, and in order to increase productivity and determine the position of the brand, a description of the importance of international marketing for success of the brand on the market, defining the basic elements of the marketing mix in order to present a marketing strategy that can be applied by a wide range of companies in different fields of activity. The company monitors when consumers buy, whether the price of their products is acceptable for them, how they react to new tastes or products in their assortment, whether they are satisfied with the packaging of the products, and the like. The coordinates of the direction vector show that the company "Jaffa" is characterized by an aggressive strategic position. Its advantages can be attributed to the following factors: product innovation, growing market share, professional management team, high vertical integration, the creation of recognizable products for the general public and a strong financial position.

**Keywords:** Development strategy, Brand, Marketing mix, Competition, Market

### **INTRODUCTION**

The company "Jaffa" from Crvenka has been operating for many years and thanks to its innovative and high-quality products, they have built a tradition and a recognizable name all over the world. In recent years, the company has made an expansion both in the part of the production line and in the part of profit and market share that this company achieved on the world market. Based on this information, this work is dedicated to companies that want to improve their business, develop new brands, improve existing ones, break into hitherto unrepresented markets by using marketing tools with concrete suggestions through the proposed models.

The subject of this article is the presentation of strategies for the development of the "Jaffa" brand and international marketing on the example of the candy factory "Jaffa" from Crvenka with a proposal for improving marketing processes.

The aim of this article is to point out the complexity and importance of international marketing in the company, with the aim of increasing productivity and establishing brand positions; to describe the importance of international marketing for the success of a brand in the market; to expose and define the basic elements of the marketing mix and show a marketing strategy that can be applied by a wide range of companies in different fields of activity.



## **HISTORY**

"Jaffa" AD Crvenka has a business tradition of more than 30 years. For many years, the products of the "Jaffa" AD Crvenka factory have been synonymous with quality and good taste. It is present in all markets in the region. The quality and popularity of Jaffa products is evidenced by the constant growth of exports. Listening to the needs of consumers, "Jaffa" has significantly expanded its range, so in addition to the already popular O'Cake, the offer also includes Homemade biscuit, Tea pastry, Petit Beurre and lean variants of this biscuit, integral Mill's Digestive, salty cracker Tak, chocolate cream Nougat, several types of wafers and "Marquise" cake sponge cake.

"Jaffa" AD Crvenka is one of the first factories in the region whose production complies with the most demanding sanitary, hygienic and technological requirements, which includes the HACCP certificate. The HACCP and ISO 9001 system (by Quality Austria) was introduced in 2004, and in July 2007 it was recertified for the next three years. 30 million euros have been invested in the factory from 2006 until today, a new production hall with a total area of 12,000 m<sup>2</sup> was built, in which three state-of-the-art lines for the production of confectionery products were installed.

## **MANAGEMENT STRUCTURE**

"Jaffa" currently has 397 employees. The company is made up of the people who work in it, and the Jaffa team is made up of people who approach their work with enthusiasm. Working in Jaffa means working in one of the leading confectionery factories in South East Europe and therefore their team is carefully selected. The entire production process is supervised by professional, reliable and experienced staff. All their energy is directed towards the consumer. The satisfaction of their customers is their ultimate goal. They built the trust they gained over the years, patiently and strive to preserve it. The secret of their success lies in listening to the needs, not of the market, but of the people who make up that market - the customers. Based on a careful analysis of consumer needs, but also relying on their own experience and intuition, they built a recognizable brand. Jaffa's success is guaranteed by the business philosophy followed by all employees, which are three principles:

1. Use of only the highest quality ingredients,
2. Insisting on a unique, original image,
3. Using the most modern technology.

In order to maintain a leadership position, in addition to constant investment in equipment, they also invest in the knowledge of their employees. They often organize visits to the world's leading factories, fairs and congresses, where they compare achievements and gain new knowledge.

## **ANALYSIS OF THE SITUATION**

### **Mission and vision**

Every year "Jaffa" strives to provide more to its consumers, but also to gain new fans of Jaffa delicacies. The image of the Jaffa factory from Crvenka is modern and contemporary, and can be compared with the world's large biscuit factories. "Jaffa" JSC Crvenka wants to maintain and strengthen its leadership position in the production of confectionery products in the country and the region. At the same time, it strives to achieve a significant placement of its products in the territory of Southeast Europe and to be present and known on the world market. "Jaffa" AD Crvenka with its high-quality and health-safe confectionery products fully meets the demands, needs and expectations of customers and consumers, providing safety and a good life standard to its employees, resulting in profit for its shareholders. "Jaffa" AD Crvenka nurtures the tradition of participation in humanitarian and charitable actions with constant cooperation with local and regional communities to mutual satisfaction. It wants to realize its Vision to the satisfaction and with the involvement of all users and interested parties (customers, consumers, suppliers, local community, employees, business partners, shareholders). It maintains its leadership position by developing its own products. It continuously works on the improvement of personnel who are the main support in achieving the Vision (Bora et al., 2017). Markets have become too competitive so customer focus is no longer enough. The competitive environment is often called the branch environment or the task environment (Skandera et al., 2023). For a long time, the "Jaffa" company was the leader in the production of certain products such as Jaffa biscuits, however, as the product was well placed on the market, competition appeared with the same product at lower prices.

## Research

The key consumers of "Jaffa" products are final consumers, that is, children, teenagers and all those who enjoy sweets, they buy products for direct consumption. It is of great importance where the consumers are in order to communicate with them, to plan and monitor sales and the effects of communication. The company monitors when consumers buy, whether the price of their products is acceptable for them, how they react to new tastes or products in their assortment, whether they are satisfied with the packaging of the products, and the like. On the basis of the best-selling products from the "Jaffa" assortment, we come to the conclusion of what consumers want and what sets that product apart from the rest. It is also important how consumers buy, in what situations and for whom, this information is obtained by observing consumers when purchasing products, surveys, on the Internet through forums. Among other things, the frequency of purchasing "Jaffa" products, the motivation consumers have for purchasing and the continuity of product use are monitored. Great importance is attached to the way consumers/buyers first heard about "Jaffa" products, which helps them promote their products (O'guinn et al., 2014). The company came out with new products only recently and, of course, it is not objective to expect such a presence. Of the new products, "jafolitanks" have the most potential, their place has already been taken by "okajek" and is the leader among wellness programs, and "pti ber" ranks well in the category of hard biscuits. These are product categories that have continuous growth on the market, and the company's management expects that trend to continue in the coming years, which will be supported by further investments.

However, precisely because of the mentioned products and new variations towards all the leaders among the brands, the management decided that the market must be much more aggressive in sales, which is why they reorganized and engaged the company "Nelt" as a distributor, thereby speeding up the process and justifying additional investment in marketing activities.

## Market analysis

The products of the Jaffa company are bought and consumed by all sweets lovers, regardless of age, all over the world. "Jaffa" products are ordinary (conventional) products, and the need for these products and their purchases is most often reached by the consumer impulsively, considering that they are products that have a lower value and are bought more often, therefore, when buying these products, a large amount is not required number of information because the customer already has all the necessary information. It means that "Jaffa" products belong to the group of products for everyday and simple purchases. "Jaffa" company follows the needs of consumers and their opinion is crucial for the production of a new or innovation of an existing product (Raguia, 2014).

Traditionally, the best sales, both in terms of potential and consumers, come from central Serbia, which means the city of Belgrade and Šumadija. That's where "Jaffa" has the highest turnover and the most loyal consumers, which obliges us to take special care of that fact from the aspect of development. Big changes were made in the distribution, because until now it was done passively, because "Jaffa" had some kind of guaranteed sales and placement of goods.

## Competition analysis

The main competitors in Serbia in the production and sale of confectionery products are: "Bambi-Banat", "Banini", "Hissar", "Soko-Nada-Stark", "Pionir", "Swisslion-Takovo", "Marbo product"... Veliku competition is also made up of manufacturers from abroad, who are increasingly present on our market. These are producers from the European Union and countries from the region - Milka, Nestle, Kinder, Ferrero, Kraš... Some of the products of foreign competitors can be said that there are about 80 companies operating in the confectionery industry, with 15 relatively large and over 60 medium and small ones. According to the survey of the presence of biscuit and cake manufacturers in the minds of consumers of the MP panel of the Serbian market, Soko Nada Štark and Swisslion-Takovo are in first place, followed by Banini and only then Jaffa in fourth place.

## SWOT analysis

SWOT analysis of the organization (Teoli et al., 2019). its strengths, weaknesses, opportunities and threats is a way of summarizing the current status of the organization and refers to two aspects:

1. Strengths and weaknesses are identified in a resource-based analysis,
2. Chances and threats are observed in an analysis based on the organization's environment (Mašić, 2009).

Based on the above, the SWOT analysis in the "Jaffa" company looks like this:

<p>Internal STRENGTH factors:</p> <ul style="list-style-type: none"> <li>– Dominant position on the market,</li> <li>– Effective management,</li> <li>– Quality products,</li> <li>– Modern technology,</li> <li>– Built reputation,</li> <li>– Professional staff,</li> <li>– Good marketing campaigns,</li> <li>– A rich assortment of products,</li> <li>– Own vehicle fleet,</li> <li>– Good cooperation with retail stores.</li> </ul>	<p>WEAKNESSES:</p> <ul style="list-style-type: none"> <li>– Similarity of products with other companies from the same branch of production.</li> </ul>
<p>External factors CHANCES:</p> <ul style="list-style-type: none"> <li>– Placing products on new markets,</li> <li>– Finding brand new products,</li> <li>– Inability of competitors to follow innovations in technology,</li> <li>– Large market share,</li> <li>– Turning to new target groups,</li> <li>– Development of consumer awareness about products and their quality,</li> <li>– The inactivity of the main competitors in the design, programming and implementation of designed and comprehensive promotional activities.</li> </ul>	<p>THREATS:</p> <ul style="list-style-type: none"> <li>– New competitors from abroad,</li> <li>– Unstable economic environment,</li> <li>– Constant technological innovations,</li> <li>– Strengthening existing competition,</li> <li>– Unstable political environment,</li> <li>– Inadequate behavior of competitors, i.e. unloyal competition,</li> <li>– Increasing imports.</li> </ul>

### SPACE method

In the process of making strategic decisions, the SPACE method plays a significant role. It is used to evaluate the performance of one's own and competing companies, and enables the identification of the strategic position of one's own company and its competitors (Gurbuz et al., 2013). There are four dimensions within the SPACE matrix, and they are:

1. internal dimensions, there are two: financial strength and competitive strength,
2. external dimensions, also two dimensions: environmental stability and branch strength.

Within its strategic position, the company can take the following positions: 1. 2. 3. 4., i.e. aggressive position, competitive position, conservative position and defensive position. So we had factors that determine financial strength Dimensions and factors Profitability, Financial leverage, Liquidity, Required/available capital, Cash flow and Business risk. Then the factors that determine competitive strength Dimensions and factors of Market participation, Product quality, Product life cycle, Product replacement cycle, Consumer loyalty, Competitive capacity and Technological know-how factor. Factors that determine the stability of the environment Dimensions and factors Technological changes, Inflation rate, Variability of demand, Price range of product competitiveness, Barriers to market entry, Competitive pressure and Price elasticity of demand. Factors that determine the strength of the branch Dimensions and factors Potential for growth and development, Profit potential, Financial stability, Technological know-how, Use of resources, Capital intensity, Ease of market entry, Capacity utilization and Flexibility (Taylor, 1997).

According to the SPACE matrix, the strategic position of the company "Jaffa" against competing companies, according to the mentioned elements, is as follows:

1. The dimension of environmental stability is -2.86. It indicates that the branch in which the observed company operates is relatively stable. The dominant factors are: high inflation rate, many barriers to entering the market, high price elasticity and strong competitive pressure.
2. The value of the financial strength dimension is 3.83. Factors affecting the financial strength of the company include: highly available capital, high rate of return, as well as balanced financial leverage and liquidity. High capital costs indicate that it is difficult to enter the market, which can affect the maintenance of a given financial strength.

3. The power dimension of the branch is 4.67. Considering the given assessment, we can conclude that the branch is characterized by: high growth potential, high profit potential, high financial stability, simple technological know-how, efficient use of resources and high capacity utilization.
4. The competitive advantage dimension is -1.25, indicating that the company has a strong competitive advantage. Factors that significantly contribute to that competitive advantage are: large market share, high consumer loyalty and high vertical integration.

The coordinates of the direction vector show that the company "Jaffa" is characterized by an aggressive strategic position. Its advantages can be attributed to the following factors: product innovation, growing market share, professional management team, high vertical integration, the creation of recognizable products for the general public and a strong financial position. The constant strengthening of competition and the appearance of new competition from abroad is one of the threatening factors that the company can influence through a more aggressive marketing approach, through various campaigns and humanitarian actions and an increase in product quality.<sup>1</sup>

### **CHOICE OF FOREIGN MARKET FOR PERFORMANCE**

Entering a foreign market requires careful analysis. Quality information obtained through careful and systematic research of the market as a whole environment certainly plays a basic guiding role in the part of decision-making about cooperative performance on the foreign market. It is precisely from there that different approaches to the selection of entry strategies are derived. For the "Jaffa" company, we can say that it uses a strategic marketing rule that is based on a comprehensive analysis and a systematic comparison of alternative forms of business in order to reach a final decision:

- The strategic approach affirms the importance of comparative analysis, the necessity of alternative decision-making and the need to consider the long-term market position.
- Comprehensiveness reflected in: subject analysis, factor analysis and analysis of specific advantages and disadvantages.
- A step-by-step approach that contributes to greater analytical and better quality comparison of different indicators, which is reached through four levels and stages in the analysis process: preliminary analysis, organizational feasibility analysis, market feasibility analysis and economic effects analysis.
- Flexibility that should accompany the problem of choosing the appropriate form of market presence.

We can conclude that the strategic approach in choosing the Jaffa company's strategy for entering foreign markets is very likely the first significant step in defining an international marketing strategy (Czinkota et al., 2013).

The basic 4 criteria used for grouping are (Joksimović, 2008):

1. Geographical and demographic characteristics (regions, size, climate, population, distribution of raw materials),
2. Socio-political feature (socio-political system, party system, internal policy, foreign policy),
3. Economic development characteristic (GDP size, growth rate, standard of living, rate of technological development...).
4. Socio-cultural characteristic (language, education, lifestyle, religion...).

The grouping strategy is of a preventive and preliminary nature. Its main goal is to create insights and a more complete picture of international economic and market relations. Observing the basic features of existing international integrations, regional, political and economic groupings of the country, as well as determining informal groupings of clusters, of a larger number of countries, based on the above criteria (geographical, socio-political, cultural, economic development). "Jaffa" distributors are located all over the world. In Europe, they are located in the territory of Montenegro, Bosnia and Herzegovina, Macedonia, Croatia and Slovenia, from where they distribute their products throughout the country. Then in the USA and Canada, as well as in Australia. During the selection of foreign markets, "Jaffa" goes through the following stages:

1. Preparation phase - use of all data and instructions from preliminary strategies (strategy of grouping, filtering and comparative analysis),
2. Phase - determination of assumptions about the rationality of foreign market segmentation,

---

<sup>1</sup> www.jaffa.rs

3. Determination of possible segments,
4. Phase of defining global needs by market segments i
5. Analysis of competition by segment.

"Jaffa" company studies the logic, similarities and differences of marketing systems in different national environments. This strategy involves researching marketing conditions. The basic objective is to classify markets and market segments. Based on the comparison of the basic characteristics and the observation of similarities and differences, i.e. creating a basis for rational decision-making. The "Jaffa" company is compared to national and sub-national market companies.

Market segmentation involves researching customers and users. "Jaffa" company takes care of funds and how it disposes of them, that is why it decides to perform in front of certain market segments. Segmentation is of great importance in conditions of pronounced heterogeneity. The strategic concept of "Jaffa" market segmentation is aimed at identifying the most interesting parts of the market, i.e. target market groups of customers. They use the following bases for segmentation: geographic location, socio-economic status, culture, shopping behavior.

### **INTERNATIONAL MARKET TARGETING**

The market expansion strategy includes two alternatives: international market diversification and concentration (Gómez et al., 2013). The "Jaffa" company applies diversification, that is, it penetrates a large number of foreign markets. It applies less marketing effort per market and quickly conquers new markets. "Jaffa" applies global market diversification, that is, directs marketing activities to a large number of segments and a large number of countries. Applying this "Jaffa" strategy, the company has less risk and less market dependence, greater flexibility, treatment of smaller markets and even undeveloped ones as promising, timely use of entry opportunities, use of the effects of price competition, less market share, production specialization and market development. And the lack of time to get to know the main consumers and distributors, neglect of large and important markets, increased administration, danger of wasting marketing efforts and funds, neglect of market penetration appears as a disadvantage.

"Jaffa" applies a strategy of large market share (Bertay et al., 2013). The main factors involved in a large participation strategy are:

- the economy of scale acts with the same intensity on an international scale, and therefore the economy of scale can be found in production, distribution, research, administration;
- the curve of experience in international marketing enables costs to be lowered over time and enables familiarization with the market structure, legal and customs regulations, as well as available distribution channels on the foreign market;
- the market power of the company, of particular importance is the structure of imports and the participation of a certain country in it. The advantages of market power depend on the foreign trade policy of a foreign country and its relationship to imports, which is monitored through export quotas, customs policy, tariff and non-tariff restrictions;
- the quality of management, the higher the quality of the manager's expertise in international marketing.

Positioning represents a strategy by which the company tries to differentiate its institution, its products and services in the perception of its consumers (Andaleeb 2016). There is a leader in every market segment. Every other company will try to find its place in the market. When positioning itself in relation to its competitors, the Jaffa company uses a combination of benefits that are not provided by other competitors and that are desirable for the target market. "Jaffa" products are available to a large number of consumers around the world, it has the most attractive product packaging design according to the opinion of consumers and the prices of their products are acceptable to everyone. The "Jaffa" company has been operating for many years, which instills confidence in consumers and speaks of the tradition and quality of the products themselves. The company constantly introduces new products that do not exist on the market, listens to the needs of customers, follows world trends, and keeps what makes it special and what makes it recognizable. All these reasons set the company apart from the competition.

### **MARKETING MIX**

Marketing is a set of different activities (marketing mix) aimed at 4 segments (known as 4P):

- Product,
- Price (Price),
- Placement i
- Promotion.

These activities are numerous, and each one represents an important factor on whose (non) existence the success of the entire project may depend: positioning of the product, its characteristics and quality, brand, packaging, service, choice and timing of advertising/propaganda, sales promotion, relations with by the public, the choice of the place of sale, the way and method of distribution, prices, discounts, payment methods, etc. (Khan 2014).

From this we can conclude that the company "Jaffa" has a wide and short assortment, considering that some product lines do not have more than one item (Polo, Tea pastry, Homemade biscuits and Marquees), but also that some product lines have a dense assortment.

Price means the monetary expression of the value of goods and services on the market. Through it, the company generates income, measures the market share and profitability of the company. The number of realized services and products that can be sold on a certain market at a certain time depends on the size of the selling price that the company determines (Kotler et al., 2015). In the "Jaffa" company, the strategy of product price penetration is applied. The price of "Jaffa" products is not significantly different from alternative products and has no particular advantages compared to others, due to economies of scale, there is strong competition. The leading price of the product is applied, i.e. the price of one product from the assortment is reduced so that consumers create the impression that a discount has been calculated on other "Jaffa" products as well.

Distribution is a marketing activity that includes all the activities that are necessary for products to come from producers to consumers (Machlup 2014). The goal is for the end user to be served in the fastest and highest quality way, with the lowest costs. The distribution channels of "Jaffa" products are:

- producer-consumers,
- producer-small births-consumers and
- producer-wholesale-consumers.

As a new form of distribution "Jaffa" could use Vending sales. This distribution channel includes the existence of self-service machines. Devices are installed in kindergartens, primary and secondary schools, faculties, companies where employees could be served during the break. Online shopping - Internet shopping is an increasingly common phenomenon in the world today, and they could use that form of sales channel. Namely, on the "Jaffa" website, consumers could choose products from the assortment according to their wishes, choose the appropriate packaging and send it to a loved one as a gift with an adequate message. The customer leaves information about the time and address to which he wants the package to be delivered, as well as filling out the form on the method of payment for the service, which would be posted on the site.

The distribution intensity of "Jaffa" companies is carried out in two ways. The first way is the intensive distribution that the company carries out on the territory of almost all of Europe, and in that territory there is maximum coverage of the products of the "Jaffa" company. The highest intensity of distribution is in the territory of the former Yugoslavia. As for the territory of America and Australia, exclusive distribution is carried out because there are few intermediaries and distributors in those markets.

Within the company there is a trade marketing service. The trade marketing discipline was actually invented by marketers. The so-called trade marketing came at a time when traders realized that perhaps they know their consumers better than producers. This type of marketing entered Serbia with the arrival of large multinational companies, as an opportunity to increase sales volume and due to, conditionally speaking, the saturation of communication through the media. Large companies like "Jaffa" have recognized that the key thing is to accompany the consumer at the point where they make a purchase decision, hence the investments in trade marketing because this is how new products are best presented and, in the last case, demand is controlled. Unfortunately, there are companies that "by default" have such a service, but they don't really know what to do, except that they are engaged in creating productive activities for merchants, and a little in advertising.

Trade marketing is a complex discipline that directs traders and manufacturers to cooperate as closely as possible so that their end consumer is satisfied and at the same time to acquire new consumers together (Diyanova et al.,

2019). The most important thing is the existence of awareness of investments in trade marketing, it is a trend in the world that is increasing because once much more was invested in communication through the media, however, since the decision is increasingly made at the point of sale, both have realized that the focus of the healthiest investment - trade marketing.

## CONCLUSION

"Jaffa" company continuously strives to build and improve its brand by listening to its customers. This company has built a brand and is recognizable by its logo and packaging design. Marketing involves defining customer needs and requirements and meeting customer needs better than competitors. In this way, the company creates loyal, reliable and constant customers. "Jaffa" predicts and defines in advance, both the number of target customers that are changing and their buying habits that are also changing. Namely, attracting customers and maintaining good long-term relations with them is one of the areas in which it is possible to create a competitive advantage. Psychological factors are very important, e.g. what impression the product makes or how the customer feels when he buys it. Through marketing, "Jaffa" establishes a prominent position in the minds of customers - branding. By means of marketing research "Jaffa" successfully defines which products are well accepted, which prices customers are willing to pay, which TV programs, newspapers and advertisements customers read or watch.

All other factors enumerated and processed in the paper are a concrete and very precise indicator of conditions and strategy by applying advanced management of the development of a company and brand through continuous strategically well-designed marketing activities that can be applied to a wide list of activities and different types and forms of business of different companies.

## REFERENCES

- Andaleeb, S. S. (2016). Market segmentation, targeting, and positioning. In *Strategic Marketing Management in Asia* (pp. 179-207). Emerald Group Publishing Limited.
- Bertay, A. C., Demirgüç-Kunt, A., & Huizinga, H. (2013). Do we need big banks? Evidence on performance, strategy and market discipline. *Journal of Financial Intermediation*, 22(4), 532-558.
- Bora, B., Borah, S., & Chungyalpa, W. (2017). Crafting strategic objectives: Examining the role of business vision and mission statements. *Journal of Entrepreneurship & Organization Management*, 6(1), 1-6.
- Czinkota, M. R., & Ronkainen, I. A. (2013). *International marketing*. Cengage Learning.
- Diyanova, S., Guba, E., Guseva, M., & Popova, T. S. (2019). Strategies and innovations in modern trade marketing.
- Gómez, M. I., & Ricketts, K. D. (2013). Food value chain transformations in developing countries: Selected hypotheses on nutritional implications. *Food Policy*, 42, 139-150.
- Gurbuz, T. (2013, March). A modified strategic position and action evaluation (SPACE) matrix method. In *Proceedings of the International MultiConference of Engineers and Computer Scientists (Vol. 2, pp. 13-15)*.  
<http://www.jaffa.rs>
- Joksimović, I. (2008) Brand building strategy and positioning based on international networks, master's thesis, FON Belgrade.
- Khan, M. T. (2014). The concept of 'marketing mix' and its elements. *International journal of information, business and management*, 6(2), 95-107.
- Kotler, P., Burton, S., Deans, K., Brown, L., & Armstrong, G. (2015). *Marketing*. Pearson Higher Education AU.
- Machlup, F. (2014). Knowledge: Its creation, distribution and economic significance, Volume III: The economics of information and human capital (Vol. 781). Princeton University Press.
- Mašić, B. (2009). *Strategic Management*, Singidunum University, Belgrade, p. 150-152.
- O'guinn, T., Allen, C., Semenik, R. J., & Scheinbaum, A. C. (2014). *Advertising and integrated brand promotion*. Cengage Learning.
- Reguia, C. (2014). Product innovation and the competitive advantage. *European Scientific Journal*, 1(1), 140-157.
- Skandera, D. J., McKenny, A. F., & Combs, J. G. (2023). The influence of task environmental uncertainty on the balance between normative and strategic corporate social responsibility. *Journal of Management*, 49(3), 1037-1069.
- Taylor, B. (1997). *The Return of Strategic Planning – Once More With Feeling*, Long Range Planning, USA, Vol. 30, No. 3, p. 334-344.
- Teoli, D., Sanvictores, T., & An, J. (2019). SWOT analysis.  
Web source:

## **ROLE OF DIGITAL MARKETING IN CREATING COMPETITIVE EDGE**

**Stefan Ugrinov**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

E-mail: [stefan.ugrinov@tfzr.rs](mailto:stefan.ugrinov@tfzr.rs)

**Verica Gluvakov**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Mila Kavalić**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Sanja Stanisavljev**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Maja Gaborov**

University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

### **ABSTRACT:**

In today's highly competitive business environment, companies are increasingly turning to digital marketing to gain a competitive edge. Digital marketing encompasses a wide range of strategies and tactics, including social media marketing, content marketing, email marketing, search engine optimization (SEO), and paid advertising. By leveraging these tools effectively, companies can reach and engage their target audience, build brand awareness and loyalty, generate leads and conversions, and ultimately, increase revenue and profitability. This paper explores the role of digital marketing in creating a competitive edge, examining the key benefits, challenges, and best practices for implementing an effective digital marketing strategy. Through a review of current literature, case studies, and industry data, this paper highlights the importance of digital marketing in today's business landscape and provides practical insights for companies seeking to leverage these powerful tools to stay ahead of the competition.

**Key words:** digital marketing , competitive edge, online presence, customer engagement, brand awareness

### **INTRODUCTION**

In today's rapidly evolving business landscape, digital marketing has emerged as a critical tool for companies seeking to gain a competitive edge. With the proliferation of digital technologies and the rise of online commerce, businesses of all sizes and industries are turning to digital marketing to reach and engage their target audience, build brand awareness and loyalty, and ultimately, increase revenue and profitability.

Digital marketing encompasses a wide range of strategies and tactics that are designed to help companies achieve their marketing objectives. From social media marketing and content creation to email campaigns and search engine optimization (SEO), digital marketing has transformed the way businesses connect with their customers. Unlike traditional marketing methods, digital marketing allows companies to engage with their target audience in real-time, and to deliver personalized messages and experiences that resonate with customers on a deeper level.

One of the key benefits of digital marketing is that it allows companies to create a powerful online presence. In today's digital age, a strong online presence is essential for businesses of all sizes. By establishing a strong online presence, companies can reach new customers, build brand awareness and loyalty, and increase their visibility in search engine results. This can lead to increased website traffic, higher conversion rates, and ultimately, increased revenue and profitability.



Another important benefit of digital marketing is that it allows companies to connect with customers in new and meaningful ways. By leveraging social media platforms, email campaigns, and other digital channels, companies can engage with their customers on a more personal level, and provide them with the information, resources, and support they need to make informed purchasing decisions. This can help to build trust and loyalty with customers, which can ultimately lead to repeat business and increased customer lifetime value.

However, implementing an effective digital marketing strategy is not without its challenges. With so many different digital marketing channels and tools available, it can be difficult for companies to know where to focus their efforts. Additionally, digital marketing requires a significant investment of time, resources, and expertise, which can be a barrier for some businesses, particularly smaller ones with limited budgets.

Despite these challenges, the benefits of digital marketing far outweigh the costs. By leveraging the latest digital marketing tools and techniques, companies can create a competitive edge that can help them stand out in today's crowded marketplace. From building a strong online presence to engaging with customers in new and meaningful ways, digital marketing has the power to transform the way companies do business, and to help them achieve their marketing objectives.

### **INCREASED REACH**

Digital media provide advertisers with a new way to connect with their customers and to achieve greater reach with their message. Digital marketing has opened up new channels of communication that can help businesses connect with their target audience more effectively. The widespread use of social media and mobile devices has made it easier for consumers to access information about products and services, and digital marketing can help businesses take advantage of these channels. By leveraging digital media, advertisers can create more personalized and engaging experiences for consumers, leading to increased brand awareness, customer loyalty, and ultimately revenue (Chae & Kwon, 2014).

The digital revolution has provided marketers with new ways to reach customers and target them with more precision than ever before. With the proliferation of digital technologies and online platforms, marketers can now leverage a range of digital tools and channels to engage with their target audience, including social media, email marketing, search engine optimization, and mobile advertising. These tools allow marketers to tailor their messaging and content to specific segments of their audience, creating highly personalized and relevant experiences that drive engagement, loyalty, and conversions. Additionally, the abundance of data generated by digital interactions provides marketers with deep insights into their audience's preferences and behaviors, enabling them to make data-driven decisions and optimize their campaigns for maximum impact. Overall, the digital revolution has fundamentally transformed the field of marketing, empowering marketers to reach and engage their target audience with greater precision, effectiveness, and efficiency than ever before. (Kotler & Armstrong, 2018)

Digital marketing can provide a wider reach to a more diverse audience than traditional marketing methods, offering greater potential for customer engagement and interaction (Muniz Jr. & Gordon, 2011). By leveraging digital platforms such as social media, email, mobile devices, and search engines, companies can create targeted and personalized marketing campaigns that speak directly to the needs and interests of their customers. This can lead to increased brand awareness, customer loyalty, and ultimately, higher revenue and profits. Additionally, digital marketing allows for more efficient tracking and analysis of marketing efforts, providing valuable insights into customer behavior and preferences. Overall, digital marketing represents a powerful and dynamic tool for companies looking to stay competitive and engage with customers in meaningful ways.

### **PERSONALIZED APPROACH**

Personalization is a key aspect of digital marketing, as it enables brands to connect with their customers on a more individual level and to tailor their messaging and offerings to specific needs and preferences (Quiring & Bentele, 2016). Digital media allow for the collection and analysis of large amounts of data,

including customer behavior, interests, and demographics. This data can be used to create detailed customer profiles and to develop personalized marketing messages and offers that are more relevant and engaging for the individual consumer. By using a personalized approach, brands can build stronger relationships with their customers, increase loyalty, and ultimately drive sales and revenue growth

Personalized marketing offers a significant advantage for businesses that are looking to connect with their customers in a meaningful way. By leveraging data and analytics, brands can create more targeted and relevant campaigns that resonate with their audience and drive engagement and loyalty (Fitzpatrick & Bronstein, 2015). In today's digital age, consumers are inundated with messages from a variety of sources, and personalized marketing allows businesses to cut through the clutter and deliver messaging that is tailored to the specific needs and interests of their customers. By using customer data to inform their marketing strategies, businesses can not only improve the effectiveness of their campaigns, but also build stronger relationships with their customers over time. Furthermore, personalized marketing can help businesses to optimize their marketing spend by targeting high-value customers and reducing waste on ineffective marketing efforts

Personalization is a powerful tool for digital marketers, as it enables them to create more relevant and engaging experiences for their customers. By tailoring content, offers, and messaging to individual preferences, marketers can increase customer satisfaction and drive higher levels of engagement and conversion (Hemann & Burbary, 2013). Personalization allows brands to cut through the noise and connect with their audience on a deeper level, demonstrating that they understand and value their individual needs and preferences. By leveraging data and analytics, marketers can gain insights into customer behavior and preferences, and use this information to create targeted and personalized campaigns that resonate with their audience. This can lead to increased customer satisfaction, loyalty, and advocacy, as well as improved ROI for the brand.

## **DATA DRIVEN STRATEGIES**

Data-driven marketing is transforming the way businesses approach customer engagement and acquisition. By using data to understand customer behavior and preferences, marketers can create more targeted and effective campaigns that drive engagement and conversion (Verhoef , 2015). This approach allows businesses to move beyond traditional segmentation and targeting methods, and instead develop a more holistic view of the customer journey. By combining data from multiple sources, including transactional data, social media data, and demographic data, businesses can gain a deeper understanding of customer behavior and preferences, and create more personalized and relevant campaigns. In addition, data-driven marketing allows businesses to measure and optimize their marketing efforts in real-time, using insights from data to make informed decisions and drive continuous improvement

Data-driven marketing is rapidly becoming the future of digital marketing. By leveraging data and analytics, marketers can gain a deeper understanding of customer behavior, preferences, and needs, and use that information to create more personalized and relevant experiences for their customers. This approach enables marketers to deliver the right message to the right person at the right time, increasing the likelihood of engagement and conversion. As the volume and complexity of data continue to grow, data-driven strategies are becoming essential for businesses that want to stay competitive in the digital landscape (Berli & Schwaiger, 2016).

Examples of data-driven strategies used in digital marketing:

1. Audience Segmentation: This strategy involves dividing your target audience into smaller groups or segments based on specific characteristics such as demographics, behavior, or interests. By doing so, you can create more personalized and relevant campaigns that resonate with each group's unique needs and preferences.
2. A/B Testing: A/B testing is a method of comparing two versions of a webpage, email, or advertisement to determine which one performs better. By testing different variations of your content, you can identify what works best for your audience and optimize your campaigns for better results.

