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Technology innovation and firm performance of non-financial public listed companies: the case of vietnam.

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Abstract: This research investigates the impact of technological innovation on the productivity of non-financial public listed companies in Vietnam. The FGLS regression model is used with data collected from the financial statement of Vietnam from 2011 to 2023 with 4610 observations. The results show that most technological innovation variables have a negative effect on the return on assets and have no impact on the market value. Specifically, technological innovation influences enterprise revenue and profit, including new products, new processes, R&D expenditure, age, size, and employee cost. From the study results, some implications are suggested to improve public-listed companies' performance in Vietnam.

Keywords: Technology innovation, firm performance, public-listed companies.

1 Introduction

Previous research has reported companies, in particular small and medium companies, must implement a technical innovation plan that is incorporated with the overall strategy of the firm to gain and increase their competitiveness [15]. Technological innovation activity has also been shown to boost corporate performance [11]. Product innovation, as example, product innovate is the outcome of a company's performance and efficiency in launching innovative additional features to the market, which can be measured in market share and profit oriented [13]. Additionally, both large and small businesses profit from green technology and feasible development in all aspects. There are numerous ways in which technology innovation can contribute to environmental, economic, and social sustainability, it found that Greater inventiveness can improve urban environment [6]. Although a several of studies suggesting that innovation and technology activities has a beneficial influence on corporate performance, other statistical research has found that these activities may not always have a positive effect, depending on the characteristics of the organization or the collection of firm-level variables and environmental contingency [9]. One study has reported that Companies that have a successful track record in developing a technology may not be as

successful in developing products based on that technology [22], while other study has indicated that the most essential component of success in business is innovation and that investing in technical innovation is the most prevalent approach for increasing growth [12]. It is due to the technological innovation types and features and companies' firm levels are complex, and there have also been inconsistencies in the statistical and analytical approaches used by academics [22]. Despite the necessity of innovation has achieved widespread acceptance from a mixture of empirical analysis results which have produced a mixed argument based on theory, empirical results, and real businesses experience.

Given that Vietnam is an emerging economy with many flaws, a high level of information asymmetry, and low financial disclosure transparency, the question of whether investing in technological innovation influences the performance of listed companies has caught the interest of both researchers and policymakers. Additionally, the majority of studies in Vietnam are mentioned about the roles of innovation in the performance of the SMEs companies. Most studies are restricted to a particular region or town, with a limited selection of businesses surveyed. As a result, the representativeness of the research is low. The paper investigates the relationship between technological innovation and the performance of non-financial public firms in Vietnam (including revenue, profit). Since then, the paper will make a recommendations to improve the business performance of Vietnam's publicly traded enterprises.

2 Literature review

2.1 Innovation and its role in development

The word "innovation" signifies many various things to various individuals, as is frequently a case with phrases that are popular at certain times. When it comes to the meaning of this word, it is impossible not to mention the definition of Schumpeter who first began to theorize about the characteristics and dynamics of innovation in the early 20th century. According to Schumpeter, innovations are innovative mixture of skills, resources, and so on that are subject to commercialization attempts [20]. It is fundamentally the process where new concept are developed and commercialized and he saw innovation as capitalism's lifeblood. Following an early study of entrepreneurship and innovation, the next definitive work on this subject was in the 1980s by the well-known manager Peter Drucker. In his 1985 book "Innovation and Entrepreneurship", Drucker defines "innovation" as: "Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service." [8]. According to his definition, innovation is more than just new innovations or

technologies; it is also about emerging opportunities provided by new technologies, products, processes, business models, and so on. The following years after that, there are a lots of research sharing the same idea, according to Bessant & Tidd, the transformation of ideas into useful and used widely new products, processes, and services to benefit the organization and its stakeholders is known as innovation [5]. According to OECD's definition, innovation can be divided into four types: product innovation, process innovation, marketing innovation, and organizational innovation [18]. Following [18], the principal international source of rules for identifying and assessing initiatives for innovation.

Therefore, innovation is vital because it leads to the formation of new businesses, which in turn fosters economic growth. It is true if the new firms are fresh start or new companies within existing organizations, the latter of which has recently been referred to as entrepreneurship. While both start-ups and current businesses benefit from these breakthroughs in the form of increased sales and profits, the net effect on the national and international economies is growth. Economic growth is defined as the yearly growth rate of a nation's gross domestic product (GDP), and it is a proxy for the overall well-being of its citizens.

2.2 Technological innovation

2.2.1 Analyzing technological innovation base on product and process innovation

Typically, technology advances are associated with product and process innovation[7]. Product innovation is the capacity to create new products to consistently bring innovative products to the market and supplement value to its products by combining technology in order to please customers or the market. Process innovation, on the other hand, reduces production costs through the development of new technologies to substantially boost productivity and the development of process innovation that connect between input and output [7].

2.2.2 Analyzing technological innovation Base on Research and Development (R&D)

The innovation process often begins with research and development activities including market research, analysis of demand, formulating a new concept, testing them through evaluation, and designing a new product [3].

R&D investment may improve the allocation of resources for innovative activities, enhance production circumstances, and boost technological progress output. Using technological improvement accomplishments such as scientific and patents papers, It is achievable to mission of creating new goods, decreasing resource use, and

lowering emissions of the forms of trash, thus attaining and expanding economic development [13].

2.3 The institutional background of Vietnam and the factors that determine the success of these companies

2.3.1 Innovation history of Vietnam

As the adoption of Doi Moi strategy, Viet Nam's innovation policy structure has changed considerably. Since then, Vietnam has steadily shifted from a centrally organized to a socialist-oriented market economy. The science and technology system was reformed and the state management of science and technology was modernized between 1996 and 2010. However, from 2011, the Vietnamese economy has experienced slower growth and slight improvement in growth quality and labor productivity. Science and technology development and innovation were identified as top goals in the Socio-economic development Strategy plan 2011–2020.

During 35 years of industrialization, modernization and international integration (1986-2021), Vietnam's innovation strategy has seen dramatic changes, including scope changes, ease of entrance and operation in S&T, and types of aid [23]. As a result, science and technology in Vietnam have achieved significant progress in all areas, providing a real improvement to the economic growth of society, improving people's quality of life, and consolidating national defense and security.

2.3.2 Overview about public listed company in Vietnam

After 18 years of development and expansion, the Vietnam stock market now has 731 companies listed due to international investor interest and the liberalization of state-owned industries [17]. Nonetheless, in comparison to other countries, the Vietnam stock exchange still has some limitations, such as a borderline with a small size, transparency minimal, and, most significantly, an inadequate shareholder protection system [17]; [14].

2.3.3 The contribution of public-listed companies to Vietnam economy

After 25 years of operation, Vietnam's stock market today contains around 1,900 public businesses, with 404 listed on the Ho Chi Minh Stock Exchange (HOSE) and the Stock Exchange. The Hanoi Stock Exchange (HNX) has 343 listed companies, while the Upcom Stock Exchange has 895 enrolled for trade. Moreover, the size of our country's stock market is expanding, and it is becoming a key medium- and long-term capital mobilization route for the economy [16].

According to the Ministry of Finance, investors' quality is steadily improving. Foreign and institutional investors' active engagement in Vietnam's stock market has helped to improve the level of corporate governance in conformity with worldwide principles for

listed businesses. The stock market is seen as a "launching pad" for many enterprises to grow drastically in size and quality, eventually becoming industry leaders [10]. The stock market plays an active part in the equitization of state-owned firms, allowing state-owned enterprises to be more open and transparent, therefore helping to the execution of the policy of restructuring state-owned enterprises [10].

2.3.4 Firm performance: concept and measurement

In this research, author considers ROA as a accounting-based criterion and Tobin's Q like a market-based criterion of company management and how it's being changed by technological innovation. Tobin's Q may be determined by the ratio of the company's market capitalization divided by its total assets. Companies has a Q ratio larger than 1.0 is able to produce more value by successfully utilizing accessible resources, whereas others has a Q ratio less than 1.0 are linked to inefficient use of the available resources. Tobin's Q has come to be recognized as an essential indicator of corporate success since it demonstrates the value provided for investors. A higher Tobin's Q value indicates better economic success [1]. In that way, the author can evaluate the companies from both inside and outside impacts to help firms build a wise strategy.

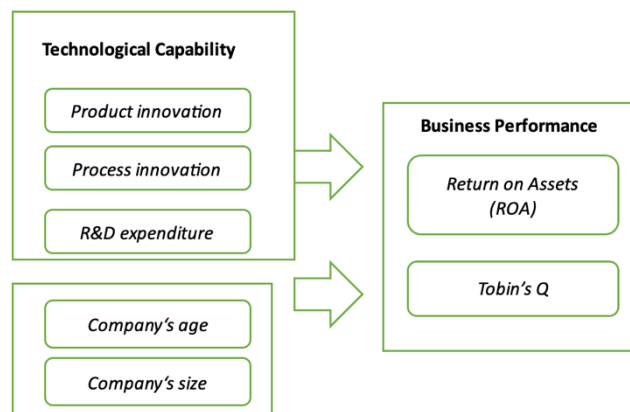


Figure 1
Research Model
Source: Developed by author

3 Methodology

The data of this research was collected and processed by the author as follow:

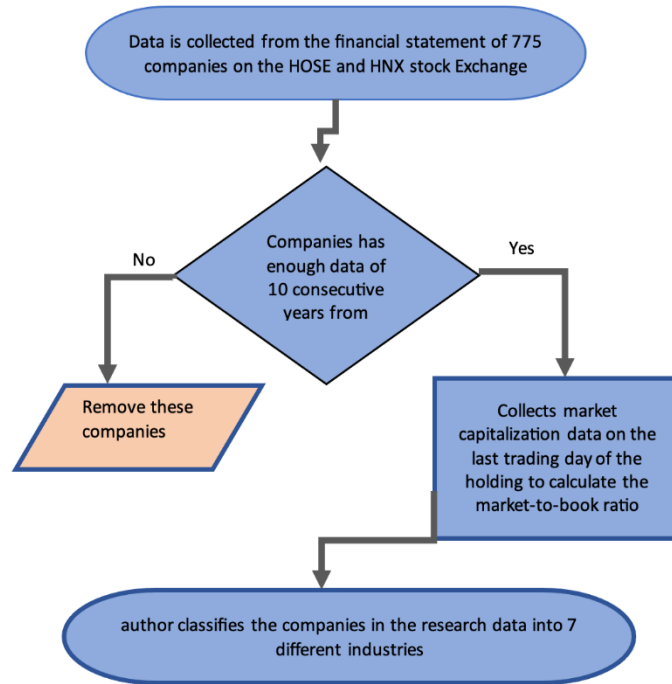


Figure 2
Research Data Process
Source: Developed by author

3.1 The research method

3.1.1 Research Models and Variables

Model 1:

$$ROA_{i,t} = \beta_0 + \beta_1 PDI_{i,t} + \beta_2 PCI_{i,t} + \beta_3 RD_{i,t} + \beta_4 AGE_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 GOS_{i,t} + \beta_7 EC_{i,t} + \varepsilon_{i,t} \quad (1).$$

Model 2:

$$TobinQ_{i,t} = \beta_0 + \beta_1 PDI_{i,t} + \beta_2 PCI_{i,t} + \beta_3 RD_{i,t} + \beta_4 AGE_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 GOS_{i,t} + \beta_7 EC_{i,t} + \varepsilon_{i,t} \quad (2)$$

In which:

Variable	Acronym	Formular
Return on Assets	ROA	$\frac{\text{Net profit after taxes}}{\text{Total assets}}$
Tobin Q	TobinQ	$\frac{\text{MVE} + \text{PS} + \text{DEBT}}{\text{TA}}$
Product innovation	PDI	Dummy=1 if the company invests in developing new items or new manufacturing technologies, or in improving existing products, 0 otherwise.
Process innovation	PCI	Dummy=1 if the company's production or service delivery flexibility has improved, increased production capacity or reduced labor cost, energy cost and 0 otherwise.
R&D expense	R&D	$\frac{\text{Cost of goods sold}}{\text{Net Revenue}}$
Size of company	SIZE	$\text{Ln}(\text{Total assets})$
Age of company	AGE	$\text{Year}_{n+1} - \text{year established}$
Government policy	GOS	Dummy=1 if the company receives state support in the form of grants, loans, subsidies, tax refund, and programs for the innovation process from the government, 0 otherwise.
Employees cost	EC	$\frac{\text{Payables to employees}}{\text{Number employees of company}}$

Table 1
Variable calculation
Source: Developed by author

3.1.2 Research method

The study uses balance panel data to examine the impact of technological innovation on firm performance. The combination of cross-sectional data and time series data are the panel data, so observed variables have higher variability, provide more information and have higher reliability. The study uses the least squares estimation method (OLS); fixed-effects model (FE); random effects model (RE); feasible general least squares estimation method (GLS).

4 Results and Discussions

4.1 Descriptive Statistical Analysis

Descriptive statistics are an important step that needs to be taken to analyze research data. Descriptive statistics help describe the basic characteristics of the data in detail. Table 4.1 provides the results describing the variables used in the research model, the descriptive characteristics include: Number of observations, mean value, standard deviation, maximum value, minimum value of variables.

Variable	Obs	Mean	Std.Dev.	Min	Max
ROA	4610	.0631792	.0786784	-.6455064	.7836998
TobinQ	4610	.545117	.6419687	0	8.733678
PDI	4610	.6399132	.4800774	0	1
PCI	4610	.6800434	.46651	0	1
RD	4610	.8132609	.2845973	-8.384849	12.27424
AGE	4610	27.44534	17.38669	0	146
SIZE	4610	11.79551	.6722815	10.13225	14.11896
GOS	4610	.0848156	.2786373	0	1
EC	4610	61.7937	166.6636	.0282461	3077.741

Table 2
Descriptive statistics of the variables in the study
Source: Aauthor collects from Stata 15.1

First, descriptive statistics show that the Return on Assets index of companies in Vietnam has an average value of 0.0631792, that is, the efficiency of using assets of Vietnamese companies in about 6.3%. However, Vietnamese companies only have a very large

difference in the use of company assets with the smallest value being -0.6455064 and the largest value being 0.7836998 indicating their financial competitiveness. The main differences between companies.

Next, for the market value variable (TobinQ), descriptive statistics demonstrate that the minimum and maximum values of Tobin's Q of firm's market value are 0 and 8.733678, respectively, when compared to the individual variances between firms. The average value is 0.545117 (less than 1), revealing that most firms' market value is less than the enterprise's replacement cost, and the enterprise's investment volume has shrunk, indicating that the enterprise is still some distance from the point of equilibrium where Tobin's Q equals 1.

For the investment and development cost (RD) variable, the statistical results show that the R&D cost for Vietnamese enterprises is 0.8132609, the minimum and maximum value of R&D of Vietnamese companies is -8.384849 and 12.27424. This shows that the level of investment in science and technology of domestic enterprises varies greatly and depends on the policies of each company.

The remaining control variables include: company size (SIZE), company age (AGE), and labor cost (EC). The results of descriptive statistics show that the company size of the enterprise has an average value of 11,79551, the age of the company up to the present time reaches the highest value of 145, this shows that there is companies sustainable development over the past 100 years. For labor cost (EC), this value reaches at least 0.0282416 and the highest is 3077.741.

4.2 Correlation Analysis

The author performs correlation analysis using the Pearson correlation matrix to get an initial view of the correlation between the variables used in the research model, especially the correlation between the dependent variable and the independent variables. The correlation coefficients between the variables in the model are detailed in Table 4.2.

Variables	ROA	TobinQ	PDI	PCI	RD	AGE	SIZE	GOS	EC
ROA	1.0000								
TobinQ	0.5338*** (0.0000)	1.0000							
PDI	-0.0129 (0.3827)	0.0559*** (0.0001)	1.0000						
PCI	-0.0162 (0.2701)	0.0326*** (0.0269)	-0.0088 (0.5483)	1.0000					
RD	-0.2988*** (0.0000)	-0.1921*** (0.0000)	-0.0088 (0.5483)	-0.0109 (0.4596)	1.0000				
AGE	0.0581*** (0.0001)	0.1444*** (0.0000)	0.0655*** (0.0000)	Insert Caption ** (0.0000)	-0.0235 (0.1104)	1.0000			
SIZE	-0.0349** (0.0177)	0.0220 (0.1360)	0.0456*** (0.0019)	0.00251* (0.0881)	-0.0127 (0.3886)	0.1554*** (0.0000)	1.0000		
GOS	0.0126 (0.3914)	-0.0166 (0.2600)	-0.0052 (0.7241)	-0.0082 (0.5790)	-0.0038 (0.7958)	-0.0340** (0.0208)	-0.0790*** (0.0000)	1.0000	
EC	0.0420*** (0.0044)	-0.0285* (0.0530)	0.0058 (0.6946)	0.0053 (0.7193)	-0.0065 (0.6571)	0.0699*** (0.0000)	0.1599*** (0.0000)	-0.0353** (0.0164)	1.0000

(***),(**),(*) indicate respectively significant level of 1%;5%;10%

Table 3

Correlation matrix

Source: Aurther collects from Stata 15.1

The results of the correlation analysis show that Vietnamese companies have the correlation coefficient between firm performance (ROA) and product innovation (PDI) variables and process innovation (PCI) of -0.0129 and -0.0162, respectively. As for the correlation between company age (AGE) and ROA, the analysis results showed a positive correlation between these two variables. However, the analysis results also show a negative correlation between company size (SIZE) and the level of profitability of the company, it has shown a negative correlation between these two variables. When it comes to the relationship between Tobin Q and product innovation and process innovation, there is a positive correlation between them. This coefficient shows that the greater the innovation in products and processes of the enterprise, the more it can increase the value of Tobin Q. From an economic view, it can be seen that when the enterprise has innovation, the The company's position in the market has increased significantly. The analysis results also show a positive correlation between the age of the company and the tobinQ index.

Conclusion

Companies have lately had to prove a movement reaction to external developments in the fourth industrial revolution, limited infrastructure prosperity, and long-term sustainability, or, more recently, the Covid-19. Companies must establish strategies to ensure a lasting competitive advantage via creative internalization, as well as strengthen their corporate skills and long-term growth in all aspects: social, environmental, and

economic. In this phase, the role of firms as innovators, as well as their desire to produce, distribute, and engage in innovation activities, has been stressed in the field of technical innovation. Nevertheless, technical innovation strategies, organizational competitiveness, and enhanced internal capacities of businesses may serve as the foundation for a nation's overall competitiveness and sustainable growth. The author's study focused on the impacts of innovative activity on company results in terms of how valuable a firm is in comparison to its total assets, which is the internal health, and Tobin's Q, which is the market worth of companies.

Firstly, Vietnamese companies have technological innovation activities but have not really increased the operational efficiency of enterprises. When a company implements technological innovation, it also means supply, manufacturing organization, quality control, product marketing, distribution, and human resource management operations at all stages, finance and investment. It means the company must also perform to ensure production and business activities. However, the process of technological innovation in organizations is always fraught with obstacles, particularly when it comes to technologies that have been heavily invested in but are now obsolete due to a lack of cash, expertise, and human resource capabilities do not adapt to the new situation businesses can currently reap the benefits of innovation and technological advancement from practice in the 4.0 era as well as from countries around the world, but when faced with production difficulties and technology are issues that have not been prioritized for investment by Vietnamese enterprises. Enterprises' lack of initiative in accessing new technologies and failing to prioritize technological investment in production not only affects production and business efficiency, but also has a detrimental influence on the environment in the area where the firm is located.

Second, R&D expenditure had no obvious impact on present firm performance. This is due to the activity's high investment costs and lengthy implementation time. As a result, R&D activities are undervalued in developing countries. Large and medium-sized organizations are more likely than small businesses to conduct both research and innovation. Only microenterprises have a disadvantage in conducting both research and innovation. Furthermore, when an enterprise's financial resources are still limited, investing a considerable amount of money in R&D expenses would result in financial deficits, resulting in worse operating efficiency and making it difficult to attract potential investors.

Third, the age factor of the company (AGE) has a positive influence on the performance of the company. This means that the more senior the company, the longer it exists in the market, the more it can increase its competitive position in the market, making investments more secure and attracting more customers. more external capital for the business, thereby increasing revenue and profit.

Finally, no association was established between government assistance policy and the study results. It can be explained that, in Vietnam today, practically all capital for investment in technical innovation comes from firm self-capital. Despite the fact that

there are government programs and money for this purpose, businesses rarely have access to capital from the state budget to carry out technology upgrade operations.

However, when studying the impact of technological innovation on enterprise performance, the author's study still has some limitations:

First, the effect of technological innovation on firm's performance through non-financial features such as reputation or dedication have not yet been studied. The author only uses analytical approach utilized in the study was regression.

Second, the number of studies on the impact of technical innovation on firm performance in Vietnam is still limited, with most focused on SMEs; thus, the authors' research findings have little comparison with other studies conducted in Vietnam under similar conditions

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Creation of a Unique University Diploma Based on Non-Fungible Token

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Abstract The educational institution issues a diploma to the student after completing higher education. With the advent of blockchain technology, and then with the spread of NFT (Non-Fungible Tokens), it became possible for educational institutions to issue a unique diploma for the students, which is different in terms of form. This would make the diploma more customizable, which would include the student's emotions, thoughts, and insights expressed in graphic representation. The formally personalized diploma certainly represents even greater value for the students, which they will proudly show to their parents and friends. The purpose of the research is to examine how to create a diploma with NFT elements, as well as to reveal the more important steps of its creation. As part of the practical implementation, I will create an NFT-based diploma. To achieve this, I need a digital wallet, a blockchain suitable for NFT storage, and an NFT marketplace.

Keywords: Blockchain Technology, NFT, MetaMask, OpenSea, Ethereum

Introduction

On March 11, 2021, an exclusively digital piece of art in the form of a non-fungible token (NFT) was sold for the equivalent of \$69 million. This work of art by the artist Beeple can be freely viewed or accessed by anyone on the Internet. So why was such a large sum paid for it? Arguably because this piece of art is an NFT. NFTs are blockchain-based tokens that securely map ownership rights to digital assets. Analogous to owning a physical work of art (that visitors to a museum can also look at without owning it), NFTs provide a way to represent ownership or possession of digital assets such as art, music, games, or collectibles [1].

The rapid and dramatic development of information technology, over the recent decade, cannot be denied [2]. Higher education institutions should adapt to the new solutions [3]. The concept of a Non-Fungible Token is essentially a digital diploma of authenticity that cannot be replicated. NFTs are stored on a blockchain or a distributed ledger and are used to represent ownership of unique items. Thanks to the secure properties of blockchain technology, the record of ownership is always

available, and immutable and ensures that there can be only one owner at a given time [4].

Today, blockchain technology is still considered a novelty, even though new ideas in this area appear daily. IT professionals are still getting to know blockchain-based solutions and are trying to take advantage of its potential.

NFT-based blockchain technology has not yet spread in university education, although it is already successfully used in many areas [5] such as:

- Typical NFT use cases are related to collectibles, access keys, tickets, and numbered seats for concerts and sports events. ERC-721 (Ethereum Request for Comments 721), standardizes non-fungible tokens by defining an API interface to implement a smart contract on the Ethereum blockchain and by mandating the functionality that such a smart contract must provide. The functionality is mainly related to the transfer of tokens from one account to another, the retrieval of the current balance of a wallet, and the retrieval of the ownership of a specific token [6],
- In the future, official medical certificates will widely use Industry 5.0 technology. However, the Remix Ethereum platform is currently being used in conjunction with the MetaMask wallet to implement the proposed framework for generating medical certificates such as birth, death, and illness certificates [7].

Research is progressing toward the notion of issuing university certificates not only in paper-based form but also as an electronic document, issued through a blockchain, as data stored in a blockchain provides a high degree of security. By the implementation of such a method, the number of misuses could be minimized, as there were several cases of the applicants producing fake diplomas to the employers [8].

The research is structured according to the following structure:

- Choosing the optimal blockchain for storing the university's NFT-based diploma,
- Choosing a digital wallet that supports a blockchain capable of storing NFT,
- Selection of the NFT marketplace, where the university can most effectively sell its diploma containing NFT elements to its students,
- Creating an NFT-based diploma.

1 Creating a Unique Diploma

1.1 Choose a Blockchain

To create an NFT-based diploma, you must first select the necessary blockchain on which you can store NFT. These may include:

- *Ethereum - Blockchain.*

In practice, NFT is derived from the Ethereum token standard, which aims to make each token distinguishable and completely unique [9]. Ethereum is a popular NFT blockchain. Using the ERC-721 (Ethereum Request for Comments 721) standard, it is possible to create NFTs on it, which are stored in the blockchain. Example functionalities ERC-20 provides:

- Blockchain,
- Transfer tokens from one account to another,
- Get the current token balance of an account,
- Get the total supply of the token available on the network,
- Approve whether an amount of token from an account can be spent by a third-party account [10]

Ethereum is one of the most reliable and stable blockchains on the market.

- *Solana – Blockchain*

The purpose of the Solana protocol is to create and operate decentralized apps. To effectively solve the problem of scalability, the blockchain is the so-called It uses a combination of proof of history and proof of stake algorithms, and the result is an extremely short validation time for both transactions and the execution of smart contracts. All of this is achieved at a very low network fee, which is why Solana has attracted the interest of both corporate and private investors. Solana offers transaction fees of less than \$0.01 and a growing list of supported apps for NFTs [11].

- *Flow – Blockchain*

Flow is a fast, decentralized, and developer-friendly blockchain, the goal of which is to create an ecosystem where a new generation of online games and dApps (decentralized apps) can see the light of day. All forms of use and applications of the protocol require the possession of the Flow token, and the cost of blockchain interactions must also be paid with Flow. In addition, Flow is suitable for obtaining rewards on the network, for transaction validation, or for development. Network management, like other proof-of-stake blockchains, is also in the hands of token

holders. Flow is a PoS blockchain designed for NFTs and decentralized gaming applications and hosts the popular NBA Top Shot NFT collection [12].

Unfortunately, Solana's network has experienced test issues more than once, even though it is a very good and forward-looking blockchain. It is advisable for the university to choose a blockchain that has operated stably for many years and is not in danger of being discontinued. The Flow blockchain is only two years old. The possible errors inherent in it have certainly not been revealed yet. Therefore, I chose the Ethereum blockchain for the practical implementation.

1.2 Set Up an NFT Wallet

It is necessary for the university to create an NFT wallet so that students can pay for their NFT-enhanced diploma. Creating an NFT costs money, which the student must pay. In essence, this would be an added extra service from the university that the student could request if they wanted to customize the look of their diploma. The creation of the NFT primarily includes the cost of the university graphic designer and the purchase of blockchain storage space. The university can pay the NFT with its students using a digital wallet. These may include:

- *MetaMask*

MetaMask is an open-source Ethereum wallet that supports all Ethereum-based tokens (such as those following the ERC-20 standard or non-fungible tokens). What makes MetaMask to link to web pages. For other wallets, you'll need to copy payment addresses or scan a QR code on a separate device. special is its ability With the MetaMask extension, the website simply searches for the wallet and asks its owner to accept or reject the transaction [13].

MetaMask includes a secure identity store that can be used to sign blockchain transactions on various websites with the user's identity and account. The MetaMask add-on can be installed in Chrome, Firefox and Opera [14].

- *Coinbase Wallet*

Coinbase is a DeFi wallet that does not own the wallet's private keys. If their funds are lost, there is no guarantee that they will receive compensation from the service provider. As a result, users have more control over their funds. With Coinbase Wallet, private keys are encrypted on your computer. The only way for Coinbase to decrypt your wallet is to enter your password [15]. These types of software wallets are vulnerable to hacker attacks because the keys are stored on the computer. However, the latest mobile wallets already have ARM TrustZone for protection, which guarantees adequate security [16].

- *Ledger Nano X*

Hardware wallets offer much more security than web wallets. They exist in physical form and are capable of generating public and private keys. The keys are stored on a device that is not connected to the Internet, so it is more difficult to steal them. These wallets are considered one of the most secure options for storing cryptocurrencies. When we want to use the wallet, it must be connected to the computer [17].

The application of the hardware wallet is characterized by continuous remittance. If, for example, we want to exchange our coin on the exchange, it must first be transferred to the exchange. This entails several error possibilities, such as choosing the wrong deposit address or the wrong blockchain for the transfer. It is recommended that the university choose this solution when it wants to keep the coins in the long term and does not plan to make frequent transfers from one address to another.

During the practical implementation, I used the MetaMask wallet, as it is easy to use, which can presumably be an important aspect for the university as well. First, I installed the software and then I created the MetaMask wallet. This is a very important step as this is where MetaMask enters the Secret Backup Phrase. This must be stored in a safe place because if it is lost, we will not be able to access the amount in the wallet, and if hackers get it, they can steal all the digital currency stored in it.

Since blockchain creates new blocks by solving mathematical algorithms in a decentralized manner, its operation can be trusted. Since it is based on the operation of algorithms, the centralized banking system can be bypassed, the consequence of which is that in case of theft, the cryptocurrency will be lost, and no one will reimburse the amount to the customers. To prevent crypto money from being stolen by unauthorized persons, the Secret Backup Phrase must be stored in a safe place.

1.3 Choose an NFT Platform

The university must choose the NFT platform that best suits it, where it can sell the prepared NFT-based diploma to its students. Before this, however, the NFT wallet must be connected to the NFT platform so that the payment can take place. Before selling the student's NFT-based diploma, you must make sure that the NFT diploma is purchased by the student who is entitled to it. This is a key factor in the entire solution, as the reputation of the university may be damaged in the event of incorrect sales. The university should choose from the following NFT platforms:

- *OpenSea*

OpenSea is a very popular crypto market dealing with the buying and selling of NFT. OpenSea was launched in November 2017, but today a total of 10 million digital objects from more than 300 projects are listed on it. Crypto collections, domain names, and other NFTs can all be found, and the tokens of supported

projects can be accessed from your own Ethereum wallet. ERC-721 and ERC-1155 tokens can be found and traded on the platform. Regolit, mycryptoption [18],

- *Solanart*

Solanart was released in 2021. To date, it has been used by 233,000 merchants and generated sales of \$657 million. The advantage of Solanart is that it processes data both off-chain and on-chain. Featured NFTs are all displayed in real-time, thus supporting trading. Solanart users are always informed about the most popular NFTs [19].

This is a very useful function, but the university does not need it, since only our own students sell NFTs.

- *Binance Exchange*

Today, there are more than 100 cryptocurrency exchanges. which have different in-depth technical competencies, such as security, liquidity, transaction speed, coin variety, low fees, deposit options, and mobile applications to attract investors. Binance has the highest volume among the crypto exchanges [20]. In addition, it also has its own coin with BNB [21]. On the Binance exchange, it is possible to create NFT directly. It is an easy and simple solution to create NFT and even to pay coins you don't have to leave the exchange. However, in my opinion, if the university is thinking long-term about creating NFT-based diplomas, it is more appropriate to choose a solution that is not so universal, as it has more options for personalizing NFTs.

1.4 Create the NFT

The creation of the NFT-based university degree consists of the following important steps. This is shown in the first figure.

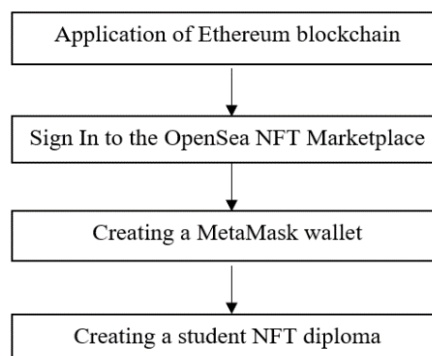


Figure 1

The process of creating an NFT-based university degree

The last step is to create the NFT image. All NFTs are built from layers. This means that the images can be placed on top of each other. In this case, each image represents a layer. The images must have a PNG extension, this ensures that the NFT will have a sharp image. In the case of the university, the basic layer is the university diploma itself, on which the other layers can be placed, and this makes it unique. To create image layers, it is advisable to use the following software:

- Photoshop,
- Figma,
- Corel,
- Illustrator.

I used the open-source Hashlips Art Engine to create a unique image. With the help of this, I modified the metadata in the main, js file in the ERC 721 smart contract from the point of view of the uniqueness of the appearance of the university diploma. This is shown in the second figure.

```
name: '${namePrefix #${edition}}',
description: NFT_based_diploma
file_url: '${baseURI}/${_edition}.png',
custom_fields: {
dna: sha1(_dna),
edition: _university edition1,
date: dateTime,
compiler: "Hashlips Art Engine".
},
...extraMetadata,
attributes: attributesList,
},
ff (network = Solana) {
tempMetadata & {
```

Figure 2
Smart Contract metadata

With the help of an Ethereum smart contract, the university can determine the cost of issuing a diploma containing NFT elements. Since the Smart Contract is part of the blockchain, it is also completely transparent and unforgeable. In this way, abuse during payment can be avoided. The third figure presents the payment mechanism of the Smart Contract.

```

1 contract University NFT diploma{
2 uint public price ;
3 uint public university's stock ;
4 /.../
5 function updatePrice ( uint _price ){
6 if ( msg. student == university )
7 price = _price ;
8 }
9 function buy ( uint quant ) returns ( uint ){
10 if ( msg. value < quant * price || quant > stock )
11 throw ;
12 stock -= quant ;
13 /..

```

Figure 3

Sale of university study materials using a Smart [5]

Each NFT diploma can be connected to a node node, therefore its parameters can be set with the following settings, which is demonstrated in the fourth figure.

```

Student node 1
nohup geth --nousb \
--datadir=$pwd \
--syncmode 'full' \
--port 20241 \
--networkid 1112 \
--miner.gasprice 0 \
--miner.gastarget 470000000000 \
--http \
--http.addr 192.168.1.24 \
--http.corsdomain '*' \
--http.port 8971 \
--http.vhosts '*' \
--http.api admin,eth,net,txpool,student,\
--mine \
--allow-insecure-unlock \
--unlock "0x7Bb542DEd40d0E6Bd01a1bAe39e47ztr436E48" \
--password - diploma

```

Figure 4

Creation student diploma node

2 Possible Disadvantages of Using an NFT-Based Diploma

The NFT-based diploma must also reflect uniformity in terms of customization since without this it becomes difficult to be easily identified. Since the NFT diploma differs in appearance from the usual uniform university diploma, it can be assumed that many people will try to fake it and thereby deceive future employers.

Ethically, the appearance of the NFT diploma must be regulated primarily at the university level. The appearance of the diploma must match the university's regulations and its interests, as well as it must contain forward-looking solutions, since without this, its introduction becomes unjustified.

Another disadvantage of using an NFT-based diploma is that its production is a power-intensive operation since it works on a blockchain basis. For this reason, it is advisable to choose a blockchain that uses a consensus mechanism that requires less electricity. Instead of PoW (Proof-of-Work), it is recommended to use Pos (Proof-of-Stake) or POA (Proof-of-Authority) solutions.

Conclusions

The diploma containing NFT elements is currently considered a novelty, which has not yet been applied by educational institutions. A degree customized in its formal appearance is considered a forward-looking solution. In my opinion, the diploma loses none of its value if it contains NFT elements.

For the university to create an NFT-based degree, it needs an IT specialist with graphic design skills. It would be his responsibility to design the appearance of the diploma, after consulting with the student. After that, the appearance should be examined and approved by the university in every case.

Creating such a diploma comes at a cost, which would burden the student. The university must also be open to accepting cryptocurrencies since the most straightforward way for the student to pay for the unique diploma is with the help of the blockchain. With the use of the MetaMask wallet, the student would transfer the cost of issuing the diploma in Ethereum.

Upon entering the OpenSea Marketplace interface, the diploma would become available to the student, which only he or she could purchase. The university should pay a lot of attention to this so that it only sells the diploma to students who are entitled to it.

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Creating an Energy-Efficient University Blockchain

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Abstract: A much-discussed issue of blockchain technology in the scientific world is that blockchains consume large amounts of electrical energy for their sustainability and operation, which has a harmful effect on the environment. During my research, I am looking for the answer to what blockchain technologies are available that would consume less electrical energy, and whether a blockchain with a higher electrical energy demand can be sustained using renewable energy sources in today's world. As part of the practical implementation, I am creating a private university blockchain to store data. After that, it was calculated how much electrical energy is needed to operate this blockchain. I will investigate what kind of solar solution I can use to reduce the operating costs of the blockchain I'm creating while keeping in mind that this blockchain uses a renewable energy source. My research goal is to propose ways to make blockchains "greener".

Keywords: Blockchain Technology, Solar panel, Green energy

1 Introduction

As a result of continuous development and digitization, more and more devices that consume electrical energy appear daily. The high economic growth rate of developing countries increases energy consumption, and because of this, the electrical energy demand will increase by 28% by 2040. It is irresponsible to meet this level of electrical energy demand with fossil energy, therefore renewable energies must be prioritized and used. Solar energy is in constant transformation, analogue solar solutions have been replaced by digital systems [1].

With the advent of blockchain technology, there is an even greater demand for rooftop photovoltaic (PV) systems [2] since the mining difficulty is constantly increasing, because of which the energy consumption required to produce the blocks is also continuously increasing. During the production of the blocks, the goal is to use the most efficient renewable energy. The blockchain is a decentralized system that works on a mathematical basis, so the trust that the blockchain provides can be established more easily than in the case of a centralized solution. It can be used effectively in many areas of life, such as in the energy sector, as it provides

transparency, reliability and, if necessary, anonymity for the parties. Carbon dioxide emissions are also beneficial for the trading system, as it makes the energy sector distributed and thus require solving many problems, such as distributed storage, control, management, and trading. Traditional energy systems cannot solve these problems, while the features of the blockchain can provide solutions [3]. In addition, blockchain is used with great efficiency in many other areas of life, which is presented in the first figure.

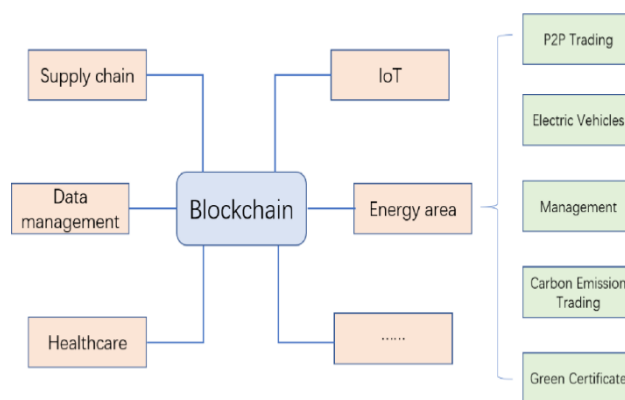


Figure 1.
Possibilities of applying blockchain technology in everyday life [3]

The use of solar energy is essential, but paying for it is already a complex task, which requires a bilateral agreement by the parties, as well as the conclusion of a contract. The days are longer in the summer and shorter in the winter, which affects the efficiency of rooftop photovoltaics (PV), and the prices may change accordingly. It would be advisable to formulate a condition advantageous for both parties and to use a smart contract to comply with it. Companies that sell solar energy pay their customers not immediately, but with a delay of 1-2 months, which can even have a negative impact on the business [4]. Also, by means of a blockchain-based smart contract, daily energy price changes could be recorded automatically, which would enable more accurate payments. It is advisable to choose from the following smart contract platforms to record this type of contract:

- In Ethereum, the 160-bit addresses of user accounts are derived from public keys, and in the case of contract accounts, they consist of the address of the creator of the contract and the nonce address, [5] which results in a very efficient and secure smart contract platform.
- The Solana network runs the mathematical functions in real-time, which also offers reliable smart contracts for application. A big advantage is that you don't have to waste computing resources to synchronize the time, since the time is preset for you and cannot be changed. If we want to know the

hash value when the index is 300, the only way to do this is to run this algorithm 300 times. Based on this, we can conclude from the specific data structure that the smart contract process takes place in real-time [6].

The research is structured according to the following structure:

- Proof-of-Work and Proof-of-Stake consensus examination, considering power consumption requirements,
- Creating a blockchain called Óbuda University suitable for university data storage,
- Calculation of the solar electrical energy demand of a Óbuda University blockchain suitable for university data storage.