3. **Marketing Automation:** Marketing automation involves using software to automate repetitive tasks such as sending emails, social media posts, or other types of content to your audience. By automating these tasks, you can save time and resources while still delivering relevant and timely content to your customers.
4. **Predictive Analytics:** Predictive analytics is the use of data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes based on historical data. By analyzing data from past campaigns, you can identify patterns and trends that can help you make more informed decisions about future marketing strategies.
5. **Personalization:** Personalization is a strategy that involves tailoring content, offers, and messaging to individual preferences, based on data such as past purchase history, behavior on your website, and other factors. By personalizing your content, you can increase customer satisfaction and drive higher levels of engagement and conversion.

Each of these strategies can help us make more informed decisions about our digital marketing campaigns, and ultimately drive better results for our business.

### **COST EFFECTIVE**

One of the most significant benefits of digital marketing is its cost-effectiveness. Compared to traditional advertising channels, such as television and print, digital marketing can be much more affordable, allowing businesses of all sizes to compete on a level playing field (Chaffey & Smith, 2017). The affordability of digital marketing is one of its most appealing features

Digital marketing can be a highly cost-effective way for businesses to reach their target audiences, as it allows for precise targeting and efficient use of advertising dollars. By leveraging data and analytics, marketers can identify the channels and tactics that deliver the greatest return on investment and optimize their strategies accordingly (Gayo-Avello, 2016). Unlike traditional marketing channels, which often involve broad targeting based on demographics or geographic location, digital marketing enables marketers to reach specific audiences based on factors such as interests, behaviors, and search queries.

The cost-effectiveness of digital marketing is one of its most appealing features, as it allows businesses to reach their desired audience with precision and efficiency. By using data to identify target segments and tailor messaging and offers accordingly, marketers can achieve greater returns on investment and maximize the impact of their campaigns (Meyer & Schwager, 2017).

Digital marketing provides a unique opportunity for businesses to engage with customers at a relatively low cost. By using social media, email, and other digital channels, marketers can create highly targeted campaigns that are both cost-effective and highly engaging (Pauwels, 2016).

### **DIGITAL MARKETING IN SERBIA**

Digital marketing is becoming increasingly popular in Serbia, as more businesses recognize the importance of having a strong online presence. A study by IAB Serbia found that 84% of Serbian businesses have a website, and 57% use social media to reach customers. Social media is one of the most popular digital marketing channels in Serbia (Pavlović, 2019). According to a report by Hootsuite, Facebook is the most widely used social media platform in Serbia, followed by Instagram, YouTube, and Twitter. Serbian businesses are also increasingly investing in search engine optimization (SEO) to improve their online visibility. A survey by the Serbian Chamber of Commerce found that 42% of Serbian businesses use SEO to improve their search engine rankings (Manasijević & Milićević, 2017).

Mobile optimization is also becoming more important in Serbia, as more consumers use mobile devices to browse the internet and make purchases. A report by Google found that 70% of Serbian consumers use their smartphones to research products and services. E-commerce is also growing in Serbia, with more businesses launching online stores to reach customers. A study by the Serbian Chamber of Commerce found that 10% of Serbian businesses have an online store, and 27% plan to launch one in the future.

Finally, digital marketing in Serbia is becoming more sophisticated, with businesses increasingly using data analytics and automation tools to improve their marketing strategies (Gajić & Petrović, 2017). However, there is still room for growth in terms of digital marketing skills and knowledge among Serbian businesses, as well as the need for greater investment in digital marketing campaigns.

## CONCLUSION

Digital marketing has revolutionized the way businesses connect with their customers. For businesses looking to stay competitive in today's market, it is essential to embrace the power of digital marketing and to stay up-to-date with the latest trends and best practices in the field. Personalization, data-driven strategies, and cost-effectiveness are key themes that have emerged in this space. Personalization enables brands to tailor their messaging and offerings to individual needs, driving engagement and loyalty. Moreover, digital marketing is highly cost-effective, allowing businesses of all sizes to compete on a level playing field. As businesses continue to adapt to the ever-changing digital landscape, it is clear that these themes will remain essential for success. In Serbia, as in other countries around the world, digital marketing has become an increasingly important tool for businesses looking to connect with their audiences and drive growth. With a growing emphasis on data and analytics, personalized messaging, and cost-effectiveness, digital marketing will continue to play a critical role in the success of businesses in Serbia and beyond.

## ACKNOWLEDGEMENT

This work is a part of the current project TR-35017 funded by Ministry of Science, Technological Development and Innovation of the Republic of Serbia.

## REFERENCES

- Chae, Y., & Kwon Y. (2014), Impact of social media on purchase decisions in the market, *International Journal of Advertising*, 33(4), 719-740.
- Kotler, P., & Armstrong, G. (2018), *Principles of Marketing*. (17th ed.). 406.
- C. L. Muniz Jr., & G. J. Gordon (2011), Personalized marketing in the digital age: strategies for enhanced customer engagement, *International Journal of Advertising*, 40(3),53-64.
- T. Quiring., & T. K. Bentele, (2016), The impact of digital marketing on competitive advantage, *International Journal of Advertising*, 35(5), 761-780.
- K. Fitzpatrick., & K. Bronstein, (2015), Leveraging predictive analytics for improved customer acquisition in digital marketing ,*Journal of Direct, Data and Digital Marketing Practice*, 17 (4), 270-278.
- L. E. Hemann., & S. K. Burbary, (2013), Exploring the power of digital marketing analytics for data-driven decision making *Digital Marketing Analytics*, 1(1),1-22.
- G. Verhoef . (2015), *Journal of Marketing*, 79(1),17-40.
- M. Berli., & J. Schwaiger, (2016), Leveraging data-driven strategies for effective digital marketing campaigns, *International Journal of Advertising*, 35(5),771-782.
- D. Chaffey., & P. Smith, (2017), Digital marketing excellence, *Journal of Direct, Data and Digital Marketing Practice*, 5(1),23-43.
- G, Gayo-Avello. (2016), Handbook of research on digital information technologies: innovations, methods, and ethical issues, *Journal of Direct, Data and Digital Marketing Practice*, 1(1), 135-153.
- Meyer, P., and Schwager, N.W. (2017). Understanding customer experience throughout the customer journey, *Journal of Interactive Marketing*, 38 (9), 69-82.
- Pauwels, K. (2016). Digital and social media marketing: a results-driven approach, *International Journal of Engineering Business Management*, 10(8), 47-53.
- Pavlović, V. (2019). Digital marketing channels in Serbia: analysis of the current state and trends. *International Journal of Engineering Business Management*, 11, 1-15. doi: 10.1177/1847979019867825.
- Manasijević, D., & Milićević, S. (2017). Digital marketing communication in Serbia - current trends and future challenges. *Journal of Women's Entrepreneurship and Education*, 4(3), 66-78.
- Gajić, J., & Petrović, M. (2017). Digital marketing as a competitive advantage for companies in Serbia, *Marketing*, 48(7), 267-276. doi: 10.5937/markt1703267G.



**Session D: ECONOMY**

---

**Papers (pp. 159-206):**

Marko Aleksić, Radmila Bjekić, Nemanja Berber, Maja Strugar Jelača, Dimitrije Gašić APPLICATION OF RESOURCE EFFICIENCY IN THE GREEN BUSINESS CONCEPT	...159
Valentina Bozoki MANAGEMENT IN THE TEXTILE INDUSTRY - THE FUNCTION OF MANAGEMENT AND ITS RESULTS	...165
Miloš Ivaniš FACTORING – INSTRUMENT OF ENTERPRISE FINANCING	...171
Miloš Ivaniš FORFAITING – INSTRUMENT OF ENTERPRISE FINANCING	...177
Branimir Kalaš, Vera Mirović, Nada Milenković, Milica Inđić INTERDEPENDENCE BETWEEN BUDGET DEFICIT AND PUBLIC DEBT: THE CASE OF BRICS COUNTRIES	...183
Nada Milenković, Branimir Kalaš, Jelena Andrašić, Miloš Đaković SME BANK LOANS VS. VC FUNDS ACTIVITY IN SERBIA	...188
Miloš Pjanić, Mirela Mitrašević, Stevan Luković CYBER INSURANCE MARKET: STATE AND FUTURE DEVELOPMENT DIRECTIONS	...194
Aleksandra Zhemkova THE IMPACT OF COVID-19 ON THE PRODUCTIVITY OF RUSSIAN COMPANIES	...200



## **APPLICATION OF RESOURCE EFFICIENCY IN THE GREEN BUSINESS CONCEPT**

**Marko Aleksić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Radmila Bjekić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

E-mail: [radmila.bjekic@ef.uns.ac.rs](mailto:radmila.bjekic@ef.uns.ac.rs)

**Nemanja Berber**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Maja Strugar Jelača**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Dimitrije Gašić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

### **ABSTRACT**

Efficient use of resources and waste treatment as a resource that returns to production (recycling) are prerequisites for the development of green economy and business that brings the economy closer to nature and its principles, and allows natural resources to regenerate. The circulation flow of material use provides a suitable basis for assessing the efficiency and effectiveness of using natural resources in economic systems. The Environmental Pollution Prevention Strategy is focused on use of materials, procedures that reduce generation of waste at the source of emissions. This includes efforts to reduce the use of hazardous substances, energy, and water. The aim of the research is to point to the experience and problems of packaging waste (in terms of the concept of "zero waste"). The methodology of paper includes analysis of theoretical achievements in the mentioned fields of research - resource efficiency, sustainable development, green business.

**Keywords:** Resource efficiency, Zero waste, Sustainable development.

### **INTRODUCTION**

Contemporary trends in business, characterized by turbulence, uncertainty and the existence of strong competition, require the company to be innovative in business. There is a particular pressure on production companies because they are large "consumers" of natural resources, on the one hand, and significant polluters, on the other. In these circumstances, companies make a compromise between economic and environmental performance, as environmental costs can lead to higher product prices and reduced competitiveness. The importance of information technologies and their application provide opportunities for market expansion and easier business (Somjai & Jermittiparsert, 2019). Effects achieved through innovative e-business activities can positively influence sustainable development. The compromise between economic and environmental business results resulted in the development of the concept of eco-efficiency. Eco-efficiency means measuring the economic and ecological performance of business, i.e. the economic effects of improving environmental performance and, conversely, the ecological effects of investments in clean technologies, implementation of environmental protection standards, etc. (Sudha, 2020).

From a long-term perspective, the process of adjusting economic and overall human behavior is not easily achievable, that is, it cannot be implemented in the short term. One of the crucial goals of every company is to make as much profit as possible, but in addition, more and more companies recognize that their business activities have a wider impact on the environment (economic, social, ecological) and decide (voluntarily) to contribute to a better society (Matzembacher & Meira, 2019).



## **RESOURCES AND RESOURCE EFFICIENCY**

Company resources are "inputs in the primary processes and supporting business processes of the company", i.e. "tangible and intangible assets that enable the development of its economic activity" (Krstić, Sekulić, 2007, p.3). Management of the use of resources in all activities in the chain of value creation is extremely important and can be measured through performance of the use of resources in companies as a measure of success, i.e. a measure of the rational use of resources in business processes to achieve business goals and objectives (Krstić, Sekulić, 2007; Zhu et al. al., 2020).

A company's resource efficiency represents the relationship between production output and input and shows how efficiently resources are used to create added economic value (Papetti et al., 2019). In the above context, resources are understood as raw materials, energy sources and other materials (auxiliary, overheads - from daily businesses) needed to create value. In order to improve resource efficiency, it is necessary to reduce consumption of raw materials, auxiliary and overhead materials, energy per unit of product, but also to reduce the amount of waste generated in the production process. The use of resources should be planned and controlled (Huang et al., 2019 ).

Resource efficiency means sustainable management and use of resources throughout the entire cycle (from extraction, through distribution, transformation and consumption, all the way to waste disposal). Resource efficiency is finding ways to produce more with fewer inputs and less impact on the environment (Wilts & O'Brien, 2019). The solution is to use resources in a limited way, to ensure quality that will lead to a sustainable future. In order to develop a complete picture of resource consumption, target values for the absolute reduction of resource consumption and the use of three consumption indicators (carbon, water and soil impact) and a fourth indicator of biodiversity conservation should be introduced (Petrović-Randjelović, Radukić, 2010).

Increasing importance is attached to resource efficiency. This is due to the fact that when it comes to companies in Europe, on average about 40% of the total costs are the costs of the basic material. If the costs of water and energy are added to them, that share amounts to about 50% of the total costs. From another point of view, labor costs average about 20% of the cost price. The above data show the importance, that is, the positive impact that the improvement of resource efficiency can have on the overall efficiency of manufacturing companies (Hafner et al., 2020).

Resource efficiency can be improved in three ways: through eco-efficient product design, resource-efficient average production (at the level of production facilities, factories) and optimization of the production value chain.

## **RESOURCE EFFICIENCY – AN EXAMPLE OF PACKAGING AS WASTE**

Special attention should be paid to the possible consequences of the impact of used and discarded packaging. It is a very valuable secondary raw material or it can be one, especially from polymer materials, and it must have an eco-label. This marking allows simple sorting of packaging according to raw material origin, which is important due to the possibility of reprocessing (Misra & Pandey, 2005).

The basic division of eco-packaging is into (1) recycled, (2) recyclable and (3) biodegradable (Pakkanen et al., 2017). Recycled is the one that is built from already used and recycled materials. Recyclable is composed of materials that can be recycled and reused, and biodegradable packaging is made of completely natural materials, such as organic raw materials. Biodegradable is the least harmful to the environment. Particularly interesting are sprays that do not contain freon and thus do not damage the ozone layer (Zhang et al., 2019).

The main goal of eco-packaging is to save resources, primarily natural, but also money. In ecologically and economically stable countries, next to the containers (for plastic, glass, paper and organic matter),

there are vending machines for cans and PET bottles that return the money spent on packaging (Kochańska et al., 2021).

We are witnessing the intensive development of technologies. If the environmental balance criteria are applied to packaged products, the least amount of energy is used for plastic packaging. Paper packaging can have a similar ecological status, but only under the condition of forming new plantations before cutting down forests and taking all environmental protection measures in the phase of wood processing and paper production (Raimi et al., 2019).

In addition to the above, design for environmental protection is also important. It deals with minimizing waste, reducing the use of energy and materials in production to a sustainable level, and extending the period of use of the product.

Modern society has a tendency to contribute to the excessive depletion of natural resources, the increase in water and air pollution, the extinction of plant and animal species, and the accumulation of waste. In order to break that chain, it would be necessary to take measures that will limit the production of waste, excessive consumption and pollution, and on the other hand, satisfy the global demand for goods and services. The solution is sought in ecological design, then optimization of production procedures, size reduction, ie concentration of products. When it comes to transportation, it is necessary to choose places for production, taking into account the final destination, in order to reduce the cost, but also to use alternative fuels. In order for the use to be as efficient as possible, it is necessary to produce functional and energy-saving products, as well as to develop products that can be reused or recycled (Ilic & Hafner, 2015).

When it comes to the Republic of Serbia, the packaging sector is one of the developed sectors with a tendency to grow in the future. The dynamic growth of the packaging sector was contributed by the entry of a large number of foreign products into the domestic market, which, with their design, quality and standards imposed by the EU, raised awareness of the importance of packaging (Đurić et al., 2017). The ISO 9001, ISO 14000 and HACCP standards prevail in domestic companies engaged in the production of packaging. The need for the most successful trade exchange with EU countries obliges them to comply with the requirements of the European Directive 94/62/EC. The Government of the Republic of Serbia adopted the Plan for the Reduction of Packaging Waste, which foresees specifying the amount of waste that needs to be recycled and the amount of individual materials that go into reprocessing. Very important activities organized by governmental and non-governmental institutions should be aimed at educating young people and raising awareness about the importance of recycling for environmental protection (Nikolic et al., 2017).

The following tabular presentation will show general and specific goals for the period from 2020 to 2024.

*Table 1: General and specific recycling goals for the period from 2020. to 2024. in the Rep. of Serbia*

General goals					
	2020.	2021.	2022.	2023.	2024.
Reused %	61	62	63	64	65
Recycled %	56	57	58	59	60
Specific goals for packaging					
Paper/cardboard	62	64	66	68	70
Plastics	26	30	34	38	42
Glass	44	45	46	47	48
Metal	45	46	47	48	49
Wood	17	19	21	23	24

When preserving natural resources, packaging waste should be viewed as a valuable secondary raw material. Discarded or used packaging is a valuable secondary raw material, and it can be recycled to the starting raw materials that are the basis for the production of packaging (Davis & Song, 2006).

With the treatment that reduces the amount of final waste, extracting secondary raw materials from discarded and used packaging as waste, we contribute to reducing environmental pollution. We use less amount of non-renewable natural resources, and the import of secondary raw materials decreases, which is in a causal relationship with the capital outflow of a certain country.

Sustainable consumption is finding an appropriate solution that will balance socio-economic development and environmental protection, through more responsible individual behavior. It is related to production, distribution, use of products and waste disposal. Most definitions of sustainable consumption emphasize how to spend less as a priority. But that doesn't mean having less, but rather how to spend more efficiently. The basic principles of sustainable consumption refer to the optimal use of resources, reduction of waste generation at the source, reduction of pollution, balanced distribution of resources between developed and underdeveloped parts of the world, but also acting with care for future generations (Hernandez et al., 2020). For this purpose, the plan of future activities on waste management is presented in Figure 1.

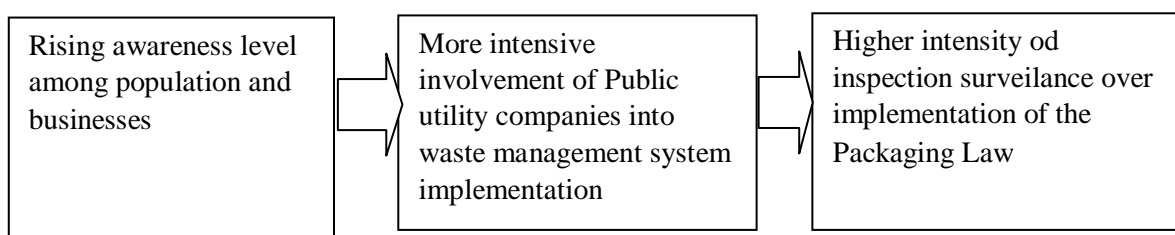


Figure 1: Future activities plan

Issues related to the preservation of natural resources and environmental protection are embedded in every sphere of social life. In a wide range of negative effects on the environment and on man himself are human activities. Waste represents an increasing problem for environmental degradation, both in the world and in our country. Packaging waste accounts for about 35% of total waste.

In order to protect the environment and reduce packaging waste, three basic requirements are set:

- Reducing and avoiding packaging, without endangering the product itself;
- Reuse and multiple use of packaging
- Selection of materials that are acceptable for the environment, preferably biodegradable and without harmful ingredients (Zhang & Zhao, 2012).

Regarding creation of increasing amounts of waste, the solution is found in recycling. The advantages of recycling are indisputable, but it should be noted that by recycling a part of the material is irretrievably lost. Recycling also creates additional pollution and requires investment of a large amount of energy in order to collect, transport and process the waste material. The way we deal with the waste should be changed, and all resources should be focused on eliminating the waste. Recycling only tries to solve the symptoms of the waste, instead of eliminating its causes. Excessive waste is the result of poor design and poor decision making.

At the beginning of the 80s, the idea of "complete recycling" began to be advocated. The idea of "Zero Waste" is considered to be the solution to one of humanity's biggest problems. It was adopted for the first time in Canberra, Australia, in 1996. "Zero waste is a philosophy that will lead citizens to adapt the use of resources and processes so as not to disrupt natural cycles." The goal is to create an environment where there is no waste. Every part of the process must be planned so that nothing is generated as waste, which cannot be recycled (Wilson et al., 2006). Any output product whose destination is land, air or water must not disturb the health of the planet. The basic principles of this philosophy are that in the "Zero waste" system, everything must go somewhere, all that is discarded creates a job, waste is a strategic raw material, we are all responsible and we should take care of the waste that is created (Vollmer et al., 2020).

Modern models of production and consumption generate increase in the amount of waste. All economic sectors have a share in the production of waste. It is related to inadequate consumption of resources and energy, but also uncontrolled consumption of final products. In Europe, it is estimated that more than 3,500 million tons are generated each year. A business ethics movement is developing. The warnings that come to us from the world's scientists, but also from nature, force us to take action in order to redefine our relationship with planet Earth, while there is still time. It is necessary to define the limits of one's development and change one's lifestyle (Peiró et al., 2008).

Ecological ethics implies the moral behavior of people towards all living beings, as well as towards the factors that ensure that life. Environmental awareness is the awareness of every individual who knows, can and wants to behave ethically towards the environment. The "Zero waste" strategy is, from an economic and ecological point of view, one of the plans that leads in the direction of creating an ethical society, in which moral norms will govern human behavior towards nature (Zaman & Lehmann, 2011).

Environmental pollution is becoming more intense. The largest share in the Republic of Serbia, when it comes to waste, is garden waste, followed by biodegradable waste, paper and glass. It is necessary to create measures to preserve the quality of life and ensure the conditions for biological survival. The fact is that both ecology and economics deal with the study of the relationship between society and the natural environment. Adaptability of nature to human material needs is an important issue for economics, while for ecology it is the other way around. The question arises as to how it is possible to balance the development of society against the processes in nature. We are coming to the concept of "Zero waste", which can be implemented in our country (Ivanov, 2020).

## CONCLUSION

At the achieved level of economic development, and especially in the process of future economic development, knowledge assumes the role of a primary factor. The economic evaluation of the quality of the environment and changes in the level of quality is a critical step in the development of sustainable development policy.

The environmental pollution prevention strategy tends towards the use of materials, processes and procedures that reduce the generation of polluting substances or waste at the source of emission. All actions are aimed at preserving natural resources through more efficient use. Implementation of the strategies will ensure an increase in employment, revitalization and development of the industry, a change in the industrial structure in favor of more profitable high-tech industries, an increase in exports and a foreign trade surplus, and thus the maintenance of macroeconomic stability.

In recent decades, the problem of packaging waste management has become increasingly evident, resulting in more restrictive legislation and emerging of environmentally "conscious" or "green consumers". Sustainable consumption is finding an appropriate solution that will balance socio-economic development and environmental protection, through more responsible behavior of companies. It is related to production, distribution, use of products and waste disposal.

## REFERENCES

- Davis, G., & Song, J. H. (2006). Biodegradable packaging based on raw materials from crops and their impact on waste management. *Industrial crops and products*, 23(2), 147-161.
- Đurić, D., Ristić, J., Đurić, D., & Vujanić, I. (2017). Export of agricultural and food products in the function of economic growth of Republic of Serbia. *Економикатољопривреде*, 64(3), 887-900.
- Hafner, Manfred, and Pier Paolo Raimondi. (2020). "Priorities and challenges of the EU energy transition: From the European Green Package to the new Green Deal." *Russian Journal of Economics* 6.4, 374-389.
- Hernandez, R. J., Miranda, C., & Goñi, J. (2020). Empowering sustainable consumption by giving back to consumers the 'right to repair'. *Sustainability*, 12(3), 850.

- <http://www.pravno-informacioni.sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/uredba/2020/81/3/reg>  
[http://www.sepa.gov.rs/download/Ambalaza\\_2021.pdf](http://www.sepa.gov.rs/download/Ambalaza_2021.pdf)
- Huang, S. Y., Chiu, A. A., Chao, P. C., & Wang, N. (2019). The application of Material Flow Cost Accounting in waste reduction. *Sustainability*, 11(5), 1270.
- Ilic, I., & Hafner, P. (2015). Environmental aspects of the process of globalization—negative implications and crisis. *Facta Universitatis, Series: Economics and Organization*, 109-120.
- Ivanov, M. (2020). Opportunities for building ecological urbanism through socio-economic cohesion, development of mobility and improvement of infrastructure in the border municipalities between the Republic of Bulgaria and the Republic of Serbia: Chimera or reality. *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM*, 587-594.
- Kochańska, E., Łukasik, R. M., & Dzikuć, M. (2021). New circular challenges in the development of take-away food packaging in the COVID-19 period. *Energies*, 14(15), 4705.
- Matzembacher, D. E., & Meira, F. B. (2019). Sustainability as business strategy in community supported agriculture: Social, environmental and economic benefits for producers and consumers. *British Food Journal*, 121(2), 616-632.
- Misra, V., & Pandey, S. D. (2005). Hazardous waste, impact on health and environment for development of better waste management strategies in future in India. *Environment international*, 31(3), 417-431.
- Nikolic, A., Mikic, M., & Naunovic, Z. (2017). Broadening the urban sustainable energy diapason through energy recovery from waste: A feasibility study for the capital of Serbia. *Renewable and Sustainable Energy Reviews*, 69, 1-8.
- Pakkanen, J., Manfredi, D., Minetola, P., & Iuliano, L. (2017). About the use of recycled or biodegradable filaments for sustainability of 3D printing: State of the art and research opportunities. *Sustainable Design and Manufacturing 2017: Selected papers on Sustainable Design and Manufacturing 4*, 776-785.
- Papetti, A., Menghi, R., Di Domizio, G., Germani, M., & Marconi, M. (2019). Resources value mapping: A method to assess the resource efficiency of manufacturing systems. *Applied Energy*, 249, 326-342.
- Peiró, L. T., Méndez, G. V., & Durany, X. G. I. (2008). Exergy analysis of integrated waste management in the recovery and recycling of used cooking oils. *Environmental science & technology*, 42(13), 4977-4981.
- Petrović-Randelović, M., & Radukić, S. (2010). The impact of environmental policy in shaping the environmental performances of foreign direct investment. *ECONOMIC*, 573.
- Raimi, M. O., Suleiman, R. M., Odipe, O. E., Tolulope, S. J., Modupe, O., Olalekan, A. S., & Christianah, M. B. (2019). Women role in environmental conservation and development in Nigeria. *EcolConservSci*, 1(2).
- Somjai, S., & Jermittiparsert, K. (2019). The trade-off between cost and environmental performance in the presence of sustainable supply chain. *International Journal of Supply Chain Management*, 8(4), 237-247.
- Sudha, S. (2020). Corporate environmental performance—financial performance relationship in India using eco-efficiency metrics. *Management of Environmental Quality: An International Journal*, 31(6), 1497-1514.
- Vollmer, I., Jenks, M. J., Roelands, M. C., White, R. J., van Harmelen, T., de Wild, P., ... & Weckhuysen, B. M. (2020). Beyond mechanical recycling: Giving new life to plastic waste. *Angewandte Chemie International Edition*, 59(36), 15402-15423.
- Wilson, D. C., Velis, C., & Cheeseman, C. (2006). Role of informal sector recycling in waste management in developing countries. *Habitat international*, 30(4), 797-808.
- Wilts, H., & O'Brien, M. (2019). A policy mix for resource efficiency in the EU: key instruments, challenges and research needs. *Ecological economics*, 155, 59-69.
- Zaman, A. U., & Lehmann, S. (2011). Challenges and opportunities in transforming a city into a “zero waste city”. *Challenges*, 2(4), 73-93.
- Zhang, G., & Zhao, Z. (2012). Green packaging management of logistics enterprises. *Physics Procedia*, 24, 900-905.
- Zhang, Y., Luo, W., Wang, J., Wang, Y., Xu, Y., & Xiao, J. (2019). A review of life cycle assessment of recycled aggregate concrete. *Construction and Building Materials*, 209, 115-125.
- Zhu, Z., Zhao, J., & Bush, A. A. (2020). The effects of e-business processes in supply chain operations: Process component and value creation mechanisms. *International Journal of Information Management*, 50, 273-285.
- Krstić, B., & Sekulić, V. (2007). Upravljanje performansama preduzeća. *Ekonomskifakultet, Niš*, 8-41.

## **MANAGEMENT IN THE TEXTILE INDUSTRY - THE FUNCTION OF MANAGEMENT AND ITS RESULTS**

**Valentina Bozoki**

University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia

E-mail: [valentina.bozoki@tfzr.rs](mailto:valentina.bozoki@tfzr.rs)

### **ABSTRACT**

In this paper, we investigate how management functions in the textile industry and how the application of the management function affects business results. The textile industry faces many challenges, including cost reduction, product quality improvement, supply chain management, and maintaining market competitiveness. Human resource management plays a key role in this context. It is important to have a good organizational structure, and managers should be able to recognize and solve problems and make decisions that will positively affect the business. Technological progress plays an important role in the development of the textile industry, and management should be aware of the impact the industry has on the environment and develop strategies that promote sustainability. Successful management in the textile industry can reduce costs, increase productivity and improve product quality. This paper aims to provide insight into management in the textile industry and its function, and highlight the importance of applying management to achieve success in business in this industry.

**Keywords:** Textile industry, Management, Business, Strategies, Promoting

### **INTRODUCTION**

The textile industry is one of the oldest and most important industries in the world. Since ancient times, people have used textiles for various purposes, such as clothing, furniture, decoration, etc. Today, the textile industry plays a key role in the global economy and is one of the largest industries in the world. Management in the textile industry plays a vital role in maintaining competitiveness and business success in this industry.

The aim of this paper is to investigate how management functions in the textile industry and how the application of the management function affects business results. The textile industry faces many challenges, such as reducing costs, improving product quality, managing the supply chain and maintaining competitiveness in the market. Human resource management plays a key role in this context. It is important to have a good organizational structure, and managers should be able to recognize and solve problems and make decisions that will positively affect the business. Technological progress plays an important role in the development of the textile industry, and management should be aware of the impact the industry has on the environment and develop strategies that promote sustainability. Successful management in the textile industry can reduce costs, increase productivity and improve product quality. In this paper, we will focus on the importance of the application of management in the textile industry, analyze the function of management in the industry, and highlight the effect of the application of management on business in this industry. We will also analyze several case studies in order to better understand the application of management in the textile industry and draw important conclusions.

## ORGANIZATIONAL STRUCTURE AND HUMAN RESOURCE MANAGEMENT IN THE TEXTILE INDUSTRY

In the organizational structure of the textile industry, there are different levels of management, as well as functions and departments that are usually found in other types of industries. For example, there are departments for procurement, production, marketing, finance and human resources. Depending on the size of the company, these functions can be divided into several departments, and sometimes some functions are merged. In the management of human resources in the textile industry, as in other industries, it is crucial to ensure that the company has a qualified and motivated workforce. This includes processes such as recruitment, employee training and development, performance management, pay and benefits, and employee communication and collaboration. In order to ensure the effective management of human resources in the textile industry, it is important to have specialized human resource management experts who are familiar with the special challenges and needs of this industry (Čolović & Paunović 2013 at Marketing management in the clothing industry & Veličković, Đorđević, & Radivojević 2019 at The role and importance of human resources in the textile industry. The Journal of Cotton Science and Technology).

Organizational structure, as seen in Figure 1, is one of the most important aspects of management in the textile industry. Managing the organizational structure can be a key factor for successful business in this industry, especially when considering competitive forces and the complexity of business processes. There are different types of organizational structures that can be applied in the textile industry, including functional, divisional and network structures. The functional structure is based on functional areas, such as production, marketing and finance. A divisional structure is an organizational structure in which businesses are organized into different divisions according to products or geographic areas. Network structure refers to the organization of business with a high degree of integration among business partners, suppliers and customers (Milanović. n.y).

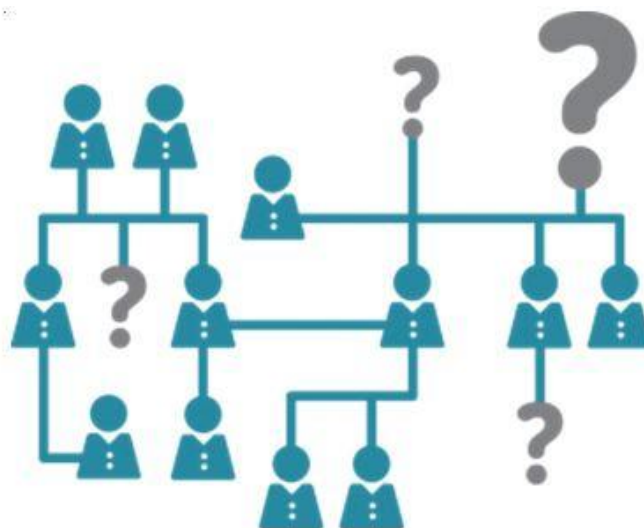


Figure 1: Organizational structure

One of the factors that should be taken into account when choosing an organizational structure is the size of the company, but also the speed of growth. Also, it is important to consider the market orientation and specifics of the business environment in which the company operates. Human resource management is also a very important aspect of the organizational structure in the textile industry. Human resources play a key role in achieving competitive advantage and success of companies in this industry. Human resources management includes the process of hiring, training and developing employees, as well as motivating and retaining them in the company. There are various strategies for managing human resources in the textile industry, including developing a flexible

workforce, improving occupational health and safety, and using technology to improve employee productivity (Čolović & Paunović 2013).

Human resource management in the textile industry includes all activities aimed at managing human resources in the organization, in order to ensure the achievement of the organization's goals. Human resource management includes various activities such as workforce planning, recruitment and selection of employees, training and development of employees, performance appraisal, rewarding, motivating and retaining employees. One of the most important roles of human resource management in the textile industry is to ensure adequate training of the workforce. In order to ensure high-quality production, employees in the textile industry must be well trained and qualified for their jobs. In this sense, human resources managers should ensure that employees are trained in the use of equipment and technology used in production, as well as that they are familiar with occupational safety regulations (Ahmed & Khan 2016).

Another important role of human resource management in the textile industry is to ensure fair and adequate remuneration for work. This includes determining wages and other remuneration for work, as well as ensuring fair working conditions in terms of working hours, work schedules and other aspects that affect the working conditions of employees (Ahmed & Khan 2016).

When it comes to the organizational structure and human resources in the textile industry, it is important to keep in mind that it is an industry that is subject to rapid changes and challenges. Therefore, it is important that the organizational structure is flexible and adaptable to changes, as well as that managers have a clear vision and strategy to deal with changes in the market. Also, it is important to have a good human resources management system that will enable the hiring of qualified workers, their retention in the company, as well as continuous education and development. This is particularly important in the textile industry, which faces increasing competition and pressure to constantly improve processes and products (Ahmed & Khan 2016).

In addition, it is important that managers in the textile industry take care of employee satisfaction and motivation, in order to achieve better productivity and work efficiency. This means introducing a reward system, providing opportunities for advancement, as well as designing a work environment that encourages teamwork and creativity. In the literature, it is often pointed out that human resource management is the key to success in the textile industry. Various studies indicate that successful textile companies have a well-designed human resource management system that focuses on employee motivation, development and engagement. For example, research conducted by Khan and Ahmed (2016) found that successful textile companies in Pakistan have a well-structured human resource management system, including employee selection, training, development and rewards.

In short, organizational structure and human resource management are key elements for success in the textile industry. The flexibility of the organizational structure and a good human resources management system can help companies in this industry to adapt to changes in the market, hire qualified workers and maintain competitiveness (Ahmed & Khan 2016).

## **APPLICATION OF THE MANAGEMENT FUNCTION IN THE TEXTILE INDUSTRY**

The application of the management function in the textile industry is key to achieving success in this sector. The main management functions that are important for the organization and management of textile companies are listed here and those are, as seen in Figure 2: planning, organizing, controlling and leading.

**Planning:** Planning is the process of setting goals and establishing a strategy to achieve them. In the textile industry, planning refers to the planning of production, material procurement, marketing and distribution. Planning in the textile industry includes market assessment, production planning, material inventory management and financial management (Khan, 2021).



**Organizing:** Organizing refers to setting up the structure of the organization and establishing a system of responsibilities and competencies. In the textile industry, organizing involves establishing inventory management, logistics and production systems. Organization includes establishing a clear hierarchy within the company, dividing tasks, delegating authority and creating work teams. The organizational structure in the textile industry depends on the size of the company and its form of ownership (Khan, 2021).

**Leading:** Leading involves motivating employees and establishing effective communication processes. In the textile industry, leadership refers to the establishment of motivational programs, employee training and the establishment of clear communication channels. Leading includes setting goals, motivating employees, establishing clear lines of communication, and creating effective management systems (Khan, 2021).

**Controlling:** Controlling refers to monitoring performance and checking whether set goals are being met. In the textile industry, control includes product quality monitoring, cost monitoring and optimization of production processes. Controlling includes monitoring the company's performance, identifying problems and taking corrective measures (Khan, 2021).

With the application of these management functions, textile companies can achieve more efficient operations, increase productivity, reduce costs and increase profitability.

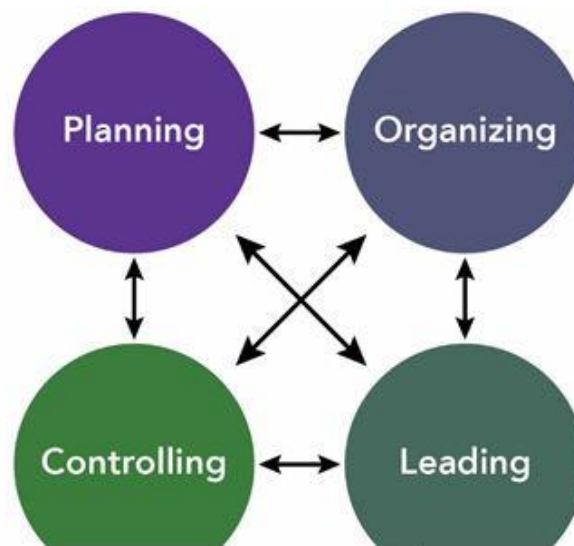


Figure 2: Primary functions of management

## EXAMPLES OF SUCCESSFUL MANAGEMENT IN THE TEXTILE INDUSTRY

There are many examples of successful management in the textile industry, the data was taken from their websites, and some of them are:

**Inditex** – The company that owns the popular brand Zara, is known for its innovative and efficient approach to management. Inditex has flexible and fast production, as well as excellent supply chain management, which allows them to respond quickly to market trends and demand. The Spanish brand Zara has become one of the most successful brands in the textile industry, with over 2,000 stores in 96 countries around the world. Their business model is based on quick response to market needs and quick production and delivery of clothing. Zara uses advanced technologies in the production process and logistics, which allows them to respond to demand and deliver products to customers in record time. This agile and efficient management has helped Zara gain a loyal clientele and become a market leader.

**The Mills** – Is another successful example of management in the textile industry. This company was created in 2014 in Hong Kong, and was founded by creative director and designer Dorian Ho together with several partners. The Mills focuses on sustainable textile production and innovation in production technology. One of the main goals of The Mills is to raise awareness of sustainability and create a textile industry that is focused on environmental protection. The Mills also has an interactive museum that provides an insight into the history of the textile industry and shows visitors how the technology of textile production has changed over time. In addition, they offer various education programs on sustainability and the textile industry. The Mills is an example of successful management in the textile industry that managed to achieve a balance between innovation, sustainability and education.

**Patagonia** – Is an American company that manufactures clothing and equipment for outdoor activities, which stands out for its commitment to sustainable business and environmental protection. The company was founded in 1973, and today it is headquartered in California. One of the key success factors of Patagonia is its management. The company has a decentralized organizational structure, where each sector is managed independently. This means that decisions are made at lower levels and that staff are involved in the decision-making process. This enables a faster response to changes in the market and a more efficient use of resources. Patagonia is also known for its award-winning human resource management practices. The company is committed to empowering employees and providing opportunities for professional development. In addition, Patagonia offers competitive salaries, employee benefits and flexible working conditions, resulting in a high rate of employee satisfaction. Another important aspect of Patagonia's management is its focus on sustainability.

**H&M** – Is one of the world's largest fashion companies, with over 4,500 stores in 69 countries around the world. The company is known for its fashion that is accessible to a wide range of customers, as well as for its sustainability and social responsibility. One of the key success factors of H&M is their management, which focuses on innovation, speed and flexibility. H&M is known for being quick to respond to trends in the fashion industry, which allows them to quickly adapt their offerings to customers. This ability to adapt quickly is made possible through effective supply chain management, which is a key part of their management. Human resource management at H&M focuses on the development and motivation of employees, as well as maintaining a healthy work environment.

**Levi Strauss & Co.** – Is a global company engaged in the production and sale of denim clothing and other related products. The company was founded in 1853 in San Francisco, and today has over 2,800 retail locations worldwide. Management at Levi's plays an important role in maintaining the company's competitiveness and business success in the textile industry. One of the key elements of management at The company is committed to reducing its negative impact on the environment, and this is reflected in all aspects of the business, from production to packaging and transportation. Levi's also uses innovative management methods to deal with challenges in the textile industry. The company has developed digital tools that enable better procurement management, production planning and distribution optimization. This helps to increase efficiency and reduce costs. Another important element of management at Levi's is the focus on employee satisfaction. The company is committed to creating a work environment that encourages creativity, diversity and inclusiveness. They also offer a number of training and development programs for their employees to help them develop their skills and careers.

These examples show that successful management in the textile industry requires an agile approach, a focus on innovation and effective human resource management. Companies that manage to establish such management have a chance to achieve significant success in the market and remain industry leaders.

## CONCLUSION

Organizational structure and human resource management play a key role in the business of the textile industry. In order for textile companies to remain competitive and successful in this fast and

unpredictable market, they must adapt to changes in the market, as well as ways of managing and organizing business. The application of the management function in the textile industry is key to achieving business goals. Planning, organizing, leading and controlling must be applied at all levels of business in order to achieve the desired goals. Successful examples of management in the textile industry, such as The Mills, Patagonia, H&M and Levi's, show that innovative approaches to management and organization can result in increased productivity, reduced costs and increased employee and customer satisfaction. Although organizational structure and human resource management are key to the success of the textile industry, the industry faces many challenges in the future. Constant changes in technology, growing competition and increasing pressure to comply with ethical and environmental standards can affect the operations of textile companies. In order to successfully deal with these challenges, textile companies must remain flexible and innovative in their management and organizational approaches.

Overall, the textile industry plays an important role in the global economy and is one of the largest industries in the world. Management and organization of business in the textile industry are key to success and competitiveness. The application of the management function, as well as successful examples of management in the industry, can help companies achieve their goals, but at the same time they must be ready to face changes and challenges in the future.

## REFERENCES

- Ahmed, S. S., & Khan, S. S. (2016). Human Resource Management Practices in Textile Industry of Pakistan. *International Journal of Business and Social Science*
- Čolović, G., Paunović D. (2013). Marketing management in the clothing industry
- Čolović, G., Paunović D. (2013). Marketing management in the clothing industry
- Milanović, D. (n.y.). Organizational structures. Available at:  
[http://ie.mas.bg.ac.rs/data\\_store/upload/458\\_hendaut\\_2\\_-\\_prof\\_dr\\_d\\_milanovic.pdf](http://ie.mas.bg.ac.rs/data_store/upload/458_hendaut_2_-_prof_dr_d_milanovic.pdf)
- Moin.S Khan. (2021). Total Quality Management (TQM) in Textile Industry, Textile Learner
- Veličković, S., Đorđević, B., & Radivojević, N. (2019). The role and importance of human resources in the textile industry. *The Journal of Cotton Science and Technology*

## **FACTORING – INSTRUMENT OF ENTERPRISE FINANCING**

**Miloš Ivaniš**

University Business Academy in Novi Sad, Faculty of Economics and Engineering Management, Novi Sad,  
Republic of Serbia

E-mail: [mivanis97@gmail.com](mailto:mivanis97@gmail.com)

### **ABSTRACT**

Factoring is a modern non-credit business that purchases short-term accounts receivable. The purchase is done prior to maturity, and in the developed market economies factoring is frequently used as a form of accelerated recovery of claims. A company resorts to obtaining funds by way of sale of receivables when it cannot obtain the money in other ways, or if it sells its products on credit. Positive effects of factoring are the most important for small and medium enterprises, as well as start-ups, primarily due to the unwillingness of banks to grant loans to such firms. Factoring enables many companies to be competitive and survive in the market. The aim of this paper is to highlight the importance of factoring as a contemporary form of enterprise financing, as well as its advantages and limitations.

**Keywords:** factoring, factor, client, customer, calculation.

### **INTRODUCTION**

Factoring is a specific tool used to obtain funding by way of sale of accounts receivable. Namely, factoring is generally defined as the sale of receivables by a business entity (enterprise) to an agent organization that purchases the receivables and assumes the whole risk of possible inability to collect the purchased receivables. The purchase of receivables is done prior to maturity. In doing so, a factoring company immediately pays part of the receivables in the amount of 80% to the client company, while the remaining amount of 20% is used for accounts receivable corrections and is made available to the client after the collection of receivables by the factoring company. The factoring company charges a fee usually around 3% of the accounts receivable amount of the factoring service, including credit risk and interest from the time of purchase to the collection of the receivables. Factoring companies operate as independent organizations, with a large capital which provides for a number of economic entities that have an interest in this activity.

In developed market economies, factoring is frequently used as a form of accelerated recovery of claims. In this sense, a company resorts to obtaining funds by way of sale of accounts receivable when it cannot obtain the money in other ways, or if it sells its products on credit, due to which the company's receivables constitute a big part of its assets. Factoring involves the conclusion of an agreement according to which the client (enterprise) is obliged to transfer (assign) receivables which are the subject of the factoring agreement to the factor. In addition, the client may transfer their accounts receivable in their entirety or only partially and also can assign their future receivables in their entirety or partially. As a legal source, on the occasion of the conclusion of a factoring agreement, general business terms of the factoring organizations, trade practices, appropriate norms of commercial and contract law, as well as legal and arbitration practices apply. In this respect, it should be noted that factoring agreements are governed by the UNIDROIT Convention on International Factoring, which was adopted in Ottawa on 28<sup>th</sup> May 1988.

## **PARTICIPANTS IN THE FACTORING BUSINESS**

As a rule, the main entities participating in the operation of the factoring business are: the client, the customer and the factor. The client is an entity that produces goods (or offers services), mostly for durable consumption, with which a factor concludes a special agreement. The customer is an entity that purchases goods from the manufacturer or service provider and that becomes the factor's debtor and bears an obligation to repay the loan in connection with the sale of certain products or provision of services by the client. The factor is an organization that purchases invoiced amounts from clients over a longer period of time. The main activity of the factor is reflected in the fact that it collects the receivables transferred (assigned) to it by the client.

The main obligation of the client is to continuously and duly submit to the factor the invoices which relate to products shipped to the customer (or to services) in accordance with the provisions of the sales agreements. In addition, invoices must be complete, contain all relevant data and information so that customers are able to duly pay the value of purchased goods and services. Under the terms of the agreement of sale of goods or services, the client is obliged to indicate the payment terms on the invoice: payment in full or by installments, payment deadlines, as well as an indication that the payment is made through a designated factor.

The main obligation of the customer stems from the essence of the factoring mechanism, where the customer is the main subject with important functions, since it bears the payment obligation resulting from the purchase agreement entered into with the manufacturer of the product (or service provider). In doing so, it is the customer's insistence that the products or services are paid on credit, which means the customer is specifically interested in the conditions of payment using the current situation in the market. The existence of the credit relationship is important for the interests of the customer, regardless of who provides the credit, the client or the factor. With the act of payment of the debit amount by the customer, ends the final stage of the funding procedure using the factoring mechanism.

The main obligation of the factor is to undertake all necessary procedures for the granting of credit lines to the client, or the limit to which the client has the right to do business with its customers, taking upon itself the 100% of the risk that may occur if the customer, for any reason, defaults payment under the credit line approved by the factor. Furthermore, the factor is required to keep accurate records of whether the payment of receivables is duly made and controlled, because the client sells its receivables for goods or services to the factor most commonly without the recourse. Therefore, there is a constant obligation to keep track of the maturity of receivables from customers. However, practice often shows cases when the factor occasionally gets responses from customers that they do not want to make the payment, that they will return the goods or make it available for use by others, or offer payment at a reduced price, which, in fact, presents the customers' refusal to pay, which is usually caused by the poor quality of the contracted goods, inadequate packaging, or other defects. In such cases, when it comes to customer payment disputes, the practice is that the factor addresses the client in order to determine the reasons for customer's refusal to perform its obligation to pay the amount owed, or the proposal of the customer for reduction of the obligation. Similarly, the client is obliged to respond to customer complaints relating the default of payment of receivables by the customer or to delay payment at the time of maturity. There is no doubt that this situation leads to unfavorable relationship between the entities in the factoring business. Although the main activity of the factoring company consists of client financing or the redemption of its invoiced receivables, it should be noted that the factoring organization, in addition to its main function, can also deal with activities that are outside of its usual and regular scope of activity. This means that in certain cases, the factoring company can provide services which can be of great benefit to the customers due to their importance and possibilities of material savings. Among these services and activities of the factors, the following particularly matter: (a) maintaining accounting services by the factor, (b) audit of business records and documents by the factor, (c) development and improvement of turnover, especially for small and medium enterprises, i.e. clients who do not possess the appropriate marketing department, and (d) improving client's business, in relation to the management, planning and control in various areas of its operations.

## **TYPES OF FACTORING**

As a form of financing company's renewal process, factoring can occur in several types and various contents. Therefore, in business practices, there are different types of factoring agreements depending on the criteria observed in their classification. However, despite the abundance of division criteria, it can be said that, in practice, most commonly used forms of factoring are the following: firstly, open-factoring, secondly, closed or hidden factoring and thirdly, true factoring and quasi factoring.

Open factoring - occurs when an exporter assigns (transfers) its receivables from a foreign buyer, with a notice to pay the debt to the factor. In addition, there are two types (forms) of open factoring. The first form of open-factoring is when the exporter of receivables, owed by a foreign buyer, transfers them definitively to the factor. At this point the exporter ceases to be the creditor of the debtor from the previous main business and his place is taken by the factor as a new creditor. The value of this form of factoring can be up to 95% of the book value of receivables, and it depends on the volume of turnover that is realized through the factor, the degree of risk the factor enters into, and the balance sheet of the foreign buyer. For the transferred accounts receivable, the factor pays the export value of receivables minus the interest, fees and costs of the collection of receivables. Another form of open-factoring is when the exporter assigns his receivables solely for collection. In this case, the assignment is made with the aim of the definitive transfer of receivables to the factor, so that the factor could collect the receivables from the foreign buyer in its own name, and on behalf of the domestic exporter. The factor pays the exporter a designated amount in equal installments over a specified period of time. However, in modern economic practices, the combination of these two forms of factoring can occur, when the exporter has more accounts receivable from abroad, and gives only one to be collected, and the other receivables transfers definitively to the factor. In fact, open factoring, in both its forms, has proved its value in practice, so that today it is widely spread in the open market.

Closed or hidden factoring is a financing mechanism that is more complicated than the open factoring. Namely, this form of factoring occurs when an exporter sells goods meant for export to the factor for money, in the way that the bank, acting as a hidden principal resells the same goods through the same exporter to the foreign buyer on credit. In this form of factoring business, the factor makes a profit on the price difference. In addition, the profit is significant because it concerns the financing of export business, which enables the exporter to place the goods abroad. In this factoring model, the exporter is enabled to place the goods while the factor is given the possibility to make a profit arising from the price difference by assuming the risk of sales.

True factoring is present in all cases where the factor carries out three functions cumulatively. These are: (1) function of refinancing of accounts receivable, (2) function of payment security, and (3) function of service provision in connection with the sales of goods and collection of receivables. Quasi-factoring - occurs when the factor carries out one or two of these three functions. In this form of factoring, the factor does not assume the risk of collection and is not liable for the collection of receivables, which remains with the client if it does not manage to collect the receivables from the debtor.

Finally, we should mention that in practice we often see another division of factoring - factoring with the right of recourse and without the right of recourse. Recourse factoring allows the factor to ask for credit protection and realization of payment in the amount of outstanding receivables from the client in the event of insolvency of the buyer, or more of them. In non-recourse factoring, the factor is not given the right of compensation from the client if one or more buyers are unable to pay their obligations. In the modern world practices, non-recourse factoring agreements are dominant, which means that the whole obligation of the realization of receivables from the buyer lies with the factor.

## **FACTORING CALCULATIONS**

As with leasing arrangements, what is very important for deciding in favor of financing through factoring is the so-called project analysis of the factoring business, based on which both the seller and the

buyer of receivables make their respective detailed calculations. The seller does so in terms of its internal labor and business economy, like the buyer, but the latter having to take certain risks into account. For this reason, the buyer of receivables in the calculations goes for reinsurance, i.e. guarantees and superguarantees by other companies regarding the collectability of receivables from a particular debtor. When making the calculation for the sale of their receivables or the calculation of the costs for the collection of receivables, the seller of receivables starts from the activities which it transfers to the factor such as: information about the credit worthiness of the buyer, accounting, correspondence with the buyer, time of collection of receivables and the amount of interest not charged during the time, the level of risk connected to uncollectible debt and so on. Based on all these elements and others relevant for decision making, one can draw a conclusion on costs of the collection of receivables which are acknowledged to the factor, and the receivables are sold reduced for the amount. In this respect, the determined costs of collection of receivables could be expressed in different ways. Firstly, in a fixed amount for each receivable, separately for regular ones, and separately for disputed receivables, and that the amount is paid in full to the factor on the conclusion of the agreement. Secondly, in the reduction of the invoiced receivables for the amount of recognized costs in both types of receivables (regular and disputed). Thirdly, in the percentage for which the factor participates in the charged receivables (3%, 5%, 10% or 20%) depending on the previously made calculations.

Calculations of factoring operations are business documents of the factor and the seller of receivables and are considered confidential until the conclusion of the agreement, which may occur at a later time. Modern practice has shown that the most stimulating solution for both parties is when factoring costs are provided from the collected amount. However, for a more practical understanding of the factoring mechanism, it is best to provide a practical example of financing through factoring, where the key question comes down to the following: is it better for an organization to entrust a factoring company with the collection of receivables, or is it better to wait for payment, i.e. collect the payment using own resources? Accordingly, the main elements for consideration of this hypothetical example are contained in the following data: the accounts receivable on 1/1/2023 amount to 300.000 euro, the payment is agreed for the period of one year, with 12% interest rate (per annum), and the receivables mature on 1/1/2024. Examples of calculations for collection of receivables are given in Tables 1 and 2.

Calculations presented in Tables clearly show that the amount of updated receivables in the first case amounts to 257.730 euro, while in the latter case it amounts to 283.432 euro. Similarly, this undoubtedly leads to the conclusion that the collection of receivables should be left to a factoring organization, because it is more profitable for the creditor's company. The main reasons for this decision are as follows: firstly, it is about a higher purchasing power of the same amount of receivables, and secondly, it accelerates the turnover of assets in the company's process of renewal. Considering the relations in the presented calculations, one should bear in mind that the difference shown may be even smaller, assuming that the collection from the debtor can be accelerated by cash discounts, but it can also be much higher if it is about receivables arising from international economic relations connected to the countries with the currency devaluation. According to the presented example, we see that the factoring organization, apart from the fees of 6.000 euro also charge 12% interest on the amount of 225.000 euro, or a total of 33.000 euro, comprising a total of 11% on the initial (assumed) accounts receivables.

## **ADVANTAGES OF FACTORING**

The main benefits of the factoring business are manifold, both on the macro and micro level, i.e. on the level of companies as active participants in all financial flows of the economy. At the macro level, there is an evident impact of factoring on the growth of production and turnover, and the overall effects in the economic and financial flows, faster flows of exports and imports, with a positive impact on the country's balance and the overall economic growth. Factoring allows all producers, particularly exporters, to quickly adapt to market developments, to increase manufacturing efficiency and direct their activities towards the problems of demand, also achieving significant cost savings, by way of transferring receivables to the factor. Additionally, factoring is generally not used to meet the needs

concerning fixed assets (which is typically the case in forfeiting), but is mostly used in cases of sales or exports of consumer products.

*Table 1: Calculation of in-house collection of receivables*

Indicators	Amount
1. Receivables on 01/01/2023 (mature on 01/01/2024)	300.000
2. Agreed interest rate 12% (regular)	36.000
3. Gross receivables (01/01/2023 = 1 + 2)	336.000
4. Index price of raw materials 135.2 i.e. calculated depreciator (100 : 135.2)	coefficient 0,7391
5. Discount factor $I_{12}^1$ (table)	coefficient 0,8928
6. Discounts: (a) according to the table $0.8928 \times 300.000$ (b) according to the depreciator $0.7391 \times 300.000$	267.840 211.730
7. Differences – loss of receivables (a) 1 minus 6/a = discount (b) 6/a minus 6/b = inflation (c) total loss of receivables (a+b)	32.160 46.110 78.270
8. Updated receivables (3-7c)	257.730

*Table 2: Calculation of collection of receivables through factoring*

Indicators	Amount
1. Paid by the factoring contract 01/01/2023 75% of 300.000	225.000
2. The remainder of the receivables in the amount of 75.000 euro paid on 01/01/2024 with 12% interest	84.000
3. Gross collection (1 + 2)	309.000
4. Discounts: (a) according to the table $0.8928 \times 75.000$ (b) according to the depreciator $0.7391 \times 75.000$	66.960 55.432
5. Differences – loss of receivables (a) 2 minus 4/a = discount (b) 4/a minus 4/b = inflation (c) total loss of receivables (a+b)	8.040 11.528 19.568
6. Factoring fee ( $300.000 \times 2\%$ )	6.000
7. Updated receivables [ $3 - (5c+6)$ ]	283.432

At the micro level, i.e. regarding economic enterprises, there are also multiple benefits from factoring, since the factoring mechanism enables companies to quickly respond to changes in demand at home and abroad, and to avoid significant costs which they would otherwise have if they carried out the collection of receivables on their own or based on approved loans. An important benefit of using a factoring mechanism for a company is that their own company balance is not burdened as the factor assumes the risk of the collection of receivables. In this way, the manufacturer-exporter does not wait for the realization of its receivables or the realization of loans of domestic and foreign customers, but immediately receives funds or loans by handing over an invoice with appropriate supporting documentation on shipping and payment security.

In addition, factoring mechanism provides an opportunity for manufacturer-exporter to sell goods for cash, rather than to deliver products on credit or by deferred payment. In this way, the manufacturer-exporter has a possibility to quickly acquire the necessary means for the normal funding of the next production cycle. The use of factors enables the manufacturer-exporter to pursue a policy of procurement of raw materials in accordance with the dynamics of the sale of products as well as the possibility of selling more products to a larger number of buyers-importers, given the fact that factoring organization takes on the obligations of credit risk, even in a higher amount in relation to the number of customers.

In the context of the aforementioned, there is no doubt that the rational use of a factoring arrangement can provide the necessary funding to allow export-oriented enterprises to achieve optimal business operations. In other words, this means that the overall functioning strategy of the specific form of



enterprise financing presented here - the factoring mechanism, is aimed primarily at increasing the economic efficiency of enterprises and financial flows in the open market, which implies the company's opportunity and need for the rational use of the factoring mechanism.

## CONCLUSION

Factoring activities provide the company with the possibility to reach the required funds, especially when the funds cannot be provided in any other way. Moreover, the strategy of using factoring as a financing mechanism should focus on increasing the economic efficiency of business enterprises. Therefore, the decision whether the company will assign the collection of receivables to the factoring organization, requires rationality and prudence. In this regard, in order to assess the feasibility of financing through factoring the significant parameter is the volume of business. For example, in Germany it is estimated that the upper limit for profitable operations with the factor is at the level of EUR 75-100 million of annual turnover, while the lowest limit of turnover, below which the effects of factoring are not evident, is at EUR 1.5 million. Because of this, when deciding in favor of factoring, it is necessary to bear in mind all the advantages it offers but it is also necessary to take into account all its limitations.

In Serbia, financing through factoring is not yet developed, in contrast to the developed countries with market-type economy. Because of this, the positive effects of factoring as a contemporary form of financing fall substantially behind the actual needs of local companies. In addition, financing through factoring would have the most impact on small and medium enterprises, as well as start-ups, primarily because of the unwillingness of banks to grant loans to such firms. Since there are no legal obstacles to the application of financing through factoring, it is expected that in future this type of financing will increasingly gain in importance, which would provide many companies with a greater degree of competitiveness and survival in the market. It should be noted that there are hundreds of factoring companies in the world today, operating in Europe, the USA, Canada, Australia, Japan etc. The largest factoring company in the world is The International Factors Group, which operates in many countries and does business with the world's leading banks.

## REFERENCES

- Anthony, M., Biggs, N. (2016). *Mathematics for economics and finance*, Cambridge University Press, United Kingdom.
- Brealey, R., Myers, S., Allen, F. (2017). *Principles of Corporate Finance*, McGraw-Hill Education, New York.
- Brzaković, T. (2016). *Savremene poslovne finansije – principi i primena*, Univerzitet Privredna akademija u Novom Sadu i Fakultet za primenjeni menadžment, ekonomiju i finansije, Beograd.
- Ivaniš, M, Vapa Tankosić, J. (2020). Factoring as an important instrument of corporate finance, MEFKON2020, Internacional Thematic Monograph – Thematic Proceedings, ISBN 978-86-84531-50-8, Faculty of Applied Management, Economy and Finance, Belgrade, University Business Academy in Novi Sad, 3rd December 2020, Belgrade, Serbia, p. 166-181.
- Ivaniš M. (2019). *Poslovne finansije*, Fakultet za ekonomiju i inženjerski menadžment u Novom Sadu, Univerzitet Privredna akademija, Novi Sad.
- Ivaniš, M. (2013). Faktoring - savremeni oblik finansiranja preduzeća, *Ekonomija – teorija i praksa*, 1 (6), ISSN 2217-5458, Fakultet za ekonomiju i inženjerski menadžment u Novom Sadu, Novi Sad, p. 55-77.
- Kozomara, J. (2018). *Osnove međunarodnog poslovanja*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Rakita, B., Marković, D. (2019). *Međunarodni biznis i menadžment*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Todorović, M., Ivanišević, M. (2021). *Poslovne finansije*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Vunjak, N. (2010). *Finansijski menadžment – poslovne finansije*, Proleter AD –Bečej, Ekonomski fakultet u Subotici, Subotica.

## **FORFAITING – INSTRUMENT OF ENTERPRISE FINANCING**

**Miloš Ivaniš**

University Business Academy in Novi Sad, Faculty of Economics and Engineering Management, Novi Sad,  
Republic of Serbia

Email: [mivanis97@gmail.com](mailto:mivanis97@gmail.com)

### **ABSTRACT**

Forfaiting is a modern non-credit transaction by which the repurchase of long-term receivables is carried out. Repurchase of receivables is made before maturity, so the countries with developed market economies use forfaiting as a form of accelerated debt collection. Forfaiting is related to the purchase of long-term outstanding receivables arising from the delivery of goods and services - mainly in export. Generally, it is a repurchase of long-term and outstanding receivables where the buyer assumes all the risks of collection of receivables from a third party. As a rule, forfaiting organizations set up banks with high financial and investment potential. This allows banks and their forfaiting organizations, with the acceptance of appropriate risk, to achieve much higher profit margins than those that can be achieved through regular credit transactions. On the other hand, forfaiting offers a number of advantages that are not typical for the traditional methods of enterprise financing. For that reason forfaiting provides many companies with competitiveness and survival in the market. The aim of this paper is to highlight the importance of forfaiting as a modern form of enterprise financing, as well as its advantages and limitations.

**Key words:** forfaiting, forfaiter, exporter, importer, bank.

### **INTRODUCTION**

In modern economic practices, forfaiting is one of the specific ways of enterprise funding. This form of financing occurs in large individual transactions for delivery of equipment, "turnkey" construction of facilities or capital projects with deferred payment ranging from one to several years. The essence of a forfaiting contract is reflected in the fact that the bank (forfaiter) purchases its client's receivables from the third party (the buyer-investor), which the client (seller-producer) assigns with the transfer of instruments for the settlement of maturity that was contracted with the buyer (bills of exchange, documentary letters of credit, a guarantee of a third party, etc.). The bank accepts assignment of receivables and pays a nominal value of the receivables to the seller (producer) as its client, minus the discount interest rate, fees and expenses related to the job. In addition, the bank is obliged to bear the risk of collection of assigned receivables, i.e. will not seek reimbursement of outstanding receivables from the seller-producer. Forfaiters are usually large banks or other financial institutions which have great potential for refinancing or obtaining of funds in the capital market. The main motive of the forfaiter is profit, which is often a few percentage points higher compared to that which would be achieved from the invested capital under the usual market conditions.

By concluding a forfaiting contract, the seller (producer) acquires cash, which *de facto* means that they have sold their commercial loan to the bank and since the bank paid for the transferred receivables, now the bank provides funding to the buyer (investor), collects assigned receivables at maturity, with transferred payment instruments, and thus actually returns cash given to the seller (producer). Bearing in mind that the assigned receivables are higher than the given amount of cash for the discount interest rate, fees and expenses, bank gains income equal to the difference between assigned receivables and given cash. In addition, it should be noted that the amount of the discount interest is influenced by: the degree of risk taken on by a commercial bank, creditworthiness of the third party (debtor), type of collateral, economic and other conditions in the country where the property is located etc. Solvency of

the third party, from whom the receivables are collected, is very important for a forfaiting contract and it can be expressed in different forms such as: in the form of securities, in the form of transferable documentary letter of credit with deferred payment period, in the form of guarantees of third parties and civil legal assignments.

Conclusion of forfaiting agreements is commonly practiced in export activities (export of equipment, construction of facilities and execution of capital projects). The forfaiting agreement, as a supplementary form of long-term transactions financing, provides conditions for the purchase of supplies, equipment and modern technology without using own funds or seek loans from commercial banks. From the aspect of financing costs (expenses), it should be said that this form of crediting is somewhat more expensive compared to conventional bank loans, but it has more security in terms of the collection of receivables. Bearing in mind that it is the sale of goods on credit, in this way local exporters (sellers-producers) are enabled to place their products or services on the international market at a much more favorable terms. In contrast, for the importer, the free import of modern technology from highly-developed countries is of particular importance, which is a fundamental prerequisite to the development and improvement of domestic technology and manufacturing companies' development.

### PARTICIPANTS AND RELATIONSHIPS IN THE FORFAITING BUSINESS

When it comes to forfaiting arrangements, it should be noted that the main participants in the business of forfaiting are the following: (1) the seller-exporter, (2) the buyer-importer, (3) the customer's (importer's) bank, (4) forfaiting organization, and (5) optional subjects. In the process of doing forfaiting business, several legal and financial relationships are formed between these parties, each of them producing legal effects only for the involved parties (Figure 1).