2 Proof-of-Work and Proof-of-Stake Consensus Mechanisms

As stated in the previous chapter, blockchain technology has a very important place in the use of renewable energy, as well as in its administration, even if the operation of the blockchain itself requires a lot of energy. Blockchains use several types of consensus mechanisms. The following two mechanisms are the most common in the crypto world:

- Proof-of-Work (POW),
- Proof-of-Stake (POS).

The Bitcoin blockchain network uses Proof-of-work consensus. This is one of the earliest and most widespread solutions for nodes to verify transactions. This requires a serious calculation [7]. During PoW, the algorithm distributes rewards to the miners who produce the blocks. The essence of this algorithm is that only those who have sufficient computing capacity can create new blocks. Although the PoW algorithm is used by the largest cryptocurrencies, this method has certain disadvantages. Solving computational tasks requires a lot of time and energy, so it is a relatively expensive process [8]. The second figure shows the Bitcoin difficulty historical chart. This leads to the conclusion that the mining computing capacity increases continuously in direct proportion to the power requirement, because the more difficult a mathematical operation is, the more power it requires.

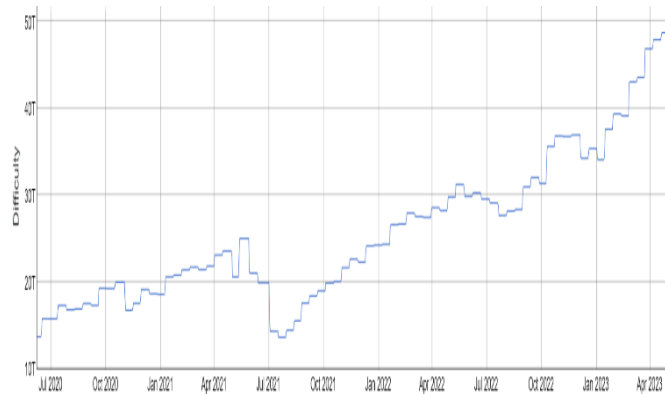


Figure 2
Bitcoin difficulty historical chart [9]

Since the electrical energy demand for the calculation of blocks increases drastically, miners use renewable energy sources to reduce their production costs. The Bitcoin Mining Council (BMC), which represents the global forum of mining companies, stated that in the year 2022, 59% of the mining industry used renewable energy sources. In the previous year 2021, only 37% of renewable energy sources were used. In their view, their goal in the coming years is to make mining even greener [10].

The Proof-of-Stake algorithm uses a so-called "random" selection process to select validators from a pool of nodes. The system uses a combination of several factors simultaneously, including staking time, an element of randomness, and node wealth. In Proof-of-Stake systems, blocks are produced, not mine. However, the term mining is often used. Most Proof of Stake cryptocurrencies starts with a pre-minted coin offering so that nodes can start immediately. In the random block selection method, validators are selected by looking for nodes with the lowest hash value and the highest stake combination [11].

The Ethereum blockchain initially used a POW consensus but switched to the POS mechanism in 2022 during an update called Merge. In the third figure, you can clearly see that the mining difficulty did not decrease, instead disappeared, since Ethereum could no longer be mined. This method has made the blockchain green as its power consumption has been drastically reduced. This is shown in the third figure.

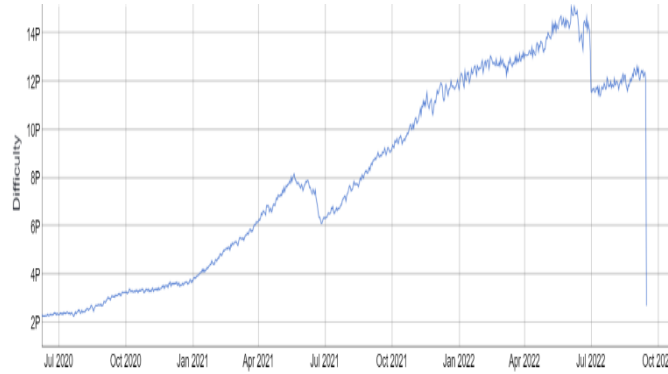


Figure 3
Ethereum difficulty historical chart [12]

Based on these, it can be concluded that blockchains using POS consensus use much less electrical energy than those using POW solutions. It is unnecessary to assume that Bitcoin will switch to POS consensus since BTC was the very first crypto blockchain, so its operation will not be changed at this level, because then the original Bitcoin blockchain itself would be "damaged", thereby losing its original state. Currently, the POW consensus uses the most electrical energy to mine blocks. This is presented in the first table below. This is shown in the first table.

Blockchain	Consensus protocol	Hash function	Energy consumption
Bitcoin (BTC)	POW	SHA-256	Annual energy consumption 160 TWh
Ethereum (ETH)	POW (to 2022) POS (from 2022)	Ethash	The annual consumption 74.6 TWh. 99.95% less energy after the Merge

Table 1.
Energy consumption of cryptocurrencies [13]

3 Creation of a Blockchain Called ÓUB (Óbuda University Blockchain)

The system of prioritized skills is constantly changing, so higher education institutions must adapt to new solutions [14]. The blockchain technology used for university data storage is a novelty that few universities use in everyday life.

The ÓUB blockchain is a blockchain suitable for data storage. Due to its structure, it can store university data in blocks, which are closely connected to each other, thus creating the blockchain. It uses a Proof-of-Stake solution instead of Proof-of-Work, thus ensuring less power consumption and a high degree of security. This blockchain can also store sensitive university data more securely than a centralized data store.

The power supply of the blockchain must be continuous, however, the productivity of the PV system varies. In accordance with Hungarian rules, a balance settlement must be applied. This means that the excess energy produced is sold by the system, and when the solar production is not sufficient, electrical energy must be purchased. The essence of the operation of the solar system is that at the end of the balance settlement, the expenditure should not be more than the income.

Creating a blockchain does not involve high costs. To develop and operate it, only one IT specialist is needed, who take care of the various blockchain maintenance processes.

The creation of a university private blockchain provides the opportunity to safely save the university's sensitive data in the blockchain instead of centralized data storage. When a blockchain is created, its operating conditions must be defined. These are the following:

- Choosing the optimal block size. Because if the block is too big, the blockchain will run slower. In the case of consumer trends and purchases, defining a block size of 1 MB is more than enough, since in this case, consumer and customer data are recorded.
- The rules for joining the blockchain must be clearly defined so that they are easy to understand for customers.
- The security rules and regulations for the operation of the blockchain must be recorded.
- Access to the server must be strictly limited so that no unauthorized person can access it [15].

The fourth figure shows the steps for creating the genesis block of the Óbuda University Blockchain (ÓUB). After the genesis block is created, the other blocks will be generated.

```
{
"config": { // the config block defines the settings for our custom chain and has certain attributes to
create a private blockchain
"chainId": 987, // identifies ÓUB blockchain.
}
"homesteadBlock": 0, // Homestead version was released with a few backward-incompatible protocol
changes, and therefore requires a hard fork. UDSC chain however won't be hard-forking for these
changes, so leave as 0
"eip155Block": 0, // Homestead version was released with a few backward-incompatible protocol
changes, and therefore requires a hard fork. UDSC chain however won't be hard-forking for these
changes, so leave as 0
"eip158Block": 0
},
"difficulty": "0x400", // This value is used to control the Block generation time of a Blockchain. The
higher the difficulty, the statistically more calculations a Miner must perform to discover a valid block.
"gasLimit": "0x8000000",
"alloc": {}
}
```

Figure 4.
Creating a genesis block [15]

The blockchain must be created in such a way that it can store sender and receiver data and record order data. The structure of the creation of the blockchain is presented in the fifth figure.

```

Óbuda University Blockchain-util generate ÓUB
the default settings would be used:
/default ~ university chain/ ÓUB /chainsettings.dat
chainsettings.dat include:
Database addresses [receiver (cloud storage) IP address, sender (university) IP address],
Database system addresses [receiver (university database) IP address, sender IP address],
Terms of GDPR database.
Next, the ÓUB blockchain would be initialized, and the genesis block would be created
university blockchain ÓUB
The server will be started in those few seconds after the genesis block has been found, then the node
address needs to be connected:
ÓUB@192.168.0.1:8008
After these steps, the connection can be attempted from a second server:
university blockchain ÓUB@192.168.0.1:8008
After the message confirming the chain has been initialized, permission is not given for connection to
the database.
The address would be copied and pasted: 192.168.0.2
finally, permission for connection would be granted:
university blockchain ÓUB grant 192.168.0.2 connect.

```

Figure 5.

The creation of an ÓUB blockchain [15; 16; 17]

After the creation of the blockchain, I examined the electrical energy required for its operation, which I will present in the next chapter.

4 Calculation of the Solar Electrical Energy Demand of a Óbuda University Blockchain Suitable for University Data Storage

Clean and smart technologies such as blockchain computing perfectly aligns with the principles of green to run the processes smoothly without taking up much electricity [18]. An average desktop computer, equipped with speakers and a printer, consumes around 200 W of electrical energy. Assuming 8 hours of operation per day, this means an annual consumption of nearly 600 kWh, which results in 175 kg of CO₂ emissions. In the case of a laptop, power consumption of 50-100 watts/hour should be expected. Calculating with 8 hours of daily use on an annual basis, we get a much lower value, approximately 150-300 kWh, which results in 44-88 kg CO₂ emissions per year. In terms of economy, the laptop is certainly the better choice [19].

To run a decentralized private blockchain suitable for university data storage, you need at least 2 server-level computer capacities, which start working when the blockchain is created. These computers have a higher capacity than traditional desktop computers, so their power consumption is also higher, they use approximately 1000 W of power in total. Since blockchain is run on them, they need to work all day. This means an annual consumption of 9,000 kWh.

Nowadays, the monocrystalline 460Wp solar panel, which consists of 156 cells, is the most common. Its parameters and performance are illustrated in the second table.

Solar panel module properties		
Module efficiency	20.6	
Tolerance (W)	0	~ +5
Test environment	STC: irradiation power 1000 W/m ² , cell temperature 25°C, AM1.5	NOCT: irradiance 800W/m ² , ambient temperature 20°C, wind speed 1m/s
Maximum power Pmax (W)	460	348
Opening circuit voltage Uoc (V)	50.01	47.38
Short-circuit current Isc (A)	11.45	9.33
Maximum power voltage Um (V)	42.13	39.68
Maximum power current Im (A)	10.92	8.76
Operating temperature range (°C)	-40	+85
Size (mm)	2120×1052×40	
Weight (kg)	25	

Table 2.

Specificity of JA Solar JAM72S20-460/MR Monocrystalline Solar Panel [20]

Based on the second table above, considering the performance of the solar panel module and the capacity of the two blockchain servers, it was calculated the required solar panel investment. Based on this, I received the following results, which apply to a flat university roof structure:

- The size of the system must be 7.44 kWp,
- A quantity of 19 panels is required,
- It is necessary to install a 6 kW inverter, as well as
- A flat roof area of 38 m² is required.

If the university has a sloping roof, the surface size of the required roof area will also change. In Hungary, considering the geographical location of Budapest, the obtained data are as follows compared to the previous calculation, which is presented in the third table.

Pitched roof	System size	Solar panel number	Inverter	Required roof area
East	9.56 kWp	24	8 kW	48 m ²
Southeast	7.92 kWp	20	8 kW	40 m ²
South	7.45 kWp	19	6 kW	38 m ²
Southwest	8.01 kWp	20	8 kW	40 m ²
West	9.72 kWp	24	8 kW	48 m ²

Table 3.
Required Solar Panel Installation Calculation for Pitched Roofs

Conclusions

The development of blockchain technology is unstoppable. Daily, more and more blockchains are appearing, which provide solutions to many IT problems.

However, blockchains require electrical energy to operate. For the sake of long-term sustainability, it is advisable to use a renewable energy source. The solar energy source is now within reach, as their price has decreased significantly in recent years and their efficiency has increased.

By installing solar panels, the cost of blockchain operation can be kept low, which is a beneficial feature for the future.

In addition to using renewable energy sources, I recommend getting modern computers that consume less electrical energy, so less electrical energy will be needed to operate blockchains.

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Modeling customer purchase intentions based on Corporate Social Responsibility practices

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Abstract: Incorporating Corporate Social Responsibility (CSR) into business practice is no longer just about doing the right thing in an ethical sense but represents wise business decision-making and the creation of an adequate strategy for achieving success. Understanding customer needs is vital to achieving the desired results for any company. The practice of CSR helps companies direct customer behavior towards purchasing their products and increasing satisfaction and loyalty. Therefore, analyzing and modeling customer purchase intentions resulting from CSR practices is essential. This research aims to identify aspects of CSR that directly link customers' perceived level of CSR and their intention to recommend and pay premium prices for products or services from a socially responsible company. The structural equation modeling (SEM) technique was applied to test the consequential connections between ecological, social, and consumer-oriented CSR practices and customer purchase intentions. The obtained results imply that it is possible to contribute to the company's business results through the fostering implementation of CSR.

Keywords: Corporate Social Responsibility, customer purchase intentions, structural equation modeling

1 Introduction

Corporate social responsibility (CSR) implies a kind of opposition to the traditional business assumptions that prioritize profit creation as the exclusive and fundamental objective. Researchers, practitioners and society agree that businesses should meet

other responsibilities besides financial ones, such as certain ethical, environmental and social issues. While not all theorists and practitioners support that view [1], to meet the expectations of stakeholders and ensure the sustainability and competitiveness of the company nowadays, it is necessary for CSR to become an integral part of business strategies. Thus, CSR can be a practice through which the interests and values of the company and stakeholders are connected. It is evident that managers must make business decisions by making numerous trade-offs between different stakeholders, constantly asking how specific stakeholders will see the company's efforts to be socially responsible [2]. However, CSR can also be used as a managerial strategy to differentiate and achieve competitive advantage by combining business and social goals and creating a solid marketing base [3].

The contribution of CSR to solving global problems, as well as to company results, cannot be directly measured [3]. However, companies have long been applying certain types of CSR practices as successful promotion tools to improve customer attitudes and behavior and business results. Scandellius and Cohen emphasized communication as the basic building blocks of collaboration between the company and stakeholders [4]. The idea of communication between customers and the company about CSR does not always require answers but can be seen through the purchase of products and services or reactions to the company's behavior. Nevertheless, numerous studies have been conducted addressing consumer attitudes towards CSR, and no unique conclusions have been reached about the impact pathways on customer purchase intentions.

This study strives to tackle the influence on customer purchase intentions by examining CSR practices as a predictor of desired customer behaviour. For the study, a survey of customer attitudes was conducted regarding specific CSR practices that companies apply in ecology, society, and customer relations. These attitudes were then linked to customer purchase intentions. The study thus contributes to understanding customer behavior by implying which CSR activities best contribute to the company's efforts in establishing a successful CSR strategy.

2 Literature review and hypotheses development

By implementing CSR activities, companies, in addition to meeting stakeholders' expectations, try to capitalize on their efforts through a good reputation and customer loyalty. Many studies have shown that customer loyalty is vital for achieving the company's business results [5]. Also, an interesting topic in research is customer engagement through intensive sustainable marketing, which also significantly affects buying customer intentions [6,7].

CSR is often viewed as a singular concept encompassing specific company activities that directly affect customer purchase intention [1]. Also, CSR's importance is indirectly determined through mediators such as awareness about the

importance of CSR, brand image, or customer trust [8,9]. Researchers have confirmed that customers connect with a brand and relate to the values that certain brands demonstrate, therefore, their purchase intentions can be influenced through CSR [9].

On the other hand, many studies deal with specific aspects of CSR, such as ethical corporate social responsibility, legal corporate social responsibility, and environmental corporate social responsibility [3]. The findings suggest that customers are ready to buy the products of companies that practice certain socially responsible practices. Namely, important relations the company realizes with its social environment are established through activities supporting social cohesion improvement [10].

Due to significant changes in the business scene, attention has recently been devoted to greening production and consumption by introducing sustainable business practices. The positive impact of CSR on green innovations and on ecological aspects in the worsening climate environment was partially confirmed in the work of [3], and it was shown that brand loyalty is a mediator to sustainable purchase intentions. It has also been shown in the literature that CSR and green trust positively affect consumers' behavioural intentions [11].

Considering that companies are interested in the fact that they can influence customers through CSR, it is emphasized that customers especially respond to CSR activities related to their needs. When it comes to this type of CSR activity, customers, first of all, pay attention to the complete and honest communication they have with the company about products and services without discrimination and doubts, as well as the adequate fulfilment of the company's obligations [12,13].

Consumers' behavioral intentions are primarily reflected in word-of-mouth intention, purchase intention and willingness to pay a higher price [11,14,15]. A Wongpich and others' survey found that while customers focus on the company's motives when evaluating its CSR policies and activities, managers are interested in how their CSR activities affect customer response and how customers direct their behavior accordingly [16].

Therefore, this research was conducted to determine whether there are significant relationships between CSR activities that are pointed out in the literature and customer purchase intentions, so the following hypothesis has been proposed:

Hypothesis 1: CSR activities have a direct positive relationship with customers' purchase intention

3 Methodology

3.1 Measuring Instrument Development

To conduct this research, a questionnaire was created to survey customers' attitudes with utmost efficiency and precision. The questions in the questionnaire were defined based on the literature review and adapted to the research's needs. Part of the questionnaire on CSR consisted of three aspects that described activities focused on social needs, ecological issues, and high customer care. Questions related to purchase intention covered attitudes about paying a higher price for products from companies that are socially responsible and recommending products from such companies. Respondents' answers were obtained on a five-point Likert scale.

3.2 Sample and Data

Data were collected through an online questionnaire created on Google Forms. This data collection method is appropriate when collecting as large an unstratified sample as possible. After collecting the data, a review was conducted, and it was determined that 572 responses were adequate for the analysis. Further, the data were coded and used for two-stage structural equation modeling (SEM) procedures performed in AMOS v.22 software.

3.3 Data Analysis Techniques

The data were analyzed by testing two models that make up the SEM methodology: measurement and structural. The measurement model examines the relationships between latent variables and their indicators, while the structural model examines the internal relationships and influences between latent variables. Testing the adequacy of the measurement model is based on numerous statistical measures that confirm the validity and reliability of the proposed measuring instrument. After confirming the measurement model's adequacy, the hypothesis is tested using a structural model emphasizing the assumed relationship between variables.

4 Results

Table 1 presents the demographic profile of the survey respondents. The respondents were also asked to determine which communication channels they receive information about companies' CSR activities. 84.3% of respondents chose the Internet as the primary channel for obtaining information about CSR, while 40.7% also indicated TV. 25.3% of the respondents stated that advertisements on

the product provided information about CSR, and 19.4% received information from friends or relatives.

A certain percentage of respondents, 22.6%, stated that they had never heard of the concept of CSR, but their answers were retained in the analysis because they definitely recognized the activities companies implement that actually belong to the domain of CSR.

Variable		Frequency	Percent
Age	18-25	340	59.4
	26-35	88	15.4
	36-45	65	11.4
	46-55	45	7.9
	56-65	25	4.4
	Over 65	9	1.6
Gender	Male	214	37.4
	Female	358	62.6
Level of education	High school diploma or under	128	22.4
	Vocational Education	249	43.5
	BSc	103	18.0
	MSc	70	12.2
	PhD	10	1.7
	Other	12	2.1
Occupation	Student	200	35.0
	Employee in a private company	96	16.8
	Employee in public company	108	18.9
	Self-employed	58	10.1
	Retired	69	12.1
	Unemployed	41	7.2

Table 1.
Demographic profile of respondents

The results of testing the measurement model are satisfactory (Table 2). Firstly, Cronbach's α coefficients were checked for each group of questions, and high values of over .7 for each construct confirm the reliability of the constructs. Also, AVE (Average Variance Extracted) values above .5 indicate convergent validity for all constructs [17]. Also, composite reliability (CR) was checked, whose values above .7 represent satisfactory reliability. After that, discriminant validity was tested using the Fornell and Larcker ratio, presented in Table 3. The values given in the diagonal represent the square root of AVE and are higher than the other correlations in the table. That proves the discriminant validity is satisfactory [17].

Variables	Standardized factor loading	Critical ratio (t- value)	α	AVE	CR	P
Costumers			.843	.525	.846	
EC2	.650					
EC4	.762	14.964				***
EC5	.786	15.288				***
EC6	.768	15.041				***
EC7	.642	13.063				***
Ecology			.846	.526	.847	
ENV2	.660					
ENV3	.668	13.616				***
ENV4	.773	15.280				***
ENV5	.760	15.094				***
ENV6	.758	15.065				***
Society			.760	.515	.761	
VO1	.733					
VO2	.740	14.162				***
VO3	.678	14.021				***
Costumers purchase intentions			.803	.51	.804	
CB1	.624					
CB4	.640	12.123				***
CB6	.802	13.888				***
CB7	.772	13.686				***

*** statistical significance at the level $p < .001$

Table 2.
Validity and reliability of measurement model

	Costumers	Ecology	Society	Costumers purchase intentions
Costumers	.725			
Ecology	.607	.725		
Society	.460	.322	.718	
Costumers purchase intentions	.258	.185	.392	.714

Table 3.
Variable correlations and the square root of AVE

Also, the results in AMOS enable monitoring of the model's fit, and the results indicate that the proposed model has a good fit (Table 4).

Fit indices	χ^2/df	RMSEA	RM R	CFI	NFI	TLI	IFI	GFI
Measurement model	2.0	.042	.035	.969	.941	.963	.970	.955
Structural model	2.2	.046	.050	.963	.934	.956	.963	.949
Recommended values	<3	<.08	<.10	>.90	>.90	>.90	>.90	>.90

Table 4.

Fit indices for the measurement and structural model

The paper proposes a hypothesis in which it is assumed that CSR activities can directly influence customer purchase behavior. The results of structural model testing are presented in Figure 1. Therefore, hypothesis H1 is accepted ($\beta=0.334$, T-value=5.159, $p<0.001$), which confirms the positive impact of CSR activities on consumer attitudes and behavior. The structural model showed a good fit (Table 4). This model explains 11.2% of the variability of customers' purchase intentions.

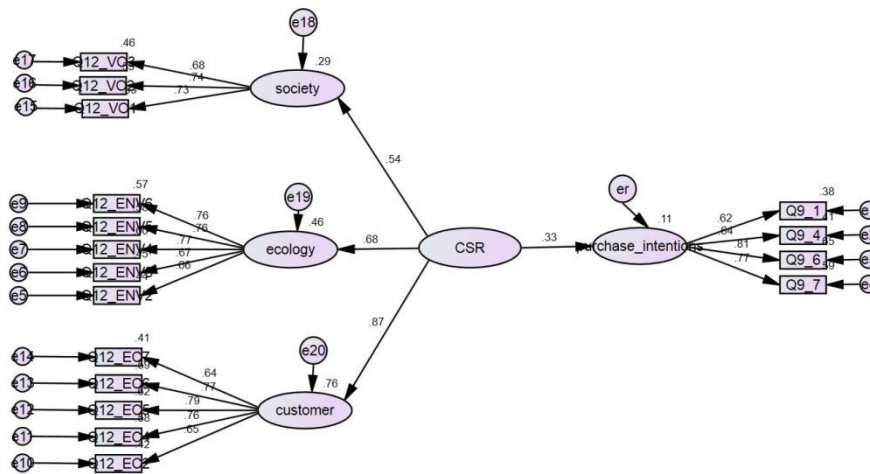


Figure 1

Hypothesis testing results

5 Discussion

In this study, the impact of corporate social responsibility on customer purchase intentions was modeled. The methodology for examining the assumed relationship

consisted of a measurement model that checked the validity and reliability, and then the proposed hypothesis was tested using a structural model. The obtained results are in accordance with previous research, in which CSR activities were seen as a unique set, and the direct link with customer buying intentions was confirmed [1,9,15, 18]. In general, it was shown that CSR has the power to influence customer behavior and uncover ways in which companies' efforts can be channelled to gain a competitive market advantage and satisfy their goals as well as the goals of society.

Conclusions

This study confirmed that customers' perception of a company's CSR activities directly impacts their intentions to purchase the company's products. This proves that customers pay attention to the company's efforts to be socially responsible and fulfil its obligations towards society and the environment.

Although positive and expected results were obtained, the study has certain limitations. Namely, the study focuses on the impact of CSR as a single influential variable, while it would be interesting to examine the individual effects of aspects. Also, the purchase intention survey is based on the estimation of the intention and not on the actual purchase behavior. Therefore, future research can also include variables related to actual customer behavior to further contribute to the literature and practice in this area.

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Service Quality in the Hotel Industry: Tourist Satisfaction and Loyalty. Case of Albania and Montenegro¹

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Abstract: The hotel industry has become a driving force of economic development in Albania and Montenegro. The number of arrivals and the number nights spend has increased each year. The purpose of the study is three-fold: first to examine tourists' perceptions of service quality in the Albanian and Montenegrin hotel industry; secondly to empirically examine the dimensions that impact tourist satisfaction and their loyalty; third, it assesses whether there is any relationship between tourist satisfaction and tourist loyalty. This study adopted SERVQUAL scale with some customizations to measure perceived service quality dimensions: tangibles, reliability, responsiveness, assurance and empathy. Data were collected from 9 hotels in Shkodra, 15 hotels in Saranda, 19 hotels in Ulcinj and 21 hotels in Budva, using a self-administered questionnaire.

To find out the service quality dimensions that impact tourist satisfaction and tourist loyalty, the factor analysis and reliability were used. We also performed the multiple regression analysis, using the 'tourist satisfaction' or "tourist loyalty" as the dependent variable and dimensions as: 'tangibles', 'reliability', 'responsiveness', 'assurance' and 'empathy' as independent variables. We found several dimensions with a significant impact on tourist

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satisfaction and their loyalty. Moreover, we run with a simple regression analysis and correlation showing a positive relationship between tourist satisfaction as an independent variable and tourist loyalty as dependent variable.

Findings of the study can be used from hotel managers as a guide to improve their service quality and hotels' performance.

Keywords: service, dimension, tourist, SERVQUAL, regression, Albania, Montenegro.

1 Introduction

In today's fast-paced world, the tourism sector emerges as a swiftly growing industry², characterized by robust competition and the resulting hurdles in winning and keeping a customer base. This is particularly evident in the hospitality sector, where the dynamic nature of consumer needs and desires puts pressure on hotels and associated accommodations to stay ahead. To address this issue, entities in this domain have placed a strong emphasis on the continuous improvement of service quality, recognizing it as the critical action to ensure consumer gratification and encourage their return. (Rao & Sahu, 2013; Shyju et al., 2021; Nyagadza et al., 2022; Zhang, 2022). A qualitative service keeps customers satisfied therefore increasing the chances for hospitality structures to differentiate from competitors and increase customer loyalty over time.

Positive opinions about the hotel lead to positive word-of-mouth recommendations, repeated visits, enhanced efficiency, ultimately increasing revenues and profitability (Duncan & Elliott, 2002; Kandampully & Suhartanto, 2000; Khan et al., 2013; Malik et al., 2020; Yoon & Suh, 2004). In today's digital age, where online reviews and social media play an important role about customer perceptions, hotels are not in a position to underestimate the importance of service quality. Hotels should prioritize service quality and cultivate long-term relationship with customers. By doing so, hotels can ensure sustainability and competitive advantage (Butnaru & Licau, 2017; Koyuncu et al., 2014; Pereira-Moliner et al., 2016).

Montenegro's tourism industry and hotel stays have experienced significant growth in the recent years, positioning the country as one of the most popular destinations in the Western Balkans. The Montenegro Tourism Development Strategy 2022-2025, released by the Ministry of Economic Development, indicates that in 2019, the tourism and travel sector's direct and indirect contributions accounted for 30.90% of Montenegro's overall GDP. Additionally, the sector's total impact on employment was 31.90%. The number of tourist arrivals and the number of overnight stays has increased as well in the last three years according to the data

² <https://www.unwto.org/news/tourism-s-importance-for-growth-highlighted-in-world-economic-outlook-report>

published by Statistical Office of Montenegro (MONSTAT). According to MONSTAT the number of tourist arrivals was 1 670 879 in 2021; 2 183 975 in 2022; and 2 613 300 in 2023 (MONSTAT, 2021;2022;2023). Also, the number of overnight stays increased each year respectively, from 9 872 573 in 2021, to 12 428 787 in 2022, and 16 389 279 in 2023 (MONSTAT, 2021; 2022; 2023).

In recent years, Albania’s tourism sector has flourished, particularly following the pandemic period. A report on Tourism and Hospitality in Albania, jointly produced by the UNDP in collaboration with the Albanian Tourism Association, sheds light on this growth. According to the report, the direct contribution of the travel and tourism sector to the Albanian economy has ranged from 8.5% to 8.7% of GDP. However, when considering the indirect impact, this contribution amounts to approximately 20%³.

Analyzing data from the Albanian Institute of Statistics (INSTAT), we observe a significant increase in the number of international tourist arrivals from 2018 to 2023. Specifically, the figures rose from 5,926,803 in 2018 to 10,155,640 in 2023. Despite a temporary decline due to the pandemic in 2020 (2,657,818), subsequent years have witnessed a robust upward trend⁴.

Europe remains the primary source of international tourists, with a focus on the Southern part. Notably, over 70% of non-resident visitors have Albanian origins, hailing from neighboring countries such as Kosovo, Montenegro, and North Macedonia, as well as Albanians from the diaspora in Italy, Greece, the USA, UK, Germany, and beyond⁵. The majority of international tourists visiting Albania during the period 2018-2023 did that for personal reasons, while a very small percentage visited the country for business or professional reasons⁶. Based on data collected from the hospitality industry, from August 2023 to January 2024, the average monthly number of visitors staying in the Albanian accommodation infrastructures amounts to 212,223, from which 125,919 are non-resident visitors. In addition, the average monthly count of overnight stays totals 548,014, with 352,661 attributed to non-resident visitors⁷.

³ <https://www.undp.org/albania/publications/tourism-and-hospitality-albania-2022>

⁴ <https://www.instat.gov.al/al/temat/industria-tregtia-dhe-sh%C3%ABrbimet/statistikat-e-turizmit/#tab2>

⁵ <https://www.undp.org/albania/publications/tourism-and-hospitality-albania-2022>

⁶ <https://www.instat.gov.al/al/temat/industria-tregtia-dhe-sh%C3%ABrbimet/statistikat-e-turizmit/#tab2>

⁷ As above

2 Theoretical background

Various frameworks have been developed in order to measure service quality, each one offering a unique perspective on the dimensions and factors that influence customer perceptions (Caro & Garcia, 2007; Cronin & Taylor, 1992; Dabholkar, 1996; Dabholkar et al., 2000; Frochot & Hughes, 2000; Gounaris, 2005; Grönroos, 1984; Haywood-Farmer, 1988; Jabnoun & Khalifa, 2005; Mattsson, 1992; Sower et al., 2001; Spreng & Mackoy, 1996; Vandamme & Leunis, 1993, Fatima et al., 2019; Endeshaw, 2020). While these models have been used in several industries there are also models used and developed especially for the hotel industry (Akan, 1995; Akbaba, 2006; Choi & Chu, 2001; Ekinci et al., 2003; Oberoi & Hales, 1990; Saleh & Ryan, 1991; Wong Ooi Mei et al., 1999, Rao & Sahu, 2013; Shyju et al., 2021; Nyagadza et al., 2022; Zhang, 2022).

Many of the above-mentioned frameworks are based on the SERVQUAL model of service quality, which is a result of the work of Parasuraman et al., 1985 and Parasuraman et al., 1988. At first, in 1985 they published a conceptual paper identifying five service quality gaps influencing the quality of service as perceived by the consumer. They used an exploratory study based on in-depth interviews with executives from four nationally (American) recognized firms and focus groups interviews with consumers. The result of the study was a framework, consisting of the five service quality gaps, defined as follows: difference between consumer expectations and management perceptions of consumer expectations, difference between management perceptions of consumer expectations and service quality specifications, difference between service quality specifications and the service delivered, difference between service delivery and what is communicated about the service to consumers, difference between consumer expectations and perceptions.

The focus group interviews revealed that regardless of the service type, consumers usually use the same criteria in evaluating service quality. These criteria were grouped into 10 categories, which were known as the “service quality determinants or dimensions”, and were: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the customer, and tangibles.

Later, in 1988, they conducted additional research to determine the underlying dimensions used by consumers in evaluating service quality. They included in their study customers from four different service settings such as retail banking, credit card companies, long-distance telephone, real estate brokers and domestic appliance repair and maintenance. Respondents had to answer 97-paired questions, related to their expectations and perceptions of service quality. Based on the results of this survey the items used to evaluate service quality by the consumers’ viewpoint were reduced from 97 to 22 and dimensions from 10 to 5. The resulting questionnaire represented the famous instrument called SERVQUAL, which was then tested for reliability and validity. The test study proved that SERVQUAL was reliable and valid in measuring service quality as perceived by the customers in many service and retail organizations. The five underlying dimensions of SERVQUAL, as

defined by Parasuraman et al. (1988) consist of the following: Tangibles, Reliability, Responsiveness, Assurance, and Empathy.

In the following years several researchers have provided theoretical and empirical evidence, recognizing the contribution of Parasuraman et al. in service quality literature, but, on the other hand, they have also identified some problems related to the SERVQUAL measure. These problems can be grouped into two main categories: conceptual and operational. Conceptual problems consist of: 1) the use of difference scores (perceptions scores minus expectations scores) to measure perceived service quality; 2) the ambiguity of the expectations construct; and 3) the appropriateness of the measure in different service industries. Operational problems, on the other hand, are the result of the afore-mentioned conceptual problems and include generally low reliability, unstable dimensionality and poor validity (Carman, 1990; Cronin & Taylor, 1992; Teas, 1993; Paulin & Pierrin, 1996; Van Dyke et al, 1999; Jian J.J. et al. 2000).

Even though SERVQUAL Model is among the first frameworks used to evaluate the service quality and despite its criticisms (Bhat, 2012; Smith, 1995; Williams, 1998), it still remains a leading measure of service quality and largely used in the hotel industry (Ali et al., 2021; Chand, 2010; Akbar et al., 2010; Hossain, 2012; Mey et al., 2006; Mohamad et al., 2019; Nguyen et al., 2015; Thi et al., 2020, Rao & Sahu, 2013; Shyju et al., 2021; Nyagadza et al., 2022; Zhang, 2022).

SERVQUAL Model, which as mentioned-above emphasizes on five dimensions of service quality: tangibles, reliability, responsiveness, assurance and empathy – has been widely adopted in hospitality research. Various researchers have described the dimensions as follows:

Tangibles are described as the physical evidence of service including physical facilities, appearance of personnel, tools, and equipment used to provide the service. Several studies highlight the importance of the tangible dimension on customer satisfaction (Devi Juwaheer, 2004; Hossain, 2012; Nguyen et al., 2015, Bayad Jamal Ali et al., 2021; Zhang, 2022). While tangibles are important in shaping initial impressions of the hotel, research indicates that they are not sufficient to guarantee high level of service quality (Ekinici et al., 2003; Markovic & Raspor, 2010).

Reliability is described as the ability to perform the service dependably, consistently and accurately. Studies have shown that guest value reliability highly, as it instills confidence and trust in the hotel brand. For instance, Markovic & Raspor (2010), Ali et al. (2021), found that reliability significantly influences customer satisfaction and loyalty.

Responsiveness is described as the willingness to help customers and provide prompt service. Research indicates that responsiveness plays a crucial role in shaping customers perceptions of service quality and overall satisfaction. A study demonstrated that customers perceptions of responsiveness positively influence

their satisfaction levels and their likelihood of returning to the hotel (Kandampully & Suhartanto, 2000, Zhang, 2022).

Assurance is described as the knowledge and courtesy of employees and their ability to convey trust and confidence. Customers expect hotel staff to possess the necessary skills and knowledge to meet their needs and provide a sense of assurance throughout their stay. Finding suggest that assurance is positively related with customer satisfaction and loyalty (Rao & Sahu, 2013; Ali et al., 2021; Nguyen et al., 2015).

Empathy is described as Caring, individualized attention of hotel employees to its customers. Research suggest that empathy of the hotel employees contribute positively to customers satisfaction and loyalty (Rao & Sahu, 2013; Ali et al., 2021; Hossain, 2012; Nguyen et al., 2015), while other finding suggest that empathy is the factor with the strongest relationship with customer satisfaction (Ekinici et al., 2003).

3 Research questions and hypotheses

Based on the above-mentioned discussion, this study seeks to answer the following questions:

- What are the potential service quality factors impacting tourist satisfaction and tourist loyalty?
- Is there a significant relationship between tourist satisfaction and tourist loyalty?
- Are there any significant differences in tourist satisfaction and tourist loyalty based on the destination (four cities)?

Consistent with the research questions raised, the following hypotheses are derived:

H1a: There is a significant impact of service quality dimensions on tourist satisfaction.

H1b: There is a significant impact of service quality dimensions on tourist loyalty.

H2: There is a positive relationship between tourist satisfaction and tourist loyalty.

H3a: There are significant differences in customer satisfaction based on the destination.

H3b: There are significant differences in customer loyalty based on the destination.

4 Method

4.1 Subjects & Procedure

Data were collected through questionnaires, distributed to tourists visiting four cities: Shkodra (9 hotels) located in northern Albania, Saranda (15 hotels) located in southern Albania, Ulcinj (19 hotels) located in southern Montenegro, Budva (21 hotels) located in central part of Montenegrin coast, during summer 2023. A random sampling method was utilized; subjects were approached by the interviewer and asked if they would be willing to participate in the study. In-person based administration of the questionnaire provides the interviewer with the opportunity to directly interact with the participants of the study, as well as introduce the research topic and eliminate any area of confusion. A total of 467 usable responses were received. Of 467 participants, 201 were females and 266 were males. With regards to education, 35 completed secondary education, 193 completed high school, 143 completed undergraduate studies, and 96 completed graduate studies. The following descriptive statistics pertained to the destination: of 467 participants, 119 were from Shkodra (Albania), 105 were from Saranda (Albania), 127 were from Ulcinj (Montenegro), and 116 were from Budva (Montenegro). The data were uploaded into SPSS®.

4.2 Independent Variables

Five service quality dimensions were used in this study: 'Tangibles' (X1), 'Reliability' (X2), 'Responsiveness' (X3), 'Assurance' (X4) and 'Empathy' (X5). It should be noted, that based on Parasuraman's et al. SERVQUAL model (1985; 1988), perceived, expected, as well as the gap between perceived and expected values were used in this study. We will only be presenting the factor and reliability analyses for perceived measures. To measure each of the dimensions, some items were included in the questionnaire. A principal component analysis, using eigenvalue greater than one criterion, revealed a simple structure with factor loadings greater than 0.6. Each factor explained greater than 70% of the total variance. The results of the reliability analysis for each dimensions indicated a Cronbach alpha greater than 0.8, respectively Tangible (6 items) with Cronbach alpha = 0.907; Reliability (6 items) with Cronbach alpha = 0.891; Responsiveness (6 items) with Cronbach alpha = 0.889; Assurance (4 items) with Cronbach alpha = 0.848; Empathy (4 items), with Cronbach alpha = 0.857.

4.3 Dependent Variables

Two dependent variables were used in this study: customer satisfaction and customer loyalty.

Customer Satisfaction – To measure customer satisfaction, five items were included in the questionnaire based on literature. A principal component analysis, using eigenvalue greater than one criterion, revealed a simple structure with factor loadings greater than 0.8. This factor explained 81.7% of the total variance. The results of the reliability analysis indicated a Cronbach alpha of 0.890.

Customer Loyalty – To measure customer loyalty, four items were included in the questionnaire. Using principal component analysis, this factor explained 81.9% of the total variance and Cronbach alpha was 0.924.

5 Analysis & Discussion

5.1 Multiple Regression

To explore the potential factors impacting customer satisfaction, we performed two multiple regression analyses. The five factors : ‘Tangibles’ ($X1$), ‘Reliability’ ($X2$), ‘Responsiveness’ ($X3$), ‘Assurance’ ($X4$) and ‘Empathy’ ($X5$) were used as the independent variables.

5.1.1 The first model

- ✓ Results indicated that the model was highly significant $F(5,461) = 393.4(p = 0.000)$
- ✓ $X4$ variable was not significant ($p = 0.112$)
- ✓ adjusted R^2 was 80.8%.
- ✓ the significant variables were: $X1(p = 0.023)$, $X2 (p = 0.000)$, $X3 (p = 0.044)$, and $X5 (p = 0.000)$.

Consequently, hypothesis H1a was supported given that we found four service quality dimensions, precisely $X1$ ”Tangibles”, $X2$ “Reliability”, $X3$ ”Responsiveness” and $X5$ “Empathy” to have a significant impact on customer satisfaction.

5.1.2 The second model

- ✓ We found the model to be significant ($F(5,461) = 431.7, p = 0.000$);
- ✓ adjusted R^2 was 82.2%.
- ✓ The significant variables were: $X2 (p = 0.000)$, $X4 (p = 0.002)$ and $X5 (p = 0.000)$;
- ✓ however, $X1$ and $X3$ variables were not significant.

Consequently, hypothesis H1b was partially supported given that we found three service quality dimensions, such as X2“Reliability”, X4 “Assurance”, and X5“Empathy” to have a significant impact on customer loyalty.

5.2 Simple regression

To test whether or not there is a significant relationship between customer satisfaction and customer loyalty, we performed a simple regression analysis, using *tourist satisfaction* as the independent variable and *tourist loyalty* as the dependent variable. The results of the simple regression analysis indicated that there was a significant relationship between customer satisfaction and customer loyalty ($F(1, 465) = 2408.6, p = 0.000$). Furthermore, regression slope coefficient was positive and highly significant ($b = +0.911, p = 0.000$). Lastly, coefficient of correlation was 0.916, indicating a relatively strong correlation between the two variables. Consequently, hypothesis H2 was supported.

5.3 ANOVA

To test whether or not there are differences in mean *customer satisfaction* (and *customer loyalty*) based on the *destination*, two separate ANOVAs were performed. The results of the first ANOVA indicated there was a significant difference in the mean customer satisfaction based on the destination ($F(3, 463) = 26.013, p = 0.000$). On the other hand, the results of the second ANOVA showed a significant difference in mean customer loyalty based on the destination ($F(3, 463) = 16.653, p = 0.000$). Consequently, hypothesis H3 was supported. Consequently, hypothesis H3a was supported, and hypothesis H3b was also supported.

Conclusions

The purpose of the study is to examine customers' perceptions of service quality in the Albanian and Montenegrin hotel industry mainly in the city of Shkodra, Saranda, Budva and Ulcinj. This paper used the SERVQUAL model to evaluate service quality across five dimensions: tangibles, reliability, responsiveness, assurance and empathy. The findings of the study indicate that service quality influences customer satisfaction and four service quality dimensions such as X1“Tangibles”, X2 “Reliability”, X3”Responsiveness” and X5 “Empathy” have a significant impact on customer satisfaction. Based on literature review, empirical studies found the linkage between Customer Satisfaction and Reliability (Al Khattab & Aldehayyat, 2011; Markovic & Raspor, 2010; Nguyen et al., 2015) as well as between Empathy and Customer Satisfaction (Al Khattab & Aldehayyat, 2011; Ali et al., 2021; Hossain, 2012; Nguyen et al., 2015). The findings of the study, indicate also that service quality influences customer loyalty and that three service quality dimensions of the SERVQUAL model such as Reliability, Assurance and Empathy have a significant impact on Customer Loyalty. The results

of the simple regression analysis indicated that there was a significant relationship between customer satisfaction and customer loyalty. Moreover, the results of the first ANOVA indicated there was a significant difference in the mean customer satisfaction and in the mean customer loyalty based on the destination.

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Ranking Western Balkan countries according to the digital skills among older people

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Abstract: The twenty-first century brought accelerated technological progress and the need for adequate knowledge and skills that enable inclusion in contemporary trends. Having digital skills is considered an essential life competence. Their lack can increase the risk of social exclusion of already vulnerable social groups, such as people with disabilities, migrants, older adults, etc. Older adults mostly need help to use modern information and communication tools independently, which is why they cannot benefit from the advantages of the digital world. Regarding digital transformation, the entire Western Balkans region is far behind the European Union countries. This state additionally emphasizes the urgency of systemic and institutional action towards raising the digital expertise of the older population in this area. The goal of this work is to rank the Western Balkans countries based on the digital competences of the population older than 55 years. The database was created using statistical data from the EU database about individuals' digital skills in 2021. For the purpose of this study, the PROMETHEE II method was used. The obtained results indicate which of the analyzed countries should make the most effort in improving digital skills of older adults.

Keywords: digital competences, digital skills, older population, Western Balkan countries

1 Introduction

In the age of information and technology, digital literacy is becoming a need rather than a choice [1]. The gap between individuals who have access to computers and the ability to use them and those who do not is called the digital divide [2]. Numerous studies have proven that the digital divide can appear under the influence of numerous socio-demographic factors such as gender, education, age, and salary

[3, 4]. Digitalisation was implemented in recent years, so even though older people have life and work experience, they lack digital skills and access to the Internet and computers. Without digital knowledge and skills, older people cannot use social services, bank services, healthcare, or contemporary communication channels. Ageing populations and age-related e-inclusion remain fundamental European challenges [5], so digital empowerment of older people has become prominent. The discrepancies in digital skills are recognised in different European countries, especially in emerging countries [6]. The digital gap affects many aspects of life in developing countries, limiting access to contemporary technologies and preventing these countries from progressing further [7]. Economic policymakers in developing countries must realise that digital equality is closely related to the country's economic growth and development goals. It is very important for developing countries to overcome the age digital divide because older people are often forced to work even after retirement due to low pensions. By improving their digital skills, they would have the opportunity to improve their social status. Accordingly, governments should develop strategies to enhance the fundamental knowledge and abilities of older people required to succeed in a digital environment.

Recently, more studies are dealing with the development of a framework and scale for evaluating individuals' digital skills [8-10]. Technical skills are only one aspect of digital skills; other aspects include critical thinking, problem-solving, cybersecurity, content management, communication and collaboration, critical inquiry, responsibility, well-being, identity and development [11]. In 2014, the European Commission created a set of digital competence indicators [12]. This document defines five dimensions of individuals' digital competence: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Indicators are measured annually and biannually at the EU level.

The aims of this study are to:

- 1) rank Western Balkan countries based on the digital competencies of the population over 55.
- 2) determine the most and the least prominent digital competencies among the target group from each analysed country.

The obtained results will indicate which Western Balkan country should make the most effort to improve the digital skills of older adults.

2 Methodology

This study focuses on Western Balkan countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, North Macedonia, Romania, Slovenia, and Serbia). The used dataset was created according to the official Open Data Base website, and

the research period was 2021. The database consists of values of five different indicators: information and data literacy (IDLS), communication and collaboration (CCS), digital content creation (DCCS), safety (SS), and problem-solving skills (PSS) of populations' digital competencies, for each analysed country.

This study used the PROMETHEE method, which is known as one of the most effective and simplest in many fields. It was developed by Jean-Pierre Brans and Bertrand Mareschal. To analyse Western Balkan countries according to the digital skills of the population over 55, this analysis was performed using the Decision Lab software, a sophisticated application of the PROMETHEE method.

3 Results and discussion

The initial step in this analysis was the use of the entropy method in order to determine the relevant weights for each indicator. On the basis of such allocation of weights and by using the PROMETHEE II method, the rank of the analysed countries presented in Table 1 was obtained.

Rank	Action	Phi	Phi+	Phi-
1	Slovenia	0,4197	0,7098	0,2902
2	North Macedonia	0,2076	0,6038	0,3962
3	Croatia	0,1524	0,5762	0,4238
4	Serbia	0,1073	0,5537	0,4463
5	Bosnia and Herzegovina	-0,059	0,4705	0,5295
6	Bulgaria	-0,0927	0,4537	0,5463
7	Romania	-0,1373	0,4314	0,5686
8	Montenegro	-0,1597	0,4202	0,5798
9	Albania	-0,4384	0,2808	0,7192

Table 1.
Ranking results

According to the level of digital competencies of people over 55, Slovenia is the best-ranked Western Balkan country, and Albania is the worst-ranked country. According to the obtained Phi values, Slovenia, North Macedonia, Croatia, and Serbia have positive trends in digital competencies development. In other countries (Bosnia and Herzegovina, Bulgaria, Romania, Montenegro, Albania), most deficiencies in this kind of competencies have been proven.

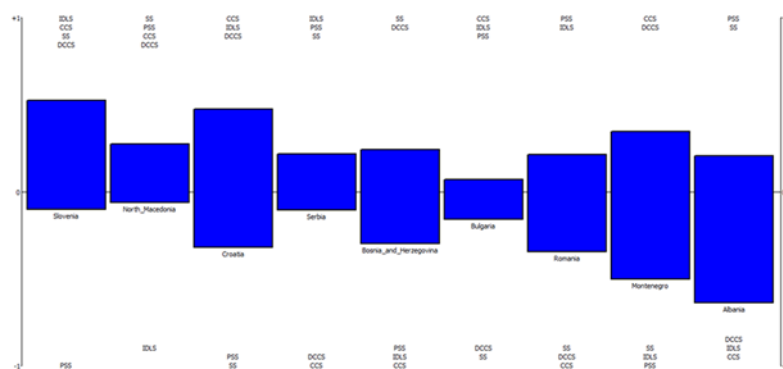


Figure 1
Rainbow diagram

According to the level of digital competencies of people over 55, Slovenia is the best-ranked Western Balkan country, and Albania is the worst-ranked country. According to the obtained Phi values, Slovenia, North Macedonia, Croatia, and Serbia have positive trends in digital competencies development. In other countries (Bosnia and Herzegovina, Bulgaria, Romania, Montenegro, Albania), most deficiencies in this kind of competencies have been proven.

Conclusions

The disadvantages of the digital skills of the target population exist in Western Balkan countries. Individuals aged 55+ do not possess digital competencies at a satisfactory level. It is crucial to analyse the forward-looking policies of developing countries in response to digital technologies. The main problem in emerging countries is that there is no necessary level of sophistication and awareness in the state administration when it comes to institutionalizing the problem of the digital divide. Accordingly, policymakers in Western Balkan countries should focus more on improving the digital competencies of older people.

The study's limitation is reflected in the small data set, which consists only of one-year indicators. Recommendations are that in future research, a longer monitoring period should be considered. That way, the trend of progress in the acquisition of digital competencies of the older population could be analyzed.

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Application of a Hybrid SEM-MCDA Approach for Examination of Different Industries' Attitude to Use ERP System

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Abstract: Enterprise Resource Planning (ERP) systems have attracted companies' attention and become an indispensable part of business practice. The success of implementing an ERP system depends on the employees' beliefs, attitudes, and behavior, which affects how employees will accept the new technology. Using the Technological Acceptance Model (TAM), it is possible to examine the ERP system adoption and acceptance factors. Structural equation modelling (SEM) is a useful way to examine the TAM constructs, while multicriteria decision-making analysis (MCDA) helps consider a set of alternatives and criteria. This paper applies the hybrid SEM-MCDA technique to arrive at answers about different industries' attitudes towards ERP system use. To apply this hybrid approach empirical research has been taken based on an online questionnaire. For using this novel approach in the first stage SEM model has been used, and in second stage results of SEM has been upgraded with MCDA technique.

Keywords: ERP system, Technological Acceptance Model (TAM), Structural Equation Modelling (SEM), Multicriteria Decision-Making Analysis (MCDA)

1 Introduction

Modern business conditions require the integration of a large amount of data, information feedback, quick response, flexibility, and the integration of business functions. To respond to the mentioned challenges, Enterprise Resource Planning (ERP) systems represent a solution [1].

ERP represents a necessity in the modern way of managing both large small and medium-sized enterprises [2]. Business operations of companies require that business processes and activities of various functions such as finance, sales, production planning, human resources, and other relevant functions be connected. ERP systems play a key role in this integration. ERP should serve as a unified system that enables the circulation of data in different departments and business functions [3].

The leading ERP system that completes the organization's operations by integrating all business functions is SAP. This ERP system has numerous advantages over competitors [4], and as such represents the sphere of interest of many studies [5-7].

Although the company's management is aware of the necessity of implementing an ERP system, employees do not always have to follow such an attitude. The success of the ERP system implementation depends on the degree to which the employees accept the ERP system. The Technological Acceptance Model (TAM) can be used to determine the main factors of ERP system acceptance.

The adoption of ERP systems in companies is often explained through contemporary studies and research that combine the TAM model with the PLS technique [8-10] However, previous literature in the field of ERP systems does not often represent the combination of hybrid methods, indicating a research gap. In order to overcome it, this paper attempt to apply this hybrid approach combining PLS with Multicriteria Decision-Making Analysis (MCDA).

The paper is structured as follows: After the introductory part, there follows a description of the research framework and the hypotheses development. The following parts of the paper refer to the applied methodology, results and discussion, and concluding considerations.

2 Research Framework and Proposed Hypotheses

The TAM model was developed in 1989, but over time it has been changed, supplemented, and developed by numerous researchers. This model provides a theoretical framework for analyzing the acceptance of new technologies in companies. In that case, it could serve as a model for accepting the SAP ERP system. Contemporary studies and research seek to explain the adoption of ERP systems in companies using the TAM model. The TAM model can consist of

different external variables and internal constructs, and in the literature, different models try to explain the degree of acceptance of the SAP-ERP system. Therefore, in this paper, after broad literature review, existing TAM model proposed by [9], has been chosen and upgraded with hybrid SEM-MCDA.

In mentioned model, five external factors and several constructs have been recognised.

The compatibility of the ERP system refers to the degree of integration of the new technology, ie. ERP systems in the daily activities and work of employees [11]. It can also be defined as the degree to which the ERP system is perceived as a consistent technology with existing values and past experiences [12]. If the employees perceive the new ERP system as compatible, then this will affect their attitude towards its use. Therefore, hypothesis H₁ is defined as: Perceived SAP-ERP Work Compatibility would significantly influence users' Attitude towards usage of the SAP-ERP system.

A positive and statistically significant relationship between the usefulness and attitude towards ERP systems has been consistently confirmed in previous research. (Putri et al., 2020; Grandón et al., 2021; Murillo et al., 2021). "The perception of system usefulness strongly influences end-user satisfaction, thus increasing their willingness to use the ERP system more. In light of this, hypothesis H₂ was proposed: Perceived SAP-ERP Usefulness significantly affects users' Attitude towards the usage of the SAP-ERP system.

Previous research has confirmed that ease of use has a positive and statistically significant impact on willingness to use the SAP ERP system [10, 13]. Hence, next hypothesis is defined as: H₃ Perceived SAP-ERP Easy of use would significantly influence user's Attitude towards usage of the SAP-ERP system

External variables of the model are those that affect or can affect the basic elements of the TAM model [14]. In this paper, the influence of several external variables was investigated, namely: system complexity, system performance, user instructions, social impact, and business process fit. Therefore, H₄ is stated as: External Factors would significantly influence user's Attitude towards usage of the SAP-ERP system.

Four perspectives (criteria) are examined in relation to Attitude towards usage of the SAP-ERP system in the proposed conceptual study model (see Figure 1)..

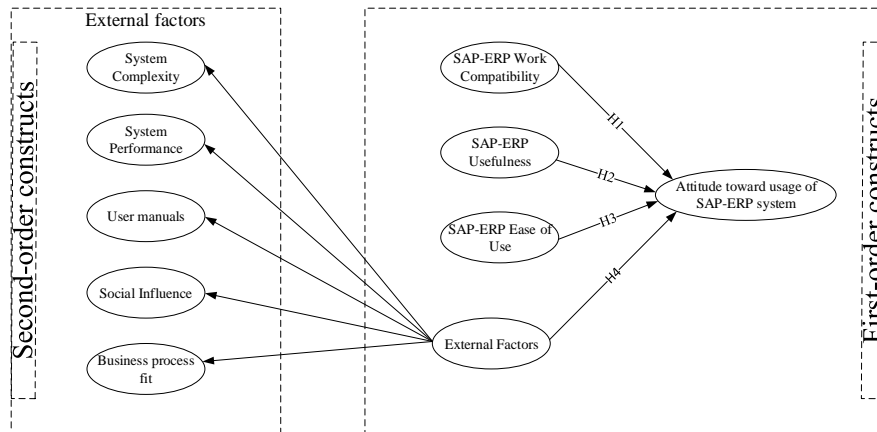


Figure 1
Conceptual Framework

Moreover, four hypotheses with these five main constructs were defined in order to test the positive effect of defined criteria on the Attitude towards usage of the SAP-ERP system

3 Methodology

3.1 Data Collection

In this study, empirical research was conducted to examine the attitude of ERP system users on the use of the SAP-ERP system. The survey included 150 respondents, 132 of whom responded to the submitted online questionnaire. Respondents represent users of SAP-ERP systems from various industries in Serbia, including the following areas: IT industry, Telecommunications industry, Automotive industry, Industrial Selling, Banking, Pharmaceutical industry, Production, Aviation industry, Mining and metallurgy, and Energy industry.

3.2 Stage 1: Structural Equation Modeling

In the stage 1, Structural Equation Modeling (SEM) has been applied. Purpose of using this methodology is to confirm proposed hypotheses (H₁ to H₄). In this paper PLS-SEM was used because of it's advantages over CB-SEM approach [15], including complex model with more constructs, variables and relationships, confirmatory approach, absence of need for set normality, and smaller sample size.

As it is shown in Figure 1, SEM model consists of two folds – first order and second order model. In this case, SAP-ERP Work Compatibility, SAP-ERP Usefulness,

SAP-ERP Easy of use are explained as a first-order constructs, and External Factors are established as a second-order constructs.

To carry out this analysis, SmartPLS version 4 was used.

3.3 Stage 2: Multicriteria Decision-Making Analysis

In the stage 2, Multicriteria Decision-Making Analysis (MCDA) has been used. The main idea of using this analysis in second stage, is to arrive at relative weightage of each criterion of first-order construct. In order to achieve this, only confirmed hypotheses were used. The relative weightage was calculated following formula:

$$w_j = \frac{\gamma_j}{\sum \gamma_j} \quad (1)$$

where:

γ_j is the result of PLS-SEM estimated path coefficient of the “j”th confirmed hypotheses.

$\sum \gamma_j$ is the sum of estimated path coefficients of all confirmed hypotheses.

4 Results and discussion

4.1 Stage 1: Structural Equation Modeling

The Structural Equation Modeling (SEM) is used to determine causal relationship between constructs and to determine the weights for further multi-criteria analysis. Two-step procedure was implemented for the data analysis. The first phase focuses on the analysis of the measurement model by using PLS algorithm (Figure 2).

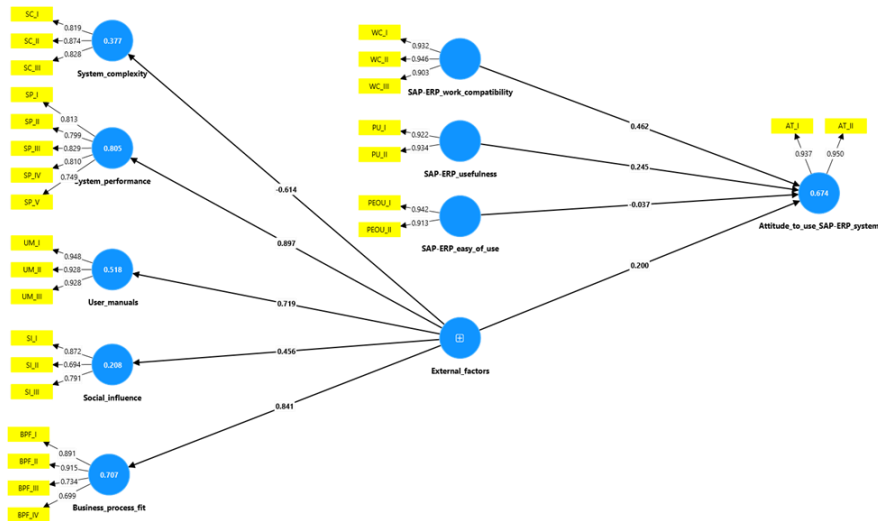


Figure 2
Measurement model

All factor loadings in the measurement model are above 0.70. As a result, the measuring model determined that every item was powerful enough to keep using the structures without eliminating any of them.

A predictor-dimensional exogenous variable External factors had a significant impact on the second-order model's R-square value for the relationship construct with five dimensions: System Complexity (37.7%), System performance (80.5%), User manuals (51.8%), Social influence (20.8%), Business process fit (70.7%). Additionally, each dimension's elements were statistically measured as second-order relationship construct dimensions, moreover, it was confirmed that they can establish the quality reflective model. The coefficient of the path correlation between exogenous latent variable External factors toward the five dimensions showed a strong association between them in descending order: System performance (0.897), Business process fit (0.841), User manuals (0.719), System Complexity (-0.614), Social influence (0.456).

The internal consistency (reliability) statistics were obtained by evaluating Cronbach's alpha and composite reliability (Table 1). The measuring model examined the following indices to verify that they were appropriate: factor loading ≥ 0.50 , AVE (Average Variance Extracted) ≥ 0.50 , CR (Composite Reliability) ≥ 0.70 . The results showed that Cronbach's alpha of each construct is more than 0.70, as well, the composite values attained more than 0.70, which confirmed that overall model constructs are reliable for further analysis. The AVE of all constructs achieved more than 0.50, except for the exogenous latent variable External factors, which was 0.387.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Attitude_to_use	0.878	0.885	0.942	0.891
Business_process_fit	0.827	0.849	0.886	0.664
ERP_work_compatibility	0.918	0.919	0.948	0.860
External_factors	0.811	0.915	0.848	0.387
Percived_easy_of_use	0.839	0.864	0.925	0.860
Percived_usefulness	0.839	0.843	0.925	0.861
Social_influence	0.704	0.754	0.831	0.622
System_complexity	0.796	0.828	0.878	0.707
System_performance	0.860	0.861	0.899	0.641
User_manuals	0.928	0.929	0.954	0.874

Table 1.
Construct reliability and validity

The discriminant validity was tested in order to analyse whether the latent construct differ from other latent constructs. To estimate the degree of shared variance among latent variables in the model, Fornell-Larcker criterion has been used. According to the Fornell-Larcker criterion, in order to eliminate discriminant issues in the SEM model, the square root of each latent variable's AVE should be greater than its association with other latent variables. Results in the Table 2 showed that the square root of each latent variable's AVE are greater than relationship between all other constructs, except for the exogenous latent variable External factors, with the value 0.622.

	1	2	3	4	5	6	7	8	9	10
Attitude_to_use (1)	0.944									
Business_process_fit (2)	0.684	0.815								
ERP_work_compatibility (3)	0.789	0.751	0.927							
External_factors (4)	0.716	0.841	0.763	0.622						
Percived_easy_of_use (5)	0.409	0.403	0.461	0.587	0.928					
Percived_usefulness (6)	0.740	0.697	0.782	0.756	0.473	0.928				
Social_influence (7)	0.413	0.384	0.411	0.456	0.243	0.307	0.789			
System_complexity (8)	-0.490	-0.388	-0.510	-0.614	-0.593	-0.557	-0.136	0.841		
System_performance (9)	0.596	0.668	0.626	0.897	0.521	0.673	0.270	-0.511	0.801	
User_manuals (10)	0.396	0.465	0.434	0.719	0.387	0.420	0.245	-0.275	0.554	0.935

Table 2
Fornell-Larcker criterion

In the second phase, hypothesized structural model was analysed to get outputs of empirical data through PLS path model. The model fit analysis's result showed that only SRMR and Chi-square values are appropriate (Table 3).

	Estimated model	Acceptable fit
SRMR	0.072	< 0.08
d_ ULS	0.547	< 0.08
d_ G	0.396	< 0.1
Chi-square	318.176	$p_{val} > 0.05$
NFI	0.774	> 0.9

Table 3
Goodness of fit results

After assessing model fit, each hypothesis was tested based on the PLS bootstrapping analysis. The results of hypotheses obtained from of the structural model are shown in the Figure 3.

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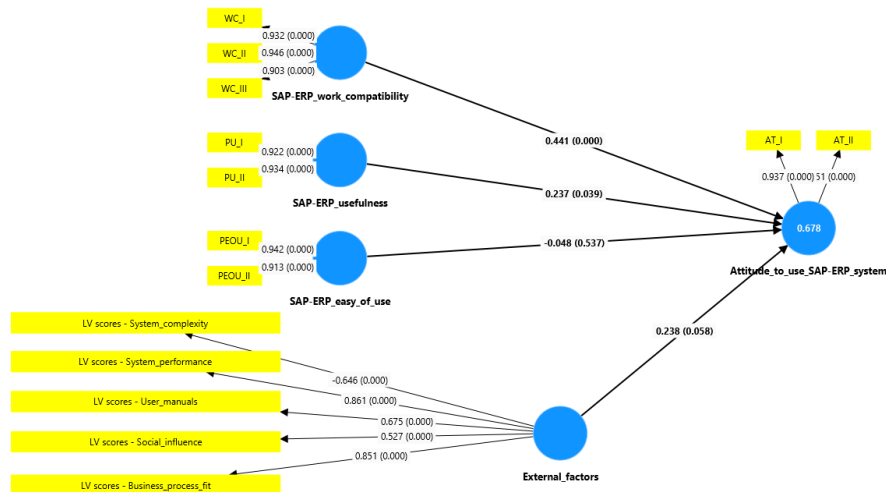


Figure 3
Results of Hypothesized model using PLS bootstrapping algorithm

Additionally, standardized path coefficients reveal that three of four hypotheses were supported. Result are shown in Tabel 4.

	Construct	Estimated path coefficient	t-statistics	p-value	Remark
H ₁	SAP-ERP Work Compatibility → Attitude toward usage of SAP-ERP system	0.441	4.451	0.000	accepted
H ₂	SAP-ERP Usefulness → Attitude toward usage of SAP-ERP system	0.237	2.069	0.039	accepted
H ₃	SAP-ERP Easy of Use → Attitude toward usage of SAP-ERP system	-0.048	0.618	0.537	rejected
H ₄	External Factors → Attitude toward usage of SAP-ERP system	0.238	1.894	0.058	accepted

Table 4
Results of hypotheses testing

According to results presented in the Table 4, it was determined that SAP-ERP Work Compatibility, SAP-ERP Usefulness and External Factors have a positive and significant effects on Attitude toward usage of SAP-ERP system. Contrary to expectations, it was found that SAP-ERP Easy of Use had a negligible detrimental impact on the dependent variable.

4.2 Stage 2: Multicriteria Decision-Making Analysis

The relative weightage is computed only for the criteria according to formula (1). Table 5 presents the normalized standardized path coefficients for these criteria as weights values.

Criteria	Normalized relative weightage
SAP-ERP Work Compatibility	0.481
SAP-ERP Usefulness	0.259
External Factors	0.260

Table 5.
Weights of criteria

From Table 5, it could be seen that SAP-ERP Work Compatibility is the most important criteria (0.481), following External Factors (0.260) and SAP-ERP Usefulness (0.259).

Conclusions

In this paper, a two-stage SEM-MCDA analysis, which represents a hybrid methodology, was applied. Based on the literature review, hypotheses were defined and a research framework was selected. Through empirical research conducted on the territory of Serbia, a research sample of various industries was collected. In the first step, the PLS-SEM methodology was applied to test the set hypotheses. In this

stadium, three hypotheses (H_1 , H_2 , and H_4) were confirmed, while one hypothesis (H_3) was rejected. In the second stage, the relative importance of the confirmed hypotheses was calculated, representing the weight of each criterion. According to the results of this research, among the set criteria, SAP-ERP Work Compatibility is the most important criterion.

Considering the above, it can be said that this paper has several significant contributions. First, it presents the application of a modern hybrid methodological framework in the research area related to ERP systems. Second, it provides an overview of the criteria important for the acceptance of the SAP ERP system, highlighting the quantified importance of each of the criteria.

In addition to the mentioned contributions, this study also has its limitations, such as the number of subjects included, the limitation to the territory of Serbia, and the limitation to SAP as only one of the current EPR systems.

Future research will be aimed at overcoming the mentioned limitations and further development of the methodology, which refers to the application of some of the MCDA tools.

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The relationship between workplace digitalization and older worker's productivity

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Abstract: Many studies have confirmed the positive impact of workplace digitalization on productivity, especially in terms of efficiency, innovation and cost reduction. On the other side, some studies reported disconnections between these two variables. Therefore, this paper is trying to resolve the inconsistent findings regarding the impact of workplace digitalization on productivity in a transitional context. The sample size used for the analysis consists of 103 respondents. Structural Equation Modeling (SEM) technique is adopted to explore complex relationships among variables. In addition, the mediation analysis was performed to investigate the mediating role of employee job satisfaction in the relationship between workplace digitalization and older employees' productivity. The results suggest that the total effect of workplace digitalization on employee productivity is significant ($\beta = 0.578$, $p = 0.000$), indicating a positive relationship between these variables without considering the mediator. When mediator job satisfaction was included, the direct effect of workplace digitalization on employee productivity became very low and statistically insignificant ($\beta = 0.003$, $p = 0.966$), suggesting that the relationship between them is fully mediated by variable job satisfaction.

Keywords: workplace digitalization, productivity, older employees, SEM, mediation analysis

1 Introduction

Over time, technology has become an integral part of our lives, revolutionizing various aspects of society, including the economy. Companies in various sectors embrace digital technologies to streamline operations, reach wider markets and deliver products and services more efficiently. The emergence of the covid-19 pandemic only further accelerated the digitization process. Technological advances

have undoubtedly led to job changes in certain sectors, especially those that rely heavily on routine tasks. However, in addition to the great benefits that the digitization process has brought, it is still a challenge to establish a balance between technological progress and the well-being of employees.

Many studies were conducted to analyze whether and how workplace digitalization influences employees' productivity [1,2,3]. Most of them have confirmed the positive impact of digitalization on productivity, in terms of efficiency, innovation and cost reduction. On the other hand, some studies reported disconnections between these two variables, due to lower socialization, and lack of skills [4].

A very low number of studies particularly examined the impact of digitalization on productivity among older employees [5,6,7] and even lower number were conducted in developing countries [8], especially Balkan countries.

In that sense, this study contributes to a very limited literature by trying to resolve the inconsistent findings on the relationship between workplace digitalization and employees' productivity in a transitional context. Four hypothesis were proposed and tested for that purpose.

Hypothesis 1 (H₁): Workplace digitalization positively and significantly impacts employees' productivity.

Hypothesis 2 (H₂): Workplace digitalization positively and significantly impacts employees' job satisfaction.

Hypothesis 3 (H₃): Employees' job satisfaction positively and significantly impacts employees' productivity.

Hypothesis 4 (H₄): Employees' job satisfaction as a mediating variable increases the effect of workplace digitalization on employees' productivity.

2 Methodology

The main objective of this paper was to study the impact of technology on older people's productivity, with mediating effect of variable job satisfaction. Sample consists of workers older than 55, employed in Serbian organizations. Study was conducted between December 2022 and February 2023. Data were collected personally. The survey covered a total of 103 workers. The demographic characteristics of the sample are shown in Table 1

		Number	%
Gender	Male	46	44.67
	Female	57	55.33
Sector	Manufacturing	21	20,6
	Service	18	17,7
	Education	4	2,9
	Administration	24	23,5
	Other	36	35,3

Table 1.
Socio-demographic characteristics of the sample

Demographic characteristics (Table 1) showed that the statistical population included mostly female employees, working in different sectors with more than 30 years of working experience.

The questionnaire is made up of two parts. The first part consists of 3 questions which lead to the socio-demographic data (gender, working experience in years and sector of employment), and the other part consists of 40 questions divided into 3 groups. Digitalization, Employee productivity and Job satisfaction [9]. Five-point Likert scale was used to assess the answers, where 1 means „I completely disagree“ and 5 means „I completely agree“.

The Partial Least Square (PLS) approach to Structural Equation Modelling (SEM) was used to analyze the relationship between the observed variables. One of the main reasons why PLS-SEM was chosen in this study is that PLS-SEM is very suitable for small sample analysis [10]. The modelling process is divided into two main stages: Stage 1 - Measurement Model Assessment and Stage 2 - Structural Model Assessment. The measurement model reflects the interactions between the observed data and the latent variable, whereas the structural model represents the relationships between latent variables. In addition, we have also analyzed the mediating role of job satisfaction in the relationship between workplace digitalization and older employees' productivity.

3 Results and discussion

3.1. Measurement model assessment

Measurement model assessment included establishing construct reliability and validity of scale tools [11]. The construct reliability and convergent validity of the measurement model are assessed using Cronbach's alpha (CA), rho A, Composite Reliability (CR), and Average Variance Extracted (AVE), which are presented in Table 2.

Construct	Cronbach's alpha	rho_A	CR	AVE
Employee Productivity (EP)	0.856	0.866	0.855	0.540
Job Satisfaction (JS)	0.925	0.927	0.925	0.509
Workplace Digitalization (WD)	0.856	0.866	0.855	0.505

Table 2.
Construct reliability and validity

According to Table 2, the Cronbach's Alpha and CR values exceed the recommended threshold of 0.70, as suggested by Hair et al. [12]. The Cronbach's Alpha values ranged from 0.856 to 0.925, indicating satisfactory internal consistency for all the constructs. Furthermore, the CR ranged from 0.855 to 0.925, providing additional support for the reliability of the constructs. Convergent validity is assessed using the Average Variance Extracted (AVE) statistic. As recommended by Fornell and Larcker [13], an AVE value equal to or greater than 0.50 indicates that the items converge to measure the underlying construct, thus establishing convergent validity. In this study, the AVE value for the constructs was higher than 0.5, so convergent validity is also confirmed.

Besides convergent validity, the discriminant validity should also be checked before assessing the structural model. Henseler et al. [10] suggested the usage of Heterotrait-Monotrait ratio of correlations (HTMT) criterion for that purpose. Ideally, according to Kline [14] a threshold value needs to be 0.85 or less, while other authors [15] proposed a threshold of 0.90 or less.

Construct	Job Satisfaction (JS)	Employee Productivity (EP)
Employee Productivity (EP)		
Job Satisfaction (JS)		0.801
Workplace Digitalization (WD)	0.716	0.581

Table 3.
Discriminant validity—HTMT ratio

Table 3 indicates that all HTMT ratios are lower than the suggested threshold of 0.9, confirming the good discriminant validity of the model.

3.2 Structural Model Assessment

Since the reliability and validity of the measurement models are established, hypothesized causal relationships within the inner model can be evaluated using PLS-SEM. The hypotheses were tested in a two-tailed manner, specifically emphasizing the positive direction of the relationships. To assess the statistical significance of these relationships, the bootstrapping procedure in SmartPLS4 software (5000 bootstrap samples were generated) was employed [16].

Hypothesis	β	SD	t	p	Results
H1: WD > EP	0.003	0.078	0.043	0.966	Nor confirmed
H2: WD > JS	0.715	0.044	16.309	0.000*	Confirmed
H2: JS > EP	0.804	0.064	12.582	0.000*	Confirmed

Table 4.
Results of the structural model assessment – direct effect

The obtained results (Table 4) show that the path coefficient indicating the relationship between workplace digitalization and productivity is very low ($\beta=0.003$) and statistically insignificant ($p=0.964$), suggesting that hypothesis H₁ should be rejected. However, positive and statistically significant path coefficients between variables workplace digitalization and job satisfaction ($\beta=0.715$, $p=0.000$), as well as between job satisfaction and productivity ($\beta=0.804$, $p=0.000$), support hypotheses H₂ and H₃.

The mediation analysis aimed to investigate the mediating role of job satisfaction in the relationship between workplace digitalization and productivity of older workers in observed organizations. The results shown in Table 5 reveal that the total

effect of WD on EP is significant ($\beta = 0.578, p = 0.000$), indicating a positive relationship between these variables without considering the mediator. When mediator JS was included, the direct effect of WD on EP became very low and statistically insignificant ($\beta = 0.003, p = 0.966$), suggesting that the relationship between them is fully mediated by the variable job satisfaction, which confirms hypothesis H₄.

	Total effects			Direct effects			Indirect effects		
	β	t	p	β	t	p	β	t	p
Workplace Digitalization on Employee Productivity	0.578	9.854	0.000*	0.003	0.043	0.966	0.575	9.415	0.000*

β = Path Coefficient, t = t-Statistics, p = level of significance *p < 0.05.

Table 5.

Total effect, direct effect, and indirect effect for the model mediation

Finally, the evaluation of obtained R² (the coefficient of determination) and f² (the effect sizes of the paths) supplement the previous analysis (Table 6).

Predictor	Outcome	R ²	f ²
Workplace Digitalization	Job Satisfaction	0.511	1.043
Workplace Digitalization	Employee Productivity	0.650	0.000
Job Satisfaction			0.905

Table 6.

R² and f² values

R² has been used to determine the explained variance of the latent dependent variables about the overall variance. The cutoff R² values suggested by Chin [17] are as follows: 0.190 weak, 0.333 moderate, and 0.670 substantial. According to the results in Table 6, the overall model explained 65% of the variance in EP. The model also explained 51.1% of the variance in variable job satisfaction, so it can be said

that some other factors influence this variable. Still, the model has a good predictive value.

According to Cohen [18], an f^2 value measures the strength of each predictor variable in explaining endogenous variables. An f^2 value from 0.02 to 0.149 is considered small, from 0.15 to 0.35 is considered medium, and higher than 0.35 is considered large. Considering these thresholds a large effect was found in the relationship between WD and JS, as well as JS and EP, 1.043 and 0,905, respectively. On the other hand, no effect was recorded in the relationship between WD and EP.

Conclusions

One of the main implications of this study is comprehension of the true value of older employees, which could serve employers to overcome the negative stereotypes about older workers and to see them as important resources. This research has limitations. Sample only included older employees from one country, hence partially restraining a generalization of the results. The questionnaire didn't include the level of education of the employees, which could, as moderator variable to some extent, change the obtained results. Future research aims to expand the sample to other countries and consider other variables, such as level of education.

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Circular Economy Solutions for the Agri-food Business

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Abstract: When we consider the long-term stability of the entire agri-food business, we are most likely at a major turning point. Recent significant disruptions in food supply chains have exposed the vulnerability of the global agri-food system, causing severe shocks to the world's food supply. The current agri-food supply chain is affected by different issues such as food loss and waste generation along the supply chain, and circular economy offers a potential solution to enhance and optimize the production and consumption process thereby achieving a sustainable paradigm shift. The article showcases several innovative solutions organized around thematic concepts.

Keywords: Circular economy, sustainability, food, agriculture, innovation

1 Introduction

In addition to the unexpected human tragedies, like the COVID-19 epidemic and the conflict in Ukraine, there are a few persistent dangers and concerns related to food and agriculture. For instance, the effects of climate change and extreme weather on ecology and the environment, crop production, agricultural resources, the supply chain, and market prices all pose a danger. For our current and future generations, pursuing a sustainable, circular route of food production and consumption is not only a viable solution but also an emerging one [1].

The circular economy concept gained momentum among scholars, industry, business and government as a more accurate concept, than green economy and green growth concepts, in dealing with environmental issues together with maintaining sustainable economic growth [2]. In particular, business enterprises started to redesign their business models based on circular economy principles, which ensures cost reductions in addition to material and energy savings [3].

According to Scott [4], circular economy is a concept, whereas sustainability is a mechanism, which ensures the implementation of circular economy tools, projects, systems and models. However, the research, which highlighted the main differences

between circular economy and sustainability, states that the circular economy is a condition for achieving sustainability [5].

The most cited definition is from the Ellen MacArthur Foundation, which states that “circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the “end – of – life” concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models” [6, p. 6].

There are three main strategies, reduction, reuse and recycle [7]. By 2017 the number of “Rs” reached nine (Table 1) [8].