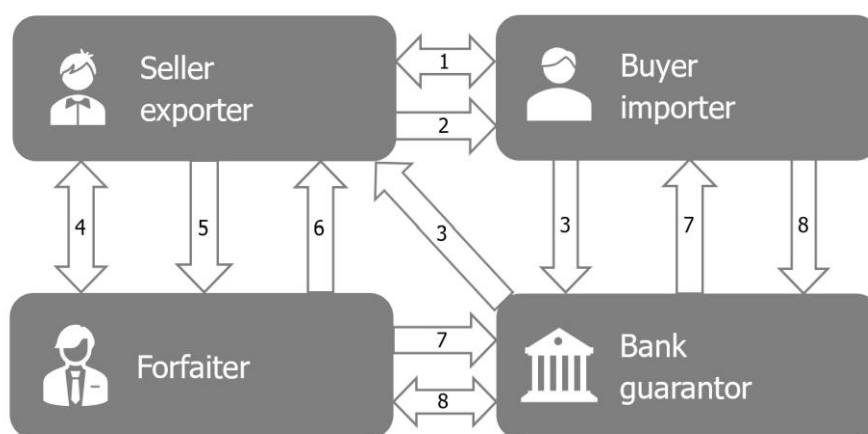


Figure 1: Forfaiting transactions

1. Commercial contract
2. Delivery of goods
3. Delivery of bills
4. Forfaiting agreement
5. Delivery of bills
6. Payment of the nominal amount minus discount
7. Submission of bills for collection
8. Payment at maturity of a bill

(1) *Seller-exporter* is the entity that produces investment equipment, builds entire facilities, carries out works abroad and approves sales on credit to customers-importers, although it cannot and does not want to be responsible for further care of it, and tries even during negotiations of purchase to find a forfaiting organization that will repurchase the receivables.

(2) *Buyer-importer* is the entity that has the intention to buy specific investment equipment but lacks the necessary funds for the intended investment. For this reason it turns to the seller-exporter (manufacturer) with a request to have the purchase on credit approved.

(3) *Bank of the buyer (importer)* is a financial institution through which the major tasks of payment securing are performed in connection with the use of factoring mechanism. The bank's activities are directed towards the issue of collateral such as guarantees and avals in favor of the seller-exporter.

(4) *Forfaiting organization* is a company engaged in forfaiting business, which has good business relations at home and abroad as well as opportunities to refinance receivables due to the seller-exporter (producer) on domestic or international capital markets. Therefore, forfaiting transactions are mostly performed by large and reputable banks which have a network of branches and correspondent relations with foreign banks. Such banks usually provide specialized organizational units or agencies for forfaiting jobs.

(5) *Optional subjects* are mediators in forfaiting operations whose role is limited exclusively to mediation, i.e. finding forfaiting buyers and sellers, as well enabling their contact with forfaiting organizations. A fee is charged for mediation services, which, although not too high, increases the costs of exports of investment equipment.

In the last decade forfaiting jobs have been gaining more importance, so forfaiting is increasingly becoming a common form of export financing, which frees the exporter from the potential risk by selling its receivables before the date of maturity. The seller acquires funds through the process of forfaiting, i.e. makes profit and has no need to seek loans from commercial banks. In other words, the exporter converts its sales on credit to cash transactions. In addition, the forfaiting bank purchases receivables, absorbs the risk of the collection and is entitled to lower the amount of the receivables for the agreed discount. Similarly, forfaiting business is very similar to factoring, with the exception that instead of selling receivables within the country, here the sale of receivables is carried out abroad. The company that has exported goods sells its receivables from the customers abroad to the relevant financial institution engaged in forfaiting, and it is, as a rule, a commercial bank registered for such operations.

## **SIMILARITIES AND DIFFERENCES BETWEEN FORFAITING AND FACTORING**

Bearing in mind that the object of the contract in enterprise financing through forfaiting and factoring are receivables with a specific maturity date and value, there is a need to define basic similarities and differences between them. The main similarity is that the seller (producer) immediately after the signing of the contract comes to cash without having to wait for the collection of the receivables in question. However, the differences between these two forms of financing can be described as follows:

1. Forfaiting operations are always performed by banks, while factoring operations are commonly done by factoring companies backed by big business. In addition, banks can perform factoring activities but it is still less common.
2. In forfaiting operations, the bank assumes the risk of collection of receivables, while in factoring the company does not always have to take on the risk, which primarily depends on the specific conditions of the factoring agreement.
3. A forfaiting agreement is always concluded for a specific job (receivables) considering large values of receivables, while in factoring operations, there may be a "global assignment" which means that all receivables from the buyer, which have arisen and will arise in the future, are assigned to a factoring company according to the previously signed agreement of "global assignment."

4. In forfaiting, receivables are always long-term, with repayment period of several years. However, in factoring, receivables are short-term and usually do not exceed a period longer than six months. In addition, the best receivables are considered those with maturity of 30-90 days.
5. In forfaiting operations, interest rate is always higher, given that its base is the current interest rate on capital market and the risks are much higher. However, in factoring the interest rate is always lower, given that its base is the current interest rate on the money market and the risks are much lower.

In the context of the above mentioned, a logical conclusion comes to mind that when an entity (enterprise) decides regarding the application of forfaiting and factoring, it needs to bear in mind a number of benefits that both forms of financing provide to their users, but it is also necessary to take into account all of their limitations, especially when it is viewed from the aspect of specific economic circumstances of certain countries, which determine both the client and the forfaiter or factor for contracting.

### **ADVANTAGES AND LIMITATIONS OF FORFAITING**

Generally, forfaiting offers a number of advantages when it comes to financial and other possibilities that are not characteristic of the so-called traditional methods of enterprise financing. The main advantages of financing through forfaiting can be best seen when viewed from the aspect of forfaiting advantages for users, i.e. participants in forfaiting arrangements. Therefore, we will present the main advantages of forfaiting for importers, exporters and forfaiters.

*Advantages of forfaiting for the seller-exporter are as follows:* (1) Collection of receivables is carried out immediately after the delivery of the equipment, thus turning sales on credit into a cash transaction; (2) Improves the liquidity of exporters; (3) Increases the credit potential of exporters, because they can borrow further; (4) Eliminates possible losses due to insolvency; (5) Eliminates the risk of rising interest rates in the future; (6) Eliminate the risks from fluctuating exchange rates; (7) Eliminates the risk arising from changes in creditworthiness of the debtor; (8) Eliminates administrative problems and the costs of debt collection; (9) Credit insurance is not required; (10) Contracts can be concluded quickly due to the simplicity of documentation; (11) Forfaiting costs may be included in the price of export business; (12) Exporter does not need to litigate over the settlement of receivables.

*Advantages of forfaiting for the buyer-importer are as follows:* (1) Enables import of the most modern equipment and technology on credit, not having to engage own funds at the time of the closing of transaction; (2) Increases the borrowing capacity of the importer; (3) Repayment of the loans according to a fixed interest rate; (4) Documentation is simple and can be provided relatively quickly, which simplifies the process of conclusion of forfaiting contracts; (5) Importer may choose the currency of payments, regardless of the needs of exporters; (6) Reduces the restrictive clauses for taking new bank loans; (7) Enables avoidance of administrative costs which are high in loan taking.

*Advantages of forfaiting for forfaiting organizations or banks are as follows:* (1) Documentation is simple and quick to complete, so there are no complex contracts as in loan operations; (2) Purchased receivables are easily negotiable and marketable in the secondary market; (3) Provides a possibility to achieve significant revenue, i.e. gain profit which is higher compared to that which would be achieved in the capital market.

In contrast to the mentioned advantages of forfaiting, we can say that it does have certain shortcomings. In this respect, the key problem is that it is a relatively expensive way of financing. Namely, the cost of financing by forfaiting of receivables is often quite high, even higher than other alternative financing options, since in the cost of financing expressed through the discount rate the forfaiter includes the costs of financing and refinancing, in accordance with the current market

conditions and risks, as well as administration costs. Although forfaiting is one of the more expensive forms of import of capital equipment, buyers-importers still find it advantageous, taking into account, first of all, all of the mentioned advantages and overall benefits offered to them.

Finally, it could be concluded that tough competition in the capital equipment markets and unfavorable conditions for investments were key reasons for the decision of exporters to offer loans to buyers-importers and thus assume the function of financing which had been otherwise formally performed by banks and other financial institutions. However, in order to eliminate the risks of loan repayment, exporters turned to specialized financial institutions that began with the application of forfaiting. In addition, the most important characteristics of forfaiting, such as: relatively simple application, flexibility and promptness of decision making, added to the popularity of forfaiting in the process of encouraging exports and imports of capital equipment. Therefore, forfaiting became one of the main mechanisms to provide conditions for banks to incorporate, together with the classical ones, new operational forms of business in their offer, which are also known as para-banking forms, but which also provide complementarity and continuity to traditional sources of financing.

## CONCLUSION

In modern market conditions, there is a growing importance of forfaiting as a form of financing and a factor of efficiency of business operations of enterprises. Simplicity and flexibility of its application have contributed to the popularity of forfaiting in the process of encouragement of exports and imports of investment equipment. Forfaiting arrangements enable business entities to use modern investment goods, with all positive effects arising from this. Forfaiting as an additional form of financing enables the importer to purchase equipment and modern technology without engaging their own funds or seek loans from commercial banks. Forfaiting as a form of financing is more expensive compared to conventional bank loans, but it offers opportunities for exporters to sell their goods and services to foreign markets under acceptable conditions. In this way creditworthiness of enterprises is preserved and many of them are enabled to use modern technology in conditions of inadequacy and scarcity of investment funds. Similarly, for countries in transition, development and further implementation of forfaiting operations are particularly significant, so that these countries may acquire modern equipment from the highly-developed countries, which is a fundamental prerequisite to the development of domestic technology development and development of manufacturing companies.

## REFERENCES

- Brealey, R., Myers, S., Allen, F. (2017). *Principles of Corporate Finance*, McGraw-Hill Education, New York.
- Brzaković, T. (2016). *Savremene poslovne finansije – principi i primena*, Univerzitet Privredna akademija u Novom Sadu i Fakultet za primenjeni menadžment, ekonomiju i finansije, Beograd.
- Ivaniš, M, Vapa Tankosić, J. (2020). Factoring as an important instrument of corporate finance, MEFKON2020, Internacional Thematic Monograph – Thematic Proceedings, ISBN 978-86-84531-50-8, Faculty of Applied Management, Economy and Finance, Belgrade, University Business Academy in Novi Sad, 3rd December 2020, Belgrade, Serbia, p. 166-181.
- Ivaniš M. (2019). *Poslovne finansije*, Fakultet za ekonomiju i inženjerski menadžment u Novom Sadu, Univerzitet Privredna akademija, Novi Sad.
- Ivaniš, M. (2012). *Finansije preduzeća*, R&B College, Beograd.
- Ivaniš, M. (2003). Forfeting kao specifični oblik finansiranja preduzeća, *Spoljnotrgovinski savetnik*, 2 (9), ISSN 1451-1215, Poslovni biro, Beograd, p. 19-24.
- Kozomara, J. (2018). *Osnove međunarodnog poslovanja*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Kovačević, R. (2020). *Međunarodne finansije*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Mitić, S. (2014). *Upravljanje izvozom - nematerijalni i marketinški aspekti konkurentnosti*, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Mladenović, O. (2010). Forfetiranje kao jedan od oblika finansiranja izvoza, *Bankarstvo*, 39 (3-4), ISSN 1451-4354, Udruženje banaka Srbije, Beograd, p. 124-146.

- Rakita, B., Marković, D. (2019). Međunarodni biznis i menadžment, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Todorović, M., Ivanišević, M. (2021). Poslovne finansije, Ekonomski fakultet u Beogradu, Centar za izdavačku delatnost, Beograd.
- Vunjak, N., Ćurčić, U., Kovačević, LJ. (2011). Strategijski menadžment u bankarstvu, Proleter a.d. Bečej, Ekonomski fakultet Subotica, Internacionalni Univerzitet Travnik,
- Vunjak N., Kovačević LJ. (2011). Bankarstvo - bankarski menadžment, Proleter-Bečej, Ekonomski fakultet u Subotici, Subotica.
- Vunjak N. (2005). Finansijski menadžment - poslovne finansije, Proleter-Bečej, Unireks-Podgorica, Ekonomski fakultet u Subotici, Subotica.

## **INTERDEPENDENCE BETWEEN BUDGET DEFICIT AND PUBLIC DEBT: THE CASE OF BRICS COUNTRIES**

**Branimir Kalaš**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

E-mail: [branimir.kalas@ef.uns.ac.rs](mailto:branimir.kalas@ef.uns.ac.rs)

**Vera Mirović**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Nada Milenković**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Milica Indić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

### **ABSTRACT**

Fiscal stability and sustainability are two essential issues for every government in the world. A sound and healthy public finance management enable positive implications for economic growth and development. The subject of this research is to determine a potential relationship between budget deficit and public debt in BRICS countries (Brazil, Russia, India, China, and South Africa) for the period 2010-2022. The obtained findings of MANOVA confirmed that there is a significant difference in the budget deficit and public debt level of BRICS countries. The results of correlation analysis confirmed that budget deficit and public debt are positively related at the BRICS group level. It implies that higher budget deficits raise the public debt of this group and it is necessary to provide better economic coordination to avoid harmful implications for their economies.

**Keywords:** budget deficit, public debt, correlation, BRICS

### **INTRODUCTION**

In today's conditions most economies in the world are faced with unbalanced budgets and uncontrolled public debt levels. An excessive fiscal deficit as a percentage of GDP tends to negatively impact on debt-GDP ratio, but also adversely affects savings and investment, as well as, growth (Rangarajan and Srivastava, 2005). Policymakers have traditionally been worried about the issue of public debt sustainability in developing and emerging market countries (Nguyen et al., 2016). Specifically, the fiscal policy's sustainability represents a central issue in the economy (Brady and Magazzino, 2017). In the world economic conditions balanced budgets have disappeared, where government deficit financing has predominated (Neaime, 2015), which is similar to Mawejje and Odhiambo (2020) that emphasized the government is rarely able to keep balanced budgets. A sound government should spend as much as it taxes, whereas in a deficit situation must be careful not to spend too fast, because uncontrolled deficits road to inflation and bankruptcy (Tymoigne, 2019). Deficits are used to evaluate whether fiscal policy is stimulating or constraining the economy, while debts are measured to identify whether high levels curb economic growth (Irwin, 2016). The structure of the research includes five parts. The first and second part implies an introduction and evolution of the BRICS group. The third part includes previous theoretical and empirical studies related to the relationship between budget deficit and public debt. The fourth part implies descriptive and empirical statistics with obtained results to precisely identify the relationship between budget deficit and public debt in BRICS countries for the period 2010-2022.



## **BRICS' POSITION IN THE WORLD**

The leaders of BRIC countries (Brazil, Russia, India, and China) convened for the first time on the sidelines of the G8 Outreach Summit in July 2006. Afterwards, the group was formalized as BRIC during the 1<sup>st</sup> BRIC Foreign Ministers' Meeting. The 1<sup>st</sup> BRICS summit was held in Yekaterinburg on 16 June 2009. Finally, the BRIC group was renamed as BRICS after South Africa was accepted as a full member of this group in September 2010 (<https://brics2021.gov.in/about-brics>). When it comes to BRICS countries, Dolls et al. (2012) highlighted that these economies, in particular China, have a significant role in the economic stability of the world. The significance of BRICS' contribution to the world economy is reflected in the fact that this group have over 40% of the human resources and more than 16% of the GDP in the world (Mbangata and Kanayo, 2017). The economic development of these economies in the past decades is projected to emerge as a dominant block worldwide (Siddiqui, 2016). This partnership is known for having the fastest-growing economies and their substantial effect on both local and global affairs (Molefe and Mah, 2020). Accordingly, BRICS has a good perspective for helping the world economy and reforming the global economic system (Zharikov, 2021).

## **LITERATURE REVIEW**

Governments should enable sustainable budget deficit and debt levels to avoid negative effects on the economy. This is in line with Van et al. (2020) who identified a harmful impact on sustainable development in 59 developing countries for the period 2004-2015. The significance of budget deficits' implication on government debt is supported by Kameda (2014) who confirmed that a budget deficit has a greater impact on debt level compared to the current deficit. When it comes to the interdependence between fiscal deficit and public debt, Prohl and Schneider (2006) confirmed that budget deficit and public debt ratios are cointegrated in the European Union for the period 1970-2014. Folorunso (2013) examined the relationship between fiscal deficit and public debt in Nigeria from 1970 to 2011. This research found positive nexus among these variables, where a 1% increase in public debt enhances budget deficit by 1.85%. Also, the growth of the budget deficit by 1% raises public debt by 0.08% in the analyzed period. Similarly, Reed et al. (2019) determined a long-term relationship between budget deficit and government debt in Iran for the period 1974-2015, Redda (2020) found unidirectional causality from budget deficit to public debt in South Africa from 2000 to 2018. Finally, Deheri and Nag (2022) identified a positive relationship between fiscal deficit and public debt in India in the short-run and long-run.

## **EMPIRICAL RESULTS AND DISCUSSION**

This part of the research includes a descriptive analysis of selected variables (budget deficit and public debt) for the BRICS group (Brazil, Russia, India, China and South Africa) from 2009 to 2022. Besides, there is a group and partial correlation between explanatory variables to provide information about the character and intensity of their relationship for the analyzed period.

The results of descriptive analysis showed that BRICS registered an average budget deficit of 4.47% of GDP, while the mean public debt level was 52.84% of GDP for the observed period. The highest budget deficit was identified in Brazil (-11.73), as well as, India (-9.35). These findings are in line with Tran (2019) that indicated BRICS economies recorded budget deficits and government debt accumulation in the past few years, especially Brazil and India whose exposed to a greater levels of fiscal imbalances. However, Joy and Panda (2020) emphasized that public debt sustainability is weak for the BRICS group, where their findings indicated that China and India have better coefficients compared to Brazil, Russia and South Africa for the period 1980-2017. Contrary, Russia recorded average public debt of 14.15% of GDP, which is much lesser than other countries in the observed period. Having in mind the current geopolitical situation in the world, this indicator could a growing trend in the coming period. Analyzing the last three years in the conditions of COVID-19 presence, BRICS registered an average budget deficit of 6.13%, whereas India recorded the highest deficit value

of 8.83%. Similarly, mean public debt values were highest in Brazil and India, where debt shares were above 80% (India) and 90% (Brazil) of GDP.

Table 1: Descriptive analysis

Country	Budget deficit	Public debt
<b>Brazil</b>		
Mean value	-6.51	76.94
Std. dev.	2.41	14.05
Min. Value	-11.73	60.19
Max. value	-3.74	98.68
<b>Russia</b>		
Mean value	-0.93	14.15
Std. dev.	2.28	2.69
Min. Value	-4.38	10.11
Max. value	2.94	19.22
<b>India</b>		
Mean value	-7.67	73.44
Std. dev.	1.07	8.54
Min. value	-9.35	66.4
Max. value	-6.22	90.06
<b>China</b>		
Mean value	-3.33	50.06
Std. dev.	2.79	15.33
Min. Value	-9.05	33.77
Max. value	-0.36	77.84
<b>South Africa</b>		
Mean value	-39.5	49.58
Std. dev.	0.41	13.26
Min. value	-4.83	31.18
Max. value	-3.46	70.21
<b>BRICS</b>		
Mean value	-4.47	52.84
Std. dev.	3.09	25.32
Min. value	-11.73	10.10
Max. value	2.94	98.68

Source: Authors based on <https://www.imf.org/en/Publications/WEO/weo-database/2022>

Table 2: MANOVA test

Budget deficit	W = Wilks' lambda		L = Lawley-Hotelling trace		
	P = Pillai's trace		R = Roy's largest root		
Source	Statistic	F(df1)	F(df2)	F	Prob > F
W	0.425	4.0	70	23.66	0.000
P	0.575	4.0	70	23.66	0.000
L	1.352	4.0	70	23.66	0.000
R	1.352	4.0	70	23.66	0.000
Residual	70				
Total	74				
Public debt	W = Wilks' lambda		L = Lawley-Hotelling trace		
	P = Pillai's trace		R = Roy's largest root		
Source	Statistic	F(df1)	F(df2)	F	Prob > F
W	0.214	4.0	70	64.48	0.000
P	0.786	4.0	70	64.48	0.000
L	3.68	4.0	70	64.48	0.000
R	3.68	4.0	70	64.48	0.000
Residual	70				
Total	74				

Source: Authors based on <https://www.imf.org/en/Publications/WEO/weo-database/2022>

The empirical results of multivariate analysis of variance (MANOVA) confirmed that there are significant differences in the budget deficit and public level of BRICS countries for the period 2010 –

2020. The values of the multivariate analysis of variance test are less than 0.05 which implies the presence of a significant difference in the observed indicators.

*Table 3: Correlation matrix for BRICS group*

Variable	Budget deficit	Public debt
Budget deficit	1.000	
Public debt	0.803 (0.000)	1.000

Source: Authors based on <https://www.imf.org/en/Publications/WEO/weo-database/2022>

The results from Table 3 confirmed a significant and positive relationship between budget deficit and public debt in the BRICS group for the period 2010-2022. The value of correlation coefficient 0.803 implies there is a strong and positive relationship between those variables. After identifying the correlation for BRICS group, the next table includes a partial analysis of these economies for the observed period.

*Table 4: Correlation matrix by countries*

Variable	Budget deficit	Public debt
<b>Brazil</b>		
Budget deficit	1.000	
Public debt	0.441 (0.132)	1.000
<b>Russia</b>		
Budget deficit	1.000	
Public debt	0.421 (0.153)	1.000
<b>India</b>		
Budget deficit	1.000	
Public debt	0.556 (0.048)	1.000
<b>China</b>		
Budget deficit	1.000	
Public debt	0.921 (0.000)	1.000
<b>South Africa</b>		
Budget deficit	1.000	
Public debt	0.610 (0.027)	1.000

Source: Authors based on <https://www.imf.org/en/Publications/WEO/weo-database/2022>

The findings of partial correlation analysis revealed that there is a significant and positive relationship between budget deficit and public debt in India, China, and South Africa, which is not the case with Brazil and Russia. Specifically, the greatest coefficient of correlation was in China (0.921), while India and South Africa recorded similar coefficient values (around 0.6). Also, positive correlation coefficients were found in Brazil and Russia with almost identical values, but there were not significant.

## CONCLUSION

The paper has analyzed the relationship between budget deficit and public debt in BRICS countries (Brazil, Russia, India, China, and South Africa) for the period 2010-2020. The average budget deficit was 4.47 of GDP, whereas Brazil registered the highest value of 11.73% of GDP. Conversely, Russia recorded the mean budget deficit of 0.93% of GDP, which is the smallest budget deficit compared to the other observed economies. A similar situation is with public debt, where Brazil and India had average public debt above 80% and 90% of GDP which is far more than Russia. The results of MANOVA confirmed that there are significant differences in the budget deficit and public level of the BRICS countries for the considered period. The value of the correlation coefficient of 0.803 reflected there was a strong and positive relationship between budget deficit and public debt at BRICS group level. Analyzing

by countries, the greatest coefficient values were identified in China (0.921), India, and South Africa (between 0.556 and 0.610). These empirical findings confirmed previous empirical studies that have identified a positive relationship between budget deficit and public debt (Prohl and Schneider, 2006; Folorunso, 2013; Reed et al., 2019). The fiscal authorities should focus on optimal budget deficit level to enable lucrative effects on economic stability and sustainability. In conditions of the controlled budget deficit and public debt, governments create favourable fiscal framework which is necessary for an adequate macroeconomic state.

## REFERENCES

- Brady, G.L., & Magazzino, C. (2017). The Sustainability of Italian Public Debt and Deficit. *International Advances in Economic Research*, 23(1), 9-20. <https://doi.org/10.1007/s11294-016-9623-7>
- Deheri, A., & Nag, A. (2020). Assessing the Long-Run Sustainability of Public Debt and Fiscal Deficit in India. *Global Journal of Emerging Market Economies*. <https://doi.org/10.1177/09749101221113881>
- Dolls, M., Peichl, A., Zimmermann, K.F. (2012). A challenge for the G20: Global debt brakes and transnational fiscal supervisory councils. *Intereconomics*, 47(1), 31-38. <https://doi.org/10.1007/s10272-012-0403-1>
- Folorunso, B.A. (2013). Relationship between Fiscal Deficit and Public Debt in Nigeria: an Error Correction Approach. *Journal of Economics and Behavioral Studies*, 5(6), 346-355. <https://doi.org/10.22610/jeb.v5i6.410>
- Irwin, T.C. (2016). *Defining the Government's Debt and Deficit. A Collection of Reviews on Savings and Wealth Accumulation*. 139-162. <https://doi.org/10.1002/9781119158424.ch6>
- Joy, J., & Panda, P. K. (2021). An empirical analysis of sustainability of public debt among BRICS nations. *Journal of Public Affairs*, 21(2), 1-14. <https://doi.org/10.1002/pa.2170>
- Kameda, K. (2014). Budget deficits, government debt, and long-term interest rates in Japan. *Journal of the Japanese and International Economies*, 32, 105-124. <https://doi.org/10.1016/j.jjie.2014.02.001>
- Maweje, J., & Odhiambo, N.M. (2020). The determinants of fiscal deficits: a survey of literature. *International Review of Economics*, 67, 403-417. <https://doi.org/10.1007/s12232-020-00348-8>
- Mbangata, T., & Kanayo, O. (2017). A Review of the Macroeconomic Policy Frameworks adopted by the BRICS countries (2000-2015). *Journal of Economics and Behavioral Studies*, 9(3(J)), 202-211. [https://doi.org/10.22610/jeb.v9i3\(J\).1759](https://doi.org/10.22610/jeb.v9i3(J).1759)
- Molefe, E.K., & Mah, G. (2020). Fiscal deficits and interest rates in BRICS economies: Testing the Keynesian-Ricardian opposition. *Journal of Life Economics*, 7(2), 177-188. <https://doi.org/10.15637/jlecon.7.012>
- Neaime, S. (2015). Sustainability of budget deficits and public debts in selected European Union countries. *The Journal of Economic Asymmetries*, 12(1), 1-21. <https://doi.org/10.1016/j.jeca.2014.10.002>
- Nguyen, T.D., Suardi, S., & Chua, C.L. (2016). The behavior of U.S. public debt and deficits during the global financial crisis. *Contemporary Economic Policy*, 35(1), 201-215. <https://doi.org/10.1111/coep.12166>
- Rangarajan, C., & Srivastava, D.K. (2005). Fiscal Deficits and Government Debt: Implications for Growth and Stabilisation. *Economic and Political Weekly*, 40(27), 2919-2934 <https://www.jstor.org/stable/4416847>
- Redda, E.H. (2020). Sustainability of public debt and budget deficit in South Africa. *Journal of Management Information and Decision Sciences*, 23(3), 164-174.
- Reed, M., Najarzadeh, R., & Sadati, S.Z. (2019). Analyzing the relationship between budget deficit, current account deficit, and government debt sustainability. *Journal of WEI Business and Economics*, 8, 20-31.
- Prohl, S., Schneider, F.G. (2006). *Sustainability of Public Debt and Budget Deficit: cointegration analysis for the European Union Member countries*. Working Paper, No. 0610. Johannes Kepler University of Linz. <https://www.econstor.eu/bitstream/10419/73195/1/wp0610.pdf>
- Siddiqui, K. (2016). Will the Growth of the BRICs Cause a Shift in the Global Balance of Economic Power in the 21st Century? *International Journal of Political Economy*, 45(4), 315-338. <https://doi.org/10.1080/08911916.2016.1270084>
- Tran, N. (2019). Asymmetric effects of fiscal balance on monetary variables: evidence from large emerging economies. *Empirical Economics*, 57, 1045-1076. <https://doi.org/10.1007/s00181-018-1483-y>
- Tymoigne, E. (2019). Debunking the Public Debt and Deficit Rhetoric. *Challenge*, 62(5), 1-18. <https://doi.org/10.1080/05775132.2019.1639412>
- Van, V.T.T., Ha, N.T.T., Quyen, P.G., & Anh, L.T.H., Loi, D.T. (2020). The Relationship between Public Debt, Budget Deficit, and Sustainable Economic Development in Developing Countries: The Role of Corruption Control. *Jurnal Ekonomi & Studi Pembangunan*, 21(1), 84-104.
- Zharikov, M. (2021). A Debt Market Model for the BRICS. *Economies*, 9(1), 1-12. <https://doi.org/10.3390/economies9010004>
- <https://brics2021.gov.in/index> download from: <https://brics2021.gov.in/about-brics>
- <https://www.imf.org/en/Home> download from: <https://www.imf.org/en/Publications/WEO/weo-database/2022>

## **SME BANK LOANS VS. VC FUNDS ACTIVITY IN SERBIA**

**Nada Milenković**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

E-mail: [nada.milenkovic@ef.uns.ac.rs](mailto:nada.milenkovic@ef.uns.ac.rs)

**Branimir Kalaš**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Jelena Andrašić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

**Miloš Đaković**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

### **ABSTRACT**

SMEs have the opportunity to access finance sources through VC fund, as an alternative source of financing. Although in 2021 the law on alternative investment funds has begun to be implemented, there is no significant investment activity of the founded funds. Furthermore, it seems that banking loans are the main source of SME financing in Serbia, besides the funding's gained through non-refundable state funds mainly for high innovative SMEs in the technology sector. The aim of this paper is to analyze the structure of the loans of Serbian banks and to extract the data about the SME financing. Comparing this data with the invested amounts of the foreign VC funds we can conclude whether there is an increase in alternative financing or the bank loans remain the main financing source of the SMEs in Serbia.

**Key words:** SME financing, bank loans, VC funds.

### **INTRODUCTION**

SMEs have a reduced opportunity to obtain financing funds in comparison to big corporations. SMEs are not listed on financial markets and cannot issue shares or bonds to increase the capital levels. Furthermore, SMEs have smaller amount of assets when it comes to collaterals for loans. Besides banking loans there are alternatives for SMEs for other financial sources, which they may use more or less depending on the SMEs management (Milenković, Mirović, & Andrašić, 2018).

In the past period, one of the reasons for the financing deficit through VC funds was the lack of legal regulations. In order to enhance the alternative sources of financing, in 2022, the law on alternative investment funds began to be implemented (Zakon o alternativnim investicionim fondovima, 2019). Although a year has passed since the implementation of the law, there has been no major progress regarding domestic VC funds. Namely, in 2022, only two funds were registered as alternative investment funds, although a larger response was expected.

Financing through VC funds is specific in relation to financing through bank loans in several aspects (Milenković & Kalaš, 2020). The advantages of this type of financing have been confirmed by a large number of authors (Audretsch & Lehmann, 2004; Bottazzi & Rin, 2002; Davila, Foster, & Gupta, 2003; Milenković & Jakšić, 2018; Vismara, 2014), and the growth of VC investments in SMEs in Serbia would certainly contribute positively to the growth of the SME industry. Although in the last few years the investment in Serbia was at a lower level compared to the average in the whole CEE region, the most similar investment model was the Hungarian model (Milenković, Kalaš, & Andrašić, 2020), which Serbia should follow in order to achieve higher levels of investment.

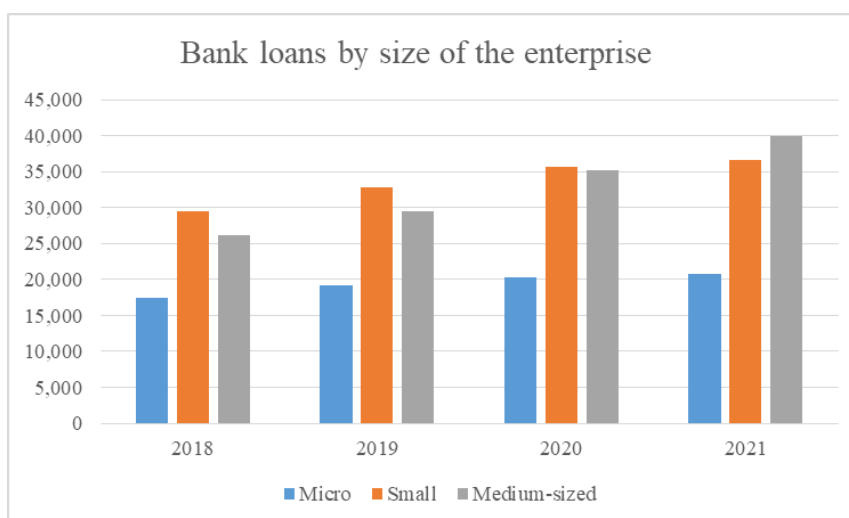
The aim of this paper is to analyze the structure of the loans in the banking sector in order to extract the participation of SME financing in it. In the second stage we compare the data with the amount of foreign VC fund investment in Serbian SMEs. Both analyses are for the period from 2018 to 2021.

## DATA AND METHODOLOGY

In this paper we obtain the data from the data base of the National bank of Serbia for the analysis of the bank loans structure. For the purpose of the VC fund activity in Serbia, we use data retrieved from the annual report of the venture capital and private equity activity in the CEE region. We use the radar chart to compare the data set of banking loans to SMEs and the invested amount of the VC funds in Serbia.

## BANK LOANS TO SMES IN SERBIA

According to the data of the National bank of Serbia there is an increase in the amounts of bank loans given to micro, small and medium-sized enterprises. The data is given in euro currency converted on 24<sup>th</sup> of February 2023 using the middle exchange rate 117.3243.



*Figure 1: Total bank loans to micro, small and medium-sized enterprises in the period from 2018 to 2021*

As seen from the figure, loans to all types of enterprises has risen in the considered period of time. In the first three years the amount of the loans given to small enterprises is the highest and in the last year the loans given to medium-sized enterprises exceed the loans given to small enterprises.

The loans in foreign currencies and FX-indexed loans are almost three times higher than the loans given in dinar currency, which is shown on figure 2.

The loans indexed in foreign currency are dominant in the structure of the small and medium enterprises in Serbia. As seen the amount of these loans are increasing by all three categories of enterprises.