R1	Refuse	“Make product redundant by abandoning its function or by offering the same function by a radically different product or service”
R2	Rethink	“Make product use more intensive (e.g. through product-as-a-service, reuse and sharing models or by putting multi-functional products on the market”
R3	Reduce	“Increase efficiency in product manufacture or use by consuming fewer natural resources and materials. It includes the prevention of food waste along food value chains including in agricultural production, processing, manufacturing, distribution and consumption”
R4	Reuse	“Reuse of a product which is still in good condition and fulfils its original function (and is not waste) for the same purpose for which it was conceived”
R5	Repair	“Repair and maintenance of defective product so it can be used with its original function”
R6	Refurbish	“Restore an old product and bring it up to date (to specified quality level)”
R7	Remanufacture	“Use parts of a discarded product in a new product with the same function (and as-new-condition)”
R8	Repurpose	“Use a redundant product or its parts in a new product with different function”
R9	Recycle	“Recover materials from waste to be reprocessed into new products, materials or substances whether for the original or other purposes. This includes the reprocessing of organic material but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations”

Table 1.

Circular economy strategies

Source: Adopted from The EIB Circular Economy Guide [9, p. 14]

The current agri-food supply chain is affected by different issues such as food loss and waste generation along the supply chain, and circular economy offers a potential

Life-Cycle Assessment (LCA), Farm-to-Table Supply Chains, Closed-loop agricultural systems	Surplus ingredient utilization, Upcycling, Revalorization , Agropark, Environmental Biorefinery
Precision Agriculture, Smart Farming, Industry 4.0	Regenerative agriculture, No-Till Farming, Biodynamic farming, Integrated Aquaponic Systems
Seed exchange systems, Agricultural Cooperatives	Local Food Systems, Pocket Markets
Solar-Powered Farming Equipment, Solar thermal, photovoltaic modules, Biogas Plant	Circular Packaging Solutions, Reusable Container programs
Food Sharing Platforms, Food Banks, Social Eating Platforms, Food Alerting Platforms, Zero-Waste Restaurants, Social Supermarkets	Permaculture, Urban Vertical Farming, Homegardens, Community Supported Agriculture (CSA)

Table 3.
Possible Circular economy solutions grouped by concepts

3.1 Reduce

Precision Agriculture

Precision agriculture is a management approach that targets production variability with the goal of improving decision-making in agriculture. It involves using technologies such as soil sensing, satellite imagery, GPS, and GIS to measure and map soil variation, locate ground positions, and store ground information [14][15][16]. By efficiently matching resource inputs with crop needs, precision agriculture can improve crop production and reduce resource wastage. It can be used for various operations such as tillage, fertilizer application, sowing, irrigation, and spraying, allowing for more precise and intensive production [17]. Precision agriculture can also help synchronize nutrient supply with crop demand, such as variable application of nitrogen fertilizer, to improve fertilizer use efficiencies and reduce environmental impacts [18]. Overall, precision agriculture combines reactive approaches using yield maps and sensors with proactive approaches using simulation modeling to optimize land and crop management, contributing to the development of sustainable agricultural production systems.

Regenerative Agriculture

Regenerative agriculture is an approach that focuses on restoring and maintaining soil health, supporting biodiversity, and improving ecological and economic resilience [19]. However, there is currently no widely accepted definition of

regenerative agriculture, with various definitions based on processes or outcomes [20].

Biodynamic agriculture, which avoids the use of inorganic fertilizers and chemicals, is one of the tools of regenerative development [21]. Instead of using artificial chemical fertilizers and pesticides, biodynamic farming places an emphasis on increasing soil fertility through the addition of compost and animal and green manures, naturally managing pests, rotating crops, and diversifying livestock and crops [22].

Permaculture

Permaculture is a concept that originated in the 1970s and is centered around sustainable and resilient systems. It goes beyond just agriculture and can be applied to various domains such as the environment, social aspects, economy, and politics [23]. Permaculture is an interdisciplinary branch of science that addresses food security, energy, and environmental care. It involves designing sustainable human communities by combining traditional techniques with new knowledge and technologies in various fields [24]. "Permaculture is primarily a thinking tool for designing low carbon, highly productive systems" [25]. Research on permaculture provides answers on how to preserve the environment while simultaneously producing food, creating energy-efficient homes, and enhancing the functioning of urban communities [23].

Sustainable energy generation

Key energy-saving strategies in agriculture farming includes photovoltaic (PV) modules, solar thermal (T), energy-efficient pumping systems, various covering materials for improved thermal insulation, and energy generation from by-products. Anaerobic digestion is a process that recycles natural organic wastes and reduces the pollution that is typically associated with them while producing methane, a premium fuel and also residue rich in protein.

Shared resources in agricultural operations

Smaller farmers now have an alternative to leverage the efficiencies of large farms and stay competitive in an increasingly consolidated agricultural sector by utilizing machinery-sharing. Sharing can provide other benefits, including improved access to skilled labor, reduced risk, and idea sharing among peer groups of like-minded individuals [26].

Local Circular Food Systems

Local circular food systems are gaining recognition as a key strategy for achieving sustainable development goals and addressing the environmental impacts of the global food system. Implementing circularity at the city scale, particularly in urban food systems, is crucial due to their significant contribution to food consumption,

loss, waste, and greenhouse gas emissions. Designing urban food systems that embrace circular economy principles can contribute to the overall transition to circular urban metabolism. The implementation and promotion of circular economy in food systems and cities can be facilitated through the development of a conceptual model for designing urban food systems that align with circular economy targets [27][28][29].

Community Supported Agriculture (CSA)

Community Supported Agriculture (CSA) programs involve partnerships between consumers and farmers, where consumers pay in advance for farm products and farmers commit to supplying a sufficient quantity, quality, and variety of products throughout the season [30]. CSA programs are seen as a potential solution to challenges in the globalized food system and a way to promote agricultural and rural sustainability [31]. CSA aims to produce environmentally, socially, economically, and nutritionally sustainable food by sharing the risks and responsibilities of farming activities between producers and consumers [32]. CSA farms seek to create a direct relationship between farmers and those who eat their food, with farm members or shareholders purchasing shares and receiving weekly allotments of produce [33].

3.2 Reuse

Food Sharing Models

Food sharing platforms have emerged as potential solutions to address food loss and waste, as well as promote sustainability in food systems. These platforms aim to reduce food waste and incorporate sustainable objectives in their mission [34].

Three types of models have become popular:

- “the sharing for money model, which is primarily a B2C for-profit model to reduce waste and, at the same time, generate revenue (social supermarkets,)
- the sharing for charity model in which food is collected and given to non-profit organizations (e.g. food banks);
- the sharing for the community model which is a P2P model where food is shared amongst consumers” [35].

Opportunities brought about by digital technology and the sharing economy phenomenon have recently increased the number of web platforms and food sharing apps being developed by new and existing entities that operate exclusively online, as well as by existing organizations [35].

However, the adoption of digitally mediated meal sharing in everyday food provisioning practices is influenced by factors such as convenience, affective engagement, and coordination with other practices [36]. Complaints within food

sharing platforms can deter participation, and analyzing these complaints using machine learning can provide insights into user dissatisfaction [37]. To assess the sustainability impacts of food sharing initiatives, an online sustainability impact assessment (SIA) tool called The Toolshed has been developed, which allows initiatives to evaluate and communicate their sustainability impacts [38].

These initiatives, while having positive social and environmental effects, are not immune to criticism because there isn't a dominant player and there is a high degree of user fragmentation among the platforms that are currently in use.

Surplus ingredient utilization

Surplus ingredient utilization is a topic that has gained attention in various fields. Researchers have focused on developing economically viable bioprocesses to convert waste and surplus materials into valuable products such as biosurfactants [39]. In the agricultural sector, there is a need for efficient management of agri-food surplus, waste, and loss (SWL) to prevent the loss of valuable compounds and promote a circular economy [40]. Pulse processing byproducts have also been explored as a potential source of functional bioactive components, and various extraction techniques have been studied for their recovery [41]. Additionally, there is potential for consumer acceptance and preference for value-added surplus products made from ingredients that would otherwise go to waste [42]. In the context of a sintering kiln, surplus heat utilization devices have been developed to collect and utilize surplus heat, resulting in energy savings and improved product quality [43].

Reusing food leftovers for new products while preserving their nutritional and commercial value is known as upcycling. Future obstacles to the reuse of side streams include securing consumer acceptance and maintaining food safety.

Circular Packaging Solutions

Circular packaging solutions aim to reduce negative environmental impacts and promote sustainable consumption. These solutions involve the application of circular economy principles to packaging design, including strategies such as refuse, reduce, reuse, and recycle. Research has focused on developing practical design guidance and considerations for circular packaging design solutions, addressing concepts, material selection, design process, and manufacture [44]. Advances have been made in the development of biobased packaging materials, including new materials, modification techniques, and end-of-life scenarios. End-of-life factors such as sorting systems, composting options, and recycling and upcycling possibilities have also been explored [45]. Implementing sustainable food packaging solutions within circular food supply chains is crucial for protecting customers and ensuring food quality and safety [46]. The implementation and management of circular supply chain management can guide efforts in innovative

logistics packaging management, such as sustainable wooden packaging logistics [47].

3.3 Outlook

Despite the fact that circular economy is a predominant concept and many studies call for shifting from linear to the circular economy, there are still superficial transitioning practices. According to the World Business Council the circular economy transition today is up to 8.6% and there is an urgent requirement to accelerate the transition [48]. The CEPS framework research claims that the linear economy practices are still dominating in production cycles [49]. One of the reasons is that linear economy is still effective in providing economic growth, despite being a reason for our current environmental and social issues [50]. Furthermore, the authors assume that linear economy can possibly remain till the time when there is a dignified alternative "green" model for it, which functions as the old one with providing the same economic benefit and does not demonstrate any errors in the deployment [50]. An additional reason of slowing circular economy transition is consumers' behavior. According to Planning [51], consumers would rather own a product for an extended period of time than reuse it, even if doing so would cost them less. This preference is attributed to the fact that consumers are habitually irrational rather than rational, and that their behavior is shaped by routines and habits.

Conclusions

The apparent short-term strategy to minimize interruption to global supply networks is to try to limit consumption and identify alternate sources of raw materials and crops. The current crisis does, however, also emphasize how heavily most nations' food systems rely on imported inputs, including fossil fuels, fertilizers, and feed. This underlines the necessity of radically changing agriculture and food systems in order to move toward sustainability. Although the benefits of novel food production methods like hydroponics and aquaponics, short supply chains, and circular economies will probably not be seen for some time, efforts should be made to support them.

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Household overcrowding in Central and Eastern Europe countries- urban-rural approach

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Abstract: Housing is a particularly important asset for humans. The use of dwelling of an appropriate standard determines the quality of life and affects all aspects of human well-being. Hence, it is important to monitor housing poverty, understood as the inability to meet housing needs at a specific level. The study focused on the problem of household overcrowding, which, like housing conditions problems, is one of the components of housing deprivation. The aim of the study is to present the problem of household overcrowding in the countries of Central and Eastern Europe (CEEs). Differences occurring in rural and urban areas were indicated. European Union Statistics on Income and Living Conditions (EU-SILC) data for 2007-2022 were used. Household overcrowding is still a serious problem experienced in the EU countries surveyed, which poses a challenge to housing policy.

Keywords: housin deprivation, overcrowding, household, housing policy, rural areas, CEEs

1 Introduction

Housing conditions play a key role in the life of every individual and constitute an important aspect of the existence and functioning of a household. Housing is one of the basic human needs, it not only provides shelter and a sense of security, but also determines the quality of life of the population [1]; [2]; [3] and affects human health [4]. Moreover, the use of an apartment with appropriate conditions enables the satisfaction of higher-level needs, i.e. work [5], study or recreation [6]; [7], and determines sustainable social development [8]. Satisfying housing needs is one of

the dimensions describing the well-being of the population. All this means that from the point of view of social policy and shaping the living conditions of the population, it is important to identify various deficiencies in ensuring adequate housing conditions, which is referred to as housing poverty.

Research reveals that the level of provision of housing needs varies in individual countries [9]; [10]; [11], which struggle with housing problems of various nature. The study analyzes one of the dimensions of housing poverty, which is overcrowding, i.e. the problem of insufficient housing space in relation to the needs of the household. The overcrowding index means the percentage of people living in an overcrowded apartment, determined on the basis of the number of rooms available in the household, the size of the household and the age of its members and family situation [12]. The problem of overpopulation is shown in the urban-rural cross-section, which is underrepresented in previous studies, especially in relation to the countries of Central and Eastern Europe (CEEs). These countries are classified as countries with poor housing conditions [11]. The aim of the study was to determine the level of household overcrowding in CEEs and to indicate differences between rural and urban areas. The following tasks are indicated: (1) to indicate changes over time; (2) to capture differences compared to other European Union (EU) countries.

2 Overcrowding as a dimension of housing deprivation

Housing deprivation is defined as the inability of an individual or household to meet their housing needs at a specific level [13]. Housing deprivation can take various forms, depending on what aspect of the housing shortage concerns. An extreme form of housing poverty occurs when an individual or household has no access to housing at all [14], which is rarely analyzed due to the unavailability of statistical data on homelessness [15]. Dimensions of housing poverty may also include the unsuitable structure of the building/apartment, inadequate technical infrastructure and the characteristics of the apartment (including leaking roof, damp walls/floors/foundations, rotting window frames or floors, lack of adequate light, lack of heating, lack of access to a toilet or shower) [6]; [13]; [14]; [15]; [16]; [17]. The overcrowding of apartments analyzed in the study is one of the dimensions of housing poverty, which means insufficient space in relation to the users and their needs. There are many indicators, both objective and subjective [18], of overpopulation levels that take into account a country's cultural and social contexts [19]; [20]. It is worth mentioning that studies often analyze extreme housing poverty, which means the simultaneous accumulation of various deficiencies in the household's ability to meet housing needs [7]; [14]; [21], which makes a decent life impossible [15]. It should be emphasized that the problem of failure to meet housing

needs concerns various social groups [15]. In recent years, the importance of research on housing conditions has been increasing [14], which results from the fact that in the era of the Covid-2019 pandemic, the apartment has become the central point of human life and work [22]. Attention is paid to new features of apartments - access to space, the Internet and the level of security in the vicinity of the residence.

When considering the problem of housing overcrowding from an urban-rural perspective, it should be noted that research indicates that the spatial dimension (especially rural areas) has received less attention than other factors determining housing deprivation [23]. At the same time, differences in deprivation in rural areas compared to urban areas are indicated [24].

The effects of apartment overcrowding may be different and may concern many spheres of human life, including having a harmful impact on both physical and mental health of people [25]; [26]; [27]; [28]. The effects include, among others: children sharing a bed or bedroom; increased physical contact; lack of sleep, lack of privacy, an inability to care adequately for sick household members; poor hygiene practices [18]. As a result, overcrowding of apartments leads to an increase in health care costs [27].

3 Methodology

Data for 2007-2022 from the European Union Statistics on Income and Living Conditions (EU-SILC) were used [29]. The study uses the definition of overpopulation according to Eurostat [14]; [29], based on the percentage of the population living in an overcrowded household. A person is considered as living in an overcrowded household if the household does not have at its disposal a minimum of rooms equal to: - one room for the household; - one room by couple in the household; - one room for each single person aged 18 and more; - one room by pair of single people of the same sex between 12 and 17 years of age; - one room for each single person between 12 and 17 years of age and not included in the previous category; - one room by pair of children under 12 years of age. The indicator is presented by degree of urbanisation (DEGURBA)⁸. The spatial scope of the study concerns the countries of Central and Eastern Europe. Based on OECD classification [30] the following countries have been selected: Bulgaria, Croatia, Czechia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia. Countries that are members of the EU were selected for the analysis [31].

⁸ DEGURBA classifies local administrative units (LAUs) as cities, towns and suburbs or rural areas based on a combination of geographical contiguity and population density: (1) Cities (densely populated areas); (2) Towns and suburbs (intermediate density areas); (3) Rural areas (thinly populated areas).

Most of these countries joined the EU in 2004, except Bulgaria and Romania (which joined the EU in 2007) and Croatia, which has been a member since 2013. CEE countries are EU member states which were part of the former Eastern bloc. Apart from their geographical location, these countries have similar historical and cultural roots and a similar development path. Their level of wealth is lower compared to Western European countries.

4 Results and discussion

In the first stage of the research, taking into account the availability of data, the level of apartment overcrowding in EU countries was compared and changes over time were indicated in the long term, i.e. in the years 2007-2022 (Fig. 1). The problem of overpopulation has been found in the countries of Central and Eastern Europe [16]. The highest rate (2022) occurs in Latvia (41.7%), Romania (40.5%), Bulgaria (36.2%), Poland (35.8%), Croatia (32.7%) and in Slovakia (31.8%). At the same time, a significant improvement in the overpopulation rate can be observed in all CEEs in the analyzed period. In 2007, the highest overpopulation rate occurred in the following countries: Latvia, Romania, Lithuania, Poland, Bulgaria and amounted to over 50%. The greatest improvement was recorded in Hungary (by 30.4 p.p.), Slovenia (28.9 p.p.), Lithuania (27.9 p.p.) and Estonia (27.8 p.p.).

It should be emphasized that CEEs also have other problems related to housing poverty. Data show that housing shortages, e.g. leaking roofs, occur in all EU countries, and interestingly, in all CEEs this problem is decreasing over time. It should be emphasized that CEEs have a lack of access to a toilet or shower (Fig. 1), which is experienced by 21.2% of apartments in Romania, 7% in Latvia and Bulgaria and 6.4% in Lithuania.

Then, the level of apartment overcrowding in CEEs was compared to other EU countries in the urban-rural section in 2013-2022 (Fig. 2, 3). Research has revealed that the problem of overcrowding in cities and towns in CEEs is more common than in other countries. This may refer to urban overcrowding typical for Soviet-style state-provided mass housing what existed in the Baltic countries [32].

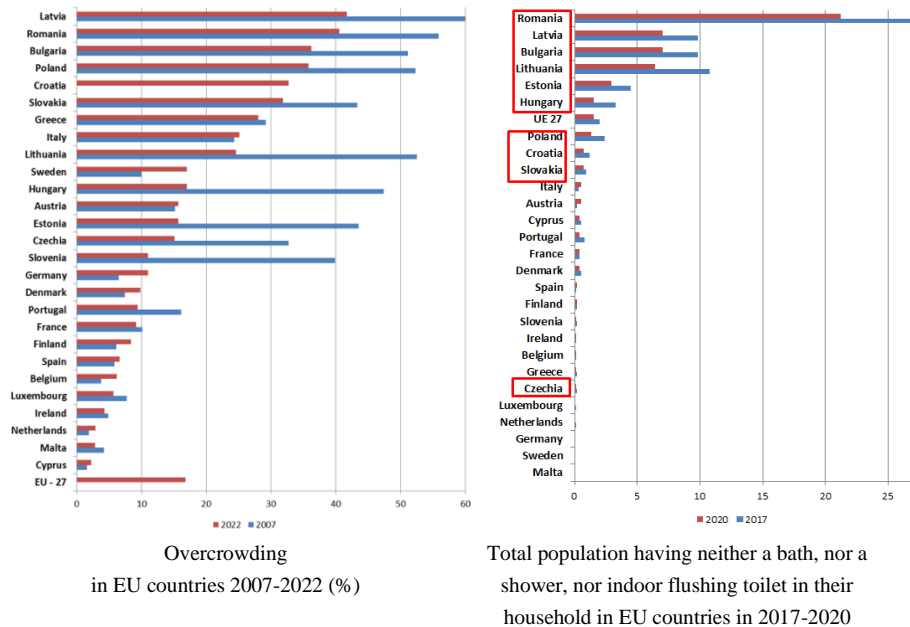


Figure 1
Dimensions of housing poverty in EU countries

In all CEEs except Latvia, the percentage of overcrowded apartments is decreasing. In some Western European countries (especially in cities), there was an increase in indicators describing apartment overcrowding, e.g. in Belgium (by 10 p.p.), France and Germany (by approximately 6 p.p.). This may be due to the positive migration balance in economically highly developed countries in recent years [6]. Overpopulation particularly affects farms located in rural CEE areas and is highest in Romania (39%), Poland (36.8%) and Latvia (36%).

The revealed differences between countries in terms of housing overcrowding confirmed the conclusions of Borg and Guio [11] from their research on housing deprivation. Housing problems, including overcrowding, are more common in eastern and to some extent southern Europe than in western and northern Member States. Moreover, as we predicted in our study, we found that the incidence of overpopulation decreased over time, as previously indicated [19]. This may be due to the fact that as people's living standards improved, more and more people could afford to buy a flat, while a decline in the size of households has been observed in recent years [19].

Among the reasons for the differences in housing overcrowding between countries, the authors point out important national nuances, pointing out that an important determinant of housing problems is the level of wealth of the country [11].

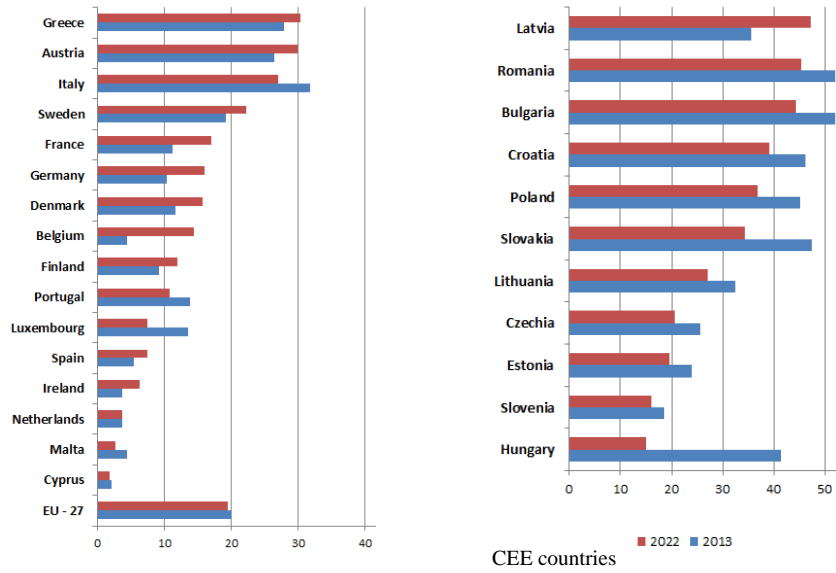


Figure 2
Household overcrowding in cities in EU countries in 2013-2022 (%)

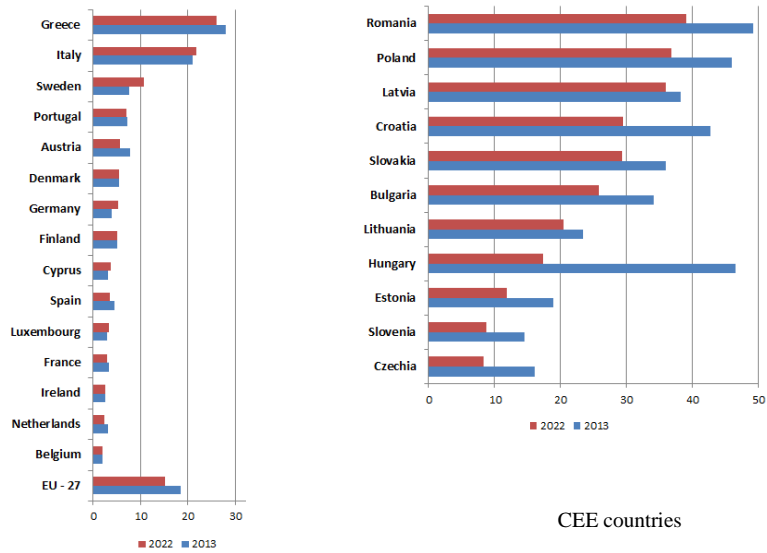


Figure 3
Household overcrowding in rural areas in EU countries in 2013-2022 (%)

Other factors explaining the identified differences may be the social welfare system, fiscal policy, and housing policy in a given country. Research by other authors

identifies determinants at the household level as important for housing conditions [11], including household income and family support [8]; [33]. Research by Rao and Chou [26] in the UK shows that the financial situation of household members (including annual income, type and status of employment) has a significant relationship with overcrowding in homes, as does the type of accommodation and the number of people living there. Taking into account the differences in development between urban and rural areas and the specificity of these areas [23], differences in the factors influencing overpopulation can be expected, which, however, requires detailed research. Differences in housing overcrowding rates between the new and the 'old' EU15-Member States, as well as between cities, towns and rural areas, may be related to the specific demographic and family structure in these countries [34]; [35]. These differences include different family models and different household structures, e.g. in some countries there is a high percentage of single-person households or multi-generational households (e.g. Southern and Eastern European countries) [34]. Shared housing, (usually with grandparents or parents), for both generations is an effective way to reduce housing costs in the context of lack of affordability [32].

It should be emphasized that there are spatial differences in the tolerance of housing crowding [18], which is related to cultural and economic factors. Other studies have found [35] that while in more developed countries (except Greece and Italy) the percentage of households that subjectively assess (living) space as a problem is much higher than the percentage of households above the Eurostat threshold, in In post-socialist countries it is the other way around. This proves that depending on the selected measures, the level of apartment overcrowding may vary [35].

Conclusions

The problem of apartment overcrowding occurs in all EU countries, but it is most visible in CEE countries. At the same time, dynamic changes in the improvement of apartment overcrowding have been recorded in CEE countries in 2007-2022.

In-depth research on housing overcrowding in CEE countries is necessary. Firstly, an important issue is a detailed analysis of the factors that led to the improvement of overpopulation rates in individual countries. Secondly, it is important to identify households that are particularly vulnerable to living in overcrowded housing. This will allow us to prepare appropriate tools for housing support and development policy.

The revealed differences in the level of overcrowding of apartments in rural and urban areas and the lack of research on housing deprivation, including overcrowding of apartments in rural areas, confirm the importance of this topic and the need to undertake further research in this respect, taking into account the territorial context. The period after the Covid-2019 pandemic is particularly important when rural areas have become an attractive place to live for urban

residents, which could cause changes in the housing conditions of the population and affect the level of housing deprivation.

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Risks and successes - through the integrity of the organizational system

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Abstract: The purpose of this study is to provide a comprehensive review of the literature on risks affecting the organization. We are looking for answers to the questions that greatly influence organizational integrity, whether organizations can prepare for all the risks affecting their integrity? Is it possible to find out an exhaustive list of risks, does such an organizational situation exist? This article also wants to look for correlations in terms of the relationship between individual performance and individual self-evaluation with organizational integrity. The authors took the characteristics of the public sector as a basis, noting that she will also aim to look at the private sector in their further research.

1 Introduction

As OECD Recommendation on Public Integrity defines, public integrity refers to the consistent alignment of, and adherence to, shared ethical values, principles and norms for upholding and prioritising the public interest over private interests in the public sector. [6]

In Hungary, we can meet a wide range of public service providers in our everyday life, such as: ensuring drinking water supply, sewage management, electricity supply, public transport, public lighting, providing postal services, operating the education system, the health system, and the list could be continued.

The importance of public services is shown by the fact that they also appear in the highest-level legal source of the Hungarian legal hierarchy, the Fundamental Law of Hungary. Article XXII of Fundamental Law. records that the state strives to ensure that access to public services is ensured for everyone, thereby stating the principle of general access to public services, and Article XXVI. According to Article 2, in order to raise the standard of public services, the state strives to "apply new technical solutions and the results of science", which indirectly formulates the expectation of raising the standard of public services.

General access to public services and the raising of the standard of public services can be achieved if performance expectations also appear at public service

organizations, which also include the expectation of organizational integrity and ethical management. In public service organizations, the existence of organizational integrity contributes to the realization of "good governance", through which it will ultimately be one of the building blocks of building a "good state". Ethical management should be viewed similarly to integrity, as its implementation serves the common good.

After a brief description of the content and concept of public services, the basic theoretical foundations of integrity and ethical management will be presented. [5]

2 Literature review

Risk

Why do organizations take risks?

Organizations take risks because that is how they learn, grow and innovate. When a company has a new product, it can minimize its risk by conducting market research and study similar products or hold focus groups to see what its audience is looking for in that product. However, the company or organization takes a risk when they launch their product because they can't know for sure how it will perform. Once the organization takes that risk on its product launch, it can change or fix the product as needed to meet customer expectations.

For example, a furniture business wants to sell a new table it has designed. To minimize the risk in the product launch, the furniture business might conduct thorough market research into the type of table they want to make. They would first study other similar products on the market, see what their audience is looking for through focus groups, and perform an analysis on how to price their product. With this information, they're more likely to create a product that succeeds, minimizing risk.

Risk Management

How to identify organizational risks

To identify organizational risks, you can try these strategies:

1. Conduct a high-level assessment

A high-level assessment is a way to find the most obvious risks to your business, and you can do this by brainstorming ideas. For example, the biggest risks for a local hardware store might include natural disasters and reputation. Identifying the

biggest risks to your business first can help you break those risks down into smaller subjects as you go along.

2. Study similar organizations

Organizations similar to your own have likely conducted their own risk analyses and made plans for them. By studying other businesses, you can learn what types of risks your business might experience. Identify some businesses that are like your own, then research them online. You can analyze the different strategies they have put into place and try to determine the risks they are addressing with those strategies. For example, a business that regularly responds to social media complaints is likely working on mitigating risks associated with customer dissatisfaction. [3]

There is no reason to assume that the elected official is not the same utility maximizer as all other actors in the economy. He also lacks profit interests, so his behavioral motives are similar to those of an office bureaucrat, and he is risk-averse in his attitude. However, compared to bureaucrats operating at lower levels, there are some unique factors that strongly influence their risk behavior. He is at the top of the hierarchy, and his activities are therefore surrounded by increased attention. It is therefore even more characteristic of him to prefer spectacular outputs, which is a doctrine that has spread in recent decades, a side effect of the expansion of transparency. The risk behavior of the elected official decision-maker is strongly influenced by the cyclical nature of the election. If the appointment period of the decision-maker is limited, this induces a short-term, medium-term way of thinking - short-term profit maximization. [2]

3 Material and method

In terms of risk behavior, the actors of business are connected by the attribute of their activity, the profit goal. In the case of public sector actors active in economic decisions, this common driving force is more difficult to find. The behavior of the public office and the decision-making behavior of the actors have been a concern of economists for a long time; Since 1765 - when the French philosopher Vincent de Gourmay coined the concept of bureaucracy - we have been using today's typically negative terminology when examining the phenomenon. The protagonist of the office, the conformist bureaucrat who sits behind his desk and often abuses his power, usually appears in the next two hundred years as the opposite of the entrepreneur who creates the foundations of prosperity. According to J. S. Mill, the danger of bureaucracy is that it turns into pedantocracy, according to Spencer, bureaucrats only work to get secure jobs for their family members and friends, and F. von Stein specifically warned against being governed by paid accountants, disinterested, propertyless clerks. Max Weber's organizational sociology works in the first half of the last century. [2]

After a brief overview of the concept of integrity, integrity controls and corruption, we can arrive at the concept of ethical management. If we look at ethics and ethical management, we can observe that they often appear closely together with integrity in the international literature, the reason for this being the close relationship between the two concepts, which is worth examining from several points of view. Integrity cannot be considered the same as ethical behavior, because the main question of ethics is whether something is (morally) good or bad, while the question of integrity is whether something is true (real) or false (deceptive). In most cases, however, what is true is good, and what is false is bad. [7] In ethics, integrity can be considered a value, so a person follows it in his actions and decisions, considers it decisive, in this sense, integrity is an element of ethical behavior. However, the content of integrity, which value the individual follows, is no longer necessarily an ethical value, but a practical value (e.g.: quality focus, customer focus, efficiency), in which case integrity means a broader concept than the field of ethics. A person's conduct, behavior and actions can be said to be ethical if they meet society's expectations, so it can be seen as an external expectation. he acted not according to external expectations, but according to his own inner conviction. [5]

After reviewing the various areas of interpretation of the concept of integrity, it is important to present the content of integrity management and the integrity management framework. Integrity management could be defined in the simplest way as the management that ensures integrity at the organizational level. Activities aimed at creating and developing integrity and taking measures against integrity violations, while at the level of the entire system, the integrity management system represents the toolbox itself. The integrity management framework was developed by the OECD, which can be considered a systematic and comprehensive approach based on a decade of data analysis and research.

The developed system consists of three main pillars:

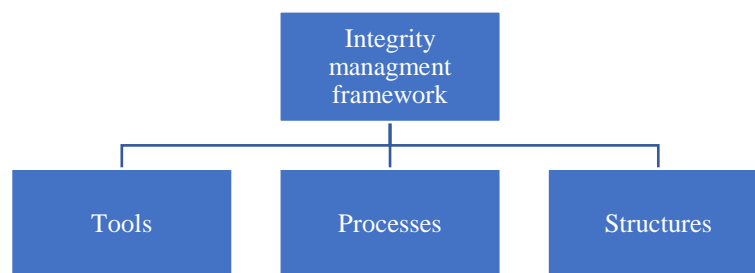


Figure 1.

The integrity management framework OECD Integrity Management Framework

Source: own editing based on OECD Integrity Framework, 2016

The first pillar, integrity, are tools that can be used to strengthen integrity. The second pillar, the processes, the steps of which are planning, implementation, evaluation and adaptation represent a continuous activity, integrity cannot be realized in the organization without the cycle of process development. The third pillar, the structures, which represent the determination of responsibilities related to integrity within the organization, the coordination within the organization, and the integrity-based design of the organization's structure. Two levels of the three pillars can be distinguished: • Primary tools, processes, actors: the primary purpose of which is to promote integrity. • Additional tools, processes, actors: which are primarily part of different management areas, for example quality management, procurement management. Their primary purpose is not to promote integrity. [5]

In terms of risk behavior, the actors of business are connected by the attribute of their activity, the profit goal. In the case of public sector actors active in economic decisions, this common driving force is more difficult to find. The behavior of the public office and the decision-making behavior of the actors have been a concern of economists for a long time; Since 1765 - when the French philosopher Vincent de Gourmay coined the concept of bureaucracy - we have been using today's typically negative terminology when examining the phenomenon. The protagonist of the office, the conformist bureaucrat who sits behind his desk and often abuses his power, usually appears in the next two hundred years as the opposite of the entrepreneur who creates the foundations of prosperity. According to J. S. Mill, the danger of bureaucracy is that it turns into pedantocracy, according to Spencer, bureaucrats only work to get secure jobs for their family members and friends, and F. von Stein specifically warned against being governed by paid accountants, disinterested, propertyless clerks. Max Weber's organizational sociology works in the first half of the last century reevaluated the phenomenon; with him, the bureaucratic organization appears as a type of organization that follows from the general development tendencies of modern societies, being the legal consequence of rationalization. [2]

4 Results

OECD Recommendation might be the key to the integrity subject, a framework and a starting point in the subject. OECD recommends that Members non-Members having adhered to this Recommendation (hereafter the“Adherents”) build a coherent and comprehensive public-integrity system.To this end, Adherents should:

Demonstrate commitment at the highest political and management levels within the public sector to enhance public integrity and reduce corruption, in particular through: a) ensuring that the public integrity system defines, supports, controls and enforces public integrity, and is integrated into the wider public management and governance framework; b) ensuring that the appropriate legislative and institutional

frameworks are in place to enable public-sector organisations to take responsibility for effectively managing the integrity of their activities as well as that of the public officials who carry out those activities; c) establishing clear expectations for the highest political and management levels that will support the public integrity system through exemplary personal behaviour, including its demonstration of a high standard of propriety in the discharge of official duties.

OECD recommends that Adherents cultivate a culture of public integrity. To this end, Adherents should:

Invest in integrity leadership to demonstrate a public sector organisation's commitment to integrity, in particular through: a) including integrity leadership in the profile for managers at all levels of an organisation, as well as a requirement for selection, appointment or promotion to a management position, and assessing the performance of managers with respect to the public integrity system at all levels of the organisation; b) supporting managers in their role as ethical leaders by establishing clear mandates, providing organisational support (such as internal control, human resources instruments and legal advice) and delivering periodic training and guidance to increase awareness of, and to develop skills concerning the exercise of appropriate judgement in matters where public integrity issues may be involved; c) developing management frameworks that promote managerial responsibilities for identifying and mitigating public integrity risks. [6]

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The Effects of Decoupling and its Implication for Business Executives and Enterprises

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Abstract: This research examines the complex interplay of geopolitical tensions, trade disputes, national security concerns, and fundamental differences in economic systems driving the decoupling of the US and Chinese economies. These forces are reshaping global trade patterns, economic integration, and policy decisions with significant implications for businesses worldwide. The study explores the ongoing trends of de-globalization, characterized by reduced economic cooperation and heightened protectionism, and their impact on supply chain resilience. It highlights businesses' need to adapt by reassessing supply chain strategies, investing in resilience, and planning for economic and political uncertainties, particularly considering the unpredictable US election outcomes in 2024. The research emphasizes the need for further investigation into key areas, including the impact of nationalist policies on global trade, effective supply chain resilience strategies, long-term economic consequences of US-China decoupling, leveraging technological investments, and managing geopolitical risks.

Keywords: Decoupling from China, Globalization, Geopolitical Tensions, Offshore Supply, Effects of Decoupling, Global strategy, Strategic planning

1 Introduction

The COVID-19 pandemic has significantly reshaped the global business arena, posing unprecedented challenges and changing the fundamental logic behind globalization. Scholars in International Business (IB) have extensively studied the pandemic's effects, primarily concentrating on risk management strategies to bolster the resilience of global value chains (GVCs) and adjust international human resource management techniques to the 'new normal' [1], [2]. However, the pandemic's impact goes beyond immediate risk management to profoundly and enduringly influence the geopolitical aspects of international business.

Throughout history, globalization has been primarily driven by efficiency and comparative advantage, fostering strong economic interconnectedness among nations [3]. Besides the COVID-19 crisis, recent events such as the Suez Canal blockage in 2021, invasions of Russia on Ukraine in 2022, and the ongoing war in

the Israel-Gaza disrupting Global Value Chains (GVCs) and escalating geopolitical tensions between China and Western nations have prompted a reassessment of this conventional wisdom. The United States and its allies are gradually shifting their focus from mere cost reductions to forming trade and investment partnerships based on mutual principles to lessen dependence on China [4]. This change has introduced a 'new' vulnerability to globalization. Unlike previous crises that posed temporary challenges without fundamentally altering its core tenets, the COVID-19 pandemic stands out for triggering a substantial and potentially lasting transformation in international business dynamics. The increasing pressure for decoupling from China, motivated by national security and concerns about economic interests, has created an uncertain institutional landscape marked by ongoing tensions between globalization and deglobalization.

This article critically discusses these geopolitical pressures, contending that the pandemic has heightened the intricacy and instability of the global business milieu. Business leaders and organizations must now navigate a landscape where the future of international business is likely to be more fragmented, driven by both geographical proximity and ideological congruence, with diverse repercussions across various sectors and regions. Furthermore, this article offers predictions and considerations for business leaders and organizations to incorporate decoupling challenges into their strategic planning.

1 Literature Review

1.1. The Concept of Decoupling between the US and China

Decoupling refers to reducing economic interdependence between trading partners and two or more economies. This process is driven by geopolitical tensions and efforts to mitigate the risks of over-dependence on each other [5]. Historical examples include the United Kingdom's exit from the European Union (Brexit) and the imposition of sanctions on Moscow in response to Russia's invasion of Ukraine, which led to the cessation of many countries' reliance on Russian exports.

In the context of China and the United States, decoupling is increasingly perceived as a significant policy direction for the United States to manage its economic relations with China. The concept of decoupling between the US and China has its roots in the Cold War era, during which the United States imposed a comprehensive technological blockade on China aimed at restricting its access to technologies that could enhance its military and industrial capabilities. This embargo was part of a broader strategy to contain the spread of communism and limit the influence of the Soviet Union and its allies, including China. The embargo included restrictions on the export of military technology and dual-use technologies, which have both civilian and military applications. However, the Sino-American relationship

evolved, especially during the 1970s when the US began engaging with China, leading to significant technological cooperation. The dual-track approach of blockade and engagement was predominant until the end of the Cold War [6].

The economic interdependence between the US and China has evolved over several decades. In the late 20th century, China began to open its economy to the world, leading to significant foreign investment and trade relationships. The US played a crucial role in China's economic rise, with American companies investing heavily in Chinese manufacturing and the US market becoming a major destination for Chinese exports. This relationship was characterized by mutual benefits: American companies capitalized on lower production costs in China, while China experienced rapid economic growth and development. The accession of China to the World Trade Organization (WTO) in 2001 marked a significant milestone, further integrating China into the global economy and solidifying its economic ties with the US [7].

As studied by Schell O. et al., the global financial crisis of 2008 exposed vulnerabilities in the global economic system, prompting both nations to reassess their economic strategies [8]. Concerns in the US regarding trade imbalances, intellectual property infringement, and national security risks associated with China's technological advancements grew over time, underscoring the gravity of the situation.

In the mid-2010s, decoupling gained momentum during Donald Trump's 2015 presidential campaign. Concerns grew in the US about China's rapid technological advances and their potential impact on American economic and national security interests. Viewing technology as crucial for influence, the Trump administration saw China's progress in high tech as a major threat. Measures like export controls, investment restrictions, and sanctions targeting firms such as Huawei and ZTE aimed to limit China's access to critical technologies and prevent the transfer of US tech enhancing China's capabilities. By 2018, Huawei and Alibaba were global leaders in 5G, e-commerce, and cloud computing. The 2018 trade war between the US and China marked a turning point in their economic relations, with both sides imposing hefty tariffs, escalating tensions. Despite some negotiation attempts, unresolved issues deepened mistrust, leading to economic and political consequences. The trade war exposed vulnerabilities in supply chains and highlighted strategic competition between the world's top two economies. Under the Biden administration, the focus on China remains on national security and multilateral cooperation with allies. Coalitions are actively forming against perceived Chinese threats, and efforts are underway to establish common standards excluding Chinese tech from critical infrastructure in allied nations. Increased domestic investment in AI and quantum computing aims to keep the US ahead in innovation while decreasing reliance on Chinese tech, demonstrating a clear strategy to maintain technological leadership [6], [7].

1.1.2 Implications for Business and Companies

The decoupling between the US and China has far-reaching implications for businesses across various sectors. The disruption of global supply chains is one of the most immediate and visible impacts. During the COVID-19 pandemic, the dependency on Chinese manufacturing for critical goods like N95 masks became glaringly apparent, leading to significant supply chain disruptions as China prioritized domestic consumption over exports. These disruptions were widespread, affecting retail trade, construction, and manufacturing sectors, with 50–60 percent of businesses experiencing supply delays [9]. This highlighted the vulnerabilities in relying heavily on a single country for critical supply chain components, prompting many businesses to explore ways to diversify their supply chains, onshoring production where feasible, and seeking alternative suppliers in other regions.

Intel, for instance, has expanded its footprint in Malaysia, establishing multiple assembly and test facilities in response to the need for diversified supply chains. Microsoft has shifted part of its production to Thailand to navigate the complexities of the U.S.-China trade environment and enhance supply chain robustness. In the apparel and footwear sector, Nike has significantly increased its manufacturing presence in Vietnam, renowned for its skilled labor force. This strategic decision aims to mitigate rising labor costs and geopolitical uncertainties associated with China. Similarly, Dell has moved some of its manufacturing to Malaysia to build a more resilient production network. Western Digital, a major player in the data storage industry, has expanded its operations in Thailand, leveraging the country's established manufacturing infrastructure. This move aligns with the broader industry trend of diversifying production bases away from China. The automotive sector has seen significant shifts as well. Ford has increased its manufacturing in Mexico, benefiting from the USMCA trade agreement and lower labor costs while enhancing supply chain proximity to its primary market. General Electric has diversified its manufacturing locations to include Mexico, where it produces appliances and power generation equipment, and Eastern Europe, particularly Hungary, where it manufactures consumer electronics. In the aerospace industry, companies like Pratt & Whitney have established a manufacturing presence in Poland to leverage Eastern Europe's proximity to Western markets and its growing manufacturing capabilities. Similarly, Goodyear has bolstered its tire manufacturing operations in Indonesia to reduce exposure to rising costs and trade tensions in China. Additionally, Samsung has expanded its manufacturing operations in Hungary, producing consumer electronics and home appliances, underscoring the importance of adaptive strategies in a changing geopolitical and economic landscape [10].

While diversifying manufacturing away from China helps to reduce the risks of depending too much on one country, it also brings new challenges. Apple, for example, has dealt with strong local competition and difficulties finding production options outside China [6]. Additionally, the trade restrictions and tariffs imposed by the Trump administration were meant to shield American industries from what they

saw as unfair trade practices by China. These actions have made it harder for companies to enter the Chinese market, prompting a strategic reassessment of their business strategies. Tariffs on Chinese goods and China's counter-tariffs on American products have disrupted established trade patterns. Nonetheless, as many IB argue [6], [7], [9], businesses are not just reacting; they are strategically looking into other markets and diversifying their customer base to mitigate the risks of the changing geopolitical and economic landscape.

3 Discussion and Considerations for Navigating Decoupling

After a detailed review, it is evident that the decoupling between the US and Chinese economies is driven by a complex interplay of geopolitical tensions, trade disputes, national security concerns, and fundamental differences in economic systems. These factors are reshaping policy decisions and investment flows, with significant implications for global trade and economic stability. As both countries navigate this challenging landscape, business leaders and organizations must adjust to a new era of economic relations characterized by increased scrutiny and strategic realignment. To overcome and prepare for these decoupling challenges, the considerations for business leaders and organizations are fourfold:

First, de-globalization continues to reshape the business landscape. This trend, which accelerated since the election of Donald Trump and continues today, is characterized by reduced economic integration and cooperation between nations. In the US, this movement is driven by nationalist policies, including heightened protectionism and a return to traditional cultural practices. China, emboldened by events such as Moscow's invasions into Ukraine, is experiencing heightened tensions with the US. While economically interconnected, these nations are also competitors in economic and political spheres. Post-COVID-19 de-globalization involves relocating supply chains closer to home to mitigate risks, a trend expected to continue into 2025.

Second, geopolitical tensions are straining supply chains. Over the past two decades, the cost-saving allure of relocating supply chains to low-cost locations overshadowed associated risks, leading to compromised supply security and quality control. Events like the Israel-Gaza war, which disrupted the supply of electronic components from Israel, and the Russia-Ukraine conflict [11], [12], which impacted natural gas supplies to Europe, highlight the vulnerabilities in supply chains. These events, along with escalating US-China tensions, are reshaping global supply chains. Despite prevailing geopolitical tensions, inflation has been contained in most regions, enabling smooth business operations with low unemployment rates. An anticipated stable economic environment in 2024 will allow business leaders to focus on strategic planning and long-term growth investments.

Third, strategically move supply chains out of China. The pandemic exposed vulnerabilities in global supply chains, prompting businesses to bolster resilience and agility. In the coming year, many businesses are likely to reevaluate their supply chains to reduce risks, leading to significant diversifications away from China. With China's growth slowing, Western companies may shift production and sourcing outside China to lessen reliance risks. This transition could prompt Chinese policymakers to reassess trade relations with the West.

Fourth, prepare for US Election uncertainty and its impacts. As of writing this article, the candidates for the US elections are Donald Trump and Joe Biden, both known for their confrontational policies toward China. The outcome of this election could significantly influence the US-China economic decoupling. Regardless of who wins, the challenges in the coming years are unpredictable. Businesses should anticipate and plan for economic and political uncertainties in 2024 and onwards. Despite the curbed inflation and a robust US economy, election-year risks and geopolitical tensions could impact global economic stability. Companies should invest strategically in technology and growth initiatives to improve operations and results. Business leaders should prioritize strategic planning and long-term investments in 2024, as 2025 may present new challenges.

Lastly, it is important to note that the limitations of these recommendations are solely the author's opinions, and further research is recommended to help businesses make appropriate decisions. Key research areas and questions include exploring how the rise of nationalist policies in major economies will influence global trade patterns and economic integration. Another area is supply chain resilience strategies, focusing on identifying the most effective strategies for building resilient supply chains in the face of geopolitical tensions and global disruptions. Additionally, understanding the long-term economic consequences of the US-China decoupling for both countries and the global economy is crucial. Businesses also need to investigate how technological investments and innovation can mitigate risks associated with supply chain disruptions. Finally, developing frameworks for better anticipating and managing geopolitical risks in operations and supply chains is essential. Further research in these areas will provide more comprehensive insights and guidance for businesses navigating the decoupling economic landscape.

Conclusions

In conclusion, the evolving economic and geopolitical landscape, while presenting significant business challenges, also offers numerous opportunities for those who can navigate it effectively. The decoupling of the US and Chinese economies, driven by geopolitical tensions, trade disputes, national security concerns, and fundamental differences in economic systems, demands a strategic realignment and increased scrutiny. Businesses, by addressing these challenges, can position themselves for success in the new global order. They must navigate the complexities of de-globalization, characterized by reduced economic integration and a

resurgence of nationalist policies. They must address geopolitical tensions that strain supply chains, reassess supply chain strategies to reduce reliance on China, and plan for economic and political uncertainties, particularly given the unpredictable nature of the upcoming US elections in 2024.

To effectively adapt, businesses should invest in resilience, agility, and innovation to mitigate risks associated with supply chain disruptions. Developing robust frameworks for managing geopolitical risks will also be crucial. However, it's important to note that these are not one-time solutions. The evolving economic and geopolitical landscape demands continuous learning and adaptation. While the considerations offer a strategic starting point, further research is not just beneficial, but essential, to refine these strategies. Investigating the impact of nationalist policies on global trade, exploring effective supply chain resilience strategies, understanding the long-term economic consequences of US-China decoupling, leveraging technological investments, and enhancing geopolitical risk management will provide deeper insights and more comprehensive guidance for businesses.

Acknowledgment

Zsofia Nguyen expresses her gratitude to the Obuda University staff for their constructive guidance throughout the revision and the exceptional support in organizing the 22nd International Conference on Management, Enterprise, and Benchmarking, at which this article was presented.

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The expectations of the supply side of the hospitality labor market from employers in the Central Region of Romania

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***Abstract:** The objective of my study was to analyze the impact of training and job offering program. It was offered by an NGO for the development of the civil society and was funded by the European Union. The target group were long time unemployed persons in Central Romania. They were trained for the jobs of cooks and waiters. The program offered places where to practice their new skills and eventually those who showed good results, were offered jobs or help to start up new firms in the hospitality sector.*

Data and methods: 105 unemployed persons were offered the training and all 105 persons completed a questionnaire. 33 entrepreneurs who offered places to practice were interviewed. For general description of the labor market official data from the Romanian National Institute for statistics were used. The results showed that the hospitality industry in Romania recovered from the shock caused by the Covid-19 pandemic and there is a growing demand for skilled workers in the industry. The conclusion is that the competition in the Romanian hospitality industry is growing, profit margins are weakening and there is a lack of skilled employees.

My paper reflects the results of the questionnaires completed by the participants of the training course.

***Keywords:** labor market, EU funds, hospitality sector, human resources*

1 Introduction

This paper is based on a market study funded by the European Social Fund (Fondul Social European) through the Human Capital Operational Programme (POCU 2014-2020), Call Code: POCU/1080/3/16/: Improving the level of professional skills and increasing the employment rate of unemployed and inactive people in correlation with the needs of the labour market; Project title: AȘA- Acces la Șansă (Accessibility to Chance), project code: 157085

The project itself consisted of theoretical and practical courses for the jobs of waiters and cooks. The selection of the course beneficiaries (105 people who were

long-term unemployed or inactive) was carried out by two NGOs⁹. These NGOs organized the theoretical courses and selected the companies in the industry, where the practical training was done in the field. After completion of the course the best trainees were offered jobs or the possibility to start their own business in the industry.

The study contained a survey, in which we measured the appreciation of the services offered in the project, the appreciation of the collaboration between the project partners and the participating employers. We also measured mutual (employee-employer) expectations and values. The survey also referred to the employer's expectations from the staff (level of training, qualities, skills and abilities, etc.).

33 employers (business owners) participated in the survey on one side and all the 105 trainees on the other side.

The first part of the study included a general analysis at European and national level of the HORECA market evolution over the last decade.

The second part described with statistical data the evolution of the labour market and unemployment in Romania and the Centru statistical development region with a focus on the HORECA market.

The third part described the behaviour and qualities of generations X, Y and Z in the labour market. This part was included because from the interviews with employers we learned that different generations behave very differently when they are employed.

In the final part of the study the results of the opinion survey among the target group members and the results of the interviews with employers were presented in detail.

This paper is the part of the study that deals with the participants and the supply side of the market. The employers and the demand side were presented in the paper "The expectations of the demand side of the hospitality industry's labor market towards employees in the Central Region of Romania" presented at the 47th EBES CONFERENCE - BERLIN, GERMANY.

⁹ Szabó Árpád, 2023: Studiu despre situația pieței muncii în domeniul ospitalier, Fundația Civitas pentru Societatea Civilă, Odorhei

2 Literature review of hospitality labor market and the COVID 19 pandemic

As described by HOTREC¹⁰, the hospitality industry represents 6% of consumer expenditure in the EU and contributes to approximately 2 to 3% of the EU GDP. Hospitality is composed of almost 1.9 million enterprises, 89% of which are micro-sized (i.e. employing less than 10 people).

Besides, the hospitality industry alone created 2 million new jobs between 2015 and 2019 taking its workforce from almost 9 million employees to almost 11 million for the EU27.

In addition, 29.6% of the workers in the sector are relatively unskilled, compared to 16.1% in the overall economy, meaning that hospitality is inclusive and welcomes people with different profiles and backgrounds.

Moreover, 17.4% of the employees are aged under 25 years compared to 7.6% in the overall economy. This means hospitality provides young people with the possibility of developing their first working experience within the sector. It also helps fight youth unemployment.

The sector promotes gender balance: while in the overall economy 46.2% of people employed are women, in the sector the figure rises to 53.4%.

HOTREC's Romanian affiliate (FIHR/Romania) estimates that 15% of the total number of employees (around 30,000) are missing in the sector.

The COVID 19 pandemic hit very hard the sector. Xu mentions¹¹, that the number of international tourists in European countries has decreased by about 95%, which has caused great trauma to the development of the industry.

The problem has socio-economic impacts, as the impact of the COVID crisis is likely to concentrate on the most vulnerable segments of the working population.¹²

Haenraets¹³ presents the challenges for the sector:

- Adjustments to service offerings and operating hours

In order to cope with fewer staff, many hospitality businesses are adjusting their service offerings and operating hours. This may include simplifying menus, reducing room service hours or temporarily closing certain facilities. These

¹⁰ HOTREC, 2022: Labour shortages in the hospitality sector: forward-thinking and practices sharing

¹¹ Xu, Haixin. (2021). The Impact of COVID-19 on European Tourism Industry

¹² Fana, M., Tolan, S., Torrejon Perez, S., Urzi Brancati, M.C. and Fernandez Macias, E., The COVID confinement measures and EU labour markets

¹³ Haenraets, Bram, 2023: Europe's Hospitality Staffing Challenge - staff shortage: strategies, impacts, and future prospects for european hotels and restaurants in 2023

adjustments help businesses maintain service quality while managing the available workforce more efficiently. In addition, some are exploring pop-up concepts and seasonal adjustments to align their offerings with staffing levels and customer demand.

➤ Changes in guest expectations and experiences

As the hospitality industry adjusts to staff shortages, guests adjust their expectations as well. There is a greater understanding that service may not be as prompt or comprehensive as before. However, guests still expect a certain level of quality and personalization in their experiences. This creates a new dynamic where guests' patience and flexibility are tested against evolving service standards.

➤ Balancing service quality and value for money

Hospitality businesses strive to strike a balance between maintaining service quality and managing costs effectively. As operating costs rise, partly due to labour shortages and inflation, some of these costs are inevitably passed on to guests in the form of higher prices. Businesses are therefore challenged to justify these price increases through service quality, ensuring that guests feel they are still getting value for money. This balancing act is essential to maintain customer loyalty in a competitive market.

Among the most important future digital skills expected are online marketing and communication skills, social media skills, MS Office skills, operating system skills and online review monitoring skills. The biggest gaps between current and future skill levels were identified for artificial intelligence and robotics skills, as well as AR and VR skills, but these skills, along with computer programming skills, were also seen as the least important digital skills for future travel and hospitality employees.¹⁴

Hospitality insights, one of the sector's publications¹⁵ tries to oversee the future trends:

- Empowering the workforce: Turning challenges into opportunities
- Artificial intelligence and technology: Choosing the best technology to revolutionise the hospitality industry
- Culinary experiences: Putting experiences, authenticity and senses first
- Bars and drinks redefined: Adding creativity and design to the drinks menu
- Fine dining: In need of reinvention, but full of potential
- Fine wine prices: Navigating the fluctuating vineyard market
- Rising interest rates: Impact on hotel property values and transactions
- Green hospitality: Beyond sustainability to net positivity

¹⁴ Carlisle, S., Ivanov, S. and Dijkmans, C. (2023), "The digital skills divide: evidence from the European tourism industry"

¹⁵ Hospitality insights (2024): <https://hospitalityinsights.ehl.edu/hospitality-industry-trends>: Elevate experiences, embrace evolution - 10 hospitality trends in 2024

- Data-driven decision making: Data analytics for optimal customisation
- The power of social media: Creating authentic narratives.

HeyHire¹⁶ foresees the transformation in the restaurants business and also offers hiring tips to business owners :

- Mass Customization Tip: Look for culinary professionals who can create unique dishes and a front desk staff with skills in providing personalized service.
- Seamless online reservations and ordering Tip: Look for candidates with expertise in web development, app design and cybersecurity to effectively manage your online presence.online review monitoring skills.
- Embracing sustainability and local sourcing Tip: Look for chefs and kitchen staff who are passionate about sustainable cooking and sourcing. In addition, consider hiring a sustainability coordinator to manage eco-friendly initiatives.
- Flexible dining options Tip: Expand your kitchen staff to include chefs or cooks experienced in managing diverse food needs, and consider hiring delivery drivers or partnering with delivery platforms.
- Improved customer communication Tip: Improve customer communication: Look for candidates with excellent communication skills and experience managing customer relationships through various channels, such as social media and online review platforms.

3 Macroeconomic developments in Romania in the European context, with a focus on the HORECA sector

The HORECA sector in the EU is characterised by diversity, with a wide range of establishments catering to different customer segments and prices. The sector is also highly fragmented, with a large number of small and medium-sized enterprises (SMEs) representing a significant part of the industry.

In 2019, the EU HORECA sector generated an estimated turnover of €1.3 trillion and employed over 12 million people. This represents around 6% of the total EU workforce and 10% of EU GDP. The sector has seen steady growth in recent years, driven by the growth of tourism and rising disposable incomes.

Despite the challenges caused by the 2008-2010 financial crisis, the EU HORECA sector has shown signs of recovery in recent years. Consumer spending has increased and the number of tourists visiting the EU has grown steadily. Businesses

¹⁶ Restaurant Industry Trends, 2023: Adapting to Evolving Consumer Preferences

are also adapting to market developments by developing new products and services, such as online booking and delivery options.

The recovery of the HORECA sector has been uneven across the EU, with some countries, such as Germany and Spain, seeing a strong recovery in activity, while others, such as Greece and Italy, have been slower to recover.

3.1 The HORECA sector in Romania

The HORECA sector in Romania has followed a similar trajectory to the EU as a whole. The sector experienced significant growth in the years leading up to the 2008 financial crisis, but was hit hard by the recession. In the years following the crisis, the sector showed signs of recovery.

The HORECA sector in Romania is characterised by a large number of SMEs, many of which are family businesses. The sector is also highly dependent on tourism, with a significant part of its revenue generated by foreign visitors.

Despite the challenges it faces, the HORECA sector in the EU and in Romania has a number of opportunities for growth. The growing popularity of travel and tourism is expected to continue to boost demand for HORECA services. In addition, the growth of e-commerce and mobile technology is creating new opportunities for businesses to reach customers and improve their operations.

However, the sector also faces a number of challenges. Competition from new entrants and the sharing economy is putting pressure on traditional business models. In addition, rising labour costs and regulatory requirements are making it harder for businesses to operate profitably.

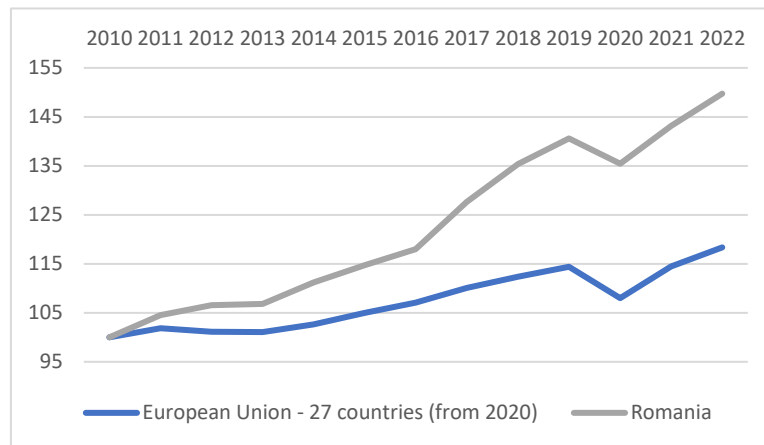


Figure 1.

Evolution of GDP in Romania and the EU as a percentage of the reference year 2010

Source EUROSTAT <https://ec.europa.eu/eurostat/databrowser/view>

As shown in Chart 3.1.1, Romania has developed strongly economically in 2010. By 2019, Romania's GDP had grown by 40 percent compared to 2010, while the European Union achieved a GDP growth of only 20 percent.

On the graph you can see the effect of the Covid19 pandemic, when growth was interrupted by a harder period, but in 2021 and 2022 growth continued. So it looks like our country has recovered from the effects of the pandemic. Of course the GDP data was calculated at current prices, so inflation in the last year drops a bit the very good result.

If we look at Table 3.1.2 and the graph drawn based on the numerical data in it, we can compare the year-on-year percentage change in GDP between the European Union and Romania. It can be seen very well that in 2010 Romania was still feeling the effects of the 2008 global financial crisis, but since 2011 year-on-year our country has managed to outperform the EU figures, 2017 being the best year with an 8.2% growth.

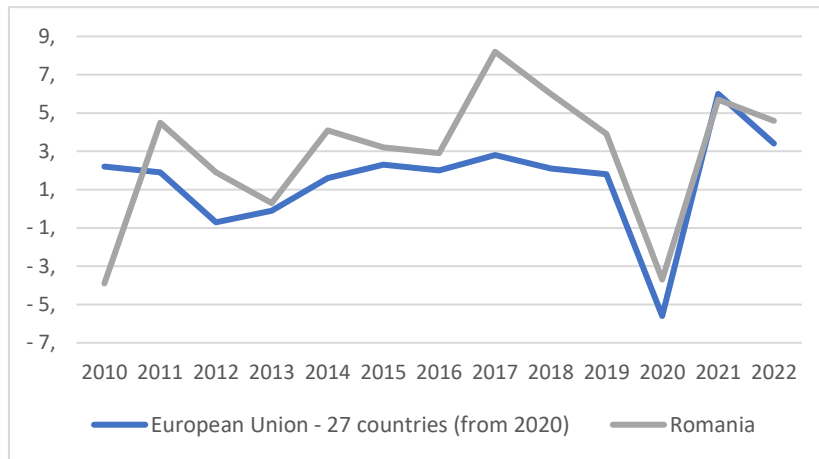


Figure 2.
Evolution of GDP in Romania and the EU in percentages compared to the previous year
Source: EUROSTAT <https://ec.europa.eu/eurostat/databrowser/view>

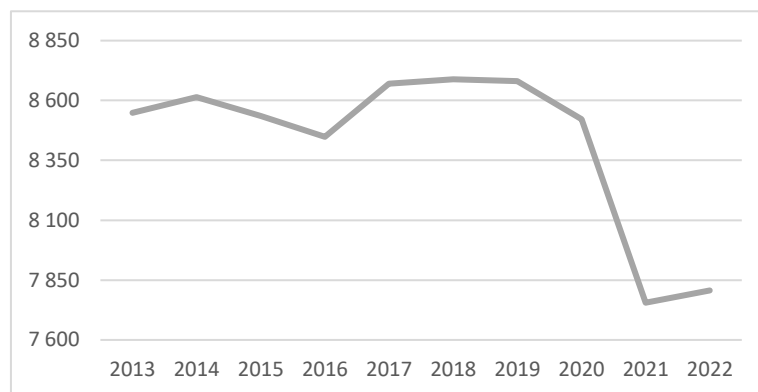


Figure 3.
Evolution of the number of employees in the EU and Romania in the last decade (million persons)
Source: EUROSTAT (Employed persons and employees by sex and full-time/part-time activity and NACE Rev. 2 activity [tour_lfs6r2__custom_9043139])

Graph 3.1.3 shows the evolution of the number of employees in the European Union and Romania over the last decade. It can be seen that the European Union already in 2022 managed to exceed the number of employees it had before the pandemic. In Romania we see a very steep decline in 2020 and a slower recovery (or beginning of recovery) in 2021.

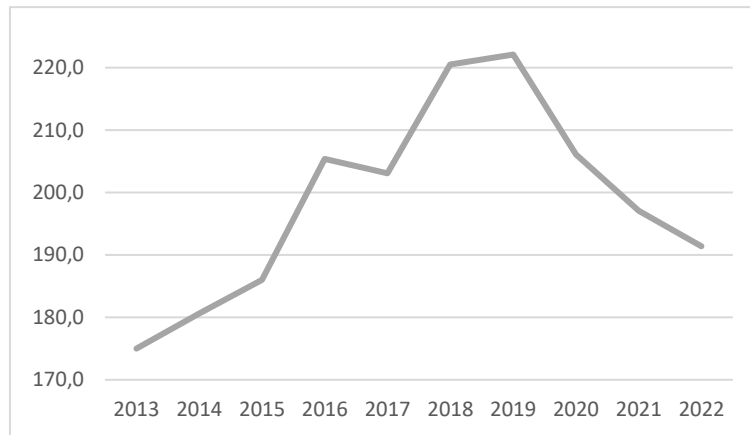


Figure 4.

Evolution of the number of employees in the accommodation and catering sector in the EU and Romania in the last decade (thousands of persons)

Source: EUROSTAT (Employed persons and employees by sex and full-time/part-time activity and NACE Rev. 2 activity [tour_lfs6r2__custom_9043139

Chart 3.1.4 shows the effects of the Covid pandemic on the accommodation and catering sector in both the European Union and Romania. It can be seen that in the European Union in 2022 there were already 9.1 million employees in the sector compared to 8.2 million in 2020 and 7.96 million in 2021. In Romania, however, 2022 has not yet brought an increase.

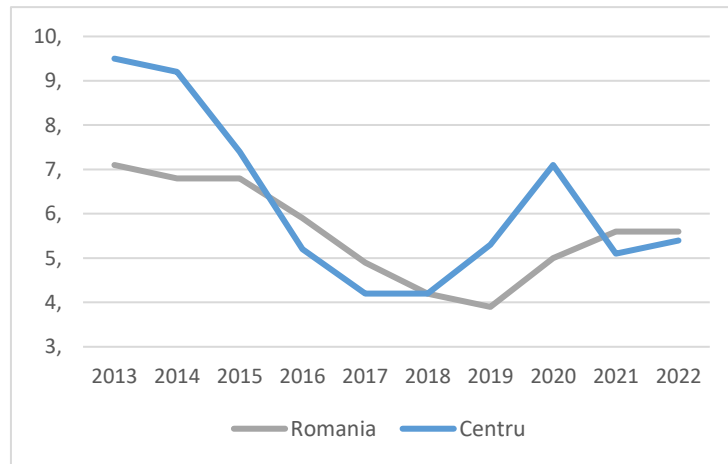


Figure 5.

Evolution of unemployment rate in the EU, Romania and the Centre Region (in percentages)

Source: EUROSTAT <https://ec.europa.eu/eurostat/databrowser/view>

Graph 3.1.5 Compares the evolution of the unemployment rate in the European Union in Romania and the Centru region. It can be seen from the graph that in the Centre region during the Covid pandemic there was a very high increase in the unemployment rate, while in Romania this increase was less steep.

If we look at long-term unemployment we see that between 2017 and 2020 there were no people who were unemployed for more than one year only after the Covid pandemic there was an increase in their number but it seems that in 2022 they also found work.

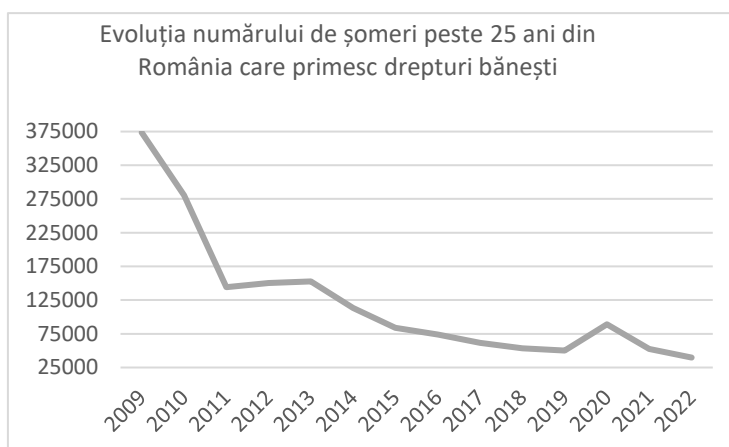


Figure 6.

Registered unemployed over 25 years of age, recipients of cash benefits

Source: EUROSTAT <https://ec.europa.eu/eurostat/databrowser/view>

Concluding the first part of this analysis, we can say that after the end of the Covid19 pandemic both the EU and Romanian economies have started to recover. It seems that things are evolving for the better

3.2 Labour market and unemployment developments in Romania, the Centre region and the region's counties, with a focus on the HORECA market

If we zoom in on the centre of the country, we can see that the economic growth in the Centre region in 2010-2019 was even higher than the average for the country. We see almost a doubling in 9 years from 61 to 119 billion RON.

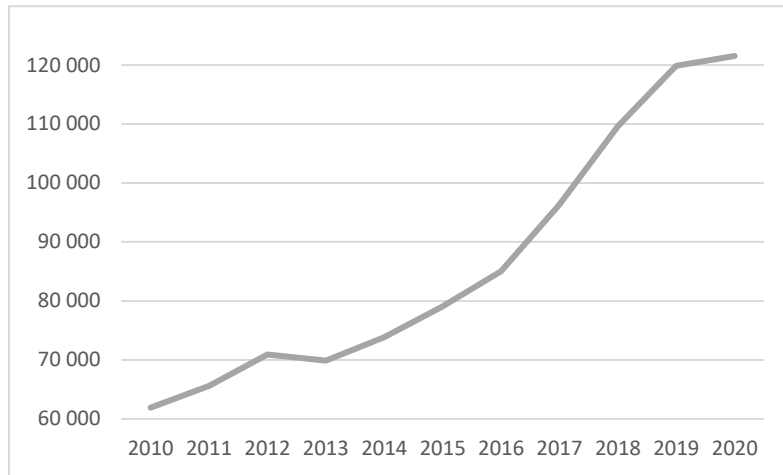


Figure 7.

Evolution of GDP in Central development region of Romania (millions RON)

Source: DIRECTIA REGIONALA DE STATISTICA ALBA <http://www.alba.insse.ro>

Before the pandemic in the Centre region both in general and in the Horeca sector in particular, the number of employees increased from year to year. During the pandemic we see a decrease that seems steeper in the Horeca sector. And after 2020 it seems that the other sectors have started to grow and hire new people, but the Horeca sector is stagnating in terms of employment in this region. (Chart 3.2.2.)

Charts 3.2.2.

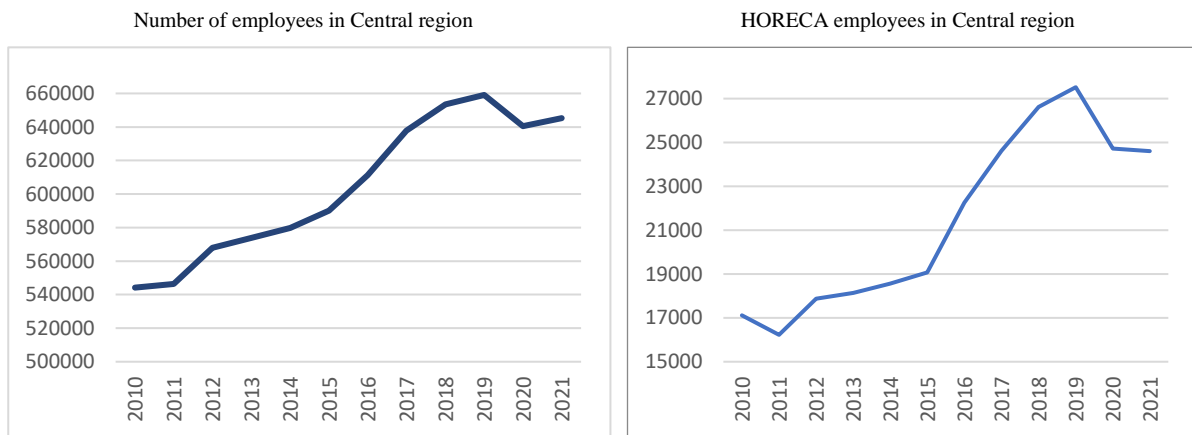


Figure 8.

Source: DIRECTIA REGIONALA DE STATISTICA ALBA <http://www.alba.insse.ro>

As shown on chart 3.2.3., in the last year we can see the recovery in the number of HORECA employees in Romania.

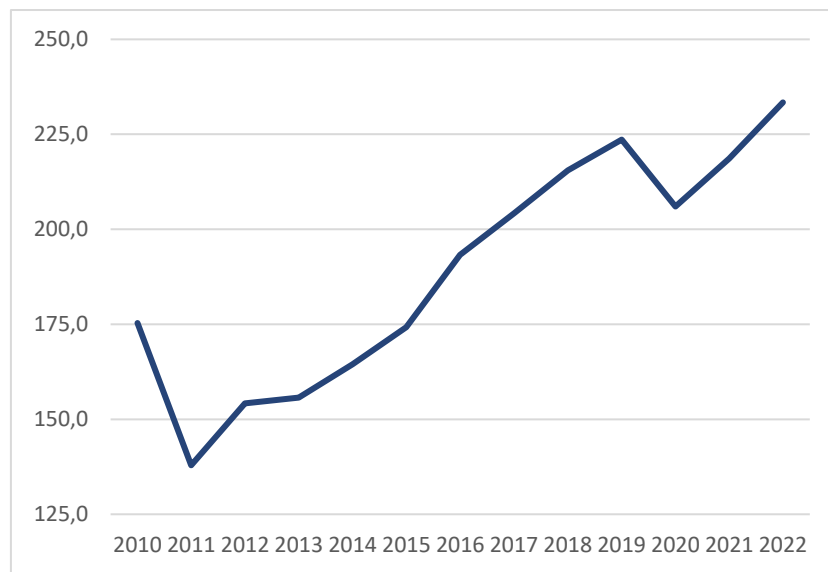


Figure 9.

HORECA industry employees in Romania in thousands

Source: Institutul Național pentru Statistică, Tempo online

Chart 3.2.4. shows that employees in HORECA industry are worse paid in the Centre region of Romania, too. But their wages raised in the 2010's as they did in all Romanian sectors.

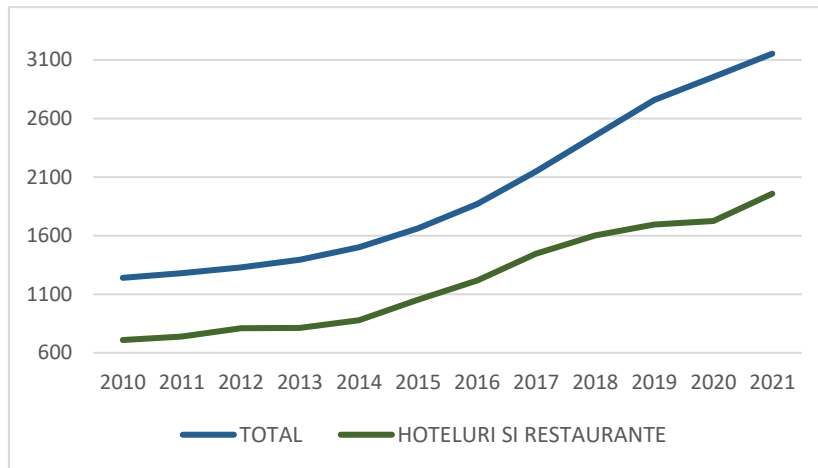


Figure 10.

Average net wages in Center region in HORECA (RON)

Source: DIRECTIA REGIONALA DE STATISTICA ALBA <http://www.alba.insse.ro>

4 Analysis of supply and demand in the HORECA labour market

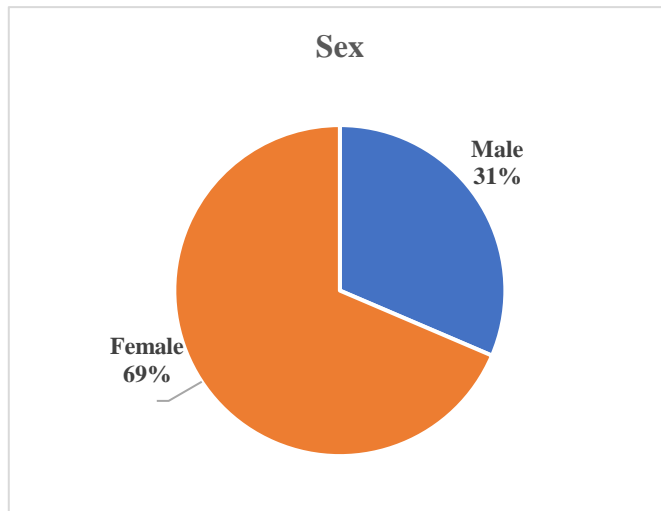
4.1 Data and methods

The actual analysis of the labour market was carried out both by questioning participants in the specialisation courses organised within the project (105 completed questionnaires) and by interviewing employers and potential employers (30+3=33 interviews).

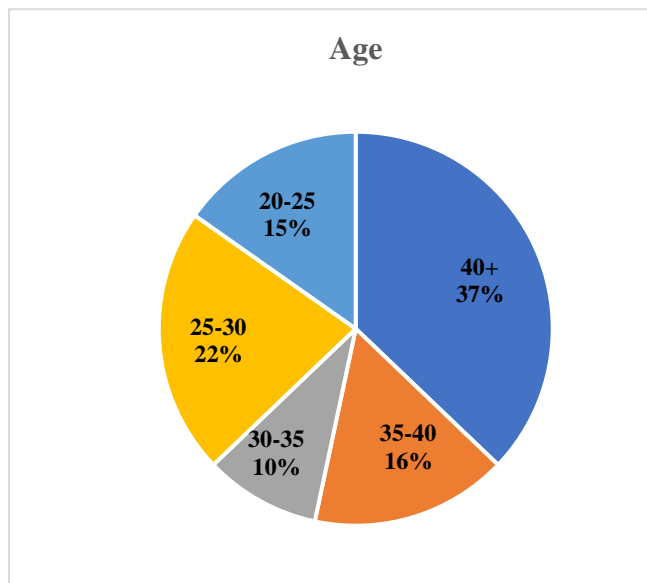
The responses are visually analysed with graphs on the following pages.

4.2 Questionnaire responses of the participants of the courses

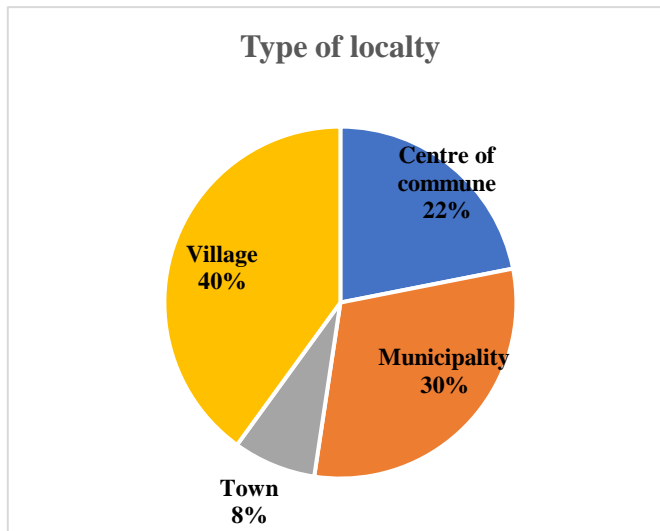
Members of the target group were predominantly women.