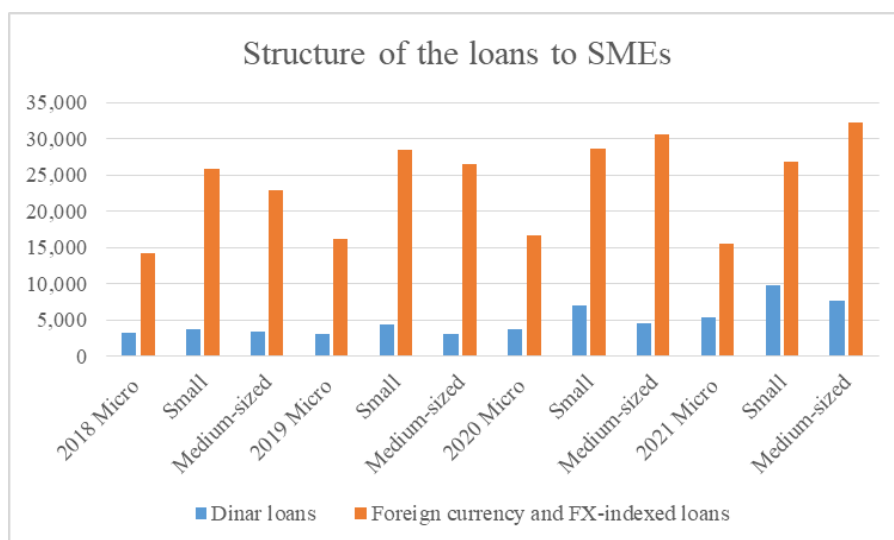


Figure 2: Domestic and foreign currency loans to SMEs

### VC FUND INVESTMENTS IN SERBIA

The VC and PE activity has increased in 2021 in comparison to 2020 in Serbia as well as in the CEE region. Considering the activity of VC and PE in the CEE region it is noticeable that the investment measured as percentage of GDP has increased from 0.108% to 0.228%. In previous years there was a concentration in investment led by few countries (Milenković et al., 2020), this trend is remaining also in 2021. First of these countries is Poland, than Czech Republic, Estonia, Slovenia and Hungary. In 2021 venture capital investments in the CEE region reached record amounts and number of companies with 659 million invested in 541 companies. The amounts invested in the CEE region are shown in the table below.

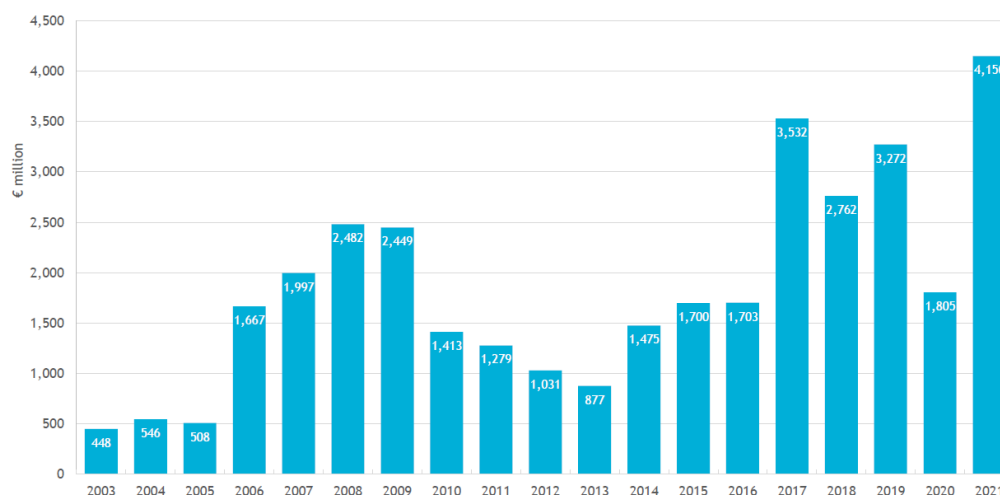


Figure 3: VC and PE investments in the CEE region from 2003 to 2021

In 2020, when the effects of the pandemic covid-19 were most visible, the investments of VC and PE declined because of the uncertainty of the course of the pandemic and its effects on business operations. In 2021 the VC and PE industry has fully recovered and gained higher levels than before the crisis.

The situation in Serbia regarding the investments was a bit different, as shown on the figure below. The data is given in millions of EUR.

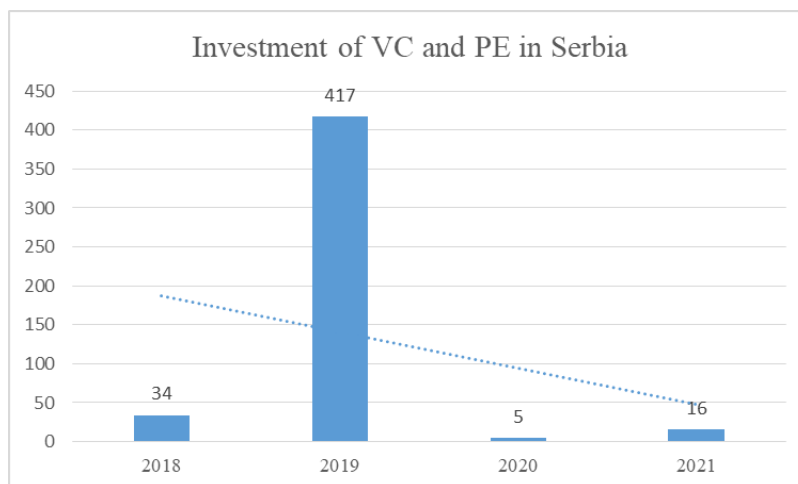


Figure 4: VC and PE investments in Serbia from 2018-2021

The average trend of the investment in Serbia has shown a decrease in the investment activity. The 2019 year is different and can be isolated because of the high levels of investments in buyouts. The structure of the investment in each considered year is shown on the following figure.

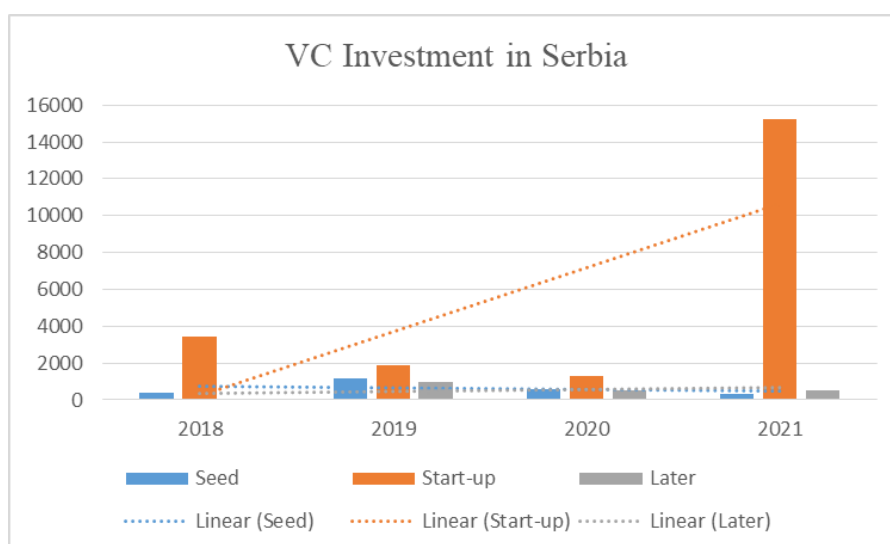


Figure 5: VC investment in Serbia from 2018 to 2021

Venture capital investment according to stages of investment has shown that the greatest amounts of investment were made in the start-up stage, but there was a decline from 2018 till 2021 when the investment has grown almost five times compared to 2018 when the second highest amount of investments was noted.

### COMPARATIVE ANALYSES OF BANK LOANS VS. VC FUND ACTIVITY

Comparative analyses of the data sets of the bank loans to SMEs and the VC invested in Serbia shows that the bank loans are remaining the main source of finance in Serbia. The radar chart shows the data for the period from 2018 to 2021.



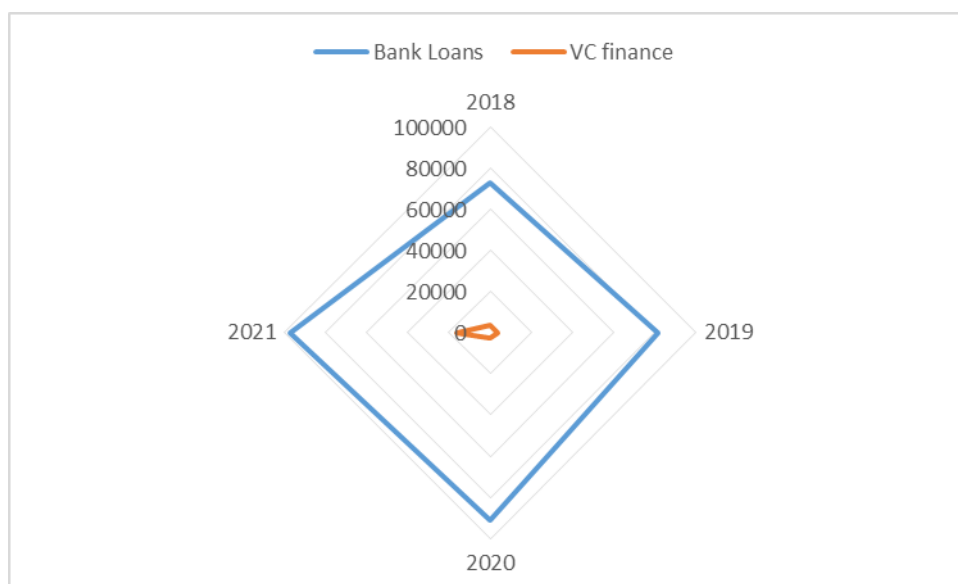


Figure 6: Comparison of the bank loans to SMEs and VC fund investments

As seen on the figure above the amount of the loans is exceeding the amounts invested by the VC funds. The VC activity of the foreign VC fund remains on a very low level in Serbia. Aldo in the last considered year there was a significant investment which is shown on the figure below.

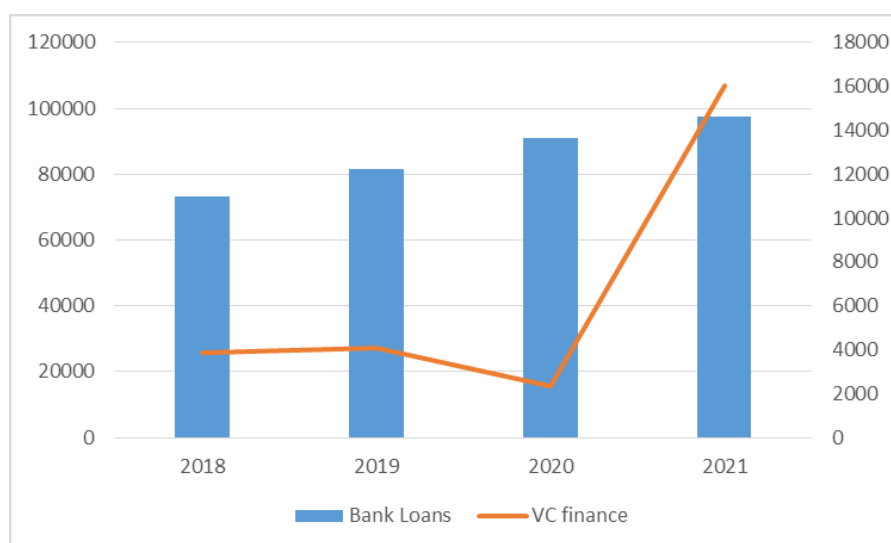


Figure 7: Trend of the bank loans to SMEs and VC fund investments by years

Probably as a result of the Covid-19 pandemic the overall VC activity in 2020 declined in comparison to 2019, but in 2021 there is an eight time higher amount of the investment noted, so there was an increase of over 600 percentage of the investment.

## CONCLUSION

Analyzing the finance sources of the domicile SMEs in the period from 2018 to 2021, it is obvious that bank loans are dominant. The trend line shows that there was a significant increase in the VC activity in the last considered year, which gives a good outlook to the VC investments in the coming years.

In the last two years two domestic VC fund has been founded in Sebia and their activity is expected to contribute the investments in SME and start-ups in the coming years. The regulation of the legal framework by passing and applying the law of alternative investment funds, opened up the possibility for the establishment and growth of domicile funds of venture capital and private equity.

## REFERENCES

- Audretsch, D. B., & Lehmann, E. E. (2004). Financing high-tech growth: the role of banks and venture capitalists. *Schmalenbach Business Review*, 56(4), 340 – 357. Retrieved from <https://link.springer.com/content/pdf/10.1007%2F03396700.pdf>
- Bottazzi, L., & Rin, M. Da. (2002). Venture capital in Europe and the financing of innovative companies. In *Economic Policy* (Vol. 17, pp. 229–269). <https://doi.org/10.1111/1468-0327.00088>
- Davila, A., Foster, G., & Gupta, M. (2003). Venture capital financing and the growth of startup firms. *Journal of Business Venturing*, 18(6), 689–708. [https://doi.org/10.1016/S0883-9026\(02\)00127-1](https://doi.org/10.1016/S0883-9026(02)00127-1)
- Milenković, N., & Jakšić, D. (2018). Finansiranje preduzeća u oblasti visoke tehnologije. In *Proceeding of the XXIII International Scientific Symposium and Decision Support Systems in Strategic Management*. Subotica.
- Milenković, N., & Kalaš, B. (2020). Banke versus fondovi rizičnog i privatnog kapitala – supstitut ili komplement? *Kultura Polisa*, XVII(41), 653–663.
- Milenković, N., Kalaš, B., & Andrašić, J. (2020). Venture Capital and Private Equity Investment in the CEE Region. In *X International Symposium Engineering Management and Competitiveness 2020 (EMC 2020) 19-20th June, Zrenjanin, Serbia* (pp. 181–186).
- Milenković, N., Mirović, V., & Andrašić, J. (2018). Available Sources of SME Financing in Serbia. In *Proceeding of the VIII International Symposium Engineering Management and Competitiveness* (pp. 232–237). Zrenjanin.
- Vismara, S. (2014). Patents, R&D investments and post-IPO strategies. *Review of Managerial Science*, 8(3), 419–435. <https://doi.org/10.1007/s11846-013-0113-5>
- Zakon o alternativnim investicionim fondovima, Pub. L. No. “Sl. glasnik RS,” br. 73/2019 (2019).

## **CYBER INSURANCE MARKET: STATE AND FUTURE DEVELOPMENT DIRECTIONS**

**Miloš Pjanić**

University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia

E-mail: [milospjanic@ef.uns.ac.rs](mailto:milospjanic@ef.uns.ac.rs)

**Mirela Mitrašević**

University of East Sarajevo, Faculty of Business Economics Bijeljina, Bosnia and Herzegovina

**Stevan Luković**

University of Kragujevac, Faculty of Economics, Kragujevac, Republic of Serbia

### **ABSTRACT**

Business entities as well as natural persons are largely aware of the dangers they may face and the necessity of managing the numerous risks they are exposed to in their business. Cyber insurance is one of the most important options available to them. Cyber insurance aims to establish the security and protection of business entities and natural persons from the various dangers they face and protection from these dangers, as well as the ability to recover as soon as possible if these dangers occur. The cyber insurance market has developed to provide financial protection for digital security and privacy risks that have arisen as a result of increased reliance on digital technologies. Cyber insurance has evolved with the emergence of new risks and the application of exclusions in traditional property, liability and some specialty policies. Early on, the focus of the cyber insurance market was on providing errors and omissions coverage for technology-based service companies. The aim of the work is the analysis of the cyber insurance market, from the aspect of the current situation, as well as the future directions of the development of cyber insurance. The first part of the paper analyzes the size of the global cyber insurance market, and the second part of the paper analyzes the adoption of cyber insurance by country, as well as potential risks within cyber insurance. The third part of the paper indicates the state of cyber insurance in the Republic of Serbia.

**Keywords:** Cyber insurance, premium, market, risks.

### **INTRODUCTION**

After the events of the last few years, the insurance industry has shown the characteristics of readiness for unexpected developments and major changes. In particular, insurers have shown that they can undertake large-scale change at a faster pace than expected within the industry. Additionally, imposed conditions in the macroeconomic environment and structural challenges expressed through low interest rates and rising inflation have encouraged the insurance industry to move towards the transformation of traditional business models. At the same time, the accelerated digitization and development of new technologies has additionally influenced the changes in strategies applied within the insurance industry.

On the other hand, all these factors have shown why the insurance industry is essential by highlighting the importance of insurance in the conditions before and after the COVID-19 pandemic. Decisions and actions taken by insurers have a significant impact on the future course of industry development as well as further development in the post-pandemic period. On the other hand, the COVID-19 pandemic and the accompanying effects on the adoption of technology as the primary business model and the transformation expressed through working from home accelerated the processes of transition to digitized business models. However, the digitization of business has paved the way for cyber security challenges combined with independent or related changes in the business environment of the insurance industry.

Today, the insurance industry is also developing in the domain of cyber attack insurance products with the inclusion of cyber risks as a result of the exposure due to the transition to modern ways of doing business for companies around the world (Gatzer & Reichel, 2022).

However, regardless of the numerous challenges facing the insurance industry, annual growth of around 5% is expected over the next ten years (life insurance with a rate of 4.9%, P&C with a growth rate of 4.6%). Such growth corresponds to an increase of 67% or additional premium income of 2.8 billion euros by 2032, of which slightly less than 1.8 billion euros will be generated by the life segment (69%) and just over 1 billion euros from foreign companies segment (63%) (Alianz, 2022).

## **METHODOLOGY RESEARCH**

Secondary research was applied in the paper. From the basic methods of knowledge, and for theoretical considerations of the research subject, analytical-synthetic, inductive-deductive, abstraction and generalization methods were used. Of the scientific methods, the method of content analysis was used. Data from available professional literature, scientific and professional works, the Internet and other sources were also used.

## **CHARACTERISTICS OF GLOBAL CYBER INSURANCE MARKETS**

The cyber insurance market has evolved to provide financial protection for digital security and privacy risks that have arisen as a result of increased reliance on digital technologies. The development of cyber insurance is driven by the emergence of new risks and the application of exclusions in traditional property, liability and some special policies such as crime, kidnapping and ransom (OECD, 2017). Although the cyber insurance market is generally considered to be still developing, specific cyber insurance products have been available for the past twenty years in some countries (for example, the USA). Early on, the focus of the cyber insurance market was on providing errors and omissions coverage for technology-based service companies.

However, the growing presence of cyber incidents has led to the development of stand-alone cyber insurance products to address risks excluded from traditional policies. Cyber insurance can be offered as standalone products specifically designed to cover cyber perils or as additional coverage to traditional lines of business, known as cyber endorsements (EIOPA, 2019). However, the growing presence of cyber incidents has led to the development of stand-alone cyber insurance products to address risks excluded from traditional policies.

Cyber insurance can be offered as standalone products specifically designed to cover cyber perils or as additional coverage to traditional lines of business, known as cyber endorsements (Glušac, 2021). So, the global cyber insurance market is relatively immature and there are numerous signs that support this assumption:

- Lack of standardization of the insurance offer (independent policies in relation to package policies),
- Focusing on standard cyber risk events that are easier to assess,
- Vulnerability of new entrants to major cyber events due to imperfect models risk pricing,
- Lack of historical experience with losses,
- Demand is not sufficiently informed about the benefits of cyber insurance (Strupczewski, 2018).

The cyber insurance market is in a critical state for both insurance carriers and policyholders. Given that the last few years have seen an increase in competition between cyber insurance carriers resulting in increased capacity and expanded coverage terms in 2020 and 2021 with a final reflection on the rapid growth of the global cyber insurance market. What's more, across industry lines, cyber attacks have increased in both cost and frequency, driving up both cyber liability claims and subsequent underwriting losses.

The market for stand-alone cyber insurance, or dedicated affirmative cover, has grown rapidly in recent years with premiums more than tripling since 2015 to reach around \$7.5 billion in 2020. The global cyber insurance market is forecast to grow from 7, \$60 billion in 2021 to \$36.85 billion in 2028 (Darren & Noordhoek, 2022).

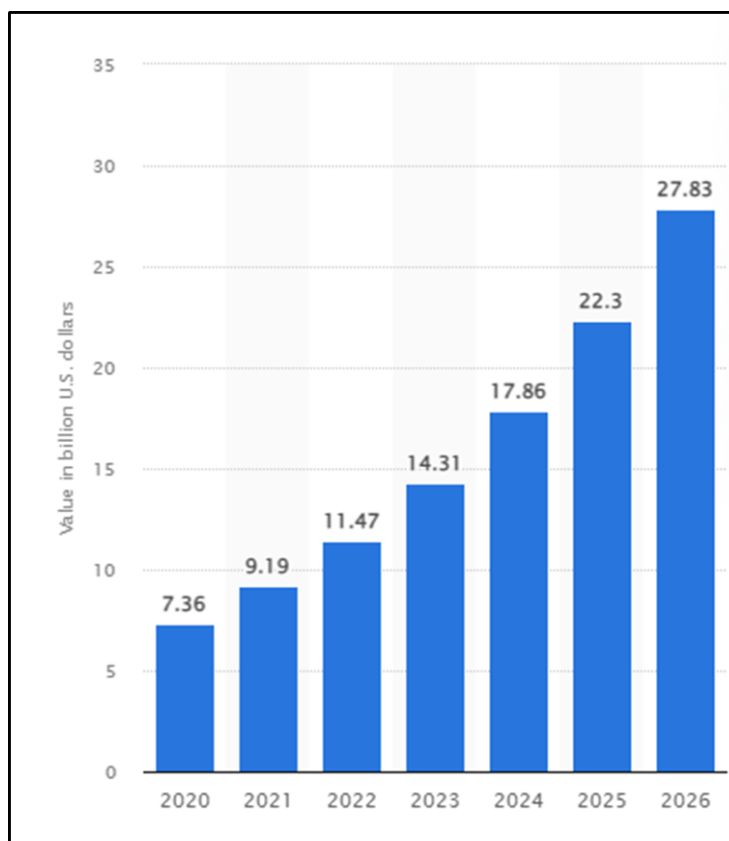


Figure 1: Global Cyber Insurance Market Size 2020 Forecast 2021 to 2026 (US\$ Billion)

Source: (Market and market, 2022).

## CYBER INSURANCE BY COUNTRY

Annual cyber premium increases averaged around 15% between January 2020 and June 2021. However, the rise in premium rates may not have much of an impact on solving the challenges of the cyber market in 2022. One of the challenges for cyber insurance underwriters is the lack of historical data. Moreover, insurers face the inability to measure and model current risks.

On the other hand, the concern rests on whether the insurance industry will be able to keep up with the new cyber exposures that may arise due to the rapid development of the Internet of Things. Such advances open up new opportunities for cyber attacks to be assessed, detected, mitigated and secured. Although new opportunities are opening up for cyber insurers, additional challenges are being generated that have no historical data to frame them. At the same time, the pandemic has served to further highlight the challenge of lacking data or reliable predictive models when considering the value and viability of cyber insurance. (Farley, 2022).

Cyber insurers are also concerned about underwriting and pricing cyber exposure given their lack of historical data. Thus, cyber insurance carriers face difficulties in choosing which policies to insure and which premiums to offer. For example, cyber security risks follow rules similar to a supply and demand market, so one useful approach would involve joint liability between cyber insurers and insureds. There are cybersecurity tools that can continuously monitor an organization's external attack surface and assess its effectiveness.

And for cyber insurance to remain a viable business, insurers and their customers need a new pool of capital to help address the risk of cyber events that affect multiple companies and cost insurers hundreds of millions of dollars. That new pool of capital could help insurers better manage their risk and give them

more room to develop cyber insurance products (Peters, Malavasi, Shevchenko, Sofronov, Trück, & Jang, 2022).

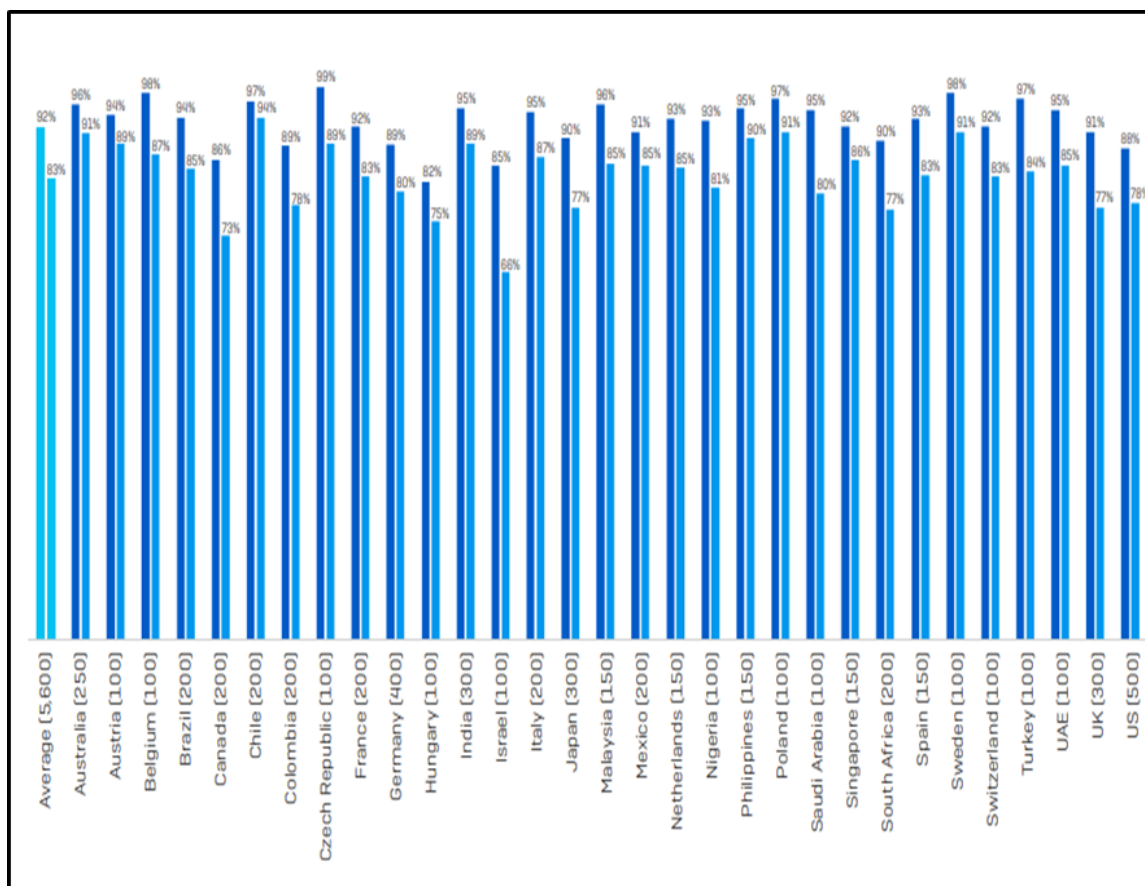


Figure 2: Cyber insurance adoption by country  
Source: (Darren & Noordhoek, 2022).

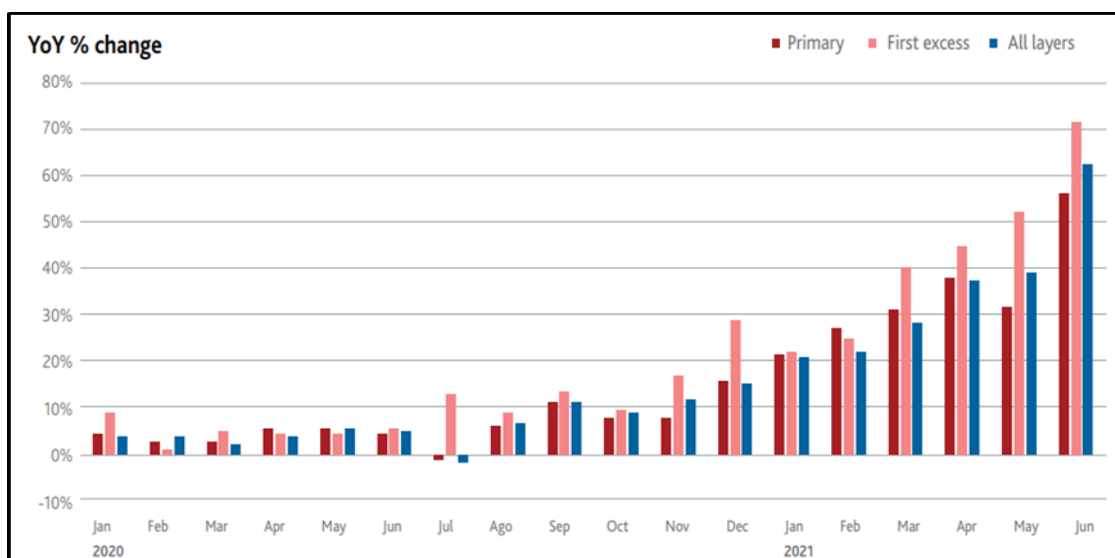


Figure 3: Cyber Insurance Premium Rate View for Coverage Layer (2020-2021)  
Source: (Darren & Noordhoek, 2022).

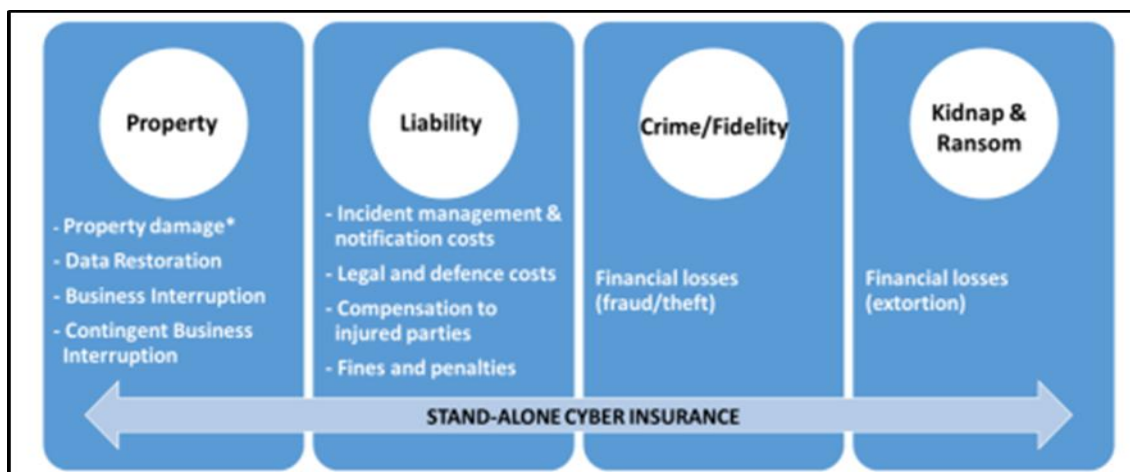


Figure 4: Losses and expenses covered by cyber insurance policies

Source: (IAIS, 2020)

Cyber insurers are also concerned about underwriting and pricing cyber exposure given their lack of historical data. Thus, cyber insurance carriers face difficulties in choosing which policies to insure and which premiums to offer. For example, cyber security risks follow rules similar to a supply and demand market, so one useful approach would involve joint liability between cyber insurers and insureds. There are cybersecurity tools that can continuously monitor an organization's external attack surface and assess its effectiveness.

And for cyber insurance to remain a viable business, insurers and their customers need a new pool of capital to help address the risk of cyber events that hit multiple companies and cost insurers hundreds of millions of dollars. That new pool of capital could help insurers better manage their risk and give them more room to develop cyber insurance products (Peters, Malavasi, Shevchenko, Sofronov, Trück, & Jang, 2022).

### CYBER INSURANCE IN THE REPUBLIC OF SERBIA

This type of insurance has just taken root in Serbia and was among the first to be offered by the company Wiener Stadtische osiguranje. As a result of the pandemic, many companies and enterprises have switched to working from home: such a setting has provided new opportunities for cybercriminals to enter corporate systems and access business data, counting on the curiosity of individuals who are offered content such as find out what is the cure for the corona virus.

Although companies have relatively quickly organized and adapted to the shift to working from home, greater exposure to cyber risks has been found due to these changes, but the main ways to cause cyber incidents have remained unchanged - emails with malicious attachments or links to malicious websites.

By opening infected links or attachments, access to company data is enabled, i.e. theft, misuse or alteration of data. A cyber risk insurance policy will provide coverage in these cases by reimbursing the cost of hiring an IT professional. These costs are mainly related to determining the extent of damage in terms of the type and number of compromised or lost data, its limitation and data recovery, removal of malicious code or viruses, and the like.

The European Union noted that the Republic of Serbia signed the Convention on High-Tech Crime (made in Budapest in 2009) and called on Serbia to further harmonize its legislation with Directive 2013/40/EU on attacks on information systems. The Ministry of Internal Affairs is responsible for the development of the aforementioned strategic document in cooperation with other state institutions.

The Convention on High-Technological Crime is designed to prevent acts directed against the integrity, confidentiality and availability of computer systems, networks and data, and therefore to prevent the misuse of those systems, networks and data by initiating criminal measures for such actions as is described in the Convention and in which penalties will be applied for the effective fight against criminal offences, and in this way the detection, investigation and prosecution of committed criminal offenses will be facilitated at the domestic and international level and will enable to ensure the conditions for a

fast and reliable international cooperation. In accordance with the Convention, the Republic of Serbia has designated two contact points of the 24/7 network that enable immediate response and data exchange in high-tech crime cases among all signatory states (Glušac, 2021).

## CONCLUSION

Developments in cyber insurance can result in improved cyber risk management for policyholders. Insurers and intermediaries are key sources of advice on good cyber security practices, but they also influence policyholders to improve their cyber security practices as part of the underwriting process. In addition to providing cyber insurance, cyber insurers offer a variety of risk mitigation and crisis response services to policyholders from cybersecurity scanning and testing services to incident response.

For example, insurance questionnaires have become more targeted and many in the industry are using specific questionnaires with a focus on controls aimed at ensuring effective prevention or mitigation of incidents becoming claims, such as multi-factor authentication and well-placed separate backups. Other insurance tactics include tightening terms, strengthening exclusions and coverage limits.

The growth of the cyber insurance market does not necessarily mean a business environment that is safer from cyber attacks. So reinsurers are supportive of insurers to keep the cyber insurance market in place, but not enough to help it grow. Reinsurance providers that help prevent and mitigate the effects of cyber incidents are increasingly important and have become permanent participants in today's cyber market.

Buyers of cyber insurance will need to take advantage of such services, while providers that can provide efficient and cost-effective solutions for the needs of specific risk profiles will continue to emerge as a necessity.

## REFERENCES

- Alianz. (2022). A decisive decade: Alianz Global Insurance Report 2022. Alianz.  
[https://www.allianz.com/en/economic\\_research/publications/specials\\_fmo/allianz-global-insurance-report-2022.html](https://www.allianz.com/en/economic_research/publications/specials_fmo/allianz-global-insurance-report-2022.html)
- Darren, L., & Noordhoek, D. (2022, January). *Ransomware: An insurance market perspective*. Geneva: The Geneva Association. IFTRIP: <https://www.genevaassociation.org/research-topics/cyber/ransomware-report>
- EIOPA. (2019). *Cyber Risk for Insurers - Challenges and Opportunities*. Luxemburg: EIOPA.  
[https://www.eiopa.europa.eu/publications/cyber-risk-insurers-challenges-and-opportunities\\_en](https://www.eiopa.europa.eu/publications/cyber-risk-insurers-challenges-and-opportunities_en)
- Farley, J. (2022). *The Cyber Insurance Market Struggles With Continued Hardening Market Conditions*. Gallagher.
- Gatzer, N., & Reichel, P. (2022). *Sustainable investing in the US and European insurance industry: a text mining analysis*. The Geneva Papers on Risk and Insurance - Issues and Practice, Springer.
- Glušac, D. (2021). Sajber osiguranje od odgovornosti, Usluge i vladavina prava, 299-306.
- IAIS. (2020). *Cyber Risk Underwriting: Identified Challenges and Supervisory Considerations for Sustainable Market Development*. International Association of Insurance Supervisors.  
<https://www.iaisweb.org/activities-topics/cyber-risk/>
- Market and market- Market research Reports (2022). [https://www.marketsandmarkets.com/Market-Reports/cyber-insurance-market-47709373.html?gclid=Cj0KCQjw6\\_CYBhDjARIsABnuSzpcgYf8iCIUCigpnje3KGyRgz-0yMUroH2w0XbtqipYKqylAhCwM7QaApGpEALw\\_wcB](https://www.marketsandmarkets.com/Market-Reports/cyber-insurance-market-47709373.html?gclid=Cj0KCQjw6_CYBhDjARIsABnuSzpcgYf8iCIUCigpnje3KGyRgz-0yMUroH2w0XbtqipYKqylAhCwM7QaApGpEALw_wcB)
- OECD. (2017). Препузето July 6, 2022 ca OECD.org: <https://www.oecd.org/publications/enhancing-the-role-of-insurance-in-cyber-risk-management-9789264282148-en.htm>
- Peters, G. W., Malavasi, M., Shevchenko, P. V., Sofronov, G., Trück, S., & Jang, J. (2022). Cyber Loss Model Risk Translates To Premium Mispricing And Risk Sensitivity. <https://arxiv.org/pdf/2202.10588.pdf>
- Strupczewski, G. (2018). Current State of The Cyber Insurance Market. *10th Economics & Finance Conference*, Rome pp. 491-501.



## **THE IMPACT OF COVID-19 ON THE PRODUCTIVITY OF RUSSIAN COMPANIES**

**Aleksandra Zhemkova**

Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia

E-mail: [alexanikitina@yandex.ru](mailto:alexanikitina@yandex.ru)

### **ABSTRACT**

The paper presents a quantitative assessment of the impact of Covid-19 and measures of government support on the productivity of Russian firms. We use financial reporting data from Spark. Our key indicators of firms' productivity include total factor productivity (TFP), labor productivity (measured per unit labor cost and per worker), and covariance between firm size and productivity. We distinguish the net effect on productivity of Covid-19 spread, restrictive measures and firm's belonging to most affected industries. Our estimates show that the effect of the pandemic was negative not for all sectors: for example, it was positive for trade, finance, information and communication sector. By decomposing productivity growth for the period of 2020-2021, we show that major decline in TFP in 2020 was driven mostly by sharp decrease in within-firm productivity. This effect was only partly compensated by a positive between-firm effect driven by reallocation of resources to the most productive firms and sectors. Finally, we assess the effectiveness of government support provided to SMEs during Covid-19 and find that, on average, initially more productive firms received support more often, but the overall effect of support was relatively small.

**Keywords:** Firm, Productivity, TFP, Covid-19, Government support

### **INTRODUCTION**

COVID-19 has caused a global economic shock, resulting in a significant decline in GDP of many countries, including Russia. This shock affected almost all firms in all industries: those industries that were not directly affected were later hit by declining household incomes and reduced demand, supply chain disruptions, additional costs, uncertainty. At the same time, government support aimed at preserving the economy, on the one hand, helped companies survive in the short term, but could lead to distorting allocative effects in the long term. Thus, the spread of Covid-19, imposed lockdowns and government support measures could have important implications for aggregate productivity, which are important to assess to guarantee a balanced and sustainable economic recovery.

### **THEORY**

Our study was based on three blocks of economic literature: (1) using microdata for country-level productivity analysis; (2) assessing the impact of Covid-19 and other shocks on the economy and firms; (3) evaluation of the impact of government support on firms' performance.

The first block of literature relates to the analysis and identification of the relationship between the performance of firms at the micro level and aggregate productivity indicators. Baily et al. (1992) developed a decomposition of productivity changes into within-firm, between-firm, entry and exit effects, which is widely used in the productivity literature. Olley, Pakes (1996), Levinsohn, Petrin (2003), Akerberg et al. (2015) proposed methodologies for estimating firms' TFP at the micro-level. Bartelsman et al. (2013) showed that differences in covariance between size and productivity of firms determine differences in aggregate productivity across countries.

The literature on assessing the economic impact of Covid-19 is growing and includes a wide range of research. The most complete reviews of the literature on the topic are presented in Brodeur et al. (2021), Criscuolo (2021). Research devoted to assessing various channels through which the pandemic impacts firms and industries at the country or other level includes Bartik et al. (2020), Wang et al. (2020), Bloom et al. (2021), Andrews et al. (2021), Cros et al. (2021), Barrero et al. (2021), and many others.

European Commission (2013) provides a comprehensive review of the methodologies used to assess the effectiveness of government support measures. One of the most relevant approaches at firms' level is counterfactual impact evaluation method. The approach answers the question of whether the observed results of the beneficiaries are due to the effect of the policy or would they have been the same anyway. The government's role in supporting firms during Covid-19 using this method is analyzed, for example, in Bennedsen et al. (2020), Bighelli et al. (2021), Lalinsky, Pal (2021).

## METHODS

Using combined data from SPARK database, Yandex datalends and open data on government support, we conducted a quantitative assessment of the impact of the Covid-19 shock on the productivity of Russian firms. We considered three key indicators of firms' productivity: total factor productivity (TFP) of firms, labor productivity (LP) measured per unit labor cost and per worker, and the covariance between firm size and productivity, all from 2019 to 2021. TFP was calculated as the residuals of the estimated at the two-digit NACE code production function by applying Akerberg et al. (2015) procedure. Labor productivity was calculated by dividing the firm's value added by its labor costs or number of workers. The covariance between firm size and productivity is given by the Olley-Pakes productivity decomposition formula and reflects the extent to which firms with higher productivity hold more market share.

The evaluation methodology included several stages. First, we used Baily et al. (1992) decomposition of productivity changes into within-firm, between-firm, entry and exit effects:

$$\begin{aligned} \Delta \ln TFP_t &= \sum_{i \in Surv} \theta_{i,t-\tau} \Delta \ln TFP_{it} && \text{Within-firms productivity change} && 1 \\ &+ \sum_{i \in Surv} (\theta_{it} - \theta_{i,t-\tau}) \ln TFP_{it} && + \text{reallocation between survived firms} && 2 \\ &+ \sum_{i \in \Delta Entry} \theta_{it} \ln TFP_{it} && + \text{reallocation to new firms} && 3 \\ &+ \sum_{i \in \Delta Exit} \theta_{i,t-\tau} \ln TFP_{i,t-\tau} && + \text{reallocation from exit firms} && 4 \end{aligned}$$

where  $TFP_{it}$  – is total factor productivity of firm  $i$  at the period  $t$ ,  $\theta_{it}$  – market share of firm  $i$ . We then applied following regression to estimate the net impact of Covid-19 and restrictive measures on productivity:

$$Y_{it} = \alpha + \beta COVID^\beta + \gamma MACRO^\gamma + \delta X_{it}^\delta + \varepsilon, \quad (1)$$

where  $Y_{it}$  – is one of productivity indicator of firm  $i$  at the period  $t$ ,  $COVID$  – is a vector of variables characterizing the impact of the pandemic: number of cases and self-isolation index,  $MACRO$  – is a vector of macro variables: interest rate, exchange rate, economic activity, industry concentration index,  $X_{it}$  – is the vector of firm's characteristics including firm's industry, size, ownership structure, age, and region.

At the next stage we assessed the impact of government support measures on the productivity of firms. We considered four groups of support measures provided to small and medium-sized enterprises (SMEs): financial ( $C_i$ ), innovation ( $I_i$ ), fiscal ( $F_i$ ) and other support ( $O_i$ ). To this purpose we applied a counterfactual impact evaluation approach. First, we selected beneficiaries and similar non-beneficiaries by using the propensity score method: we calculated firm's probability receiving any of the support measures depending on its characteristics before support: productivity, age, size, ownership structure, industry, and region of firm. Then we evaluated the impact of support measures on the productivity of firms (*ceteris paribus*), using the difference-in-differences approach, by adding into equation (1) of two group of variables:

$$Y_{iT} = \alpha + \beta_0 T + (\beta_0^C C_i + \beta_0^I I_i + \beta_0^F F_i + \beta_0^O O_i) + T(\beta_1^C C_i + \beta_1^I I_i + \beta_1^F F_i + \beta_1^O O_i) + \gamma COVID^B + \gamma MACRO^Y + \delta X_i^S + \varepsilon \quad (2)$$

where  $T$  is the indicator for the period (before receiving support and after),  $C_i$ ,  $I_i$ ,  $F_i$  and  $O_i$  – dummy on receiving corresponding type of support,  $\beta_0$  measure differences in the performance of firms that received and did not receive support,  $\beta_1$  measure the effect of support on the results of firms receiving it (net effect of support).

## FINDINGS AND DISCUSSION

The results of the analysis showed that with an increase in the number of Covid-19 cases in the firm's region by 100%, the productivity of firms decreased by an average of 1.6-2%; with the strengthening of restrictive measures – or an increase in the level of self-isolation in the region by 100%, productivity decreased by an average of 5.9-7.8%. The biggest effect was for labor productivity per worker: during the pandemic, many firms retained employees but were able to cut wage payments, while revenue and value added were falling. This led to a serious decrease in the return on the labor of the average worker, and to a much smaller decrease in the return on the wages. The pandemic also weakened the relationship between firm size and productivity: an increase in the number of diseases in the region reduced the covariance between firm size and productivity by 1.8%; an increase in the level of self-isolation - by 3.2-4.3%.

Table 1: Estimated effect of Covid-19 on firms' productivity

	TFP	Labor productivity (LP) per 1 labor cost	Labor productivity (LP) per worker	Covariance between firm size and TFP	Covariance between firm size and LP per unit labor cost
Number of COVID-19 cases	-0.019*** (0.003)	-0.016*** (0.003)	-0.020*** (0.003)	-0.018*** (0.006)	-0.017*** (0.005)
Level of self-isolation	-0.073*** (0.028)	-0.059*** (0.028)	-0.078** (0.032)	-0.032*** (0.009)	-0.043*** (0.008)

The table presents the results of the panel regression with random effects with standard errors in brackets. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ \*\*\*.

The spread of the pandemic had a negative impact on the productivity of not all sectors of the economy. For example, a 100% increase in the number of diseases in the region led to an increase in the productivity of firms in the trade sector by 1.5-3.2% - this may be due to an increase in the share of online services and trade. A positive effect - for the same reasons - was also found for the information and communication sector (on average, 3.9-4.3%); financial and insurance activities (8.5%), the healthcare sector (4.9-6.9%). However, the impact of the increase in Covid-19 cases was negative for most sectors of the economy. No significant impact of the increase in cases on productivity was found only in the sectors of electricity and water supply, construction, professional and scientific activities, education, and other services.

Table 2: Sectoral results

	Number of COVID-19 cases			Level of self-isolation		
	TFP	LP per 1 labor cost	LP per worker	TFP	LP per 1 labor cost	LP per worker
Agriculture	-0.030*	-0.05***	-0.047**	0	0	0
Mining	-0.057*	0	0	-0.052**	-0.048**	-0.017
Manufacturing	-0.05***	-0.022**	-0.026**	-0.053**	-0.087**	-0.056**
Trade	0.032***	0.018**	0.015*	0.084**	0.180**	0.187**
Transportation and storage	-0.264**	-0.131**	-0.10***	-0.27***	-0.153*	-0.244**
Hotels and catering	-0.17***	-0.07***	-0.049**	-0.19***	-0.234*	-0.359*
Information	0.041***	0.039**	0.043***	0.083**	0.081**	0.082***
Finance	0.085**	-0.012	-0.016	0.212**	0.193*	0.184***
Real estate	0.003	-0.022**	-0.017*	-0.159**	-0.151*	-0.125**
Administration	-0.07***	-0.038**	-0.016	-0.198**	-0.17***	-0.271**
Public sector	0	0	0.021*	0	0	0
Education	0	0	0	-0.173**	0	0
Healthcare	0.056***	0.049***	0.069***	0.280***	0.215***	0.145*
Leisure and entertainment	-0.091**	-0.099**	-0.101*	-0.188**	-0.171**	-0.287**
Other	0	0	0	-0.11***	0	0

The table presents the results of the panel regression with random effects. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*.

### Decomposition of TFP change

Decomposition of the productivity dynamics of firms during the Covid-19 revealed a major decline in TFP in 2020, driven primarily by falling within-firm productivity. This effect was only partly compensated by a positive between-firm effect due to the reallocation of resources to the most productive firms and sectors. A negative within-firm effect was observed in almost all sectors, despite financial and insurance activities. Due to the high and positive between-firm effect, the cumulative change in TFP was positive in the information and communication and financial industries - the most focused on remote delivery of services, and therefore, increased productivity during the pandemic. High between-firm effects were also observed in real estate, construction, hotels and restaurants (due to the reallocation of resources to firms that expanded food delivery services), culture, leisure and education. An additional drop in TFP was provided by the negative exit effect.

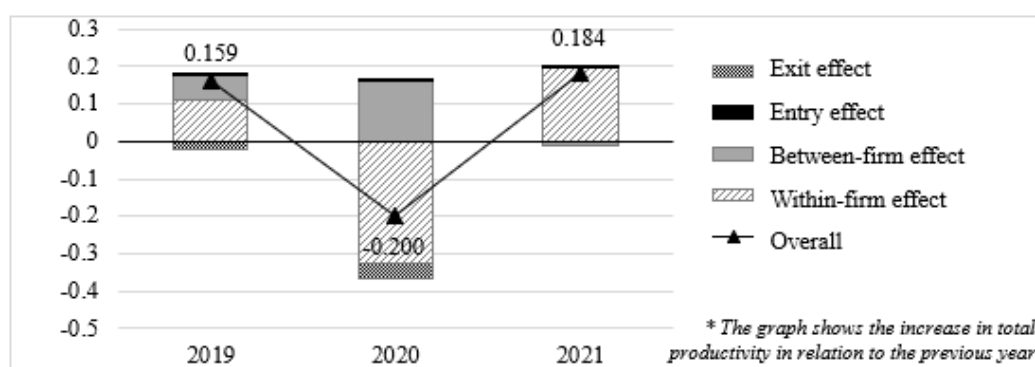


Figure 1: The results of decomposition

In 2021, TFP of firms showed an increase that was even higher than in the pre-pandemic 2019: growth was observed in almost all industries, especially in construction, manufacturing, electricity supply, transport, finance, healthcare, which stopped directing all resources to fight against the pandemic. Hotels and catering achieved notable productivity gains. The between-firm effect, on the contrary, turned out to be negative in 2021, which may be due to the restoration of the activities of less productive firms that had previously suspended work. However, this effect was quantitatively small in comparison with the within-firm effect.

### Effectiveness of government support

We also assessed the effectiveness of government support provided to SMEs. We found that, on average, initially more productive firms received support more often - so the distorting effect of support, apparently, was absent. The results at the first stage showed that, on average more productive firms were 4.8% more likely to receive support, as well as young firms, micro-enterprises - 41% more likely, small ones - 15% more likely; state-owned enterprises also received support more often.

The results at the second stage showed that much of the government support offered during Covid-19 had a positive impact on firms' productivity. In particular, firms receiving fiscal support showed 20.9% better TFP dynamics than firms not receiving it, and 21.7% better labor productivity dynamics. Firms receiving support for innovation showed 69.8% better TFP dynamics and 51.1-58.3% better labor productivity dynamics. The effect of subsidies and other financial support was lower and ambiguous – it was associated with a growth of recipients' TFP and with a simultaneous decrease in labor productivity per worker. The possible explanation is that some of this support was aimed at maintaining employment, which, with the decrease in revenue, led to a decrease in labor productivity. For other support we found no significant productivity effects.

*Table 3: The net effect of government support measures provided to SMEs*

	logTFP	logLP (per 1 labor cost)	logLP (per worker)
Fiscal support ( $F_j$ )	0.209* (0.106)	0.149 (0.122)	0.217* (0.102)
Financial support ( $C_j$ )	0.091* (0.048)	0.030 (0.018)	-0.081** (0.032)
Support for innovation ( $I_j$ )	0.698*** (0.117)	0.583*** (0.233)	0.511** (0.227)
Other support ( $O_j$ )	-0.285 (0.261)	-0.222 (0.256)	-0.306 (0.202)

### CONCLUSIONS AND IMPLICATIONS

The key difference between the Covid-19 and other crises was that it hit industries and companies within industries heterogeneously. The first year of the pandemic resulted in a significant, although short-termed decline in TFP and labor productivity in most industries, mainly due to the effect of falling within-firm productivity. Government support has been a critical economic policy response to the Covid-19 crisis. Without a quick and strong reaction, the recession could have been much more severe and longer than it was. As part of our analysis, we showed that, on average, government support (at least support for SMEs) went to more productive and growing firms, not to “zombie” firms, as one might assume. Such support should not lead to distorting effects and reduced allocative efficiency.

Despite the effect of government support was relatively small, it still had an impact on curbing the fall in aggregate productivity in 2020. Particularly strong was the effect of fiscal support and support for innovation, which contributed to the improvement of technologies within firms and the strongest productivity growth. Financial support measures (direct subsidies and grants), which implementation and effectiveness are much more difficult to assess, showed lower efficiency.

The obtained results allow us to draw important implications for economic policy. As the adverse effects of the pandemic fade over time, further support measures should be redirected from supporting survival and employment retention to promoting the growth of TFP, increasing the share of innovative, productive, and fast-growing companies to ensure long-term growth of the economy. This is especially important in the current geopolitical conditions, which require increased stimulation of innovative activity, the creation of own advanced technologies, the acceleration of the diffusion of

existing technologies, and the increase in the competitiveness of firms, including on new foreign markets.

## REFERENCES

- Akerberg, D. A., Caves, K., & Frazer, G. (2015). Identification properties of recent production function estimators. *Econometrica*, 83(6), 2411-2451
- Andrews, D., Charlton, A., & Moore, A. (2021). COVID-19, productivity and reallocation: Timely evidence from three OECD countries.
- Baily, M. N., Hulten, C., Campbell, D., Bresnahan, T., & Caves, R. E. (1992). Productivity dynamics in manufacturing plants. *Brookings papers on economic activity. Microeconomics*, 1992, 187-267
- Barrero, J. M., Bloom, N., Davis, S. J., & Meyer, B. H. (2021, May). COVID-19 is a persistent reallocation shock. In *AEA Papers and Proceedings* (Vol. 111, pp. 287-291). 2014 Broadway, Suite 305, Nashville, TN 37203: American Economic Association.
- Bartelsman, E., Haltiwanger, J., & Scarpetta, S. (2013). Cross-country differences in productivity: The role of allocation and selection. *American economic review*, 103(1), 305-334.
- Bartik, A. W., Cullen, Z. B., Glaeser, E. L., Luca, M., & Stanton, C. T. (2020). *What jobs are being done at home during the COVID-19 crisis? Evidence from firm-level surveys* (No. w27422). National Bureau of Economic Research.
- Bennedsen, M., Larsen, B., Schmutte, I., & Scur, D. (2020). *Preserving job matches during the COVID-19 pandemic: firm-level evidence on the role of government aid* (No. 588). GLO discussion paper.
- Bighelli, T., Lalinsky, T., & Providers, C. D. (2021). COVID-19 government support and productivity: Micro-based cross-country evidence. *CompNet Policy Brief*, (14).
- Bloom, N., Bunn, P., Mizen, P., Smietanka, P., & Thwaites, G. (2020). *The impact of Covid-19 on productivity* (No. w28233). National Bureau of Economic Research.
- Brodeur, A., Gray, D., Islam, A., & Bhuiyan, S. (2021). A literature review of the economics of COVID-19. *Journal of Economic Surveys*, 35(4), 1007-1044.
- Criscuolo, C. (2021). Productivity and business dynamics through the lens of COVID-19: the shock, risks and opportunities. *Beyond the pandemic: the future of monetary policy*, 117.
- Cros, M., Epaulard, A., & Martin, P. (2021). Will Schumpeter catch COVID-19? Evidence from France. *VoxEU.org*, 4.
- European Commission (2013). EVALSED: The resource for the evaluation of Socio-Economic Development – Evaluation guide
- Lalinsky, T., & Pál, R. (2021). *Efficiency and effectiveness of the COVID-19 government support: Evidence from firm-level data* (No. 2021/06). EIB Working Papers.
- Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The review of economic studies*, 70(2), 317-341.
- Olley, G. S., & Pakes, A. (1996). The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica*, 64(6), 1263–1297
- Wang, J., Yang, J., Iverson, B. C., & Kluender, R. (2020). Bankruptcy and the COVID-19 Crisis. *Available at SSRN 3690398*.



**Session E: IT MANAGEMENT**

---

**Papers (pp. 209-232):**

Dragana Sajfert, Jesa Kreiner, Srđan Barzut, Ana-Marija Vukić, Milica Jevremović THE EFFECT OF ELECTRONICS BUSINESS ON USER SATISFACTION	...209
Dragana Sajfert, Jesa Kreiner, Srđan Barzut, Svetlana Anđelić, Ana-Marija Vukić THE INFLUENCE OF INFORMATION TECHNOLOGIES ON ORGANIZATIONAL COMMITMENT IN THE ENVIRONMENT	...215
Dragana Sajfert, Srđan Barzut, Ana-Marija Vukić, Milica Jevremović THE IMPACT OF ELECTRONIC BUSINESS ON THE MOTIVATION AND PROFESIONAL CHALLENGES OF EMPLOYEES	...221
Nataša Đalić, Živko Erceg, Irena Đalić THE IMPORTANCE OF INFORMATION SYSTEMS FOR ACHIEVING THE QUALITY AND BUSINESS RESULTS OF THE COMPANY	...227





## **THE EFFECT OF ELECTRONICS BUSINESS ON USER SATISFACTION**

**Dragana Sajfert**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

E-mail: [sdragana77@hotmail.com](mailto:sdragana77@hotmail.com)

**Jesa Kreiner**

California State University, Fullerton, Los Angeles, California, USA

**Srdan Barzut**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

**Ana-Marija Vukić**

University of Novi Sad, Technical fakulty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia

**Milica Jevremović**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

### **ABSTRACT**

The impact of e-commerce on customer job satisfaction are very important concepts that organizations must understand in order to remain competitive and thus grow. It is a big task for organizations to know how to measure these constructs in order to better understand their employees and customers. The purpose of this research is to determine the impact of electronic business on customer job satisfaction. The emergence and development of electronic business is very close to the job satisfaction of employees and significantly affects the results of the success of the service industry. This paper investigates the impact of electronic business on the job satisfaction of employees and how much it affects their effectiveness. World literature from many countries has come up with results that investigated the importance of e-business and job satisfaction. The study is devoted to the interpretation of electronic business mechanisms, which are the essence and job satisfaction of employees in service industries. Participants were recruited from the Autonomous Province of Vojvodina and the City of Belgrade.

**Key words:** electronic business, job satisfaction, service activities

### **INTRODUCTION**

We are witnessing the rapid development of information technologies that influence the accelerated growth and development of electronic business, which is closely related to employee job satisfaction. The emergence of the Internet led to the expansion of e-business. Electronic business refers to a set of electronic services and the application of modern IT in all spheres of business: education, health, science and other areas of human activity (e-education, e-health, e-marketing, etc.). There are specific subtypes of electronic business: e-commerce, e-banking, e-administration. In using the benefits of electronic business, financial institutions, i.e. banks, have gone the furthest. That trend can be attributed to a large number of foreign banks that entered our market and transferred some practices from their home markets that have already proven to be good. Electronic banking services that are distributed through mobile, telephone and internet banking have become popular. Business partners communicate via the Internet, exchange electronic offers, electronically contract purchases, sign orders with an electronic signature, send electronic orders for the delivery of ordered goods, make electronic payments, report their customs procurement, electronic invoices. The development path of electronic business in Serbia should include, in addition to the development of electronic commerce, the development of electronic business whose subject is service. However, in the future we can expect more projects whose business orientation will be exclusively services in electronic business. Many users are still not satisfied with the work done by electronic business, and they are wrong to do so -

security can never be absolute, but currently the security of electronic money is at least equal to or greater than the security of real, paper money.

## **LITERATURE REVIEW**

Business that is based on modern digital technology and that enables business transactions to be carried out primarily electronically is known as "electronic business" (e-business). Radenkovic, et al. (2015) published the first textbook on Electronic Business at the University of Belgrade. Radenkovic, et al. (2015) presented in the textbook the detailed possibilities of applying modern information and communication technologies in different spheres of business, as well as the encouragement to find new and innovative ways of doing business. According to Petrović and Novović (2019), banking services are delivered through modern distribution channels, i.e. via the Internet. Radenković (2002) states that electronic business enables companies to connect internal and external processes, as well as to implement processes with suppliers and business partners in a more efficient way. According to Turban et al. (2008) e-business infrastructure is a set of platforms, networks, products, applications, data and business rules intended to manage internal and external processes. Infrastructure can be understood both as a set of technologies and as a set of platforms and services. Gupta et al. (2009) The term IT infrastructure includes all areas of information technology, excluding people, processes and documentation. European Commission, (1997) The European Union declared its policy in the field of electronic business in 1997 as the "European initiative in the field of electronic business." Porter (1985) defines strategy as the direction of an enterprise in order to achieve organizational goals. According to Porter (1985), the strategy is oriented towards the choice of the area of business activity and the allocation of the company's resources in order to create a competitive advantage in the future. McFarlan (1984) states that the World Bank has developed an e-strategy pyramid consisting of five components: policy, strategic priorities, implementation plan, actions, monitoring and follow-up. Rackoff N. (1985) states the approach to the formation of e-strategies can be realized through: Analysis of the value chain and activities in the company. The goal of this approach is to look at the interaction of activities and determine which of them can represent a source of competitive advantage. Osterwalder and Pigneur (2010) state that the creation of a business model is one of the key parts in the formation of the final e-business strategy.

A business model can be defined as a framework for creating value. It covers aspects of business such as organizational structure, practice, infrastructure, operational processes, business policy, clients, and finances. Doran (1981) states that long-term goals, the achievement of which has a great impact on the entire future business of the company. Due to the nature of Internet business, which is subject to frequent changes, goals must be: flexible, precisely defined, measurable, attainable, realistically achievable and time-bound. For a modern system of electronic business, it is necessary that a modern system of distance education follows it. According to Kuleto et al. (2011) consider that a modern distance education system also requires an appropriate software platform. Kuleto et al. (2011) state in their work and show the basic features of the software platform for the implementation of distance education, made by LINK Group d.o.o. from Belgrade, as well as experiences from its application in the realization of informal education in information technologies. Hall (2018) states in his research that it is becoming increasingly important for companies to start focusing on the main reason why their employees leave and consider how they can improve their processes for other employees. Hall (2018) states that the primary concern of companies is often to optimize their internal processes and strive to have the best employee satisfaction. In his paper, Hall (2018) discusses four best practices that e-commerce companies can follow and adopt as part of their HR strategy to begin improving employee satisfaction. Elias (2018) states that job satisfaction and service quality are very important concepts that organizations must understand in order to remain competitive and therefore grow. It is very important for organizations to know how to measure these constructs to better understand their employees and customers. Elias (2018) in his study aims to highlight job satisfaction and service quality.

Ghayas & Hussain (2015) state in their research the relationship between job satisfaction and customer satisfaction. Data was collected from IT employees working for support contracts and their respective contact persons of the clients they work for. Rahayu & Day (2017) state in their study that aims to provide an overview of e-commerce adoption by SMEs in developing countries and, in particular, the extent of e-commerce adoption by Indonesian SMEs. Rahayu & Day (2017) state that most e-commerce studies are focused more on upstream issues: to see the facilitating factors, or barriers faced in e-commerce adoption, rather than downstream issues: to see the benefits after adoption. Kusdibyo & Februadi (2019) state the purpose of their study is to measure the impact of electronic service quality on customer satisfaction and loyalty in an online shopping environment. Kusdibyo, L. & Februadi, A. (2019) state that the results show that the quality of electronic services has a positive and significant effect on job satisfaction. Also, consumer satisfaction has a positive and significant effect on loyalty.

## **METODOLOGY**

### **Hypothesis**

- There is a difference in the impact of e-business on user job satisfaction.
- There is a significant positive relationship between e-business and user job satisfaction.

### **Sample**

The sample consisted of 90 users of electronic business from the Autonomous Province of Vojvodina and the City of Belgrade. Table 1 shows the basic demographic data of users of electronic business. User groups did not differ in terms of gender and type of employment, but significant differences were found in age and length of service. Among users, there is a significantly higher number of people in the category of 5-15 years of service.

### **Instruments**

The SPSS software package was used to assess the impact of electronic business on user job satisfaction, which analyzed the data and interpreted the results obtained. OSTES consists of three subscales: Effectiveness for strategic decision-making, Effectiveness for company management, and Effectiveness for user engagement.

The user job satisfaction scale by Ho & Au (2006) was used to assess how satisfied users are with the job in relation to electronic business. Respondents were offered answers on a five-point Likert (1932) scale, from 1 - generally agree to 5 - completely agree.

### **Procedure**

Based on the overall structure of users of electronic business services, participants in the questionnaire were recruited from the Autonomous Province of Vojvodina and the City of Belgrade. The contacted users were randomly selected with the prior consent of the service company. Users were surveyed online. In the user guide, attention is drawn to the fact that the survey is anonymous.

## **RESULTS**

Table 1 shows the basic demographic data on the users of electronic business that are included in the research. User groups differed significantly in terms of gender and type of employment, very significant differences were found in age and length of service. Beneficiaries are significantly more represented in the category of 5-15 years of service. Among surveyed users in service activities, the highest representation of the 35-45 year old category is noticeable. Based on the obtained results, it can be seen that 68 users have permanent employment, and 28 have permanent employment.

Table 1: Demographic data on beneficiaries from the sample

Variables	N=90	N=90	$\chi^2$ (df)
Gender	n	%	
male	33	36,7	ns
female	57	63,3	ns
age			
25-35 age	4	4,5	31,2 ***
35-45 age	36	40	
45-55 age	32	35,5	
55-65 age	18	20	
Year of services			
up to 5 years	6	6,7	18,54 ***
5-15 godina	40	44,3	
15-25 years	34	37,7	
More than 25 years	10	11,3	
Employment			
indefinitely	62	68,8	ns
for a set amout	28	31,2	

Note: ns – no significant differences; \*\*\* $p \leq .001$

Table 2 shows the minimum and maximum values, arithmetic means and standard deviations on the OSTES and associated subscales and on the TSS, for the entire sample. Ho & Au (2006) This study proposes a measure of job satisfaction and examines the validity of its results. The obtained results relate to strategic decision-making, company management and user engagement.

Table 2 The results of respondents OSTES i TTS (N=90)

Skale i podskale	Minimum	Maksimum	AS	SD
OSTES	12	103	81,12	10,54
Strategic decision-making	4	34	30.67	3.98
Company management	6	33	26.45	5.21
User engagement	4	31	23.54	3.87
TSS	6	23	16.56	3.94

Table 3 shows the results of testing the statistical significance of differences in OSTES and TSS scores among users. Decision-making strategy has a SD of 0.82, Company management has a SD of 0.84 and User Engagement has a DS of 0.73. Service users had significantly higher OSTES scores (84.82). The surveyed users had a high TSS.