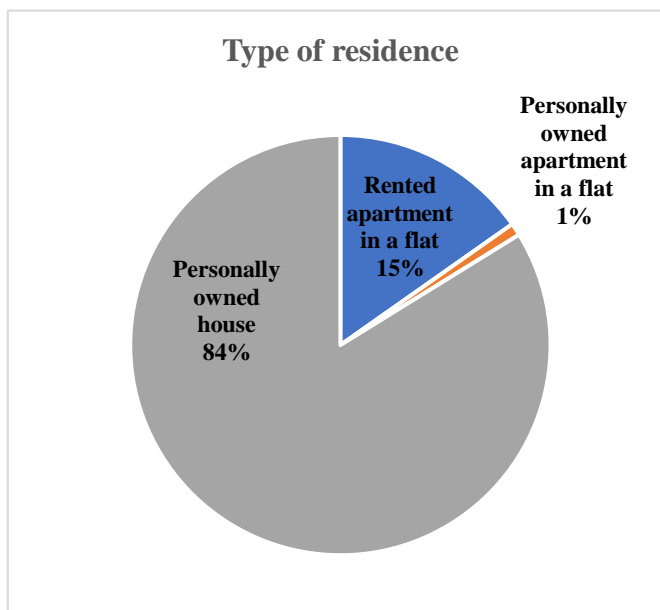
85% of respondents were over 25 years old.



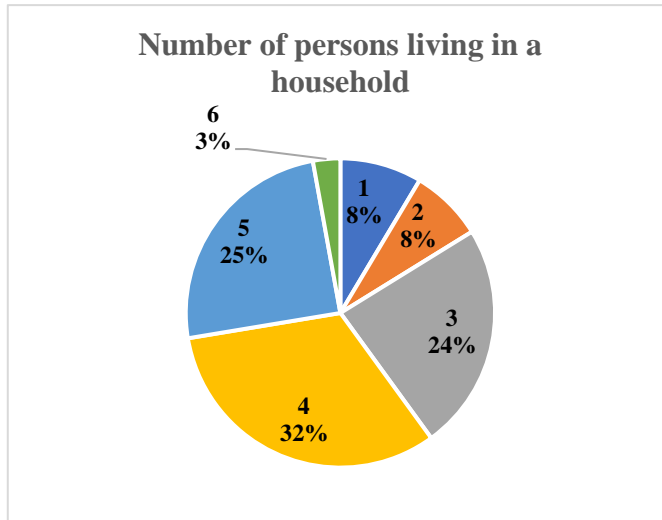
All respondents who completed the questionnaire were residents of Harghita county. 30% of the respondents lived in the municipalities of the county.



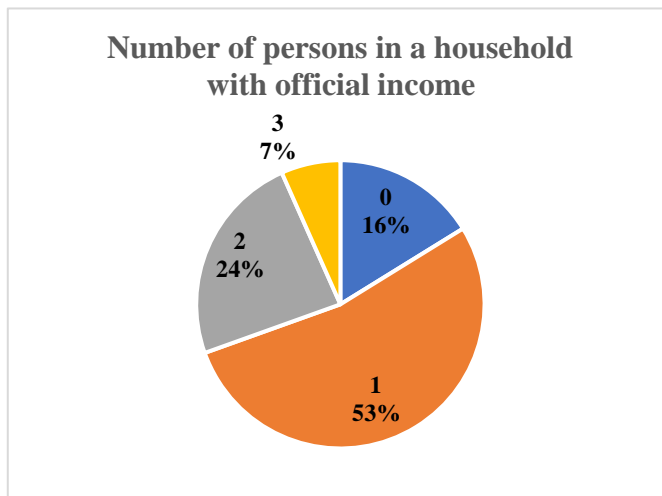
84% live in personally owned houses..



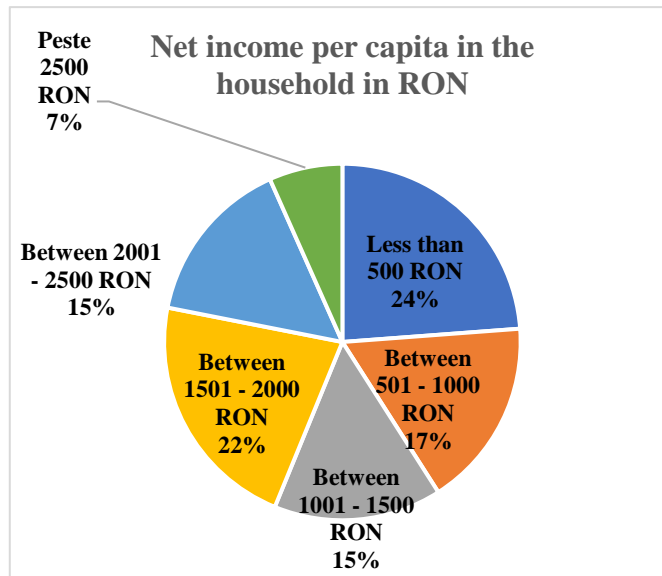
81% live 3-5 persons per household on a joint budget



16% of households have no official income on a continuous basis.

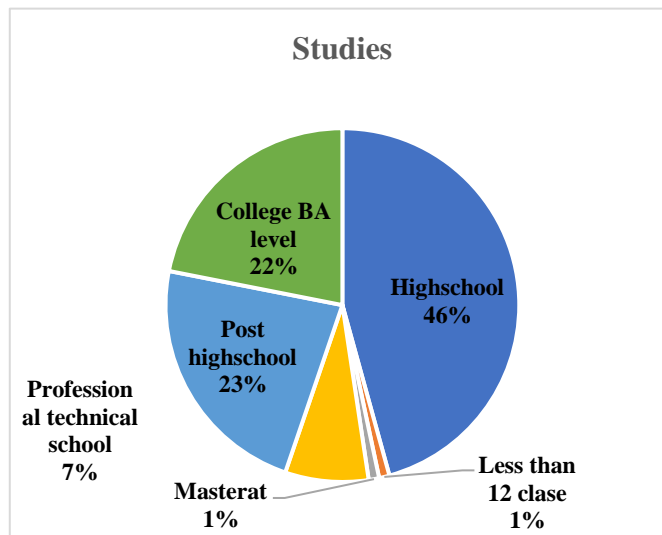


Net income per person is between 1000-2500 RON in most households, but almost a quarter (24%) have less than 500 RON.



None of the families surveyed live with a person with a disability who needs ongoing care.

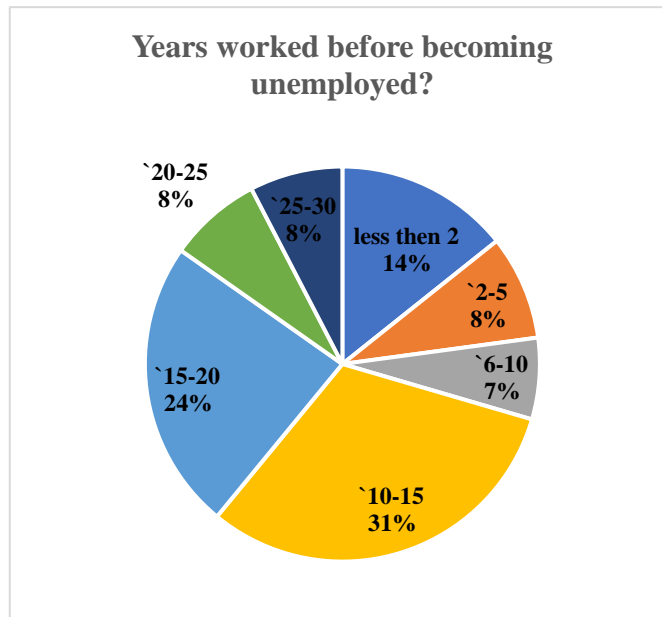
In terms of the schools attended by the respondents, almost half have a high school diploma, 22% have a university degree. 91% have also completed other specialised courses.



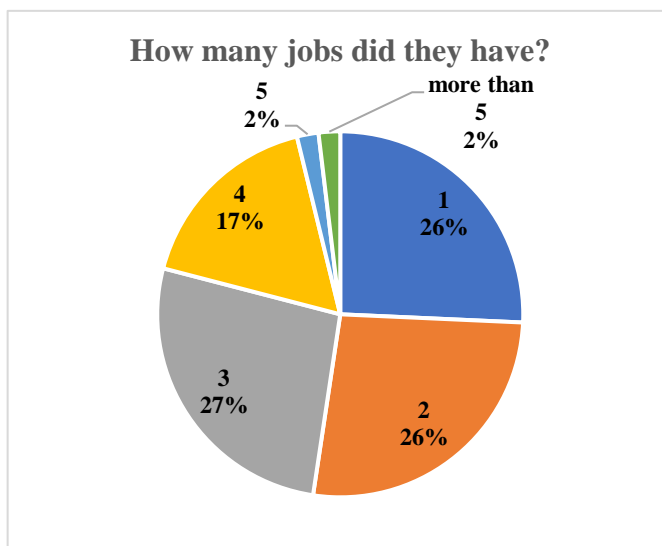
Specialisations mentioned: Cook (75%), Computer operator (15%) and Confectioner, Barber/hairdresser, Animal breeder, Medical assistant, Plumber,

Beautician, Masseur, Tailor, Nanny, Sports teacher, Musician, Social pedagogy, Receptionist, Barman, Carpenter.

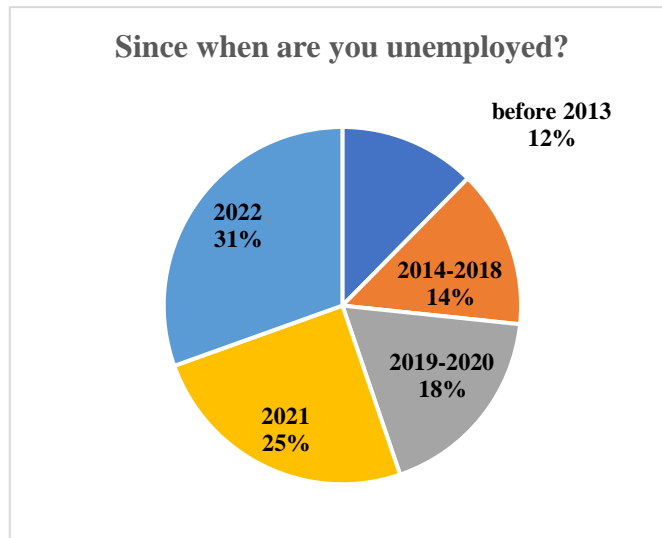
The vast majority of trainees worked for more than 10 years before becoming unemployed.



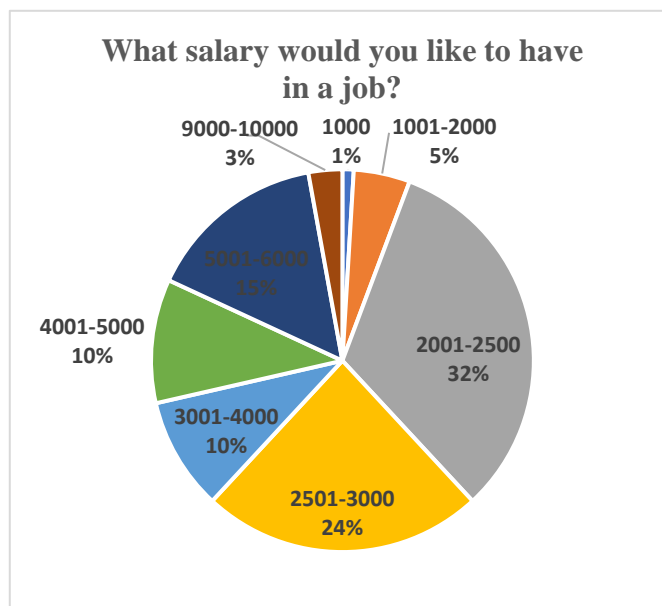
70% had 2 or more jobs during their career, the last net salary of 75% of the respondents was below 2500 RON.



12% have been unemployed for more than 10 years, only 31% have lost their job in the last 2 years.

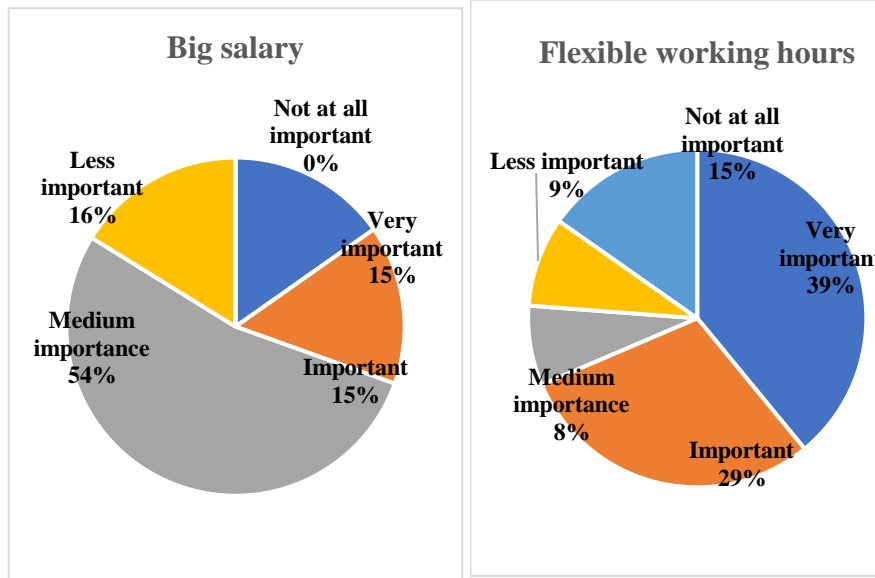


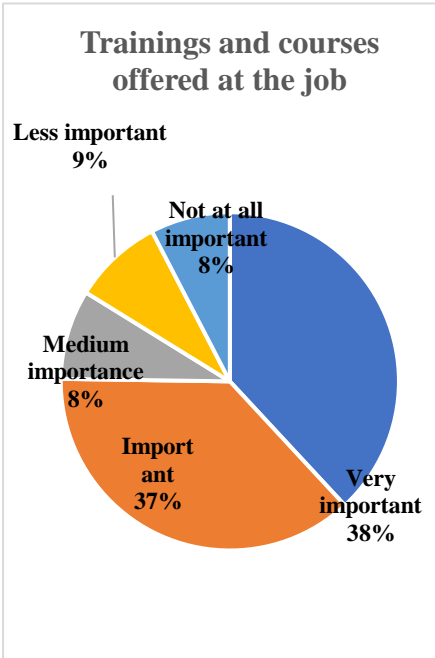
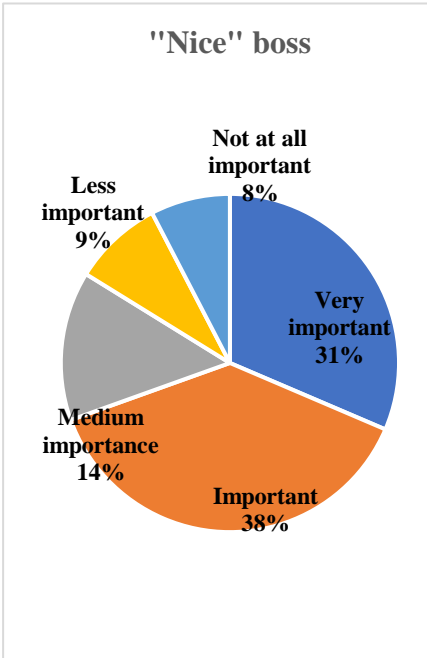
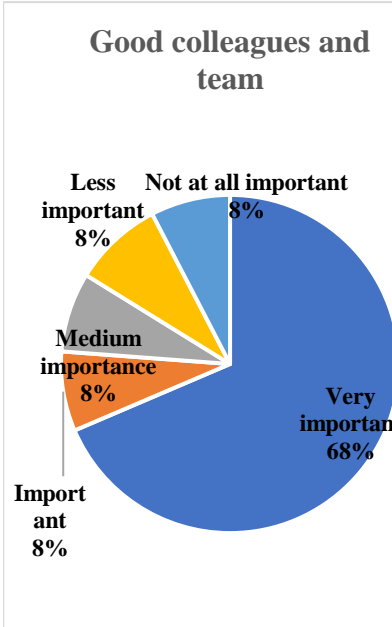
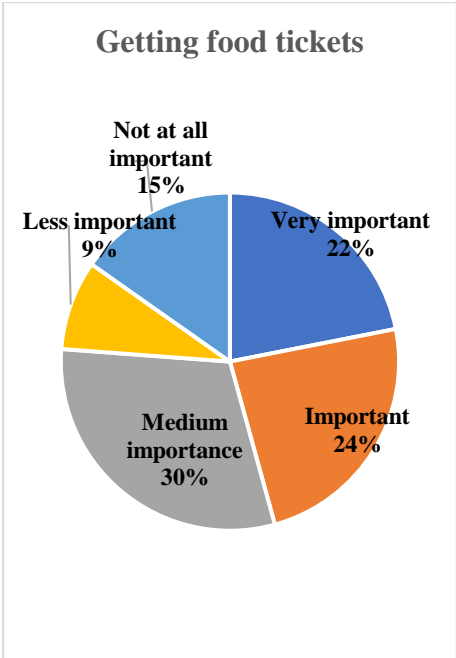
More than 90% have no other income from investments or renting property. 56% of respondents would like to get a job for a net salary of 2000-3000 RON.

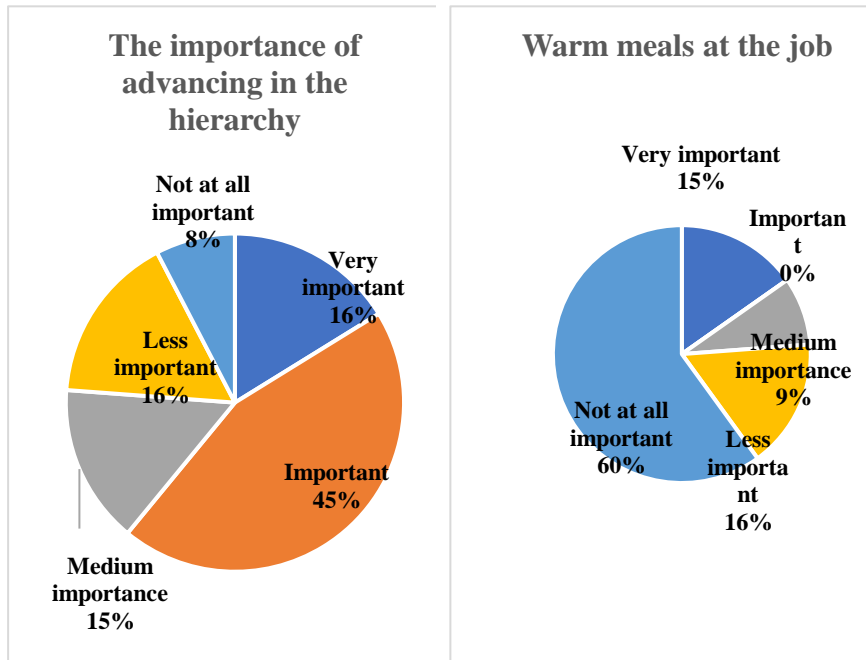


To the question where they would hire, we received the answers: Cook (32%), Bakery (25%), but also Administration, Own business, Accommodation agent, Sales agent, Music artist, "Something starting after 9 o'clock because of children", Tailoring, "Nothing in Romania", Wherever I can find, Dental technician.

An important group of questions concerned the importance of certain aspects of jobs. These are presented below:







How do these unemployed people look for work? We received the following answers; Specialist intermediary companies (82%), On the Internet (74%), Through relatives and acquaintances (32%), "I had my own business, I did not look", Newspaper advertisements, At non-governmental associations, National job placement offices, Priest/church, Headhunters.

All of them answered that they have Internet at home.

What do they expect from an employer? To be fair, honest, courteous, pay wages on time.

Conclusion

This study reveals a significant disconnect between the supply of potential hospitality workers and the demand from employers. While there seems to be a need for staff, the characteristics employers seek don't always align with the skills and motivations of the available workforce.

Challenges on the Supply Side:

Socioeconomic factors: The target group is demographically skewed towards underprivileged women with limited financial security. Many lack recent hospitality experience and have low starting salary expectations (2000-3000 RON).

Educational mismatch: Specialization courses aren't always aligned with employer needs. Additionally, some employers doubt the value of formal training due to its perceived obsolescence.

Attitudinal differences: There's a perceived generational gap, with employers criticizing young workers for lacking focus and long-term commitment.

The Post-Pandemic Landscape:

Shifting consumer behavior: The rise of food courts and home delivery services intensifies competition within the industry.

Labor market changes: The pandemic prompted some workers to leave the hospitality sector for retraining or more stable jobs.

Recommendations:

Bridge the skills gap: Revise training programs to focus on communication, planning, and soft skills alongside industry-specific knowledge.

Promote career paths: Highlight opportunities for professional development and advancement within the hospitality sector.

Competitive compensation: Offer fair wages and benefits that incentivize long-term commitment, especially for skilled positions.

Improved work environment: Foster a positive and respectful workplace culture that values employee well-being and reduces turnover.

Intergenerational collaboration: Encourage open communication and knowledge exchange between experienced staff and younger generations.

By addressing these issues, stakeholders can work towards a more balanced hospitality labor market, where employers find qualified workers and employees find fulfilling and sustainable careers. The current situation resembles a broken mirror, reflecting a distorted image of both supply and demand. By creating a more transparent and collaborative environment, the industry can create a clearer reflection of its potential and attract a more engaged workforce.

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Decision-making and leadership skills of international master students

-- experiences from a serious game

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***Abstract:** In connection with his universal Flow theory, Mihály Csikszentmihályi also identified 29 management skills which are needed to realize his "Good Business"-principles and values of leadership. In this paper, we focus on the four key skills that support decision-making and leadership supporting workplace Flow (strategic thinking, feedback, recognizing personal strengths, and the balance skill between challenges and abilities) based on the results of FLIGBY® ("Flow is Good Business For You"), a serious game developed to measure and develop Flow-promoting leadership skills. We examine the outcomes of hundreds of students in the CEMS, a global Master in Management program, highlighting the leadership skills on which they relied most on. Furthermore, we present those skills which can be best improved in replaying. This study also provides an example of how serious games can effectively analyze skill portfolios and develop leadership skills.*

Keywords: Flow, leadership skills, decision-making skills, CEMS students, serious game FLIGBY

1 Introduction

Which contemporary skills drive leadership success? Which skills enable motivation of staff so that they mobilize their inner, personal resources in such a

way that it contributes to the competitiveness of the company? The role of leadership in helping individuals to find meaning in their work is increasingly valued in organisations. Creativity and the ability to innovate, a supportive working environment, right leadership style are key to a competitive business. This is borne out by the practices of many successful companies known for their creativity (see for example Csíkszentmihályi, 2018). Competitiveness research has shown as well that there is a positive relationship between managerial skills and firms' competitiveness (Zoltayné Paprika, Wimmer&Szántó, 2007). So a good working atmosphere can be a pillar of corporate competitiveness. Managers have a significant influence on the workplace climate and on the motivation and well-being of their staff. In our investigation, we build on the experiences of a serious game for measuring and developing leadership skills, FLIGBY® ("Flow is Good Business For You"), which has been developed by Mihály Csíkszentmihályi and his colleagues in connection with the value-based "Good Business" approach - outlined in his third global bestselling book with the same title - , and analyze the leadership skills of international master students.

2 Background

In this section, we briefly discuss the essentials of leadership skills that support Flow and the role of serious games in leadership development.

2.1 Flow-promoted leadership skills

Understanding the drivers of good business performance is a key element of business success. In the late 1990s, Mihály Csíkszentmihályi, one of the founders of positive psychology and the father of the Flow approach, explored the foundations of "good business" in a research project based on interviews with executives of successful companies, in collaboration with researchers from Harvard and Stanford Universities. According to his results, the three pillars of good business are (1) business excellence, measured by profit, (2) a workplace climate that supports the creativity of employees and (3) sustainability linked to the environmental and social embeddedness of the company (based on Csíkszentmihályi, 2003, Buzády et al., 2022).

A supportive, inspiring, and motivating workplace atmosphere can facilitate the experience of Flow for both employees and managers. The Flow experience (Csíkszentmihályi, 1990) refers to the subjective state that a person experiences when fully immersed in a challenging activity. It is characterized by a sense of concentration and control, which gives the individual a good feeling. It is a state of pleasure in which the individual can achieve fulfillment. Flow is the optimal mental state (Csíkszentmihályi, 1990), it increases psychological capital and is, therefore, a pillar of competitiveness. It requires clear goals, a balance between perceived

challenges and perceived skills, and immediate, direct feedback that signals to the individual when a change is needed (Csíkszentmihályi, Abuhamdeh & Nakamura, 2014). When skills are slightly above the complexity of the task, a sense of control can be enhanced, creating a state of relaxation, which can also be motivating and important for conserving energy. While challenges that exceed skills can move beyond a general state of arousal and excitement towards anxiety and worry, in a state of equilibrium, Flow allows for continuous improvement and is therefore motivating. (These mental states can also be depicted on a Flow map, which can be used to trace the path that the individual has taken, depending on the match between skills and perceived challenges – see for example Csíkszentmihályi, 1990; Buzády&Almeida, 2019, or our Figure 2 illustrated output of FIIGBY, a Flow-based serious game.)

Flow

Among the 29 leadership skills identified in the "good business" research, four play a key role in promoting Flow at the workplace: (1) strategic thinking, (2) ability to provide feedback, (3) balancing skill and (4) recognizing personal strengths. It is important to emphasize that different leadership skill portfolios can be effective, however, leaders cannot facilitate the Flow state of employees if they do not systematically build on these four skills (Buzády et al., 2022). Strategic thinking enables the formulation of clear goals and expectations for employees, thus giving meaning to action, which is a fundamental prerequisite for the Flow state. Through feedback and managerial feedback, employees can receive confirmation or even suggestions about their efforts, but in the absence of feedback, they may become discouraged, or move towards worry or boredom. Recognizing individual strengths ensures that managers consciously build on their own and their subordinates' individual skills and strengths. This can be a source of competitive advantage for the organization, as well as a motivator for staff if their abilities are recognized in their immediate environment. The ability to strike a balance means that the manager is able to allocate resources to specific situations in a way that matches the skills of staff with the challenges they face. This is a dynamic balancing act, as the situation changes from time to time, and the employee develops and learns. The manager helps to create a meaningful and dynamic balance between challenges, tasks and abilities that is meaningful for the employee (Buzády et al., 2022). In addition to the four key skills that form the basis of workplace Flow, others are needed to ensure a suitable environment, communication, a motivating atmosphere, decision-making and the proper implementation of tasks.

2.1 Serious games in leadership skills development

Serious games are characterized by the fact that they are devices with playful elements that can be used for serious, educational purposes. In the approach of Statler et al. (2011), serious game involves individuals deliberately and purposefully engaging in a playful, self-directed activity while striving to achieve a serious task with consequences. Decisions made during the game can be recorded and analysed separately later, and the possibility of replaying allows skill development and learning (Buzády, 2017). Gamification and the use of serious games is particularly effective in business and management education, where community and relationships, communication skills, project work, competition and problem-solving are important learning factors (Buzády&Almeida, 2019). Typically, it can be practiced gradually, even repeatedly, in a computer environment by solving novel tasks that are slightly more difficult than the user's level of preparation or expertise (Mettler & Pinot, 2000). In serious games, complex business situations can be learned by modeling real-life situations without significant financial input and risk, and the learning material is not captured in the process of reading and memorizing, but through the search for and interpretation of information and the engagement of the participants (Astleitner&Leutner, 2000).

Figure 1 illustrates the role of serious games in the world of education and games. In serious games, three main elements are present together: the transfer of theory, the playful elements, and the technical support (Buzády et al. 2019).



Figure 1

Serious games at the intersection of learning, games, and simulation

Source: Buzady et al. 2019.

Simulations present the real world in a significantly simplified but still meaningful way, allowing practice in safe conditions and based on clear rules (Buzády et al, 2019, p. 90). In simulation games, the use of simulation technology is explicitly aimed at the game experience. In learning, playfulness can support experiential learning. In serious games, all these elements are present together. The learning process is based on the direct experience of the participants, and the technical support also ensures replayability. Pérez-Pérez et al (2021) point out that the use of serious games is part of the toolbox of modern experiential pedagogy. Participants can acquire professional, communication, leadership and entrepreneurial skills through the processing of real-life situations in a simulated world. The serious game can be used to identify which skills participants rely on and which skills they underuse in their decision-making. This method provides a comparable, objective result within the given framework.

3 Research method's end results

FLIGBY® ("Flow is Good Business For You") is a video-based serious game which has been developed by Mihály Csíkszentmihályi and his colleagues between 2007 and 2012. It is based on a series of leadership decisions to measure, assess and develop leadership skills that underpin Flow.

As the acting manager of a fictional family winery in California, the player's task is to make decisions that will lead to the best winery award at the end of the financial year, based on a balanced assessment of several criteria. Players' decisions will be followed by a measurement of 29 skills identified by experts, which will be reported in detail to participants at the end of the game.

In FLIGBY, the player get detailed feedback on which skills he uses more and less intensively compared to other players. Since the story is replayable, it is also possible to improve the latter, even by consciously changing previous choices by paying attention to a particular skill.

The player makes individual decisions, experiences and progressively experiences leadership situations, receiving immediate feedback on positive or negative consequences of her decisions.

The Flow map in the game provides continuous feedback on the mental state of the characters in the simulation (see Figure 2.)

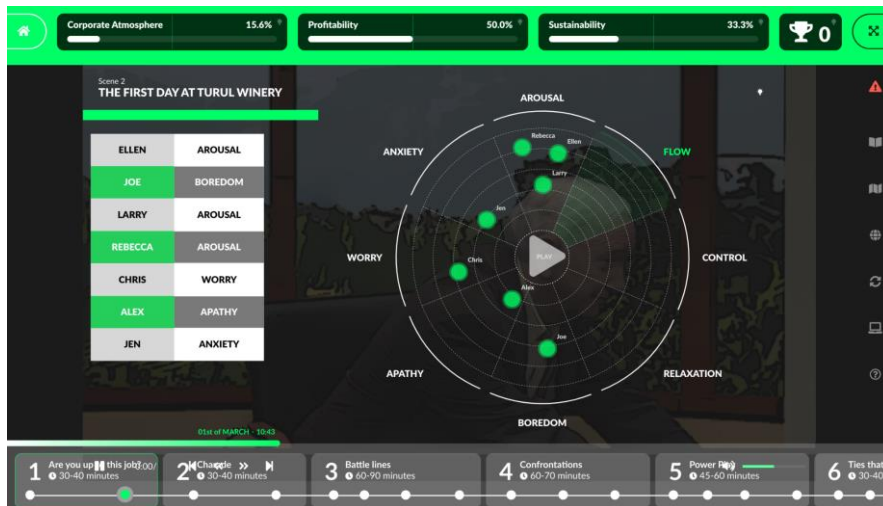


Figure 2

Workplace Flow map in FLIGBY

Source: FLIGBY serious game screenshot

Our examination is based on the results of FLIGBY games collected over several years. While providing an opportunity to measure and assess leadership skills, serious play also provides an opportunity to experience leadership Flow. The results of anonymous players also provide researchers with an excellent analytical platform and help to gain further insights into leadership skills and skill portfolios or their development.

In this paper, we examine the leadership skills of students on the global Masters in Management program enrolled on the Global Leadership and Decision-Making Skills course. CEMS (Community of European Management Schools (www.cems.org)) is a cooperation between the world's leading business schools and universities, multinational companies and social organisations, founded in 1988. The CEMS has 33 member schools, with 1300 students from 78 nationalities per academic year, and delivers the leading international Master's in International Management (MIM) that prepares responsible leaders to contribute to a more open, sustainable, and inclusive world.

We have examined the results of the FLIGBY game of 571 CEMS's students from around 30 countries (Hungarian, German, Chinese, Portuguese, Dutch, French, Belgian, Italian, Norwegian, Austrian, Czech and others) measured between 2017 and 2024.

The results of their first play are summarized in Figure 3.

The use of each skill is rated on a scale of 0-100% in FLIGBY. The skills that were most used by the players are emotional intelligence, the ability to gather information and to motivate, while time management, timely decision making, assertiveness and prioritizing are among the least used skills. We can also see that among the so-called Flow-promoting leadership skills, identified by Prof. Csikszentmihalyi, recognizing personal strengths and giving feedback are among the more used skills, while balancing and strategic thinking are in the middle, less relied upon by students.

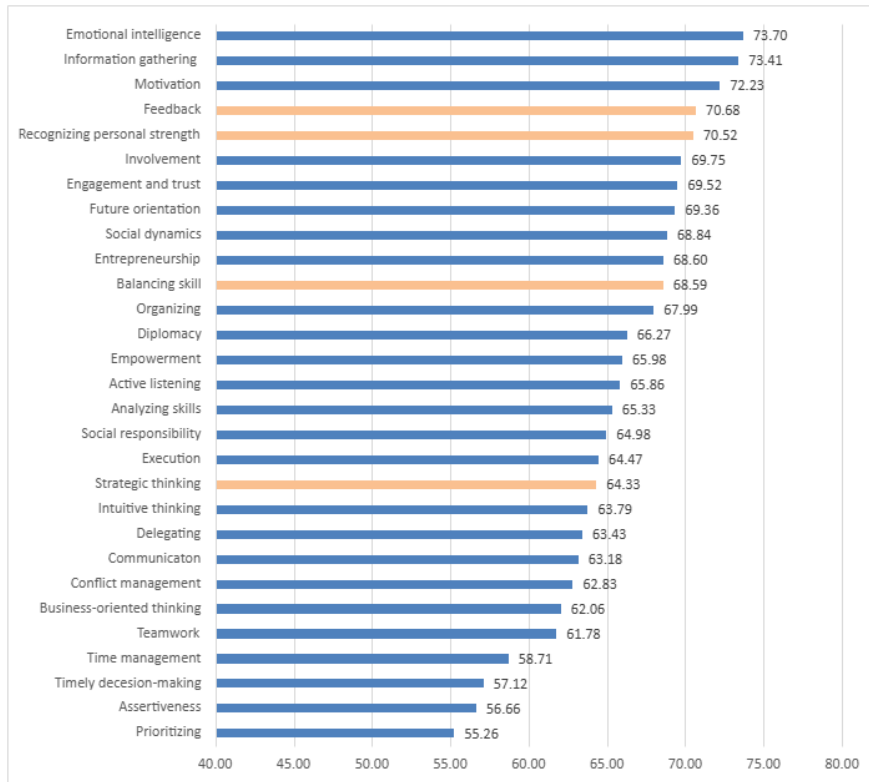


Figure 3

Using leadership skills from FLIGBY® games with CEMS students (2017-2024, N=571)

Compared to the results of the second game, it is worth highlighting those skills which show the largest increase in use up to +9. Social responsibility (+13,5), timely decision-making (+12,1), future orientation (+11,4), entrepreneurship (+10,7), strategic thinking (+10,0), recognizing personal strengths (+9,5), and feedback (+9,2).

Skills	1. game	2. game	Change
Decision-making skills			
Timely decision making	57,12	69,22	+ 12,10
Recognizing personal strengths	70,52	80,06	+ 9,55
Prioritizing	55,26	62,30	+ 7,03
Intuitive thinking	63,79	70,23	+ 6,44
Analytical skills	65,33	69,94	+ 4,61
Information gathering	73,41	73,16	- 0,25
Flow-promoting leadership skills			
Strategic thinking	64,33	74,31	+ 9,98
Recognizing personal strengths	70,52	80,06	+ 9,55
Feedback	70,68	79,92	+ 9,24
Balancing skill	68,59	76,13	+ 7,53

Table 1
Changes in the use of leadership skills in CEMS students during 2nd FLIGBY® games
(2017-2024, N=571)

Players showed the smallest increase in the second game in information gathering (-0.3), followed by diplomacy (+0.4), organizing (+1.4), teamwork (+3.0), motivation (+3.5), and time management (+3.5). This suggests that there are some types of skills that would require more time and exercise to be developed.

The Flow promoted leadership skills are among the skills that show the greatest growth in use (Table 1). During the second game, students more actively built on strategic thinking (64.33 vs 74.31), recognizing personal strength (70.52 vs 80.06), feedback (70.68 vs 79.92), and balancing skill (68.59 vs 76.13).

Concerning decision-making skills, the biggest increases were in timely decision-making (57.12 vs.69.22), and recognizing personal strength (70.52 vs. 80.06). In the middle were prioritizing (55.26 vs.62.3), intuitive thinking (63.79 vs.70.23), and analytical skills (65.33 vs. 69.94).

Conclusion

In our paper, we examined the leadership skills of master's students on the global CEMS program using FLIGBY, a serious game designed by Prof. Csíkszentmihályi

and his colleagues to measure and develop Flow-promoting leadership skills. The game supports the goals of leadership training and development by presenting the decisions in the story as real leadership dilemmas, in which it is not clear what is the right (or less wrong) decision. The player is challenged to promote a state of Flow for the game's co-workers as one of the game's goals, and in doing so, he or she can gain a leadership Flow experience. Since the game measures all players in the same decision situations, the results can be compared, the measured skills of the players. After an individual evaluation of the results, you can also support the development of skills less used in the player's leadership toolbox by replaying the game.

Reviewing our results, we conclude that this tool (FLIGBY®) is suitable for developing leadership skills and provides further opportunities for analyzing skill portfolios. Further research is needed to investigate which skills tend to develop more with increasing leadership experience, and which skills are easier or harder to be developed.

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Workers in the digital platform economy

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Abstract: Information technologies have introduced essential changes in the daily life of individuals. Due to digitization, new forms of employment are emerging, of which work on digital platforms stands out. There has been a vigorous discussion surrounding digital platforms in recent years, primarily because of their growing importance within the digital ecosystem. However, despite numerous researchers' shared interests in the work of digital platforms, existing sources and metrics to measure digital platform employment are still limited. Hence, this research aims to contribute to this gap and address the state-of-the-art research on reviewing what measurement initiatives on digital platform employment have been undertaken. Additionally, this research sheds light on digital platform workers according to age, gender, level of education, and type of service category offered in the new digital economy, indicating existing differences. Valuable insights from this research will contribute to policymakers, businesses, and researchers to create a sustainable future for workers in the digital platform economy.

Keywords: Digital platforms, Digital platform workers, Digital technologies

1 Introduction

As the Fourth Industrial Revolution gained momentum, rapid digitalization significantly changed the size, types, and task content of the available jobs and work organizations in the traditional labour market. The shift from industrial factory floor set-up to the digital application-based economy also challenged the existing labour practices and employment relationships. Over the past few years, the sharing

economy has also gained significant attention in the literature due to its exponential growth and notable impact on various aspects of the social and economic system (Merino-Saum, 2023). Sharing economy platforms have become increasingly popular, particularly during the COVID-19 pandemic (Chen et al., 2022; Belhadi et al., 2023). The platform economy refers to digitally enabled activities facilitated by digital platforms in business, politics, and social interactions (Derave et al., 2021).

The platform economy is broadly defined and overlaps with other phenomena such as collaborative economy, sharing economy, gig economy, freelance economy, peer economy, on-demand economy, collaborative commons, access economy, crowd economy, and digital economy (Ranjbari et al., 2018). However, this discussion often suffers from inconsistencies in the use of terminology and confusion in the categorization of different platform types. Therefore, it is important to be cautious. A broader approach might overestimate the impact of these new business models while not being able to differentiate them from traditional models. On the other hand, a narrower approach would limit the scope of our understanding (Sasikumar & Sersia, 2020).