Table 3: Descriptive statistics and correlations (N=90)

	M	SD	Skewness	Kurtosis	1	2	3	4	5
OSTES	83,82	-	-	-	-				
Decision making strategies	3.21	0.82	-0.26	0.49	-0.05	0.04	-		
Company management	4.34	0.84	0.27	0.86	0.06	0.03	0.31**	-	
User engagement	3.28	0.73	0.05	0.51	0.02	-0.01	0.42**	0.48**	-
TSS	18.20	1.50	-0.06	-0.08	0.06	-0.04	0.48**	0.46**	0.63**

Note:  $P < 0.01$ , \*\*  $P < 0.01$

Table 4 shows significant correlations on OSTES and TSS, on the other hand. All correlations are positive, of weak and moderate intensity.

*Table 4: Standardized indirect effects and 95% CI for the mediation model*

Model pathways	Estimated	Lower 95% CI	Upper 95% CI
OSTES	.49**	.41**	.43**
Decision making strategies	.38**	.19*	.41**
Company management	.37**	.40**	.37**
User engagement	.47**	.39**	.48**

Note: \* $p \leq .05$ , \*\* $p \leq .01$

## DISCUSSION

The results on the relationship between age and length of service with the user's job satisfaction are not consistent, but there are indications that the influence of these factors must be significant.

The surveyed users from the sample rated their job satisfaction relatively high, as the ratings for decision-making and company management strategies are slightly higher compared to the efficiency ratings for user engagement. The results of this research show that e-commerce users have a significantly higher level of job satisfaction. Significant differences for the dimension of job satisfaction were found in the decision-making strategy and efficiency for user engagement. While there are no significant differences for company management. From this it can be concluded that the successful application of effective strategies has a positive effect on the perceptions of users of electronic business. When considering the results of the impact of electronic business on job satisfaction and the career of employees in the company, empirical data on the impact of the organizational climate, collective efficiency, support of parents and company management, ways of managing the company and other characteristics of the business environment on user satisfaction should also be taken into account. Taken as a whole, these results suggest that greater job satisfaction of the user can be associated with the development of more intensive and long-lasting social relationships and, overall, with a better relationship and cooperation of the user with the service company.

## CONCLUSION

This study examined the relationship of e-business to customer job satisfaction in service companies. Based on the obtained results, conclusions can be drawn about the significant connection between electronic business and job satisfaction on the career of employees in service companies in Serbia. Further research is needed in order to understand the implications of the findings about positive perceptions of their competences and greater job satisfaction among users, realized by employees in electronic business services.

## REFERENCES

- Doran, G. T. (1981) There's a S.M.A.R.T. way to write management's goals and objectives, *Management Review*, 70(11), 35–36.
- Elias Milana (2018) Impact of job satisfaction on public service quality: evidence from Syria, *Serbian Journal of Management*, 13(2), 233-250.
- European Commission, (1997) Communication to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions, A European Initiative in Electronic Commerce. 15/04/97, COM, 157.
- Ghayas, M., & Hussain, J. (2015). Job satisfaction, service quality and the customer satisfaction in the IT sector of Karachi. *International E-Journal of Advances in Social Sciences*, 1(3), 443-451.
- Gupta, P., Prakash, S. and Jayaraman, U. (2009) *IT Infrastructure and its Management*, Tata McGraw Hill Education.
- Hall, J. (2018) Top tips to improve e-commerce employees' satisfaction, *Strategic HR Review*, 17( 6), 303-330.

- Ho Chung-Lim, & Au Wing-Tung (2006) Teaching Satisfaction Scale: Measuring Job Satisfaction of Teachers, *Educational and Psychological Measuring*, 66(1), 172-185.
- Kuleto, V., Pokorni, S., Dedić, V. (2011) Jedna realizacija softvera za podršku učenju na daljinu, *Info M*, 10(38), 37-42.
- Kusdibyo, L. & Februadi, A. (2019) The Effect of Electronic Service Quality on Customers Satisfaction and Loyalty in Online Shopping, *IOP Conference Series: Materials Science and Engineering*, 622(2), 1-8.
- McFarlan, F. W. (1984) Information Technology Changes the Way You Compete, *Harvard Business Review*, 62(3), 98–103.
- Osterwalder A. and Pigneur Y. (2010) *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. New Jersey: John Wiley & Sons, Inc.
- Petrović B., Novović M. (2019) Development and implementation of mobile banking in modern banking operations, *Vojno delo*, 7(4), 305-313.
- Petrović D. (2018) Primena koncepta elektronske trgovine u Srbiji, *Vojno delo*, Vol. 70(7), 423- 430.
- Porter, M. E. (1985) *Competitive Advantage-Creating and Sustaining Superior Performance*. New York: The Free Press.
- Rackoff N. (1985) et al., *Information Systems for Competitive Advantage: Implementation of a Planning Process*, *MIS Quarterly*, 9(4), 285–294.
- Radenković, B., Despotović-Zrakić, M., Bogdanović, Z., Barać, D., Labus, A. (2015) *Elektronsko poslovanje*, Univerzitet u Beogradu, *Elektronsko poslovanje*, FON, Beograd, ISBN: 978-86-7680-304-0.
- Radenković, B. (2002) *Elektronsko poslovanje, stanje i perspektive*, Fakultet Organizacionih Nauka, Nastavni materijal na magistarskim studijama iz elektronskog poslovanja, Beograd.
- Rahayu R, Day J (2017) E-commerce adoption by SMEs in developing countries: evidence from Indonesia *Eurasian Business Review* 7 (1), 25-41.
- Todorović M., Ćosić D. (2006) *Informacione tehnologije*, Visoka beogradska poslovna škola - visoka škola strukovnih studija, Beograd.
- Turban, E. et al., (2008) „Chapter 19: Building E-Commerce Applications and Infrastructure”; in: *Electronic Commerce: A Managerial Perspective*, New Jersey, NJ, USA: Prentice Hall.

## **THE INFLUENCE OF INFORMATION TECHNOLOGIES ON ORGANIZATIONAL COMMITMENT IN THE ENVIRONMENT**

**Dragana Sajfert**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

E-mail: [sdragana77@hotmail.com](mailto:sdragana77@hotmail.com)

**Jesa Kreiner**

California State University, Fullerton, Los Angeles, California, USA

**Srdan Barzut**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

**Svetlana Andelić**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

**Ana-Marija Vukić**

University of Novi Sad, Technical fakulty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

### **ABSTRACT**

The aim of the study was to investigate the impact of information technology on organizational commitment (as measured by the Organizational Commitment Scale). The survey was conducted on a sample of 90 employees in three information technology companies in Serbia. Information technologies have shown a strong positive impact on organizational commitment in the environment. This research confirmed the influence of information technologies on improving the performance of employees in companies on organizational commitment.

**Key words:** information technology, organizational commitment, employee retention.

### **INTRODUCTION**

Retaining IT professionals is an increasingly important challenge for organizations, and how to increase organizational commitment. The 21st century world of work is marked by unprecedented levels of talent mobility as employees strive to meet their individual demands, leading to growing concerns among organizations about retaining talented IT professionals. Job Market Trends The information technology (IT) field has continued to present increased career opportunities for IT professionals worldwide, and recruitment and retention challenges for organizations that employ these workers. This has led researchers to emphasize the importance of reviewing factors that influence organizational commitment within IT environments (Lumley 2010). Organizational commitment has attracted considerable interest as attempts have been made to better understand the intensity and stability of employee commitment in an organization (Lumley 2010). Allen and Meyer (1990) identified a relationship between organizational commitment and employee turnover, and concluded that employees who were strongly committed to the organization were less likely to leave it.

### **LITERATURE REVIEW**

According to Greenberg & Baron (1995), organizational commitment represents positive attitudes that an employee feels not only towards his job, but also towards the organization as a whole or towards some of its members. Ricketta (2002) believes that there is a positive relationship between organizational commitment and productivity at work. Lumley, et. al. (2011) found results that suggest that leaders create environments that encourage people to stay in their organizations, create meaningful work tasks, and foster positive relationships with colleagues. Eisenberger et. al. (2002) believe that if we want to fully understand people's attitudes towards work, we must also take into account people's feelings



towards their organizations. Mathiew & Hamel (1989) found that the factor of organizational commitment is higher among individuals whose jobs are highly enriched. Meyer & Allen (2007), developed a Model that measures three forms of employee commitment: Affective Commitment, Normative Commitment and Continuance Commitment). Burns e. al. (2017) state that practitioners and researchers recognize the positive impact that insider behavior can have on information systems (IS) security. According to Katz & Kahn (1978). Employees who are committed to their organization may be more willing to participate in "extra-role" activities, such as creative or innovative ones, which often guarantee the organization's competitiveness in the market.

Salary is related to organizational commitment and even more closely to information technology. According to Fu et. al. (2011) and their results, four aspects have a significant impact on organizational commitment - pay, followers, control and work itself. Crabtree (2013) states that an economically developed area does not necessarily mean that there is a greater commitment of employees. Suliman & Iles (2000) explore the multifaceted nature of commitment in their work. Their study investigates the nature of organizational commitment using employee performance. Sayyadi & Sarvtamin (2011), found that the higher the level of education, the lower the organizational commitment. Meyer & Allen (1997). state that organizational commitment is seen as a psychological bond that individuals have with their organization, characterized by a strong identification with the organization and a desire to contribute to the achievement of organizational goals. Meyer & Allen (1991) state that employees who are affectively committed to an organization are likely to want to work there because they want to.

Meyer & Allen (1997) in their second research state that affective commitment is an individual's psychological or emotional connection to, identification with, and participation in the organization.

Table 1: Affective Commitment Scale Items - Revised Version (Meyer, Allen, & Smith, 1993)

1.	I would be very happy to spend the rest of my career with this organization
2.	I really feel as if this organization's problems are my own.
3.	I do not feel a strong sense of "belonging" to my organization. (R)
4.	I do not feel "emotionally attached" to this organization. (R)
5.	I do not feel like "part of the family" at my organization. (R)
6.	This organization has a great deal of personal meaning for me.

### Measuring instruments

The Organizational Commitment Scale (OCS) survey (Meyer & Allen 1997) was used to measure variables relevant to this study. Organizational commitment was measured using the three-dimensional Meyer, Allen and Smith (1993) instrument originally developed by Allen and Meyer (1990). The affective, continuous and normative organizational commitment scale consisted of six items, modified in relation to the original questionnaire which consisted of 8 items. Meyer et al. (1993) reported internal consistency reliability estimates (Cronbach's alpha) for affective commitment (0.82), continuance commitment (0.74), and normative commitment (0.83). Responses were given on a 5-point Likert-type scale and were averaged to obtain a composite commitment score for each respondent.

## METODOLOGY

### Hypothesis

H1 – There is an impact of information technology on organizational commitment.

### Sample

The sample consisted of 90 employees from three IT companies with headquarters in Belgrade, Novi Sad, and Zrenjanin. All these companies are registered in APR. Out of a total of 120 questionnaires sent, 90 usable questionnaires were returned, which gave an adequate and usable answer. In total, there were

more male 57 (63.3%) than female 33 (36.7%) participants in the sample. Most of the participants were employed at the staff level (62%), and the rest at the supervisory level (38%).

*Table 2: Demographic data on employees in IT companies from the sample*

Variables	N=90	N=90	$\chi^2$ (df)
Gender	n	%	
male	57	63,3	ns
female	33	36,7	ns
Age			
25-35 age	4	4,5	31,2 ***
35-45 age	36	40	
45-55 age	32	35,5	
55-65 age	18	20	
Work experience in IT			
Up to 5 years	6	6,7	18,54 ***
5-15 years	40	44,3	
15-25 years	34	37,7	
More than 25 years	10	11,3	
employment relationship in IT			
indefinitely	62	68,8	ns
for a set amount	28	31,2	

Note: ns – nema značajnih razlika; \*\*\* $p \leq .001$

## Instruments

Hinkin (1995). developed a scale that was developed and validated using different samples. It was used in the work in 3 phases of measure development: item development, scale development and scale evaluation. Respondents were asked to respond on a Likert scale (1932) ranging from 1 = not at all to 5 = often, if not always. Kyriazos & Stalikas (2018) constructed a scale that has implications for research conclusions, and otherwise expressed for the accuracy and sensitivity of instruments. Cronbach's alpha for this scale was 0.88, indicating a high degree of internal consistency. In line with Amabil's (1988) view-model that general creative skills lead to creativity.

## Procedure

Based on the conducted research on the impact of organizational commitment on the information technology environment, participants were recruited from the Autonomous Province of Vojvodina and the City of Belgrade. In the instructions, the attention of the participants was drawn to the fact that the survey is anonymous.

## RESULTS

### Descriptive statistics

Table 3 shows the results of descriptive statistics of information technology variables and organizational commitment variables, that is, it shows the minimum, maximum, mean and standard deviation values.

*Table 3: Descriptive statistics: OCS (N = 90)*

Variables	Mark	N	Min	Max	Middle value	Standard deviation
Using IT	IT1	90	1	5	3.99	1.046
IT training	IT2	90	1	5	3.49	1.121
Motivation for IT	IT3	90	1	5	3.65	.987
Creativity	OP1	90	1	5	3.67	.978
Innovation	OP2	90	1	5	3.23	1.132
Teamwork	OP3	90	1	5	3.43	1.234

Based on the obtained results of descriptive statistics, it can be concluded that all observed variables of information technologies have scores above the average. The variable with the highest value is IT1 - use of IT, which indicates that adequate use of information technologies affects creativity and innovation.

When it comes to the evaluation of the organizational commitment variable, it can be stated that the grades are above average, while the variable that reached the highest value is creativity, which confirms that the adequate application of information technologies provides employees with the possibility of creative work.

**Correlation analysis**

Table 4 shows the results of the correlation analysis. Pearson's correlation was used to determine the correlation between the variables of information technologies and the variables of organizational commitment.

*Table 4: Correlation analysis between information systems variables and organizational commitment*

	OP1	OP2	OP3	OP4
IT1	.363**	.402**	.437**	.321**
IT2	.289**	.332**	.397**	.368**
IT3	.289**	.465**	.468**	.387**
IT4	.329**	.449**	.534**	.543**

\*\* The correlation is significant at the level 0.01

\* The correlation is significant at the level 0.05

The results of the correlation analysis, shown in Table 4, show that there are strong and positive, significant correlations between the variables of information technology and the variables of organizational commitment. thus confirming hypothesis 1. This indicates the fact that in companies where information technologies are used adequately, and where management attaches importance to creativity and innovation, greater organizational commitment is expressed.

Of the observed correlations, the strongest correlations are achieved by the variables IT1 - the importance of using IT and IT2, the training of employees, and the variable OP1creativity. Variables IT3 employee motivation and importance of using IT1 and organizational commitment.

**Regression analysis**

Regression analysis determined the predictive effect of employee performance variables, as independent variables: responsibility, creativity, innovation, organizational commitment, on information technology variables, as dependent variables. The results of the regression analysis are presented in Table 5.

*Table 5: Regression analysis between information systems variables and organizational commitment*

Dependent	Independent	$\beta$	t	Sig.	R <sup>2</sup>	F	Sig.
IT1	Responsibility	.245	3.234	.000	.286	12.002	.000
IT2	Creativity	.234	2.832	.021	.197	7.256	.000
IT3	Inovation	.2.03	1.985	.054	.446	25.782	.000
IT4	Organizational commitment	.095	1.678	.000	.3761	18.654	.000

The contribution of the independent variables to the total R square of the regression with the dependent variables was examined using the regression method. Based on the regression model, it can be seen that employee performance variables are the best predictors of employee innovation for IT (R<sup>2</sup>=0.446). It can be concluded that information technology has the greatest influence on the following performance of employees: responsibility and creativity, which indicates the fact that

adequate and effective application of information technology is carried out in companies where employees show their creativity, willingness to take responsibility for their tasks.

## DISCUSSION

The results of the descriptive statistics of the variables of the impact of information technology on organizational commitment show the minimum and maximum values, mean values and standard deviations, as well as the variables that will be used in this paper. The findings indicate that the observed relationships between information technology variables on organizational commitment were analyzed through different statistical methods. The results of the correlation analysis show a significant connection between the analyzed variables, thus confirming hypothesis 1 of this research. The influence of information technologies on organizational commitment was confirmed through regression analysis, where the observed variables of employees showed the greatest importance to the innovativeness of employees.

## CONCLUSION

The presented results in this research confirm the impact of information technologies on organizational commitment in the environment. Where the influence of the importance of the use of information technologies and the innovativeness of employees on organizational commitment is particularly pronounced. The use of information technologies, increased training and motivation affect the improvement of employee performance by increasing responsibility, creativity and teamwork, which positively affects their organizational commitment.

## REFERENCES

- Allen, N. & Meyer, J. 1990. The measurement and antecedents of affective, continuance and normative commitment to the organization, *Journal of Occupational Psychology*, 63(1) 1–18.
- Burns, A. J., Posey, C., Roberts, T. L., & Lowry, P. B. (2017). Examining the relationship of organizational insiders' psychological capital with information security threat and coping appraisals. *Computers in Human Behavior*, 68, 190–209.
- Crabtree, S. (2013). Worldwide, 13% of employees are engaged at work: Low workplace engagement offers opportunities to improve business outcomes. Gallup. Retrieved April 9, 2015,
- Eisenberger, R., Stinglhamber, F., Vandenberghe, C. Sucharsky, I. L. & Rhoades, L. (2002). Perceived Supervisor Support: Contributions to Perceived Organizational Support and Employee Retention, *Journal of Applied Psychology*, 87(3), 565-573.
- Eschbach Andreas (2022) Digital solutions enable continuous improvement, 17. Februar.
- Fu Weihui, Deshpande Satish, & Zhao Xiao (2011). The impact of Ethical Behavior and Facets of Job Satisfaction on Organizational Commitment of Chinese Employees, *Journal of Business Ethics*, 104(4), 537-543.
- Greenberg, Jerald, & Baron, Robert, A., (1995). Behavior in Organizations , Understanding and Managing the Human Side of Work, Prentice-Hall Inc.
- Gutierrez-Gutierrez, L. and Antony, J. (2019), Continuous improvement initiatives for dynamic capabilities development: A systematic literature review, *International Journal of Lean Six Sigma*, 11(1), 125–149.
- Khan, S.A., Kaviani, M.A., Galli, B.J. and Pharma, A. (2019), Application of continuous improvement techniques to improve organization performance A case study, *International Journal of Lean Six Sigma*, 10(2), 542–565.
- Katz, D. & Kahn, R. 1978. *The Social Psychology of Organizations* (2nd edition). New York: Wiley.
- Likert Rensis (1932) Technique for the Measurement of Attitudes. *Archives of Psychology*, 22(140), 1-55.
- Lumley, E., Coetzee, M., Tladinyane, R. & Ferreira, N. (2011). Exploring the job satisfaction and organisational commitment of employees in the information technology environment. *Southern African Business Review*, 15(1), 100-119.

- Lumley, Elizabeth (2010). Exploring the relationship between career anchors, job satisfaction and organisational commitment. Unpublished master's dissertation, Department of Industrial and Organisational Psychology, University of South Africa, Pretoria.
- Mathieu, John E., & Hamel, Karin (1989). A causal model of the antecedents of organizational commitment among professionals and nonprofessionals. *Journal Vocational Behavior*, 34(2), 299-317.
- McLean, R.S., Antony, J. and Dahlgard, J.J. (2017), Failure of Continuous Improvement initiatives in manufacturing environments: a systematic review of the evidence, *Total Quality Management & Business Excellence*, 28( 3– 4) 219–237.
- McMurtrey, E. Mark, Grover Varun, James T. C. Teng and Nancy J. Ughtner (2002) Job Satisfaction of Information Technology Workers: The Impact of Carer Orijentation and Task Automation in a CASE Environment, *Journal of Management Information Systems*, 19(2), 273-302.
- Message Costa, L.B., Filho, M.G., Fredendall, L.D., José, F. and Paredes, G. (2018), Lean, six sigma and lean six sigma in the food industry: A systematic literature review, *Trends in Food Science and Technology*, 82, 122–133.
- Meyer, P. John, Allen, J. Natali. (2007). Model of Organizational commitment: Measurement Issues, *The Icfai Journals of Organizational Behavior*, 6(4), 7-25.
- Meyer, J. & Allen, N. 1997. *Commitment in the Workplace: Theory, Research and Application*. London: Sage Publication, Thousand Oaks.
- Meyer, P. John, Allen, J. Natali, & Smith A. Catherine (1993) Commitment to organizations and occupations: Extension and test of a three-component conceptualization. *Journal of Applied Psychology*, 78(4), 538–551.
- Mitić Siniša, Popović Jovanka, Poštin Jasmina, Ćilerdžić Vesna, i Szabo Laslo (2021) Information tehnology as an indicator of the level of organizational performance, *Journal of Engeneering Management and Competitveness (JEMC)*, 11(1), 29-41.
- Riketta, M., (2002). Attitudinal Organizational Commitment and Job Prformance: A Meta-Analysis, *Journal of Organizational Behavior*, 3, 257-266.
- Sanchez-Ruiz, L., Gomez-Lopez, R. and Blanco, B. (2020), Barriers to effectively implementing continuous improvement in Spanish firms, *Total Quality Management and Business Excellence, Routledge*, 31(13–14), 1409–1426.
- Sarka, P., Heisig, P., Caldwell, N.H.M., Maier, A.M. and Ipsen, C. (2019), Future research on information technology in knowledge management, *Knowledge and Process Management*, 26(3), 277–296.
- Sayyadi, S., & Sarvtamin, H. T. (2011). Organizational Commitment in Educational Departments. *Interdisciplinary Journal of Contemporary Research In Business* 3(2), 1326-1337.
- Spector, E. Paul (1997). *Job Satisfaction: Application, Assessment, Causes and Consequences*. California: Sage Books.
- Suliman, A. & Iles, P. 2000. Is continuance commitment beneficial to organizations? Commitment performance relationship: A new look, *Journal of Managerial Psychology*, 15(5): 407–426.
- Unzueta, G., Esnaola, A. and Eguren, J.A. (2020), Continuous improvement framework to develop cultural change: case study, capital goods company, *TQM Journal, Emerald Group Holdings Ltd.*, 32( 6), 1327–1348.

## **THE IMPACT OF ELECTRONIC BUSINESS ON THE MOTIVATION AND PROFESSIONAL CHALLENGES OF EMPLOYEES**

**Dragana Sajfert**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

E-mail: [sdragana77@hotmail.com](mailto:sdragana77@hotmail.com)

**Srdan Barzut**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

**Ana-Marija Vukić**

University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia

**Milica Jevremović**

ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia

### **ABSTRACT**

The goal of this research is to understand gender differences in motivational drivers at the workplace, with a focus on people with work experience in the field of e-commerce and e-business. Special attention is paid to the preference for competitive and cooperative behavior. We examined gender differences in motivational drivers on a sample of N = 80 (40% women). The age range was from 25 to 35 years 30%, 35-45 years 40%, 45-55 years 15% and 55-65 years there were 10%. The results showed that men were ranked higher in motivation towards professional challenges, preference for a competitive environment. Women had a higher result in motivation with social support and the quality of the work environment. The results have interesting implications for human resource management and the professional challenges of employees.

**Keywords:** Motivation, Gender differences, Professional challenges, Human resources management.

### **INTRODUCTION**

Today, the dominant problem is the question of human resources and motivation for work. It's not so much a matter of human capabilities and knowledge anymore, but motivation, encouragement and application of those capabilities. Motivation answers the question of why someone behaves in a certain way, achieves or fails to achieve a certain level of work performance. Motivation refers to a series of connections between independent and dependent variables that explain the direction, size and duration of the behavior of individuals, while the effects of ability, understanding skills related to the environment are constant. Motivation refers to goal-directed behavior, that is, all forms of voluntary behavior. Numerous theories are aimed at understanding motivation, which try to answer the seemingly simple question: What is motivation and how does the motivation process take place? Seifert (2004) highlighted four theories that he calls "classics": (1) Maslow's hierarchy of needs, (2) Herzberg's two-factor theory, (3) McGregor's XY theory, and (4) McClelland's theory of achievement motivation. Maslow (1943) developed the theory of the hierarchy of needs, which undoubtedly had the greatest influence on thought and research on the behavior of people in organizations. The reason for its popularity should undoubtedly be sought in its simplicity and pioneering role in the understanding of this complex phenomenon, as well as the humanistic orientation of its creator. Herzberg (1968) made a specific approach to motivation focused on the work situation and the classification of factors for work, and not on needs. Herzberg's two-factor theory of motivation, also known as the motivational-hygiene theory. This classification of factors is a measure of job satisfaction. McGregor (1966) proposed two different views of human beings: one essentially negative and labeled Theory X, and the other essentially positive and labeled Theory Y. After observing the ways in which managers related according to employees, McGregor concluded that managers' views of the nature of people are based on a set of assumptions and that they usually align

their behaviors with those assumptions. The initial basis for the development of achievement motivation theory is the work of McClelland et al. (1953). McClelland (1961) defines the need for achievement as an individual predisposition to strive for success. More specifically, the motivation for the activity of the resultant is two forces, that is, motives of different signs: the tendency and desire for success and the desire to avoid failure, that is, from the fear of mistakes and failure.

## **LITERATURE REVIEW**

The very term "motivation" comes from the Latin word "moves, movere" which means to move. It is quite certain that the most successful people are those who have no fear of change. Stanišić, & Guera (2010) state that the importance of motivation is reflected in the fact that companies achieve goals and results based on the work performance of employees. Stanišić, & Guera (2010) state in their paper that Herzberg's motivational theory of hygiene was applied for the purpose of considering the motivational factors of employees. It is based on the claim that salary is not the main motivating factor, but other factors (intrinsic) should also be taken into account. Gherghina et al. (2021) state in a study whose aim is to investigate the impact of electronic commerce on the employment rate for a sample covering the entire 27 member states of the European Union (EU-27), from 2010 to 2019. Gherghina et al. (2021) obtained cluster analysis results show that Western Europe reveals the most developed e-commerce market in the EU-27, which shows the availability of the Internet and a high rate of penetration of digital tools, and the lowest figures are registered in the Eastern part of Europe. Gherghina et al. (2021) state that the results reveal that a percentage change in the total turnover of a company from e-commerce sales, the turnover of a company from web sales, and companies with e-commerce sales of at least 1% of turnover will increase the employment rate. Sigmundsson et al. (2020) in their article explore the psychometric properties of a new scale that aims to quantify passion, relying on McClelland's (1961) achievement motivation, i.e. passion related to becoming good or achieving it in an area/subject/skill. Sigmundsson et al. (2022) conducted a study that aimed to investigate differences in achievement passion, courage, and mindset across age and gender. In the literature, there are two basic approaches to measuring motivational drivers. First, some authors analyze how respondents rank individual motivational factors, and then compare differences between groups, based on age, gender and type of work, e.g. (Sigmundsson et al. (2022), Jachimowicz et al. (2018) Datu et al. (2021) Ledford et al. (2021). Second, some researchers analyze the importance of work value in relation to overall job satisfaction, e.g. (Bakator et al. (2019), Terek et al. (2015), Nikolić et al. (2013), Nikolić et al. (2019) ) or the gender of the individual appears to be a key factor influencing the aging trajectory Gordon & Hubbard (2020) In this paper, we use the first approach, based on a direct indication (ranking) of preferences for individual motivational factors.

## **METODOLOGY**

### **Hypothesis**

Hypothesis 1: Men rank professional challenge significantly higher than women.

Hypothesis 2: Women rank social support at work significantly higher than men.

Hypothesis 3: Women rank the quality of the work environment significantly higher than men.

Hypothesis 4: Men rank competitive attitudes at work significantly higher than women.

### **Sample**

The sample is based on the adult, economically active population of the Republic of Serbia, who has work experience in the field of e-commerce and e-business, N = 80 (32 women, 40%). The age range was from 25 to 35 years 30%, 35-45 years 40%, 45-55 years 15% and 55-65 years there were 10%. Data were collected through an online questionnaire.

## Instruments

In the questionnaire, the structure of motivation is measured as a verbalized cognitive view or attitude towards a relevant aspect of work or professional context. The variables are constructed to assess the motivational factors, values and interests that are key to one's suitability to work in a particular company, department or team, in terms of corporate culture. The questionnaire gathers motivational factors into groups: rewards, development, relationships and environment.

## Procedure

Based on the overall structure of users of electronic business services, the participants in the questionnaire were recruited from the Republic of Serbia. The contacted users were randomly selected with the prior consent of the e-business company. Users were surveyed online. In the instructions, the users' attention is drawn to the fact that the survey is anonymous.

## RESULTS

Table 1 shows the basic demographic data on users of e-commerce that are included in the research. User groups differed significantly by gender. 55% were men, while 45% were women. 30% of users were 25-35 years old. There were 45% of them aged 35-45, while 15% aged 45-55 and only 10% aged 55-65. Among the surveyed users in electronic business, the highest representation of the 5-5 years old category is noticeable with 37.5%. In second place is the category of up to 5 years of service with 32.5%. As 75% of them had indefinite working hours, while 25% had fixed-time.

*Table 1: Demographic data on benefits from the sample*

Variables	N=80	N=80
Gender	n	%
male	44	55
female	36	45
Old age		
25-35 years	24	30
35-45 years	36	45
45-55 years	12	15
55-65 years	8	10
Length of service		
up to 5 years	26	32,5
5-15 years	30	37,5
15-25 years	14	17,5
for more than 25 years	10	12,5
Employment		
indefinitely	60	75
for a certain time	20	25

Test results (ranging from 1 to 8) can be interpreted on a nine-point scale, 1-3: below average, 4-6: average, 7-9: above average. Motivational questionnaires are an effective and valid selection method in HR because the structure of motivation and interest clearly and clearly separates individuals to a large extent on a timely and consistent basis. Table 2 provides an overview of the basic values of the variables. Table 2 provides an overview of the variables (all values range from 1 to 8).



Table 2: Overview of variables and their values

	Mean	Median	Std Dev.
A professional challenge	4.21	3	1.88
Motivated by competition	4.19	3	2.13
Development possibilities	3.58	4	1.98
Performance recognition	4.85	4	2.10
Motivated by cooperation	4.77	5	1.99
Need for support	4.86	4	1.87
Financial reward	4.72	4	1.76
Work environment	5.73	5	1.69

Gender differences in motivational drivers this chapter presents key results. We used the U test (the number of valid observations is 36 for women and 44 for men) to analyze gender-based differences in preference for motivational triggers (Table 3). The adjusted Z-score can be interpreted as the intensity of preference of the respective motivational drivers. A negative Z-score value indicates a greater preference for men and, conversely, for women. A p-value greater than 0.05 suggests that there are no significant gender differences for a given motivational driver. The motivational drivers are classified according to the Z-score, which makes it possible to observe the intensity of gender differences. In the very right column (table 3), the hypotheses attributed accordingly are confirmed.

Table 3: Motivation - gender differences, sorted by Z value (adjusted)

	U	Z (adjusted)	p values	Hypothesis
Men- higher preference for motivational factors				
Motivated by competition	15925	-5.08	0.00	H4
Professional challenge	19429	-2.28	0.02	H1
Possibility of development	19486	-2.23	0.03	
There is no significant difference between men and women				
Financial reward	21377	-0.71	0.48	
Performance recognition	22120	-0.12	0.91	
Women - higher preference for motivational factors				
Social support	19921	1.89	0.05	H2
Work environment	17937	3.49	0.00	H3
Motivated by cooperation	16703	4.47	0.00	

p-values < 0,05

## DISCUSSION

The results showed that financial reward and recognition do not create a statistically significant difference in preferences by gender (table 3). The fact that men and women have equal motivational preferences in terms of monetary reward and recognition of work is a strong argument in support of the European Commission's initiative in the framework of gender equality and equal pay (European Commission 2018).

On the other hand, recognition for work performance creates gender differences. For men, recognition for work is positively associated with competitive motivation and negatively with cooperative motivation. For women, recognition is about the work environment. These findings can be interpreted as a different psychological perception of recognition by both sexes.

Opportunities for personal development (table 3) are somewhat more important for men. The absolute level of differences in preferences in all research is minimal, we assume that the specific preference in this case could be more influenced by the specific type of job, education or age. On the other hand, the professional challenge is significantly more pronounced in men, which could be understood as support for the male-warrior hypothesis.

Regarding the quality of interpersonal relationships and social support, a broad consensus prevails in the literature, especially that women attach consistently greater importance to this area. This tendency is even more emphasized when it comes to the importance of the quality of the physical work environment, our results correspond with other authors.

Our findings (Table 3) showed that men are clearly much more motivated by a competitive environment; while women tend to be more motivated when it comes to cooperative aspects.

## CONCLUSION

In this paper, the main goal was to understand gender differences in the preference of motivational triggers and the nature of gender-neutral motivational triggers. Our findings are as follows. The motivational triggers, which were significantly preferred by men, were: the motivation of a competitive setting, professional challenges. Motivational drivers that are ranked significantly high by women are: social support, physical work environment. Preference for financial reward and recognition of performance did not show gender differences. The difference in gender distribution was statistically significant; men are more attracted to "great competition and weak cooperation", and women are the other way around.

Furthermore, we were interested in the basic aspect of gender-neutral motivational factors (financial reward, recognition). Interestingly, both drivers were positively related to personal development for both genders. However, the analysis showed that recognition for work is positively associated with competition, and negatively with cooperation in men; and not for men. Thus, we assume that the psychological processes underlying the motivational process in both sexes may differ, even if both sexes rank the importance of recognition for work similarly.