The platform economy is a new way of organizing work and employment and creating value. Workers in the digital platform economy play a significant and transformative role in the modern economic landscape. Their importance extends across various dimensions, influencing businesses, consumers, and the overall work structure. While the digital platform economy brings about positive changes, it also raises important questions about workers' rights, job security, and the need for effective regulations to ensure fair and ethical practices. Balancing the benefits and challenges is crucial for creating a sustainable and inclusive digital work environment. In this light, this paper focuses on the platform economy and the employment of workers pursuing work on these platforms. As policy-makers, governments, and organizations increasingly turn to the gig economy and digital labour as an economic development strategy to create jobs where they are needed, it is crucial to understand better how the role of employees impacts this trend. The paper analyzes previous empirical studies and available results from the Eurostat database. Obtained results contribute to filling the gaps regarding the state-of-the-art in the research on digital platforms and employment. In that light, the remainder of this paper is divided into five sections. After the introduction, section two refers to the definition of the platform economy. After that, the characteristics of the digital platforms economy were highlighted, the applied methodology was presented, the discussion of the results was presented, and then in the last section, the most important conclusions, limitations of the study and future directions of development were presented.

2 Literature Review

Digital platforms are robust drivers of economic activity, as they can significantly reduce the costs of exchange and interaction. The emergence of these platforms has led to a considerable amount of academic research and has brought about significant changes in business models across various industries. The recent surge in the popularity of digital platforms has led to a widespread “land grab” where companies compete to be the first mover to secure a new territory, exploit network effects, and raise barriers to entry. However, despite the enthusiasm surrounding digital platforms, their success is not guaranteed. This is especially true for collaborative sharing platforms driven by peer-to-peer interactions (Akbar and Tracogna, 2022).

The sharing economy refers to a set of business practices that involve the temporary use of underutilized assets for free or a fee (Botsman, 2013). These practices have been around for a long time. Still, they are notable for three reasons: the widespread use of digital platforms and devices, a growing interest in sustainable consumption, and a shift towards personal interaction and community engagement, particularly in urban areas (Osztoivits et al., 2015).

Evans's (2016) research aimed to provide the first-ever comprehensive global survey of platform companies, and they found that most of today's platforms are digital, capturing, transmitting, and monetizing data, including personal data and taking advantage of pervasive internet connectivity. The sharing economy is defined by Schor and Fitzmaurice (2015) as the peer-to-peer sharing of underutilized goods and services that prioritizes accessibility and utilization over ownership. According to Stephany (2015), the sharing economy is built on the value of making underutilized assets accessible online to a community, thereby reducing the need for ownership. Online sharing platforms have revolutionized traditional business models by allowing buyers and sellers to interact and trade innovatively (Kim & Jin, 2020; Belhadi et al., 2023). After studying different definitions, the OECD (2019) modified and created a definition for platforms that accurately focuses on online platforms' capabilities. The definition states that an online platform is a digital service that facilitates interactions between two or more distinct but interdependent sets of users, whether firms or individuals, who interact through the service via the Internet.

The digital platforms economy is marked by several distinct characteristics that shape its landscape and influence the way businesses operate (Funta, 2019; Vasylytsiv et al., 2020; Hesse et al., 2020; Hasler et al., 2022; Lafuente et al., 2022). These features relate to interconnectivity, network effects, data-driven decision-making, dynamic ecosystems, platform monetization, rapid innovation, and disruption. Digital platforms have become successful by connecting people, businesses, and devices worldwide. They provide communication, collaboration, and transaction facilities through the Internet, bringing down geographical barriers and creating a highly interconnected world. These platforms often exhibit network effects, meaning the more users join, the more valuable the platform becomes

(Hasler et al., 2022). This creates a self-reinforcing cycle that attracts more participants and fosters a dynamic and growing ecosystem. Also, the digital platforms economy is characterized by creating ecosystems that unite diverse services, products, and users (Hein et al., 2020). These ecosystems often involve partnerships and collaborations, allowing platform providers to offer comprehensive solutions within a unified environment (Gawer, 2022). Digital platforms rely heavily on data analytics to make informed decisions. They collect and analyze vast amounts of data to understand user behaviour, preferences, and market trends. Platforms often act as aggregators, consolidating various services under one umbrella (Mariani and Nambisan, 2021). This aggregation simplifies user experiences by providing a one-stop shop for multiple needs, such as e-commerce, social networking, and other services. Additionally, the digital platforms economy is considered a hub of innovation. Startups and established companies continually try to disrupt traditional industries by introducing novel business models, technologies, and services. Platforms employ various monetization models, including advertising, subscription services, transaction fees, and data monetization (Täuscher & Laudien, 2018). These models contribute to the financial sustainability of the platforms and influence how they interact with users and partners.

2.1 Workers on digital platforms

The digital transformation of labour markets has led to a new way of doing work, i.e. the emergence of digital platforms that facilitate the connection between workers and employers more efficiently than ever before (Manggali et al., 2023; Nur et al., 2023). Digital work is a significant phenomenon that connects the fields of digitization, work, and employment. It refers to paid remote work, where the employer may not be present or registered in the same country as the worker. According to labour market analysis, digital work is more prevalent in developing countries with a developed information technology (IT) industry (OECD, 2018). In the digital world, physical boundaries do not exist. Digital platforms allow clients to access a global workforce anytime, anywhere. Work platforms have been created as a business model on the wave of digital innovation, enabling clients to connect with skilled workers worldwide. Although these platforms often define themselves as mediators, they perform some of the functions of an employer. They prescribe work procedures, decide who can be engaged and under what conditions, and perform accounting functions. However, these platforms do not provide options for establishing an employment relationship.

Today, digital platforms have evolved into indispensable tools and foundations of the digital ecosystem (Ha et al., 2023). The rise of the digital platform economy has brought about significant changes in employment. Digital platform workers, freelancers, gig workers, and on-demand workers are an expanding segment of the global workforce (Nur et al., 2023). Cloud-based platforms and collaboration contributed to improved traditional jobs (Kenney and Zysman, 2019; Acs et al.,

2021). At the same time, new tech industry jobs are being created in countries that have successfully facilitated the growth of platform companies.

Furthermore, many platforms have created opportunities for individuals to earn income by sharing their assets, skills, or time, resulting in a rise in the sharing economy (Poutanen et al., 2017). Digital workers predominantly offer their services in the IT sector, including software development and technology (Kenney & Zysman, 2019; Acs et al., 2021). They also provide services in various fields, such as writing and translation, creative and multimedia industry, sales and marketing, clerical services, and data entry. Additionally, they offer professional services in legal, financial, and consulting fields. The entire process of matching these services' global supply and demand occurs virtually and is agreed upon between the parties involved (Ivanović et al., 2023). In that light, this study specifically focuses on the "platform economy" and the employment of workers pursuing work on these platforms.

3 Data

This research used theoretical assumptions from scientific papers and secondary data from available databases. The terminology used in the reviewed papers is not standardized because there is no internationally agreed definition of digital platform work and employment. Therefore, the results processed in this research were taken from the Eurostat database and available reports, scientific papers and directives. Namely, within the first part of the research, this paper reviews attempts to measure digital platform employment through surveys by private and official statistical agencies. After that, in the second part of the study, an analysis of digital platform workers was performed according to gender employment statistics based on data from a Eurostat pilot survey.

4 Results

Considering that work on digital platforms is a relatively new way of organizing work, it is tough to measure the exact number of workers on digital platforms precisely. Therefore, this paper tries to cover some important previous studies that dealt with the number of workers on the platform. The European Union (EU) has roughly 500 operational digital platforms, with a presence in every European country. This sector's growth is evident, considering that between 2016 and 2020, revenues in the platform economy surged nearly fivefold, increasing from an estimated €3 billion to approximately €14 billion (European Council, 2023). Within the European Union, approximately 11% of the workforce reports offering services through a platform (Urzi Brancati et al., 2020; Morell, 2022). The Online Labour

Index (OLI) represents a tool to monitor trends in online labour and is standardized to the number of projects initiated in May 2016. This index indicates a 51 per cent rise between 2016 and 2021. More than 28 million individuals in the European Union work through one or multiple digital labour platforms. Projections indicate that in 2025, this number is anticipated to rise significantly to 43 million people (European Council, 2023).

In 2017, the first pilot survey was conducted, and 32 389 responses were received from 14 European countries. In 2018, a survey was conducted again where 38 022 responses were collected from internet users aged between 16 and 74 years old in 16 European countries. Some important conclusions that can be drawn from this research indicate the differences between “main platform workers” and “secondary platform workers”. The term “main platform workers” refers to individuals who work for more than 20 hours a week by providing services via digital platforms or earn at least 50% of their income doing so. On average, this group represents 1.4% of the respondents in the countries surveyed in 2018, which is a decrease of 0.9 percentage points compared to 2017. On the other hand, “secondary platform workers” are those who provide services via digital platforms for more than ten hours a week and earn between 25% and 50% of their income from platform work. In 2018, this group accounted for an estimated 4.1% of the respondents in the surveyed countries, which is an increase of 0.5 percentage points compared to 2017 (Urzi Brancati et al., 2020). These studies are particularly important because they largely served to define the proposal for a Directive of the European Parliament and of the Council on improving working conditions in platform work (COM(2021) 762).

Furthermore, Morell (2022) attempted to highlight gender differences, but there is a lack of gender-disaggregated quantitative data on platform work, making deeper analysis difficult. The EU Gender Equality Strategy 2020-2025 highlights the importance of integrating a gender perspective in the digital economy to achieve gender equality. However, digital policy has not given enough attention to equality issues despite some efforts to promote equal digital access and skills, such as encouraging girls and women to participate in ICT education (Ravanera, 2019).

The empirical studies published in previous years were upgraded with the results from the Eurostat database, which collected pilot data about employment on digital platforms in 2022. The survey reflected the current state of the platform workers in 17 European countries ages 15 and 64. The results presented in Table 1 show that 3% of respondents engaged in digital platform employment for at least one hour in the last year. Of that number, 80.1% of the respondents reported engaging in only one type of digital platform activity, while 19.9% reported working in two or more different categories of digital platform employment. A more detailed analysis shows that 15.5 % of respondents worked in two different categories, 3.3 % in three categories, and 1 % in four categories of digital platform employment or more.

Number of digital platform activity	Percentage (%)
1	80,1
2	15,5
3	3,3
4	0,6
5	0,2
6	0,1
7	0,0
8	0,1

Table 1.
Number of activities of digital platform

Figure 1 presents the results of the type of task or activity that workers performed on platforms, noting that respondents had the opportunity to circle several categories.

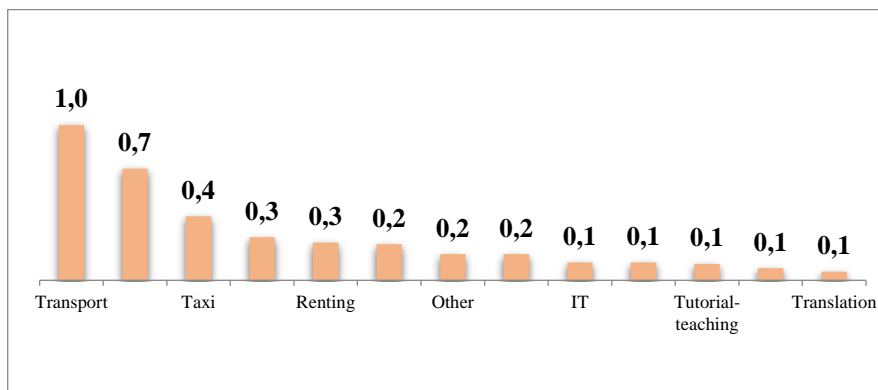


Figure 1
Digital platform workers for at least 1h in the last year by task or services category

1.0% of respondents work for at least one hour in transport services, which involves delivering food or other goods for pay or profit through an internet platform or app. The second most common job was selling goods, with 0.7% of workers engaged in the sale of goods that were collected, bought or produced. On the other hand, 0.1% of respondents were employed in IT, cleaning or handiwork, tutorial or teaching, child and elderly care and translation.

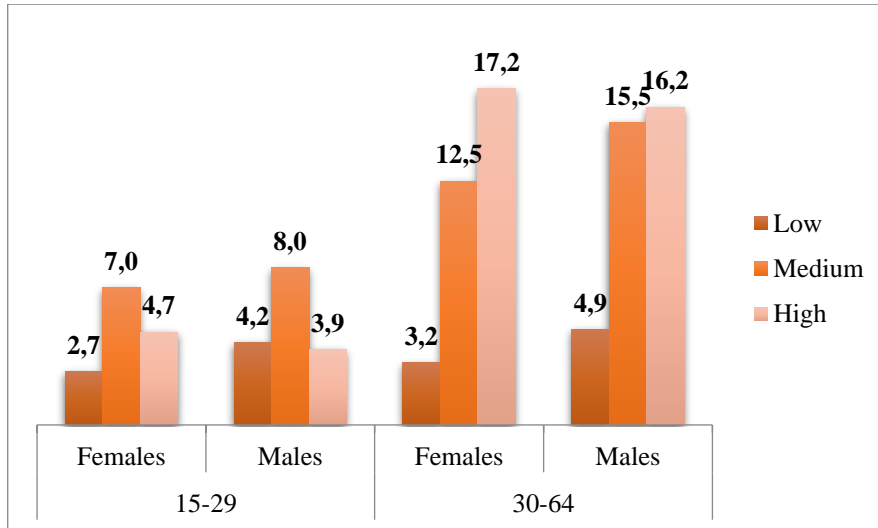


Figure 2
Digital platform workers by age, sex and level of education

The data in Figure 2 shows the distribution of respondents according to their age, gender, and education level. The study analyzed digital platform workers, who were divided into two groups: young workers aged 15-29 (30.5%) and older workers aged 30-64 (69.5%). Among the young workers, 14.4% of women and 16.1% of men were engaged in the digital platform economy. It was observed that 7% of women with a medium level of education and 8% of men with the same level of education were part of this workforce. Among the older respondents, 32.9% were female, and 36.6% were male. Of the females, 17.2% had a high level of education, while 16.2% of males had the same level of education.

Further analysis of the working hours of workers on digital platforms is presented in Figure 3. The largest number of respondents, 33.5%, were engaged between 1 and 9 hours on digital platforms, followed by less than 1 hour, 21.7%. An interesting fact is that even with a higher number of hours, many workers were engaged. For example, between 30 and 79 hours was 12.1% of engaged workers.

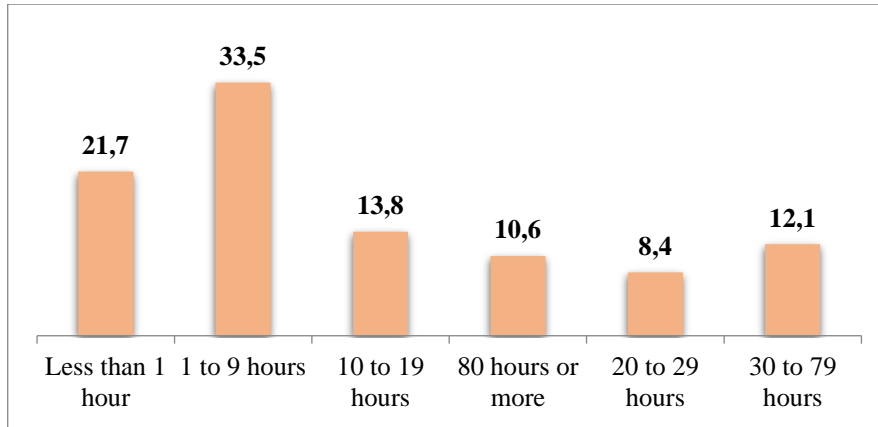


Figure 3
Working hours by people aged 15-64 who have worked in the last month

Conclusions

The sharing economy has emerged as a powerful force in the global economic landscape, impacting traditional economic and industrial models. Despite being in its early stages, the sharing economy can potentially significantly transform how people live and work. Information technologies, which have contributed significantly to the development of the digital economy, have intensified the need to establish acceptable standards for digital workers in the context of employment relationships. While platform work only represents a small percentage of the working force in European countries, it has become a central topic in research and policy discussions concerning the role of these platforms in the labour market. Therefore, this paper aims to present evidence from available empirical research in Europe, as well as results obtained from the Eurostat database.

Current results indicate that only a small proportion (around 3%) of the workers in the countries included in the research participate in platform work. However, the insights from this study show that digital platform work is slowly increasing and tends to continue growing, which has also been supported by the European Council (2023).

The significance of this study is reflected in its theoretical and practical contribution. This research highlights the importance of identifying initiated initiatives to define the total number of workers on digital economy platforms, which can be of great importance to policymakers and decision-makers in the European economies, individually and at the European level. Also, this study fulfilled the research goal by more deeply exploring the demographical differences of workers on digital platforms. This research sheds light on the worker position in the new digital economy, indicating differences among digital platform workers according to age, gender, level of education, and type of service category. These

understandings can serve as a basis for creating policies to improve working conditions and protect workers' rights, taking in mind that the European Union is developing a new directive intended to enhance the working conditions of individuals engaged in digital platform work, all while safeguarding the opportunities and advantages introduced by the platform economy.

However, this study has also some limitations. From the analyzed studies, one can see the inconsistency in the research related to the number of analyzed countries and the defined parameters. In order to generalize the results obtained, firstly, future research should specify unique measuring instruments and conduct research at the level of all European countries.

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An Econometric Analysis of the Macroeconomic Determinants on Tax Revenue in Western Balkans

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Abstract: This study explores the macroeconomic determinants on tax revenue in Western Balkan countries between 2000-2021. The panel data set is collected from World Development Indicators provided by the World Bank database. The multiple regression analysis used to explain the relationship between tax revenue as dependent variable and macroeconomic factors as independent variables. The results show that GDP growth, foreign direct investment, exports and remittances are positively related with tax revenue. The inflation rate and unemployment have negative impact on tax revenue. In addition, the net effect of each country is measured by using the Least Squares Dummy Variable technique.

Keywords: tax revenue, GDP growth, multiple regression analysis, Western Balkans

1 Introduction

Taxation, tax revenue and topics related to them are widely explored and studied from different points of view, from country analysis to cross country comparison on timely basis. On Western Balkan countries context, there are few studies that include all the six countries that are included in this region. Since all these countries are working for a long time to fulfill the criteria and perform the reforms to be a member state of EU, we need to understand which are the drivers of tax revenue in order to estimate the most significant factors and in the same time to estimate the difference from EU member states.

Economic development will often generate additional needs for tax revenue to finance a rise in public spending, but at the same time it increases the countries' ability to raise revenue to meet these needs (Tanzi, Zee, 2001,IMF).

Taxation as an instrument plays a key role in the regulation of any economy, as well as its performing, as it serves as a tool of either increasing or decreasing money supply in the economy.

By this study we try to answer the following questions:

How does GDP growth and inflation rate impact on tax revenue in WB?

What is the impact of trade openness and unemployment on government revenue from taxation ? How does remittances, FDI and corruption affect tax revenue in WB? These are the questions that this present study intends to answer by providing empirical evidence which could influence policy formation. The broad objective of this research is to examine how tax revenue is related to the key selected macroeconomic variables.

The rest of the study is as follows:section two relates to literature review on the recent studies on the evaluation impact of the macroeconomic factors on tax revenue; section three relates to data specification and description, model determination and results; section four relates to discussion and last conclusion and further research.

2 Literature review

GDP growth is expected to impact tax revenue positively (Andrasic et al.,2018; Kalas et al., 2017.2020;) They concluded that 1% increase enhances the GDP for 0.29% in OECD countries for the period 1996-2016. Moreover, Kalaset al.(2017) confirm correlation between tax and GDP growth rate in Serbia. Also their study (2020) for twenty-seven countries in the European Union for the period 2006-2018 shows that 1% increase of GDP enhances total tax revenue for 6.91%.

Inflation is expected to affect tax revenue negatively (Kalas et al., 2020). In their study for twenty-seven countries in the European Union for the period 2006-2018, they concluded that 1% increase on inflation rate causes lower level of tax revenue for 3.72%.

Unemployment is expected to impact tax revenue negatively (Kalas et al., 2020). In their study for twenty-seven countries in the European Union for the period 2006-2018, Kalas et al. (2020) concluded that 1% increase on unemployment rate causes lower level of tax revenue for 0.001%. But Daveri and Tabellini (2000) concluded a positive nexus between tax and unemployment in Europe for the period 1965-1995.

Exports are expected to impact tax revenue positively while imports are expected to impact tax revenue positively.

The empirical evidence is mixed and FDI is expected to have a potential impact on tax revenue. Paun (2019) concluded that taxation contribute to the attraction of foreign direct investment in CEE countries for the period 2005-2015. Remittances are expected to impact on tax revenue positively. Corruption is expected to impact tax revenue negatively.

3 Data, model and methodology

The data analyses evaluate the tax revenue macroeconomic determinants for six Western Balkan countries: Albania, Bosnia and Herzegovina, North Macedonia, Kosovo, Montenegro, and Serbia, for the period 1993-2021. Because of some missing data, we use a total of 132 panel data observations, for the period 2000-2021. The data are based on World Bank databases.

The study follows on examining the following hypothesis:

- H1:** GDP growth, don't have a significant impact on tax revenue.
- H2:** Inflation don't have a significant impact on tax revenue.
- H3:** Unemployment don't have a significant impact on tax revenue.
- H4:** Export don't have a significant impact on tax revenue.
- H5:** Import don't have a significant impact on tax revenue.
- H6:** FDI don't have a significant impact on tax revenue.
- H7:** Remittances don't have a significant impact on tax revenue.
- H8:** Corruption don't have a significant impact on tax revenue.

To verify the hypotheses raised in this study we are dealing with a balanced panel data, because each country has the same number of observations and we use three methods: the pooled OLS, fixed effects, and random effects.

First, we write the pooled OLS regression, as:

$$txr_{it} = \beta_1 + \beta_2 gdp_{it} + \beta_3 inf_{it} + \beta_4 une_{it} + \beta_5 exp_{it} + \beta_6 imp_{it} + \beta_7 fdi_{it} + \beta_8 rem_{it} + \beta_9 corr_{it} + u_{it} \quad (1)$$

$$i = 1, 2, \dots, 6$$

$$t = 1, 2, \dots, 10$$

Second, we continue with the fixed effects regression, as:

$$txr_{it} = \beta_{1i} + \beta_2 gdp_{it} + \beta_3 inf_{it} + \beta_4 une_{it} + \beta_5 exp_{it} + \beta_6 imp_{it} + \beta_7 fdi_{it} + \beta_8 rem_{it} + \beta_9 corr_{it} + u_{it} \quad (2)$$

$$i = 1, 2, \dots, 6$$

$$t = 1, 2, \dots, 10$$

The subscript i on the intercept term suggests that the intercepts of the six countries may be different (Gujarati, 2009), due to special features of each country. We can show this by using the dummy variable technique, as:

$$txr_{it} = \alpha_1 + \alpha_2 d_{2i} + \alpha_3 d_{3i} + \alpha_4 d_{4i} + \alpha_5 d_{5i} + \alpha_6 d_{6i} + \beta_2 gdp_{it} + \beta_3 inf_{it} + \beta_4 une_{it} + \beta_5 exp_{it} + \beta_6 imp_{it} + \beta_7 fdi_{it} + \beta_8 rem_{it} + \beta_9 corr_{it} + u_{it} \quad (3)$$

where $d_{2i} = 1$ for country 2, 0 otherwise; $d_{3i} = 1$ for country 3, 0 otherwise; and so on. Albania is treating country 1 as the base category.

And finally, we write the random effects regression, as:

$$txr_{it} = \beta_{1i} + \beta_2 gdp_{it} + \beta_3 inf_{it} + \beta_4 une_{it} + \beta_5 exp_{it} + \beta_6 imp_{it} + \beta_7 fdi_{it} + \beta_8 rem_{it} + \beta_9 corr_{it} + u_{it} \quad (4)$$

where β_{1i} assumed to be a random variable with a mean value of β_1 (Gujarati, 2009), so the intercept value for an individual country can be expressed as:

$$\beta_{1i} = \beta_1 + \varepsilon_i$$

where ε_i is a random error term with a mean value of zero and a variance of σ_ε^2 .

Inflation rate is calculated by the annual percentage change in CPI (consumer price index that reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly)

Unemployment rate is measured as the ratio of unemployed individuals and total work force.

Export is measured by the ratio of exports and gross domestic product.

import indicator is measured by the ratio of imports and gross domestic product.

Dummy for country :d2i=if the observation belongs to Bosnia-Herzegovina, 0 otherwise; d3i=if the observation belongs to Kosova, 0 otherwise;d4i=if the observation belongs to Montenegro, 0 otherwise;d5i=if the observation belongs to North Macedonia, 0 otherwise;d6i=if the observation belongs to Serbia, 0 otherwise.Albania is a comparison country, and we can use six dummiesvariables(Gujarati 2003).

<i>trx</i>	tax revenue as a percentage of total GDP(%)
<i>gdp</i>	GDP Growth(%)
<i>inf</i>	inflation rate in percentage (%)
<i>une</i>	unemployment rate in percentage (%)
<i>exp</i>	export (annual growth %)
<i>imp</i>	import (annual growth %)
<i>fdi</i>	foreign direct investment(inflow/outflow % of GDP)
<i>rem</i>	remittances(% of GDP)
<i>corr</i>	corruption
<i>d</i>	country dummy

Table 1.
Variable Descriptions
Source: Authors' expansion

The dependent variable is tax revenue and the independent variables are macroeconomic determinants such as GDP growth, inflation, unemployment etc.

4 Results and Discussion

The following table is created using the data, to generate three different estimators of tax revenue equation, where standard errors are in parentheses below the coefficients:

Dependent variable: <i>trx</i>			
Independent variables	Pooled OLS	Fixed Effects	Random Effects
<i>gdp</i>	.007 (.05)	.056 (.046)	.054 (.046)
<i>inf</i>	-.007** (.03)	-.080*** (.029)	-.080*** (.029)
<i>une</i>	-.097*** (.02)	-.081*** (.018)	-.079*** (.018)
<i>exp</i>	.026** (.01)	.016* (.009)	.016* (.009)
<i>imp</i>	-.013 (.015)	-.007 (.013)	-.008 (.013)
<i>fdi(inflow)</i>	.064** (.03)	.052* (.030)	.053* (.029)
<i>rem</i>	.089** (.03)	-.020 (.039)	-.015 (.039)
<i>corr</i>	.212 (.267)	.244 (.235)	.247 (.234)
<i>d2</i>	3.723*** (.498)		
<i>d3</i>	6.609*** (.708)		
<i>d4</i>	5.419*** (.569)		
<i>d5</i>	2.709*** (.669)		
<i>d6</i>	5.438*** (.493)		
<i>constant</i>	16.608*** (1.046)	21.26*** (.976)	21.18*** (1.482)
Observations	132	132	132
<i>R – squared</i>	.730	.790	
<i>The quantities in parentheses below the estimates are the standard errors.</i>			
*** $p < .01$, ** $p < .05$, * $p < .1$			

Table 2.
Three Different Estimators of Tax Revenue Equation
Source: Authors' calculations

On the pooled regression model we observe that the model is statistically significant ($F(13,118) = 24.63$) and Adjusted-R² = .70 indicating that 70% of dependent variable was explained by the independent variables of the model. The significant variables were, not surprisingly, inflation, unemployment, export, foreign direct investment, remittances and country.

The gross domestic product growth, import, and corruption were not significant variables in the model. Inflation measured by consumer price index negatively and significantly related with tax revenue in Western Balkans. A percentage increase in inflation, results in 0.077 percent of reduction in tax revenue; the increase in cost of living is associated with the loss of purchasing power of money, reducing real value of tax collected.

Unemployment also has negative and strongly significant impact on tax revenue. A 1% increase on unemployment rate reduce tax revenue by 0.097%.

Export has positive and strongly significant impact on tax revenue. A 1% increase on export reduce tax revenue by 0.026%.

Remittances also has positive and strongly significant impact on tax revenue. A 1% increase on unemployment rate reduce tax revenue by 0.09%.

Each country dummy variable also has positive and strongly significant impact on tax revenue.

The results of fixed and random effects models indicate that inflation, unemployment, and export were significant variables, whereas other variables were not significant in explaining the tax revenue.

Hausman test is used to check which model between fixed and random effect is appropriate for interpretation. The probability of correlated random effects-Hausman test is 0.425, which is more than 5%, thereby we can not reject the null hypothesis and conclude that the fixed effects model is not appropriate.

Conclusions

In our paper, we used panel regression analysis to investigate on the relationship between tax revenue and macroeconomic determinants for a selection of Western Balkan countries including Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia. The results of empirical research show that the sign and statistical significance of the coefficients (most of them) are correct and related with the theory. We find a positive and statistically significant result for the export, foreign direct investment and remittance's coefficients. While, for inflation and unemployment rate's coefficients we find negative and statistically significant results.

This study can be extended in a larger number of countries, dividing in subsamples new EU member states and WB country candidates for EU member to compare and evaluate further work on the path these countries must take.

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Technology Driven Inequality

An approach on Western Balkan Countries

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Abstract: The scope of this paper is to analyse the extent to which technological innovations have affected the inequality. Based on Kuznets model, while technology opens new areas for exploration and makes human capital more efficient, it will allow more people to take advantages of the resulting opportunities. The paper identifies the tools and variables used to measure inequality and further observes this phenomenon in the optic of technological development and artificial intelligence in Western Balkan Countries. The question addressed on behalf of this paper is how technological development is reshaping Western Balkan economies. The results indicate that inequality arising due to advanced technological adaption displays certain characteristics such as: speed, gender, age and access to technological industry.

Keywords: technological development, artificial intelligence, inequality, economic development

JEL Classification Codes: O15, O32, O38

1 Introduction

The world economy has gone through many changes over time and history. Industrialization, globalization, and now digital revolution. These revolutions have reshaped the world economy. In the framework of digitalization and artificial intelligence, humans and economic systems are facing new challenges and opportunities.

Artificial Intelligence (AI) can have a significant impact on equality distribution. On the one hand, AI can help to improve equality by providing access to resources,

opportunities, and services to individuals who might otherwise not have access to them. For example, AI-powered education platforms can help to provide personalized learning experiences to students, regardless of their socioeconomic status. Similarly, AI-powered healthcare technologies can help to improve health outcomes for marginalized populations.

On the other hand, there is also the risk that AI could exacerbate existing inequalities, particularly if the data used to train AI algorithms is biased or reflects existing societal inequalities. For example, if an AI algorithm is trained on data that reflects historical patterns of discrimination, such as biased hiring practices, the algorithm may learn to replicate those patterns. This could lead to further discrimination and inequality, particularly for marginalized groups.

It is therefore essential to ensure that AI technologies are designed and deployed in a way that promotes equality and does not reinforce or exacerbate existing inequalities. This can be achieved by using diverse and representative data to train AI algorithms, promoting transparency and accountability in AI development and deployment, and engaging with diverse stakeholders, including marginalized communities, throughout the AI development process.

1.1 Income inequality among Western Balkan Countries

Many definitions and studies are made regarding inequality, but this article takes into consideration the income inequality among western Balkan countries. The Western Balkans region, which includes countries such as Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia, has historically experienced significant levels of economic and social inequality.

One of the main drivers of inequality in the region is the legacy of the wars and conflicts of the 1990s, which had a significant impact on the region's economic development and social fabric. The transition to market economies in the aftermath of the wars has also been uneven, with some countries faring better than others in terms of economic growth and development.

In addition to these historical factors, there are also ongoing issues that contribute to inequality in the Western Balkans. These include corruption, weak institutions, a lack of investment in infrastructure and human capital, and high levels of unemployment, particularly among young people. Furthermore, marginalized groups such as Roma communities, women, and people with disabilities face additional barriers to social and economic inclusion. Discrimination and prejudice against these groups are still prevalent in many parts of the region.

Overall, while there have been some improvements in reducing inequality in the Western Balkans in recent years, there is still much work to be done to ensure that all people in the region have access to the opportunities and resources they need to lead fulfilling and productive lives.

Technological Development

The rapid development of technology and artificial intelligence is challenging the world economy and society in overall. There has been a huge debate whether AI is improving or worsening today's economy. Considering a simplified swot analysis, it is accepted that AI leads to (i) an increase workplace productivity and is adopted by many industries, and (ii) created a better lifestyle. In terms of weaknesses: (i) AI remains unhuman and will not be able to replace the real human as a employee, (ii) Governments are lacking behind and face difficulties in adopting or following up with AI developments.

In terms of opportunities, AI can generate (i) smart solutions for disabled human and (ii) less strain on employees. Nevertheless, it is widely accepted that AI is becoming a threatening for economic systems, as the workforce as a factor must be reconsidered.

2 Literature Review

Income plays a decisive role in determining the welfare. Shehu, Shahzad, Rubbaniy, Perveen (2017) in their study about US firms paid an important attention to income gap among gender in different industries [12]. Wage and bonus inequality are used to evaluate gender inequality and income distribution inequality.

Machin (2011) dates the start of wage inequality in the US and UK at the end of the 1970s confirming that this phenomenon is becoming more and more widespread [8].

According to Qureshi, Z. (2019), inequality has two dimensions: it has increased within most of the countries, and on the other side has decreased between countries. This is because fast growing emerging economies are narrowing the gap with advanced economies [10]. Regarding Comin and Mastieri (2018), technological advancements and their way of interacting with market conditions affects the productivity and income distribution of a country, considering here that few technologies are being adapted mainly from a small number of big companies [4].

The rapid and massive development of artificial intelligence can substantially eliminate employment. During the three industrial revolutions, the workforce largely shifted to compensate for technological changes: (i) in the first one, subsistence farming gave way largely to manufactory or other labour-intensive work; (ii) In the second, workers transitioned to assembly lines and machine-assisted tasks and (iii) in the third Industrial Revolution, workers transitioned to more service-oriented positions to capitalize on the benefits of automation and data.

Acemoglu and Restrepo (2019) in their study about US, stated that labour markets more exposed to artificial intelligence leading to lower human employability and

wage growth [1]. This consequence was heavier to those who do not have a college degree and lower-class workers, deepening income inequality among society.

Considering lower educated people more threatened by technological development, Goldin and Katz (2008) argue the role of technological development, education, and inequality in society's development [5]. They state that educational slowdown and recent technological development have increased inequality in US.

Jaumotte, Lall, and Papageorgiou (2013) in their study of 51 countries over a 23 year timespan, find out that technology is a significant force driving inequality [6]. Furthermore, they find that inequality is more severe in uppermiddle income countries.

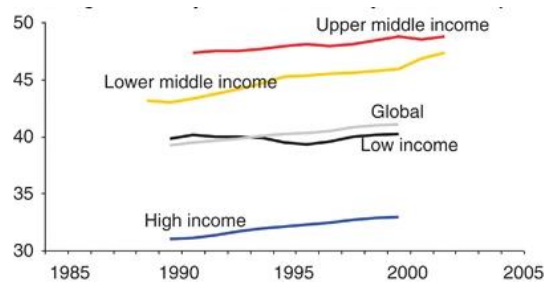


Figure 1.

Average of country Gini coefficient by income group

Source: Jaumotte, Florence., Lall, Subir., and Papageorgiou, Chris. (2013)

Considering the fact that technological advancement is more rapid in highly developed countries and more accessible to higher income societies, it must be accepted that high technological development deepen inequality. This findings about technological development and society income distribution, are in line with Liu, Zhou, and Wu (2015) [7].

Comin and Mestieri (2018) in their study about technology and income diversion after evaluating the impact of 25 major technologies into income among 139 countries over the last 200 years, confirm that income gap between Western and non-Western countries increases when growth derives only from technological advancements [4].

An important role in income distribution is played by globalisation as well. As supported from Shehu and Musta (2017) globalisation is a driving factor of society's wellbeing [14]. Jaumotte et.al (2013) finds that apart fom technology which plays a determinant role in inequality (measured here by Gini index) and important factor is globalisation as well (refer to the graph below) [6].

On the other hand, there is evidence proving that technology possession and adaption can increase access to technology and reduce poverty. For instance, Ruhyana and Essa (2020), analysed data on ICT variables including ownership of cell phones, computer usage, and internet access [12]. Their findings suggest that ICT usage correlates with a decreased likelihood of poverty, even when adjusting for factors like age, gender, education, household size, access to credit, and employment status.

Same results are indicated in the study of Bussolo and O’Connor (2002), who stated that technology has contributed to poverty reduction [2]. Rizqulloh and Firmansyah (2021) in their study onducted in 34 provinces in Indonesia, found evidence that information and communication technology significantly affect poverty alleviation [11].

Thompson and Atkins (2010) highlight that effective technology implementation can act as a social equalizer, creating opportunities for marginalized individuals [15]. Expertise is crucial for technology to reduce poverty and transform global mobility into a source of valuable information for impoverished regions.

Marker, McNamara and Wallace (2002) reveal that information, communication and knowledge are critical elements of poverty reduction [9].

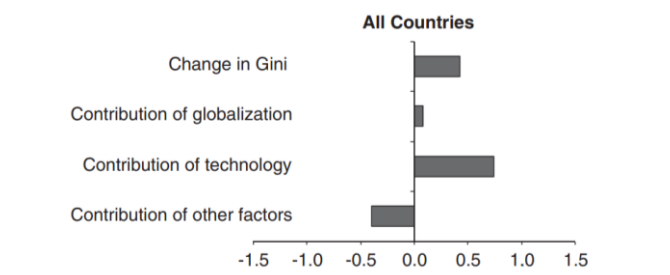


Figure 2.
Decomposition of the change in income inequality
Source: Jaumotte, Florence., Lall, Subir., and Papageorgiou, Chris. (2013)

Technological development has the potential to provide greater access to information, improve productivity, and create new economic opportunities. However, the distribution of these benefits is not always equal, and technological development can sometimes exacerbate existing inequalities or create new ones. Some of the ways in which technological development can contribute to inequality are:

Unequal access to technology

Technological development may be unevenly distributed, with certain groups having greater access to technology than others. For example, people living in rural or low-income areas may have less access to high-speed internet or the latest

technology, which could limit their ability to fully participate in the digital economy.

Skill-based inequality

As technological development advances, certain skills become more in demand, leading to a growing divide between those who possess those skills and those who do not. This can create a gap in wages and employment opportunities between highly skilled workers and those without specialized skills.

Automation

Technological development can lead to the automation of jobs that were previously performed by humans, potentially displacing workers who are not equipped with the necessary skills to transition into new jobs. This can exacerbate existing inequalities in the workforce, particularly for low-skilled or low-wage workers.

Bias in algorithms

Artificial intelligence and machine learning algorithms are only as unbiased as the data they are trained on. If the data contains biases, such as racial or gender stereotypes, these biases may be reflected in the algorithm's output, potentially perpetuating inequalities and discrimination.

Privacy concerns

With the growth of technology, there are increasing concerns around the use and misuse of personal data. Those with access to this data may be able to use it to their advantage, creating further disparities in power and wealth.

Overall, while technological development has the potential to benefit society as a whole, it is important to be aware of how it may contribute to inequality and work to mitigate these effects. Considering this inequality a toxic phenomenon, government and policy makers of each country have to consider a strategy of reducing inequality under the circumstances where technological advancements poses new challenges.

3 Data and Methodology

This section analysis the data collection, data design and methodology used to evaluate findings and draw conclusions.

3.1 Variables

Inequality

Inequality, on behalf of this article is measured through Gini index. The Gini index, also known as the Gini coefficient, is a statistical measure of income inequality or wealth distribution within a population. It is a number between 0 and 1, where 0 represents perfect equality (i.e., everyone has the same income or wealth) and 1 represents perfect inequality (i.e., one person has all the income or wealth, while everyone else has none). The Gini index is commonly used by economists and policymakers to measure and analyse income inequality and to evaluate the effectiveness of policies aimed at reducing inequality

Poverty

Technological development can provide solutions to poverty, it is also important to address the underlying causes of poverty such as inequality, lack of access to education and resources, and inadequate infrastructure. A holistic approach that considers both poverty and technological development is essential to create a more equitable and sustainable world. Poverty headcount ratio at \$2.15 a day is the percentage of the population living on less than \$2.15 a day at 2017 purchasing power adjusted prices

Technological Development

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

Research and Development

Gross domestic expenditures on research and development (R&D), expressed as a percent of GDP. They include both capital and current expenditures in the four main sectors: Business enterprise, Government, Higher education, and Private non-profit. R&D covers basic research, applied research, and experimental development.