We can conclude the following. The literature on gender preferences of motivational drivers is not consistent. When it comes to the importance of motivational drivers in the workplace, the difference can be caused by the type of work, age, education, socio-demographic background and certainly the cultural environment specific to the country, etc. However, the general findings support the thesis that gender is a predictor of preference for motivational drivers in the workplace.

The most important implication, however, is certainly the argument that supports the imperative of equal pay and equal gender treatment within the framework of remuneration, as proposed by the current policy of the European Union on the matter. The above findings could have important implications for human resource management, especially in the field of e-commerce and e-business of employees, with the aim of creating a gender-efficient motivation system and establishing effective talent management.

In further research, it would be worthwhile to look at a wider range of motivational drivers, as well as their interrelationship, with the aim of understanding the complexity of the mental processes that are the basis of motivation for work. Besides the focus on e-commerce and e-business employees, it would be interesting to expand the research focus to other specific business environments.

## REFERENCES

- Bakator Mihalj, Đalić Nataša, Petrović Nikola, Paunović Mina, Terek Edit (2019) Transition economy market factors: The influence of advertising on customer satisfaction in Serbia, *Economic Research*, 32(1), 2293-2309.
- Datu, J.A.D., Yang, L., Mateo, N.J. (2021) Are gritty students academically engaged in Math and Science? *Sch. Psychol.*, 36, 190–195.
- Gherghina Stefan Cristian, Botezatu Mihai Alexandru and Simionescu Liliana Nicoleta (2021) Exploring the Impact of Electronic Commerce on Employment Rate: Panel Data Evidence from European Union Countries, *Journal of Teoretical and Applied Economic Commerce Research*, 16(7), 3157-3183.

- Gordon, E.H., Hubbard, R.E. (2020) Differences in frailty in older men and women. *Med. J. Aust.* 212, 183–188.
- Herzberg Frederick (1968) One More Time: How Do You Motivate Employees, *Harvard Business Review*, 46(1), 53-62.
- Jachimowicz, J.M., Wihler, A., Bailey, E.R., Galinsky, A.D. (2018) Why grit requires perseverance and passion to positively predict performance. *Proc. Natl. Acad. Sci. USA*, 115, 9980–9985.
- Ledford, A., Luning, C.R., Miles, P., Dixon, D. & Lynch, S. (2021) Investigating the Measurement of, and Interrelationship Between Resilience, Hardiness, Grit in a Population of Navy SEAL Candidates. *Am. J. Manag.*, 21, 82–102.
- Maslow Abraham (1943) *Theory of Human Motivation*, *Psychological Review*, 50, 370-396.
- McGregor, M. Douglas (1966) *The Human Side of Enterprise*, Reading in Managerial Psychology, Leadership and Motivation, 310-321, The M.I.T. Press, Boston.
- McLelland, C. David (1961) *The Achieving Society* Princetom, NJ, Van Nostrand.
- McLelland, C. David, Atkinson, J. W., Clark, R. A., & Lowell, E. L. (1953) *The Achievement Motive*, New York, Appleton-Century-Crofts.
- Nikolić Milan, Kuzmanović Bogdan, Mali Predrag, Mitić Siniša, Terek Edit (2019) Model of leadership and entrepreneurial intentions among employed persons, *International Journal of Simulation Modelling*, 18, 385-396.
- Nikolić Milan, Vukonjanski Jelena, Nedeljković Milena, Hadžić Olga, Terek Edit (2013) The impact of internal communication on job satisfaction dimensions and the moderating role of LMX, *Relations Review*, 39(5), 563-565.
- Sajfert Zvonko (2004) *Menadžment ljudskih resursa – apologija humanog kapitala*, Univezitet u Novom Sadu, Tehnički fakultet “Mihajlo Pupin” Zrenjanin.
- Sigmundsson Hermundur, Haga Monika, Elnes Magdalena, Dybendal Helen, Hermundson Fanny (2022) Motivational Factors Are Varying across Age Groups and Gender, *International Journal of Environmental Research and Public Health*, 19(9), 5207.
- Sigmundsson, H. Haga, M. Hermundsdottir, F. (2020) The Passion scale: Aspects of reliability and validity of a new 8-item scale assessing passion. *New Ideas Psychol.* 56, 100745.
- Stanišić Nataša, Guera Michael (2010) Istraživanje motivacije zaposlenih u Srbiji, zasnovano na konkretnom uzorku, *Singidunum Revija*, 6(2), 180-188.
- Terek Edit, Nikolić Milan, Vukonjanski Jelena, Gligorović Bojana, Janković Branka (2015) The impact of media relations on certain organizational and business performances: Serbian case, *Relations Review* 41(3), 370-372.

## **THE IMPORTANCE OF INFORMATION SYSTEMS FOR ACHIEVING THE QUALITY AND BUSINESS RESULTS OF THE COMPANY**

**Nataša Đalić**

University of East Sarajevo, Faculty of Transport and Traffic Engineering, Doboj, Bosnia and Herzegovina

E-mail: [djalic.natasa@gmail.com](mailto:djalic.natasa@gmail.com)

**Živko Erceg**

University of East Sarajevo, Faculty of Transport and Traffic Engineering, Doboj, Bosnia and Herzegovina

**Irena Đalić**

University of East Sarajevo, Faculty of Transport and Traffic Engineering, Doboj, Bosnia and Herzegovina

### **ABSTRACT**

The need for sustainable development, the coronavirus pandemic and doing business within the framework of the fourth industrial revolution - Industry 4.0 create a challenging environment in which companies have difficulty achieving and maintaining competitiveness. Information becomes the basic construction when it comes to doing business in the modern, globalized business environment. Application of modern information and communication technologies (ICT) by companies is an important factor of sustainable development. This paper analyzes the importance of information systems on sustainable business and competitiveness, as well as the impact of quality management on sustainable business performance. The main goal is to determine the relationship between the mentioned dimensions in a transitional environment. 184 respondents (company managers) who exist in the territory of Republika Srpska participated in the research for the purposes of this work. The methods used in this research are linear regression and Cronbach's alpha test. The results show that information systems can influence business performance in a transitional economic environment.

**Keywords:** Information systems, Quality, Business performance, Market performance, Decision making

### **INTRODUCTION**

Companies have to follow the daily progress and development of information technologies, because nowadays it is one of the main conditions for survival and maintaining a competitive advantage on the international market. Due to new market paradigms, companies must become more flexible in terms of business strategies and goals, and constantly adapt to market changes. Conducting business in the midst of market globalization is a challenge for companies. The sheer number of barriers and risks that globalization has brought to markets has made achieving and maintaining a competitive position a struggle for businesses. Agility and efficient adaptation to company changes is imperative for maintaining a stable position on the market. Due to the demands of the international market, companies must consider the implementation of various integrated management systems, which can bring additional risk to the business (Đalić, 2021).

It is evident that quality management is a complex concept and a business factor that often "dictates" the success of a company's operations. Information systems, as an integral part of modern information technologies, represent an important mechanism for improving the way of doing business in the modern business environment. In order to achieve business excellence, the company must take care of all aspects of quality in order to meet the needs and expectations of users. Continuous customer satisfaction has a positive impact on the process of developing customer loyalty. A loyal user represents the pinnacle of the relationship with the user and often means an improvement in the company's market performance on the market. Quality management within the company includes various tools in order to continuously improve quality and reduce production costs, which further contributes to increased productivity. Competitiveness in the modern globalized market is difficult to achieve and easy to lose. Depending on the company's needs and defined business goals, quality tools are selected and applied that can best meet those needs and goals

of the company. Managers must identify the company's weak points when it comes to quality and, in accordance with financial and other resources, determine which quality tools must and which would be desirable to implement and apply.

Within the company, information systems have the function of supporting decision-making as well as the function of a mechanism for monitoring business processes and optimizing them in order to improve business performance. The main role is found in managers, who have to make strategic, long-term business decisions, as well as operational decisions.

## **REVIEW OF CURRENT LITERATURE**

The complexity of the study of the mentioned factors and their interrelationships requires, in addition to the research of the factors themselves, the research of the existing literature in the field of work. According to the claims of Đalić et al. (2019) states that the implementation and application of modern information systems has the potential to improve not only business processes but also employee satisfaction.

Stendhal et al. (2016) state that information systems can be viewed from the aspect of their components (component aspect) but also from the aspect of their roles (role aspect) in the organization.

When it comes to quality management systems and its impact on business results and market performance, the opinions of scientists are divided. On the one hand, the application of a quality management system is associated with the improvement of operational performance (Aba, Badar, & Hayden, 2016; Kafetzopoulos, Psomas, & Gotzamani, 2015), and with the improvement of business results and competitiveness of the company (Dick, Heras, & Casadesus, 2008). ). On the other hand, it has been discussed that the application of a quality management system does not significantly affect quality improvement (Quazi, Hong, & Meng, 2010), does not affect financial performance (Candido, Coelho, & Peixinho, 2016), and does not affect statistically significantly on profits and total revenues (Ochieng, Muturi, & Njihia, 2015). Recent research indicates that a quality culture in a company positively reflects on business results (Araújo, Santos, Costa, & Sá, 2019). The involvement of employees is gaining more and more importance, and business within the framework of Industry 4.0 as well as the concept of quality management in the modern business environment requires the commitment, effort and passion of employees towards the quality of products and services, and not just to perform quality control routinely (Gunasekaran, Subramanian, & Ngai, 2018). The modern concept of quality management should integrate modern ICT, which implies technologically improved processes of monitoring and improving business quality.

It is evident that quality management is a complex concept and a business factor that often "dictates" the success of a company's operations. In saturated market segments, where competitive relations are intense, the quality of products and services is a "weapon" for survival. Quality and quality improvement in companies should be organic and not just temporary until the conditions for certification are met. This indicates that the long-term quality of products and services, which will improve business results and competitive position on the market, is not achieved within one iteration of business quality improvement, but is the result of continuous improvement that includes cyclical evaluations and optimization of business processes.

Ćóckalo and Đorđević claim (2018) that the quality of products and services are important factors when it comes to user satisfaction. Quality management as a concept that aims to increase productivity, and which developed under the influence of market globalization and the need to satisfy the needs and wishes of users and consumers, is a necessary and indispensable item that every company should effectively practice (Ćóckalo, i Đorđević, 2018 ).

The necessity of quality management is evident not only from practice, but also in earlier literary sources where it is indicated that quality reduces operating costs and contributes to product differentiation (Llopis, & José Tarí, 2003), that the application of a quality management system positively affects not only product

quality, but also on operational performance, and performance related to the environment and environmental conservation (Bhatia, & Awasthi, 2018).

## RESEARCH RESULTS AND DISCUSSIONS

The research for the purposes of this paper included the analysis and determination of the relationships between the application of information systems and quality management, and with all of the aforementioned, the aim is to define the influencing relationships of factors on business results and market performance. For the purposes of research in this work, data related to the size of the company (based on the number of employees) as well as the ownership structure of the company (private or state-owned) were collected, while the respondents were managers of micro, small, medium and large companies who, through the evaluation of dimensions in the questionnaire presented their views related to the application of information systems in business, but also to quality management in companies. A total of 184 correctly filled questionnaires (N=184) were collected. According to the gender structure of the respondents of this research, the majority were men, as many as 120 (65%) of them, while 64 respondents (35%) were women. The methods used to analyze the collected data are linear regression and Cronbach's alpha test. The results of linear regression where all independent variables were observed together, i.e. the calculation was performed with all variables at once, are shown in table 1.

*Table 1: Linear regression (all independent variables observed together)*

Y	X	$\beta_0$	p-value	Std. Error	R <sup>2</sup>	Adjusted R <sup>2</sup>
		2.1493				
PR	IS	0.1116	0.0046	0.039	0.682	0.671
	UK	0.232	<0.0001	0.049		
Y	X	F	F Sig.	MSE	RMSE	DW
PR	IS	62.571	<0.0001	1.63	0.403	2.158
	UK					

The value of the regression coefficient R<sup>2</sup> = 0.682, which indicates strong positive relationships between the observed variables.

$$PR = \beta_0 + \beta_1 \cdot IS + \beta_2 \cdot UK + \epsilon;$$

$$PR = 2.149 + 0.116 \cdot IS + 0.232 \cdot UK + \epsilon;$$

In the next variant of linear regression, business results (PR) are still considered as a dependent variable while the other variables are independent, with the regression coefficients calculated separately for each independent variable. In this way, a more detailed insight into the dynamics of the observed variables is created, and the obtained results enable a more objective analysis of the relationships between the observed variables (table 2).

*Table 2: Linear regression (independent variables observed individually)*

Y	X	$\beta_0$	p-value	Std. Error	R <sup>2</sup>	Adjusted R <sup>2</sup>
		1.339				
PR	IS	0.406	<0.0001	0.178	0.442	0.439
	UK	0.539	<0.0001	0.037	0.545	0.542
Y	X	F	F Sig.	MSE	RMSE	DW
PR	IS	142.64	<0.0001	0.278	0.527	1.581
	UK	215.47	<0.0001	0.226	0.476	1.916

Based on the insight into the results from table 2., it is evident that all the values of the regression coefficients indicate positive relationships between the dependent variable and the independent variables, and it was observed that the values are more adequate when the independent variables are observed individually. Based on the obtained data shown in table 2, the following regression equation was established:

$$PR = \beta_0 + \beta_1 \cdot IS + \beta_2 \cdot UK + \epsilon;$$

After entering the data from table 2 into the equation, we get:

$$PR = 1.339 + 0.406 \cdot IS + 0.539 \cdot UK + \epsilon;$$

The next research part refers to the variant of linear regression when market performance (TP) is considered as dependent variables, while other variables are considered as independent variables. The results of this research part are shown in table 3.

Table 3. Linear regression (all independent variables observed together)

Y	X	$\beta_0$	p-value	Std. Error	R <sup>2</sup>	Adjusted R <sup>2</sup>
		0.822				
TP	IS	0.010	0.740	0.030	0.884	0.880
	UK	0.046	0.223	0.038		
Y	X	F	F Sig.	MSE	RMSE	DW
TP	IS	222.495	<0.0001	0.096	0.309	2.256
	UK					

All values of regression coefficients indicate positive relationships between the observed variables. Based on the obtained data shown in table 3, the following regression equation was established:

$$TP = \beta_0 + \beta_1 \cdot IS + \beta_2 \cdot UK + \beta_3 \cdot MLJR + \beta_4 \cdot RIP + \beta_5 \cdot DO + \beta_6 \cdot FPK + \epsilon;$$

After entering the data from table 3 into the equation, it is obtained:

$$TP = 0.822 + 0.010 \cdot IS + 0.046 \cdot UK + 0.027 \cdot MLJR + 0.399 \cdot RIP + 0.387 \cdot DO - 0.009 \cdot FPK + \epsilon;$$

Table 4. Linear regression (all independent variables observed individually)

Y	X	$\beta_0$	p-value	Std. Error	R <sup>2</sup>	Adjusted R <sup>2</sup>
		1.328				
TP	IS	0.489	<0.0001	0.045	0.398	0.395
	UK	0.647	<0.0001	0.049	0.487	0.484
Y	X	F	F Sig.	MSE	RMSE	DW
TP	IS	119.036	<0.0001	0.483	0.695	1.711
	UK	170.85	<0.0001	0.412	0.641	1.806

Table 4 shows the results of linear regression, where all independent variables were observed individually, that is, the regression coefficient was calculated for all independent variables separately. In this way, it is possible to more adequately identify the intensities and directions of the observed relations. Market performance (TP) was considered as a dependent variable while other factors were considered as independent variables. The obtained values of the regression coefficients indicate positive relationships between the dependent variable and the independent variables. Based on the obtained data shown in Table 4, the following regression equation was established:

$$TP = \beta_0 + \beta_1 \cdot IS + \beta_2 \cdot UK + \epsilon;$$

After entering the data from table 4 into the equation, it is obtained:

$$TP = 1.328 + 0.489 \cdot IS + 0.647 \cdot UK + \epsilon;$$

The last statistical method within this work is the Cronbach-alpha test, which was conducted in order to determine the reliability of the scales in the questionnaire used to investigate the attitudes of company managers. Cronbach's alpha test was conducted for each analyzed factor. The results of the Cronbach-alpha test are shown in Table 5. Based on the results in Table 5, it is evident that there is adequate consistency

and reliability of the scales within the questionnaire that was used to investigate the attitudes of company managers.

*Table 5. Kronbah-alfa test*

Dimenzije	Kronbah-alfa vrednost	Broj pitanja
Informacioni sistemi (IS)	0.941	12
Upravljanje kvalitetom (UK)	0.937	12
Poslovni rezultati (PR)	0.924	12
Tržišne performance (TP)	0.928	11

Linear regression was conducted in several variants. Table 1 presents the results of a linear regression where all independent variables are taken into account simultaneously. The regression coefficient R2 is 0.682, which indicates medium to strong positive relationships between the dependent variable and the independent variables.

Also, table 2 presents the results of linear regression where all independent variables are taken into account individually, that is, the regression coefficient R2 is calculated for each independent variable. It is interesting that with this variant, the problem of a statistically significant value for the variable does not exist, while all  $\beta$  values indicate a positive influence of independent variables on business results (PR). Regression coefficients R2 vary (quality management has a strong positive relationship with business results R2= 0.545. In general, all independent variables are in a medium to strong positive relationship with the dependent variable.

The differences between the variants where the regression coefficients are determined individually and the variants when all the independent variables are considered together are due to a different observation of the relationship between the dependent and independent variables. Both variants are significant because they indicate the complexity of the relationships between the analyzed variables.

Table 3 presents the results of a linear regression where all independent variables are taken into account simultaneously. The regression coefficient R2 is 0.884, which indicates a strong positive relationship between the dependent variable and the independent variables. However, according to  $\beta$  values, information systems have an almost completely neutral relationship with market performance (TP).

The results from Table 4 represent where all independent variables are taken into account individually, that is, the regression coefficient R2 is calculated for each independent variable. It is interesting that with this variant, there are no statistically significant values for the independent variables. Additionally, all  $\beta$  values indicate a positive influence of independent variables on market performance (TP).

The results of the Cronbach-alpha test indicate that there is adequate internal reliability of the scales used in the questionnaire.

Based on the conceptual study, previous research in the field of information systems and quality management indicates a positive impact of information systems and quality management on business results and market performance. The research covers complex relations and relationships of key factors for improving business results and market performance. The methodology of obtaining the results itself represents a kind of contribution from the aspect of scientific research and guidelines for future research.

## CONCLUSION

Due to new market paradigms, companies must become more flexible in terms of business strategies and goals and constantly adapt to market changes.

The scientific justification of the research is reflected in the achieved results that contribute to existing scientific knowledge through the identification of relationships and the impact of information systems on the business results and market performance of the company.



For future research, it is recommended to include more extensive structured questionnaires with more dimensions and more researched factors such as modern marketing strategies, financial performance and the application of technologies from the domain of Industry 4.0.

The conclusion of this paper is that quality management is imperative for achieving good business results and market performance, as well as the daily application of modern information systems.

## REFERENCES

- Aba, E. K., Badar, M. A., & Hayden, M. A. (2016). Impact of ISO 9001 certification on firms financial operating performance. *International Journal of Quality & Reliability Management*, 33(1), 78-89. doi: 10.1108/ijqrm-02-2014-0021
- Araújo, R., Santos, G., Costa, J., & Sá, J. (2019). The quality management system as a driver of organizational culture: An empirical study in the Portuguese textile industry. *Quality Innovation Prosperity / Kvalita Inovácia Prosperita* 23(1). doi: 10.12776/QIP.V23I1.1132
- Bakator, M., Đorđević, D., & Čočkaló, D. (2019). *Developing a model for improving business and competitiveness of domestic enterprises*. *Journal of Engineering Management and Competitiveness (JEMC)*, 9(2), 87-96.
- Ballantine, J., Levy, M., & Powell, P. (1998). Evaluating information systems in small and medium-sized enterprises: issues and evidence. *European Journal of Information Systems*, 7(4), 241–251. doi:10.1057/palgrave.ejis.3000307.
- Bhatia, M. S., & Awasthi, A. (2017). Investigating the impact of quality management systems on business performance. *International Journal of Productivity and Quality Management*, 21(2), 143-173. doi: 10.1504/IJPM.2017.083773
- Candido, C. J. F., Coelho, L. M. S., & Peixinho, R. M. T. (2016). Te financial impact of a withdrawn ISO 9001 certificate. *International Journal of Operations & Production Management*, 36(1), 23-41. doi: 10.1108/IJOPM-11-2014-0540
- Čočkaló, D., i Đorđević, D. (2018). *Upravljanje kvalitetom. Tehnički fakultet "Mihajlo Pupin": Zrenjanin*. ISBN: 978-86-7672-305-8.
- Dick, G. P., Heras, I., & Casadesús, M. (2008). Shedding light on causation between ISO 9001 and improved business performance. *International Journal of Operations & Production Management*, 28(7), 687-708. doi: 10.1108/01443570810881811
- Đalić N., Terek E., Paunović M., & Bakator M. (2019). The Importance of Information Technologies in Managing Human Potentials of the Logistic Centers of the Republic of Srpska. *Journal of Information Technology and Applications - JITA* 9(1), 36-45. (UDC: 005.96(497.6):[659.23:004.738.5), <https://doi.org/10.7251/JIT1901036DJ>
- Đalić, N., Nikolic, M., Bakator, M., & Erceg, Z. (2021). Modeling the Influence of Information Systems on Sustainable Business Performance and Competitiveness. *Sustainability*, 13(17), 9619. <https://doi.org/10.3390/su13179619>
- Emblemsvag, J. (2020). On Quality 4.0 in project-based industries. *The TQM Journal*, 32(4), 725-739. doi:10.1108/TQM-12-2019-0295
- Gunasekaran, A., Subramanian, N., & Ngai, E. (2018). Quality Management in the 21st Century Enterprises: Research pathway towards Industry 4.0. *International Journal of Production Economics*. doi:10.1016/j.ijpe.2018.09.005
- Kafetzopoulos, D. P., Psomas, E. L., & Gotzamani, K. D. (2015). Te impact of quality management systems on the performance of manufacturing firms. *International Journal of Quality & Reliability Management*, 32(4), 381-399. doi: 10.1108/IJQRM-11-2013-0186
- Llopis, J., & José Tarí, J. (2003). The importance of internal aspects in quality improvement. *International Journal of Quality & Reliability Management*, 20(3), 304–324. doi:10.1108/02656710310461314
- Ochieng, J., Muturi, D., & Njihia, S. N. (2015). Te impact of ISO 9001 implementation on organizational performance in Kenya. *The TQM Journal*, 27(6), 761-771. doi: 10.1108/TQM-06-2015-0071
- Papageorgiou, G., Petrakis, C., Ioannou, N., & Zagarelou, D. (2019). Effective business planning for sustainable urban development: the case of active mobility. In *ECIE 2019 14th European Conference on Innovation and Entrepreneurship* (2 vols) (p. 759). Academic Conferences and publishing limited
- Quazi, H. A., Hong, C. W., & Meng, C. T. (2010). Impact of ISO 9000 certification on quality management practices: A comparative study. *Total Quality Management & Business Excellence*, 13(1), 53-67. doi: 10.1080/09544120120098564
- Stendal, K., Thapa, D., & Lanamäki, A. (2016, January). Analyzing the concept of affordances in information systems. In *2016 49th Hawaii International Conference on System Sciences (HICSS)* (pp. 5270-5277). IEEE.

**Session F: ABSTRACTS**

---

**Abstracts (pp. 235-236):**

Mohammad Anisseh, Narges Sharifi, Zahra Akbari EVALUATION OF UNIVERSITYIES SERVICE QUALITY THROUGH SERVQUAL METHOD	235
Károly Szabó, László Szabó POSSIBILITEIS OF SHORT SUPPLY CHAINS IN THE SUSTAINABLE LOGISTICS	236



## **EVALUATION OF UNIVERSITYIES SERVICE QUALITY THROUGH SERVQUAL METHOD**

**Mohammad Anisseh**

Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management,  
Qazvin, Iran

E-mail: [manisseh@soc.ikiu.ac.ir](mailto:manisseh@soc.ikiu.ac.ir)

**Narges Sharifi**

Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management,  
Qazvin, Iran

**Zahra Akbari**

Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management,  
Qazvin, Iran

### **ABSTRACT**

Universities play a crucial role in societal development and growth, with higher education expanding every day. Therefore, it is essential for universities to prioritize the quality of educational services to ensure student satisfaction. Evaluating the quality of educational services is a fundamental step in improving higher education. This research is an applied study that uses descriptive and exploratory methods for data collection. The statistical population for this research includes students from the Faculty of Social Sciences at Imam Khomeini International University and the Faculty of Management at Tehran University. To gather information, a standard Servqual questionnaire was used to measure the significance of each educational service criterion on student satisfaction levels. At the end, the results have been reviewed and analyzed.

**Keywords:** Evaluation, Service Quality, Servqual model, Quality Gap

**Full paper was published in Journal of Engineering Management and Competitiveness (JEMC)  
Vol. 13, No. 1, 2023.**

## **POSSIBILITIES OF SHORT SUPPLY CHAINS IN THE SUSTAINABLE LOGISTICS**

**Károly Szabó**

Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary

**László Szabó**

Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary

E-mail: [szabo.laszlo4@uni-bge.hu](mailto:szabo.laszlo4@uni-bge.hu)

### **ABSTRACT**

Climate change has been a known problem for a long time, but nowadays its effects becoming more powerful and palpable in our everyday life. Therefore, one of the most important topics of the social sciences nowadays, the identification of the sustainable solutions. As the problem of the climate change is very complex, we have to examine it from different aspects/territories/industries. Logistics is one of these territories. Today logistics is more and more criticized as the average supply chains contribute in a highlighted way to the environmental pollution. In the past academic discussion, Short Supply Chains appeared as a potential solution but so far only in the field of agricultural sciences yet. In the current research, we will examine that can be the implemented Short Supply Chains a possible solution in other industries also? According to this, we will try to identify the international best practices on the ground of literature and with qualitative methods among Zala County enterprises.

**Keywords:** Logistics, Environment, Pollution, Short Supply Chain.

## Author Index

<b>A</b>			
Afshari, Ali Reza, Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran	3, 37	Bjekić, Radmila, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	159
Akbari, Zahra, Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management, Qazvin, Iran	235	Bogetić, Srđan, Belgrade Business and Arts Academy of Applied Studies, Belgrade, Republic of Serbia	106
Aleksić, Marko, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	159	Božović, Aleksandra, Republic of Serbia	49
Andrašić, Jelena, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	188	Bozoki, Valentina, University of Novi Sad, Technical Faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	137, 165
Anđelić, Svetlana, ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia	215	<b>C, Ć</b>	
Anisseh, Mohammad, Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management, Qazvin, Iran	235	Cvjetković, Milena, College of Academic Studies "Dositej", Belgrade, Republic of Serbia	49
Antić, Zorana, Belgrade Business and Arts Academy of Applied Studies, Belgrade, Republic of Serbia	106	Ćočkalo, Dragan, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	11, 100
<b>B</b>		Ćočkalo-Hronjec, Melita, High school "Laza Kostić", Novi Sad, Republic of Serbia	118
Bakator, Mihalj, University of Novi Sad, Technical Faculty "Mihajlo Pupin" in Zrenjanin, Republic of Serbia	11, 100	<b>D, Đ</b>	
Bafti, Farzad Ghaderi, Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran	37	Djokic, Ines, University of Novi Sad, Faculty of Economics in Subotica, Republic of Serbia	66
Bajić, Dejan, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	112	Djokic, Nenad, University of Novi Sad, Faculty of Economics in Subotica, Republic of Serbia	66
Barzut, Srđan, ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia	209, 215	Đaković, Miloš, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	188
Berber, Nemanja, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	159	Đalić, Irena, University of East Sarajevo, Faculty of Transport and Traffic Engineering, Dobož, Bosnia and Herzegovina	227
		Đalić, Nataša, University of East Sarajevo, Faculty of Transport and Traffic Engineering, Dobož, Bosnia and Herzegovina	227
		<b>E</b>	
		Erceg, Živko, University of East Sarajevo, Faculty of Transport and Traffic Engineering, Dobož, Bosnia and Herzegovina	227

Erić, Spasoje, Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia	54		
<b>G</b>		<b>K</b>	
Gaborov, Maja, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	118, 151	Kalaš, Branimir, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	183, 188
Gašić, Dimitrije, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	159	Kavalić, Mila, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	11, 100
Gluckov, Verica, University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia	100, 112	Kosobutskaya, Anna, Voronezh State University, Voronezh, Russian Federation	19
Ghayeni, Niloofar, Islamic Azad University, Department of Industrial Engineering, Shirvan Branch, Shirvan, Iran	43	Kovač, Dragana, University of Novi Sad, Technical faculty „Mihajlo Pupin“, Zrenjanin, Republic of Serbia	112, 118
<b>I</b>		<b>L</b>	
Indić, Milica, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	183	Lajić, Zoran, Maran Tankers Management Inc., Fleet Performance Department, Kallithea, Greece	124
Ivaniš, Miloš, University Business Academy in Novi Sad, Faculty of Economics and Engineering Management, Novi Sad, Republic of Serbia	171, 177	Luković, Stevan, University of Kragujevac, Faculty of Economics, Kragujevac, Republic of Serbia	194
<b>J</b>		<b>M</b>	
Janačković, Goran, University of Niš, Faculty of Occupational Safety, Niš, Republic of Serbia	60	Mali, Predrag, University of Novi Sad, Faculty of Technical Science, Novi Sad, Republic of Serbia	129
Jevremović, Milica, ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia	209, 221	Maljugić, Biljana, Republic of Serbia	124
Josimović, Milica, Republic of Serbia	71	Marić, Dubravko, High School of Sports and Health, Belgrade, Republic of Serbia	143
Josimovic, Milos, Republic of Serbia	71	Micic, Ivica, Republic of Serbia	71
Jovanović, Zoran, Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia	60	Milenković, Nada, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	183, 188
Jovanoski, Bojan, Ss. Cyril and Methodius University in Skopje, Faculty of Mechanical Engineering, Skopje, Republic of North Macedonia	83	Milicevic, Nikola, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	66
Juric, Slobodan, High school "CEPS-Center for Business Studies", Kiseljak, Bosnia and Herzegovina	71	Milićević, Violeta, Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia	60
		Milošev, Vladimir, Republic of Serbia	143
		Minovski, Robert, Ss. Cyril and Methodius University in Skopje, Faculty of Mechanical Engineering, Skopje, Republic of North Macedonia	83

Mirović, Vera, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	183	<b>S</b>	
Mitić, Siniša, University of Novi Sad, Faculty of Technical Science, Novi Sad, Republic of Serbia	124, 129	Sajfert, Dragana, ITS Information Tehnology School, Zemun-Belgrade, Republic of Serbia	209, 215
Mitrašević, Mirela, University of East Sarajevo, Faculty of Business Economics Bijeljina, Bosnia and Herzegovina	194	Sharifi, Narges, Imam Khomeini International University, Faculty of Social Sciences, Department of Industrial Management, Qazvin, Iran	235
		Sobhanifard, Farideh, University of Sistan and Baluchestan, Department of Industrial Engineering, Zahedan, Iran	3
		<b>N</b>	
Nejatpuor, Saman, Islamic Azad University, Department of Physical Education, Shirvan Branch, Shirvan, Iran	95	Stanisavljev, Sanja, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	11, 112
Nikitina, Larisa, Voronezh State University, Voronezh, Russian Federation	19	Stanojeska, Marija, UACS, School of Business Economics and Management, Skopje, Republic of North Macedonia	83
Nikolić, Milan, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	11, 129	Strugar Jelača, Maja, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	159
		<b>P</b>	
Palinkaš, Ivan, Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia	54, 118	Szabó, Károly, Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary	236
Paunović, Vladan, University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia	77	Szabó, László, Budapest Business School, Faculty of Finance and Accountancy, Budapest, Hungary	25, 236
Pjanić, Miloš, University of Novi Sad, Faculty of Economics, Subotica, Republic of Serbia	194	<b>T</b>	
Prachenko, Anton, Moscow State University of Sports and Tourism, Moscow, Russian Federation	19	Taboroši, Srđana, Republic of Serbia	124
Prvulovic, Slavica, University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia	71	Terek Stojanović, Edit, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	11, 100
Puzović, Sanja, University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia	77	Tolmac, Jasna, University of Novi Sad, Technical Faculty "Mihajlo Pupin", in Zrenjanin, Republic of Serbia	71
		Treshchevskiy, Yuriy, Voronezh State University, Voronezh, Russian Federation	19
		<b>U</b>	
		Ugrinov, Stefan, University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, Republic of Serbia	112, 151
		<b>R</b>	
Rajić, Aleksandar, Higher Technical School of Vocational Studies, Zrenjanin, Republic of Serbia	54	<b>V</b>	
Rajković, Jelena, University "Union - Nikola Tesla", Faculty of Engineering Management, Belgrade, Republic of Serbia	124, 129	Vasović, Bojan, Toplica Academy of Applied Studies, Department of Business Studies, Blace, Republic of Serbia	60



		<b>Z, Ž</b>		
Vasović, Dejan, University of Niš, Faculty of Occupational Safety, Niš, Republic of Serbia	60	Završnik, Bruno, University of Maribor, Faculty of Economics and Business, Slovenia	29	
Vesić Vasović, Jasmina, University of Kragujevac, Faculty of Technical Sciences, Čačak, Republic of Serbia	77	Zhemkova, Aleksandra, Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia	200	
Vukić, Ana-Marija, Republic of Serbia	209, 215			



# EMC2023

**13th International Symposium  
"Engineering Management and  
Competitiveness" 2023**



ISBN: 978-86-7672-365-2



9 788676 723652