Sample

The initial sample was 116 observations. After dropping the missing data, the net sample was 57 observations. Some of the Western Balkan Countries do not comply in terms of statistical data.

After having the net sample, the variables were checked for normal distribution and pretested in terms of assumptions. Variables [R&D] and [High Tech] were

transformed into natural logarithm to comply with normal distribution requirements. After generating summary statistics and correlation matrix, variables were empirically analysed through a multiple regression analysis.

4 Findings

Descriptive statistics table indicates values regarding mean, median, standard deviation, kurtosis, skewness, range of minimum and maximum values. Technological advancements show to have a strong correlation with all the variables, excluding Gini Index.

Using multivariate regression, it is obvious that under *ceteris paribus* conditions, an increase in high technology with one unit, will lower the Gini Index with 0,8 units. Almost the same finding appears with countries investing in R&D. An increase in Research and development as part of GDP planning leads to a decrease in Gini Index with 2.5 units (p value 0.013).

Similar figures are depicted when considering Poverty (using National poverty headcount indicator). Data show that increase in high technology by 1 unit, will reduce poverty by 2.8 units (p value 0.000). The technology advancements reduce the percentage of the population living below the national poverty line., giving them the opportunity to adjust with market requirements. Technology provides more opportunities to people, reduces costs, improves productivity and efficiently and hence reduces the ratio of people living below national poverty rate.

Research and development as percentage of GDP leads to a reduction of poverty. The findings on behalf of this article show that countries that spend more on Research and Development are more likely to reduce the poverty, reduce the number of people living below the national poverty line. Increase in Research and Development and technological advancements can provide access to all population, equipping them with information. Access to information and trainings on how to leverage technology can improve productivity and reduce poverty.

For instance, technology can significantly reduce poverty by enhancing access to education, creating job opportunities, and improving financial inclusion. Innovations in mobile banking and digital payment systems provide crucial financial services to underserved communities. Research and development (R&D) drive advancements in agricultural technology, boosting productivity and income for farmers. Telemedicine and health information systems improve healthcare access, ensuring better health outcomes. Additionally, technology supports small businesses through e-commerce platforms and digital marketing, expanding their market reach. R&D also contributes to infrastructure improvements, such as clean water and electricity, further enhancing living conditions and economic prospects for impoverished populations.

Table 1

Table 1 reports the descriptive statistics of the variables of this study. The sample includes 57 observations from 5 western balkan Countries. The correlation matrix gives a clear picture of the strength of potential relationships between variables.

Variables	Descriptive Statistics				Correlation Matrix								
	Obs	Mean	Median	Std	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) <i>Ln_HighTech</i>	57	20,291	20,635	0,947	17,584	21,491	1,000						
(2) <i>R&D / million</i>	57	1843	1831	803	432	4010	0,784	1,000					
(3) <i>Ln_R&Dmillion</i>	57	7,406	7,513	0,516	6,068	8,297	0,875	0,948	1,000				
(4) <i>R&D %GDP</i>	57	0,736	0,770	0,274	0,197	1,496	0,710	0,879	0,869	1,000			
(5) <i>Ln_R&D GDP</i>	57	-0,389	-0,262	0,438	-1,626	0,403	0,780	0,847	0,914	0,961	1,000		
(6) <i>Gini</i>	57	35,512	35,000	3,344	28,900	42,800	-0,224	-0,111	-0,170	-0,321	-0,328	1,000	
(7) <i>Poverty</i>	57	2,654	1,500	2,577	0,100	10,400	-0,835	-0,579	-0,687	-0,585	-0,672	0,600	1,000

Table 2

This table documents the results of our multivariate regression Models (Panel A) and (Panel B), where Inequality (Gini Index) and Poverty (Poverty index) are the dependent variables explained by the explanatory and control variables. Panel A shows the results for each of the explanatory variables individually as simple regression analysis and multiple, while Panel B exhibits the same regressions (simple and multivariate) for Poverty. P-values are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels respectively

	Panel A: GINI Index				Panel B: Poverty			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
<i>Ln_HighTech</i>	-0,826* (0,080)			-1,623* (0,067)	-2,271*** (0,000)			-2,811*** (0,000)
<i>#Ln_R&Dmillion</i>		-1,105 (0,205)		8,074*** (0,002)		-3,432*** (0,000)		2,911** (0,014)
<i>Ln_R&D GDP</i>			-2,503** (0,013)	-8,461*** (0,000)			-3,957*** (0,000)	-2,351** (0,028)

Addressing technology-driven inequalities requires a multifaceted approach from

policymakers. Firstly, investment in digital infrastructure is crucial to ensure equitable access to high-speed internet and digital technologies across all regions, potentially involving subsidies for broadband access in underserved areas or incentives for telecom companies to expand coverage. Alongside this, implementing digital literacy programs can improve digital skills among all demographics, particularly focusing on marginalized communities and older adults who may be less familiar with technology. Policymakers should also establish and enforce regulations to prevent monopolistic practices in technology markets, ensuring fair competition and consumer protection, while addressing issues related to data privacy and security.

Support for small businesses and entrepreneurs is vital, providing resources, training, and funding opportunities to help them leverage technology effectively and compete with larger firms. Inclusive innovation policies should be encouraged through scholarships, mentorship programs, and policies that promote diversity in hiring and retention practices within tech fields. To address algorithmic bias, guidelines and standards must be developed to minimize bias in AI and machine learning applications, ensuring they do not perpetuate existing inequalities. Adapting social safety nets to the digital age is also essential, considering issues such as job displacement due to automation and the gig economy, possibly exploring universal basic income or similar concepts to support those adversely affected by technological change.

Collaboration with technology companies can help design and implement initiatives that promote equity and inclusivity, such as community engagement programs and initiatives to provide affordable tech products and services. On a global scale, fostering international cooperation to address digital divides is necessary, recognizing that inequalities in access and skills are not confined within national borders. Continuous monitoring and evaluation of the impact of policies on technology-driven inequalities through data collection and analysis is essential, allowing for the adjustment of strategies to achieve more equitable outcomes. By adopting a comprehensive approach that combines these strategies, policymakers can work towards mitigating technology-driven inequalities and fostering a more inclusive digital society.

5 Concluding remarks

Digitalisation has brought about many benefits, but it has also widened the gap between the rich and the poor. The government can take several steps to reduce inequality in the framework of digitalisation, some of which are:

Encouraging digital literacy is a vital step in bridging the gap between those who have access to technology and those who don't. Imagine a community where everyone, regardless of age or background, can confidently use a computer or

navigate the internet. By providing training and education programs, the government can help make this a reality, ensuring that more people have the skills they need to thrive in the digital world. These initiatives can transform lives, opening new opportunities for learning, employment, and personal growth.

Investing in infrastructure is another crucial strategy. Picture rural areas and remote communities finally getting high-speed internet and reliable mobile networks. This isn't just about connecting people to the web; it's about connecting them to a wealth of information, resources, and opportunities that were previously out of reach. By focusing on building and expanding digital infrastructure, the government can help everyone participate in the digital economy and enjoy its benefits, no matter where they live.

Promoting digital inclusion means making sure digital services and technologies are accessible and affordable for everyone. Think of a family with a limited income who can now afford a laptop and internet service for their children's education. The government can help by reducing the cost of digital devices and services, ensuring that no one is left behind in the digital age. This inclusivity ensures that everyone, regardless of their financial situation, can benefit from the advancements in technology.

Creating regulations to protect workers, especially those in the gig economy, is essential for fair treatment and adequate benefits. Imagine a gig worker who can now rely on sick leave, retirement savings, and workers' compensation, just like traditional employees. The government can establish regulations to provide these protections, ensuring that gig workers are treated fairly and have the security they need to work with peace of mind.

Encouraging entrepreneurship by providing funding, resources, and support to start-ups and small businesses developing digital solutions to social and economic challenges is another key strategy. Envision a young entrepreneur with a brilliant idea for a tech solution that could change lives, receiving the support needed to turn that idea into reality. By fostering innovation and supporting new ventures, the government can stimulate economic growth and create opportunities for individuals to make meaningful contributions to the digital economy.

Addressing algorithmic bias is vital to prevent existing inequalities from being perpetuated by technology. Consider an algorithm that makes fair and unbiased decisions because it was developed with transparency and accountability. The government can create regulations to ensure this fairness and promote diversity and inclusion in the development of digital technologies. This way, everyone benefits from advancements in technology, and no group is unfairly disadvantaged.

Overall, R&D can sometimes widen the gap between the rich and the poor, technological advancements hold the potential to bridge these disparities. The ongoing tech revolution requires careful attention from policymakers to ensure its benefits reach everyone and its challenges are managed effectively. With thoughtful

and inclusive policies, technology can be harnessed as a powerful tool for equality and opportunity, offering a brighter future for all.

Limitations and Further Research Gaps

One of the major hurdles researchers face today is the scarcity of comprehensive and reliable data for Western Balkan countries. These nations often struggle with data collection and reporting, leading to significant information gaps. Imagine trying to understand the economic or social dynamics of a region with only half the puzzle pieces—it's challenging to form a complete picture. This lack of detailed data makes it difficult to analyse and understand the region's economic, social, and technological landscapes accurately. To make informed decisions, policymakers and researchers desperately need better data collection methods and stronger statistical frameworks. Only with high-quality, detailed data can they craft policies that truly address the region's needs and challenges.

Another pressing issue is the confusion and complexity surrounding the transition processes in many Western Balkan countries. Picture a nation trying to shift from a centrally planned economy to a market-oriented system—it's a bit like trying to change the tires on a moving car. These countries are undergoing significant structural changes and policy reforms, but the journey is often bumpy and uncertain. This period of transition is marked by inconsistent information, frequent policy changes, and a lack of coherent strategies, creating confusion both within the countries and among those trying to understand and assist them from the outside. The ever-changing landscape makes it difficult to track progress and accurately assess the impact of various policies and reforms.

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Changing social attitudes towards self-driving vehicles: the beginning of a new era

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Abstract: The proliferation of self-driving cars has given rise to mixed feelings among many. Many are excited about the developing technology, while others are concerned about the potential dangers and impacts. People are gradually switching to new technologies, for example, fewer people are watching TV, while online streaming is growing in popularity. The same applies to digital money. The advent of autonomous vehicles could bring changes in transport patterns and infrastructure. Studying adoption and analysing attitudes is key to understanding the technology. Ethical and legal issues are the main barriers to technology adoption. Issues of liability, privacy and ethical decisions need to be clarified. The research methodology involves the use of combined data. A questionnaire survey collecting the views of past respondents will allow changes to be monitored. The Covid-19 epidemic has had an impact on the adoption of self-driving cars because people are looking for distancing options. Technological development must take into account people's needs and expectations and ensure that ethical and legal frameworks are respected.

Keywords: self-driving cars, social acceptance)

1 Introduction

The adoption and uptake of autonomous vehicles is a dynamic and multidimensional process that is fundamentally transforming the automotive industry and people's daily lives. As these technological developments become increasingly integrated into society, the challenges ahead become more significant. The emergence of autonomous vehicles will not only change the way people travel, but also the way they behave, feel safe and live their lives.

This paper reviews the challenges and opportunities for autonomous vehicles and the factors that influence their social acceptance. It analyses in detail the ethical, safety and technological challenges of autonomous vehicles and the responses to these challenges [1]. Although autonomous vehicles are increasingly present in transport, their private use is still at an early stage. Despite adequate hardware and software tools, public acceptance remains low, especially among women due to fear [2].

Research shows that those who are not open to autonomous vehicles are more afraid of potential negative consequences such as hacker attacks, system failures or lack of control [3]. In contrast, proponents expect positive effects such as reducing accidents and promoting environmental protection [4]. Overall, the study helps to understand the drivers of trust in autonomous systems and provides lessons for manufacturers and policy makers to address concerns and integrate autonomous vehicles into the transport system of future smart cities [5].

2 Self-driving vehicles

Technological advances and innovations have become part of our everyday lives, but not everyone embraces them with equal enthusiasm. The rise of self-driving cars in particular has provoked mixed feelings [6]. Examining technology acceptance and analysing attitudes is key to understanding and embracing technological developments. In addition, it is important to clarify ethical and legal issues for the integration of new technologies into everyday life [1].

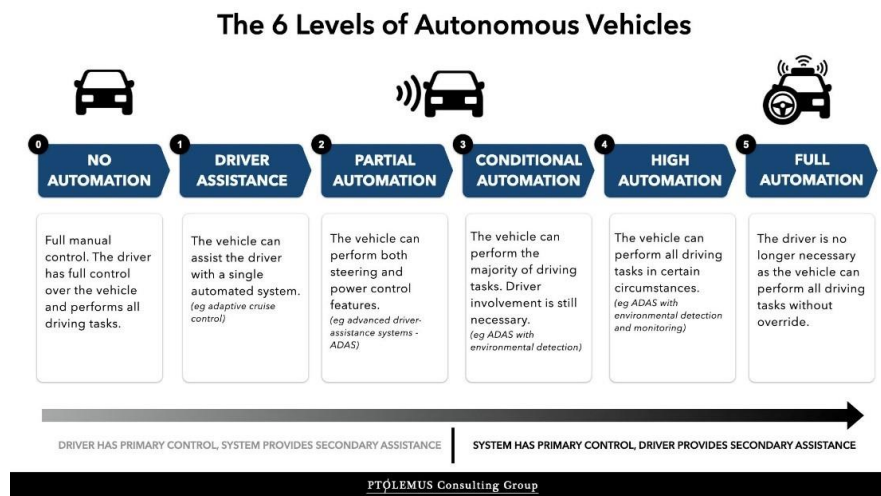


Figure 1.

Levels of automation [7]

Despite the availability of self-driving vehicle technology, questions remain about its reliability and the need for its deployment. Self-driving vehicles offer modes of transport where human supervision is not required. SAE International (2016) defines six levels of autonomy, with level 0 being full human control and level 5 being full self-driving. Although autonomous technology is available, legal and moral issues mean that few people trust these systems completely. The EU legal framework is slowly evolving, while in the US the NHTSA has issued new guidelines for self-driving cars [7] [8].

The challenges of implementing autonomous systems are rooted in legal and ethical uncertainties, in addition to high prices and personal fears [4]. Individuals' perceptions of technology are influenced by demographic characteristics such as age, gender and education [9]. Software companies have an interest in the rapid uptake of self-driving vehicles, but the complexity of the problem means that regulatory and ethical issues need to be considered.

The technological development of self-driving cars has been underway for a long time, but their mass uptake is still a long way off due to concerns about the technology and reliability issues. Legal and ethical issues continue to hinder the adoption of autonomous systems, and many people are not comfortable giving up full control to a machine [10]. The uptake of autonomous vehicles in the EU is hampered by long-standing transport conventions, such as the Vienna Convention, which require a human driver to be in the vehicle. Some countries have already amended these conventions to adapt to new technologies and allow the use of autonomous systems. In the United States, the era of self-driving cars is approaching, and safety is a priority. Car manufacturers need to ensure that self-driving cars are as safe as conventional vehicles.

When autonomous vehicles are introduced, people naturally react to new technologies with fears and concerns. Car developers need to pay particular attention to safety and reliability. People are often afraid to hand over full control to a system that is not yet fully understood and regulated. Although car manufacturers are spending considerable sums on developing self-driving cars, people are more concerned than enthusiastic about the new technology. Studies show that most drivers do not want to use fully autonomous cars, but would welcome some automated features in their vehicles [11] [12].

According to 2014 surveys, the majority of people in the US, UK and Australia expressed concerns about the cost and reliability of autonomous vehicles. However, many would welcome a higher level of autonomy in their cars if it did not increase the price. According to a 2015 survey by Kyriakidis and colleagues, the majority of respondents were optimistic about the future of self-driving cars and believed that by 2050 a significant proportion of cars would be autonomous [13]. In contrast, research by Kettles and Van Belle in 2019 showed that the majority of people would not be interested in self-driving cars in the first six months of their local introduction, although they responded positively to the performance and driving experience of autonomous vehicles [14].

People's attitudes to self-driving cars are much more positive in public transport, where it matters less whether the vehicle is autonomous as long as it is clean and comfortable. It is important to take people's opinions and attitudes into account in order to speed up the uptake of the technology. The human factor and user preparedness are key for new technologies. If preparedness is low, it can lead to a decrease in technology adoption and take-up [15]. Building trust is particularly important for self-driving cars, as people perceive their own vulnerability in

complex systems [16]. The proliferation of self-driving cars also raises ethical and social dilemmas. People express concern about loss of control and decisions made by the vehicle that may affect their well-being and safety, which poses additional challenges to the adoption of autonomous vehicles [17] [18].

Self-driving cars and control software face difficult moral choices in extreme situations, such as when a child runs in front of the car and a collision is inevitable [1]. The car must decide whether to jerk the steering wheel, endangering the occupants, or hit the child. Such ethical issues have a significant impact on the social acceptance of autonomous vehicles. People generally accept that cars should reduce casualties, but this opinion may change if they imagine themselves in the car. Regular software updates and improvements are key to the proper functioning of self-driving cars. The software must be prepared for any situation and be able to make life-changing decisions, as well as recognise and distinguish roadside objects such as traffic signs. The development and adoption of autonomous vehicles poses many challenges, but the discussion of ethical issues and the continuous development of software is essential to shape the future of autonomous transport [19] [20] [21] [22].

Security risks associated with autonomous vehicles include attacks by hackers, as any computer that communicates with or accesses another is potentially at risk [23]. Autonomous cars are no exception, and there have been examples of hackers manipulating these vehicles [24]. For example, in 2015, two hackers took control of a Jeep Cherokee's UConnect system, completely controlling the car and rendering the passenger helpless [25]. These cases highlight the challenges of developing security systems for autonomous vehicles.

3 Research methodology

The research methodology effectively combines primary and secondary data, and the convenience sampling survey is a reasonable approach given the resources available. To validate the self-developed questionnaire, I first conducted a literature review to familiarise myself with relevant theories and existing measurement tools. I then designed the questionnaire, which was evaluated with experts to refine the questions. I modified the questionnaire based on feedback from the pilot test. To ensure validity, I compared the results of the questionnaire with those of an established measurement tool and retested it to check stability. Finally, I finalised the questionnaire as a reliable and valid measurement tool.

Examining age, gender, educational attainment and technological affinity helps to reveal the deeper correlations behind attitudes. The analyses are based on simple descriptive statistics, Spearman correlations and independent samples t-tests, conducted using SPSS 20 software on the basis of the responses collected. It is important to emphasise that due to the size of the study and the non-representative

nature of the participants, the results cannot be considered as general truths. The sample does not reflect the entire population, so the results are more indicative of the relationships between the different variables describing the people in the sample.

When analysing the results of the research, it is important to stress that the conclusions presented here should not be considered as generally valid or categorically conclusive. Although the research has produced significant results, we must be aware of the limitations of the research and the risk of generalisation. Rather, the data help to explore the relationships between variables and to understand possible correlations, but further research is needed to draw more reliable conclusions. For data collection, I used an anonymised quantitative questionnaire, which allowed participants to respond honestly, increasing the statistical reliability and generalisability of the research. Online questionnaires are a cost-effective and quick way to collect data, with flexible time schedules for participants. However, low response rates and convenience sampling can distort results and make it difficult to establish causal relationships. Bias may also occur and it is difficult to check the reliability of responses. Convenience sampling may limit representativeness, so results should be treated with caution and further representative research is needed to draw more reliable conclusions. The Levene's test for equality of variance and the two-sample t-test were used to interpret the statistical table.

4 Results

4.1 Presentation of the samples

To examine demographic variables, I asked respondents about their gender, age, place of residence and highest level of education. In addition, I asked about the respondents' current level of education, employment status, attitudes towards technology in general, level of awareness, and whether they have a driver's license. The sample was gender-balanced, with 1,266 men and 1,206 women participating in the survey. Although the sample cannot be considered fully representative, the large number of respondents provides an opportunity to analyse gender differences.

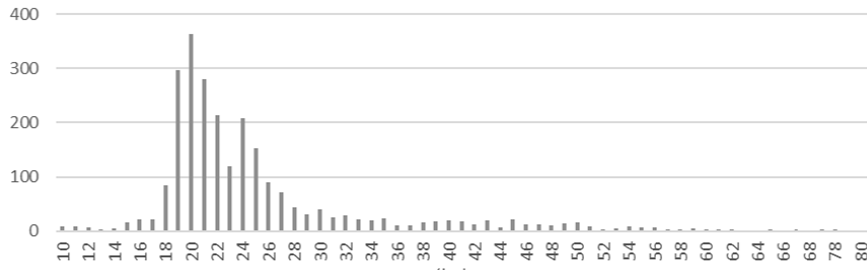


Figure 2
Age distribution of respondents

In terms of age, the average age of respondents was 25.25 years, with people aged between 12 and 70 years old taking part in the survey. 80% of the respondents were under 25 years old, which is probably a consequence of the chosen snowball method and convenience sampling. In terms of educational attainment, there were high school, college and university graduates. By employment status, students, unemployed, part-time and full-time workers also completed the questionnaire. I also looked at technological affinity and awareness, as these may affect the adoption of self-driving cars.

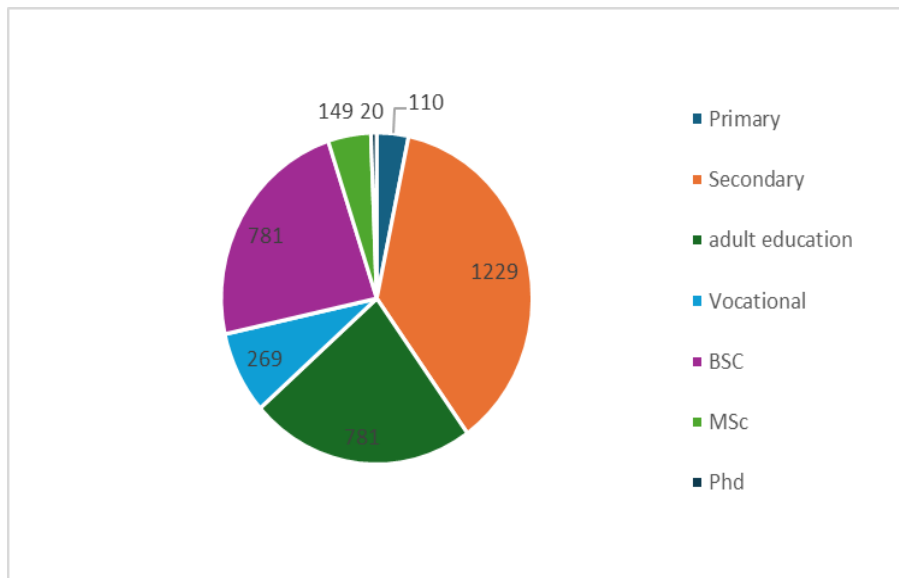


Figure 3
Distribution of respondents by educational level

In terms of highest educational attainment, the majority of respondents have a secondary school degree, 479 respondents have a BSc and 140 respondents have a MSc. Younger respondents tend to have a lower level of education. Education and employment status are correlated, with 56% of respondents working, many while studying.

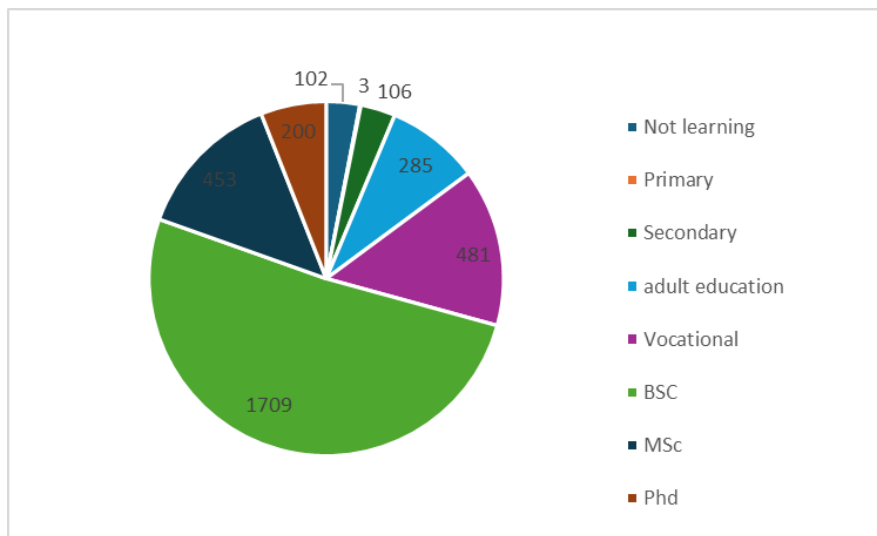


Figure 4
Studies of respondents

This indicates that the majority of respondents are continuously improving their knowledge, which is important to understand the acceptance of self-driving cars. Educational attainment and employment status can have an impact on attitudes towards technology, as learning and working together increases sensitivity to innovation. Although the majority of respondents were from the capital city, the snowball method was successful because responses were received from municipalities of different sizes. This diversity may help to get a more comprehensive picture of opinions on self-driving cars. Interestingly, 69% of respondents have a driving licence, while 31% do not, so the majority have driving experience. The survey did not reveal any significant difference between the attitudes of those with and without a driving licence towards self-driving cars. The 31% is probably due to those who are under 18 or do not wish to drive. The geographical diversity ensures that the results of the survey have a wider relevance, better reflecting the views of the population.

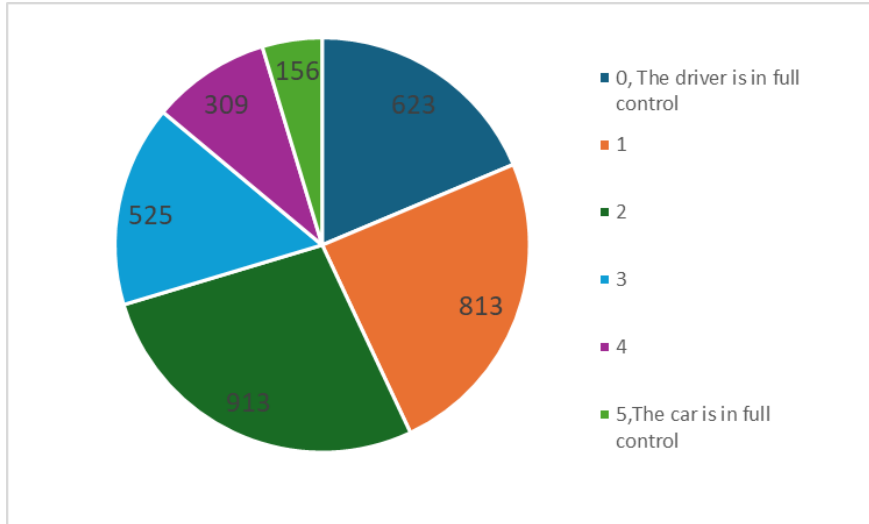


Figure 5

What self-driving mode would be supported

Figure 5 shows that the majority were interested in vehicles with a lower level of autonomy, only 6.1% were interested in fully autonomous vehicles, while 22.3% preferred to be able to regain control if needed. This is consistent with international findings that the majority are not yet ready to use self-driving cars.

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
What is your gender?		43,714	.000	-2,331	3304	.020
How old are You?	*	31,006	.000	,356	3337	,722
In which country do You live in?	*	31,783	.000	-3,869	3337	.000
Where do You currently live?	*	55,765	.000	-3,243	3337	.001
What is your highest education?	*	21,540	.000	-2,355	3337	.019
In what level are You currently studying at?	*	35,801	.000	-9,647	3337	.000
Are You working right now?	*	,241	,624	-.258	3337	,796

* Equal variances assumed

Table 1

Levene's test for equality of variance

The results in Table 1 show that there are significant differences in both variances and means for most of the variables examined. The exceptions are age and employment, where no significant differences in means were found. The results of the Levene's test and the two-sample t-test may be important for further analysis and inference, in particular for identifying and interpreting differences between groups.

	number of	number of supporter	difference of means		standard error	differences 95% confidence interval		
			mean of opponents	mean of supporters		Lower	Upper	
What is your gender?	457,000	2849,000	1,438	1,496	-,059	,025	-,108	-,009
How old are You?	465,000	2874,000	25,370	25,225	,145	,407	-,653	,944
In which country do You live in?	465,000	2874,000	10,634	12,093	-,1458	,377	-,2197	-,719
Where do You currently live?	465,000	2874,000	2,183	2,371	-,188	,058	-,302	-,075
What is your highest education?	465,000	2874,000	3,131	3,295	-,164	,070	-,300	-,027
In what level are You currently studying at?	465,000	2874,000	4,135	4,779	-,643	,067	-,774	-,512
Are You working right now?	465,000	2874,000	,542	,548	-,006	,025	-,055	,042

Table 2

Differences between demographic variables and support for the introduction of self-driving cars

Table 2 details the difference in means, standard error and confidence intervals of the differences between opponents and supporters. The results show significant differences for a number of variables, providing important insights for understanding differences between groups.

Correlations										
		Support of selfdriving cars	What is your gender?	How old are You?	In which country do You live in?	Where do You currently live?	What is your highest education?	In what level are You currently studying at?	Are You working right now?	
Spearman's rho	Support of selfdriving cars	Correlation Coefficient	1,000	-,082	,055	-,098	-,035	,065	-,113	,002
		Sig. (2-tailed)		,000	,001	,000	,043	,000	,000	,923
		N	3339	3306	3339	3339	3339	3339	3339	3339
	What is your gender?	Correlation Coefficient	-,082	1,000	,045	,038	,021	,023	,097	,036
		Sig. (2-tailed)	,000		,009	,027	,231	,181	,000	,040
		N	3306	3306	3306	3306	3306	3306	3306	3306
	How old are You?	Correlation Coefficient	,055	,045	1,000	,102	,033	,485	,174	,280
		Sig. (2-tailed)	,001	,009		,000	,054	,000	,000	,000
		N	3339	3306	3339	3339	3339	3339	3339	3339
	In which country do You live in?	Correlation Coefficient	-,098	,038	,102	1,000	,026	-,034	,096	,081
	Sig. (2-tailed)	,000	,027	,000		,132	,047	,000	,000	
	N	3339	3306	3339	3339	3339	3339	3339	3339	
Where do You currently live?	Correlation Coefficient	-,035	,021	,033	,026	1,000	,013	,012	-,067	
	Sig. (2-tailed)	,043	,231	,054	,132		,457	,477	,000	
	N	3339	3306	3339	3339	3339	3339	3339	3339	
What is your highest education?	Correlation Coefficient	,065	,023	,485	-,034	,013	1,000	,111	,185	
	Sig. (2-tailed)	,000	,181	,000	,047	,457		,000	,000	
	N	3339	3306	3339	3339	3339	3339	3339	3339	
In what level are You currently studying at?	Correlation Coefficient	-,113	,097	,174	,096	,012	,111	1,000	,003	
	Sig. (2-tailed)	,000	,000	,000	,000	,477	,000		,884	
	N	3339	3306	3339	3339	3339	3339	3339	3339	
Are You working right now?	Correlation Coefficient	,002	,036	,280	,081	-,067	,185	,003	1,000	
	Sig. (2-tailed)	,923	,040	,000	,000	,000	,000	,884		
	N	3339	3306	3339	3339	3339	3339	3339	3339	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 3

Correlation table

The data in the table confirms that certain demographic and socio-economic variables such as gender, country, place of residence, education and current education can have a significant impact on the question under consideration. Age

and employment did not show significant differences, suggesting that these factors are less relevant. These results may be important for policy, economic and educational decision making as they can help identify groups that need more attention. The results of the analysis show that although certain demographic variables such as gender, age, country, education and current education have a significant effect on the support for the introduction of self-driving cars, the correlations are generally weak. This suggests that although there are small differences between different demographic groups, these differences are not significant. The only demographic variable that does not affect support at all is employment status. These results suggest that support for the introduction of self-driving cars is influenced by a number of factors, but the effect of demographic variables is relatively small.

Summary

In my article, I showed that although self-driving vehicles are becoming more common in transport, their private use remains limited. Despite advanced technology and the growing number of semi-autonomous vehicles, public acceptance is still low, especially among women. In my research, I analysed the impact of demographic variables on support for the adoption of self-driving cars. The results of the research show that although several demographic factors (such as gender, country, current place of residence, educational attainment and current education) significantly influence support for self-driving cars, other factors such as age and employment did not show significant effects. These results may be important for manufacturers and policy makers who want to promote the uptake of self-driving vehicles, as they can help to understand and address the concerns and expectations of different groups.

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Differences in elements of safety culture between large domestic companies and SMEs

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Abstract: Within the concept of safety culture, the role and responsibility of companies is particularly important, as they have an impact on all aspects of sustainability, including social processes and environmental protection, in addition to their own safe operations. This requires organisations in which safety is both a priority and a value. The interdisciplinary nature of the field under study includes the study of the interaction between people and organisations and the interrelationship between the disciplines of organisational behaviour. The main objective of my research is to investigate and analyse the perceptions, attitudes and motivations based on value preferences of employees of companies operating in Hungary in relation to organisational safety and to identify the elements of safety culture that are specific to the company. My main research question is what cultural factors influence the safe functioning of an organisation. In this article, I present the main differences based on the variables of the large company vs. SME category

Keywords: elements of organizational safety culture, SMEs, large corporations, value preferences, organizational behaviour, applied psychology

1 Defining a safety culture

The concept of safety culture was first raised in the investigation into the causes of the Chernobyl disaster in 1986. Experts from the International Atomic Energy Agency's International Nuclear Safety Advisory Group analysed the disaster and concluded that the events could not be attributed solely to human error, technology or the socio-technical system. The identified cause was a set of organisational and management factors, which they identified as safety culture [1]. The studies showed that technology alone or human activities alone can no longer be interpreted as capable of causing accidents, but that deep layers of corporate functioning (e.g. value preferences, beliefs, attitudes, identity, etc.) must be considered in their interaction.) The first definition was also formulated at this time by the IAEA Advisory Committee on the Safety of Nuclear Installations study group on human factors (ACSNI): 'The safety culture of an organisation is the set of individual and group values, attitudes, perceptions, competencies, behaviours that define the organisation's commitment to, and style and management's competence in, health

and safety'. [2] The cultural approach to corporate safety is thus chronologically linked to the nuclear industry and the high-risk industry, but it now has a role in all sectors and research is therefore essential.

Further concepts of safety culture are largely derived from definitions of organisational culture used in social and management science. Antonsen [3], for example, considers safety culture as a conceptual label that denotes the relationship between culture and safety. Some research suggests that safety culture is an expression or manifestation of a particular organizational culture, which is then crystallized in a safety management system [4]. Others emphasize that safety culture is a kind of organizational culture that is closely related to organizational culture, but that safety culture has its own identity. [5]

Summarising the different approaches, most researchers define safety culture as an aspect of an organisational culture that is specifically focused on safety [6], other authors define it as a subordinate or secondary element [7], or a sub-dimension [8] or subset [9], referring to health and safety factors and characteristics related to employee functions [10].

2 Elements of a safety culture

In the literature, several authors propose different models to capture the safety culture, its main characteristics and measurable indicators, thus identifying the components of a safety culture. In my research, the questions (core variables) included in the theory-based questionnaire I constructed are composed of items derived from relevant organisational culture and safety culture models. Among these, I present the elements of the models related to the research result extracted for large companies vs. SMEs.

2.1 Reason model

Reason [11] defines a safety culture as one characterised by "chronic anxiety" and the maintenance of awareness and vigilance about potential health and safety hazards. One of the most influential models underpinning the theoretical background of safety culture, it emphasises the co-existence of four closely interrelated elements to achieve effective organisational safety. The elements are

(1) a reporting culture, (2) a just culture, (3) an adaptive culture and (4) a learning culture.

The culture of reporting is that minor failures and near misses are seen by organisations with a functioning safety culture as a symptom that can be used to avoid more serious incidents. Accordingly, it is important that all 'lessons learned' incidents are reported, investigated and evaluated. In other words, this is a "Don't

sweep it under the carpet" culture, for which an atmosphere of trust, acceptance, good faith, communication without fear of retaliation, constructiveness and a "more important to know than to punish" attitude are essential.

A just culture means that the reporting of safety concerns and problems is open and encouraged [12]. It involves the leader "hearing the 'bad' news and reports of problems and rewarding them to promote resolution, so that members of the organization are empowered to help intervene, change and improve safety problems [13]. A culture of justice accepts and acknowledges that unintentional human errors will occur, [14] and therefore a culture needs to be developed where work is conducted in a non-punitive environment and the disclosure of information will not have a negative impact on employees' career progression or career prospects. In addition, a culture of fairness is the extent to which reporting of errors, safety concerns and problems is open and encouraged, based on the recognition that 'honest', unintentional human errors will occur. A culture of fairness implies that reporting of problems is rewarded by management and that all members of the organization are empowered to help intervene, change and correct the problem that has developed. For this to work, there needs to be a high level of trust: employees are 'operating in a non-punitive environment', they are aware that disclosing information will not have a negative impact on their careers, job prospects or mean they will be 'disloyal to colleagues, bosses or organisation' [15], and there is a confidential reporting system that not only enables but encourages all members of the organisation to disclose errors or safety hazards. Such a culture is characterised by fairness, acceptance and investigation without blame. My empirical studies have shown that safety managers are aware of the risks of the lack of a just culture when they say that in Hungary the social embeddedness hinders the functioning of the just culture and its integration into the organisational (safety) culture, because the "hierarchy gradient" (see power distance index) is too high, which results in a "we dare not speak out" attitude. The commitment of security area managers is decisive, but not enough in itself. For a culture of fairness to work, a declared organisational safety policy must be developed and the possibility of anonymous reporting must be ensured, with the basic attitude that "we are looking for a systemic failure, not a human being". The primary research has shown, among other things, that Hungarian companies still have much to improve in both the systems approach and the culture of error.

A resilient culture is the lack of rigidity in decision-making within the organisation and the increasing need to review its response to production pressures for increased security. The degree of freedom in making decisions at different organisational and individual levels, with safety as a priority, can also be seen as an indicator of the adaptability of the system. [16] In addition, the availability of "contingency resources", such as materials, planning-oriented resources, or additional time for people to respond, allows the organisation to cope with unforeseen problems, to react quickly when unknown disturbances occur [17]. Resilience allows the organisation to cope with unforeseen problems or to respond quickly to disruptions,

and the norms and rules themselves allow for a flexible approach and decentralised decision-making. The basis for this is that senior management sees security as a core value of the organisation to which it is committed. This commitment is reflected in a sustained and positive attitude of management at the level of communication and practice: (a) consistently emphasising the importance of safety, (b) prioritising safety over production in all situations, (c) ensuring adequate resources for the implementation of safety standards and activities, (d) actively promoting safety at all levels within the organisation.

A learning culture is concerned with whether an organisation reacts to unexpected, undesirable events with denial, correction or genuine reform, and how it manages and resolves safety problems. It is also important that the organisation 'does not rest on its laurels' and that past successes are not seen as a guarantee of future success [13]. Safety incidents should be signaled throughout the organisation, 'lessons learned from incidents and other events should be treated seriously' and feedback given at all levels of the organisation. It must also ensure that discussions about safety and risk continue to take place, even if, for example, no accidents are experienced. In addition, it is important that the different organisational safety subcultures are different, because too much homogeneity can have a negative impact on organisational learning, which means that each subculture needs to recognise its own role in how it can contribute to safety, and in a way that interacts appropriately with the other participants.

2.2 Westrum model [18]

This concept raises the question of who in the organisation manages security information and responsibility. Accordingly, it defines three types: (1) pathological, (2) bureaucratic, (3) evolving culture. For example, that security information is actively sought (evolving) or rather concealed (pathological), that responsibility is shirked in case of failure (pathological) or shared and learned from (evolving), that new ideas are only disruptive and therefore regulated (bureaucratic), or that innovation in security solutions is encouraged (evolving).

2.3 McKinsey's 7S model

This model [19] classifies the elements of organisational culture into two groups. The "hard" elements belong to the regulatory framework of the organisation. E.g. strategy, organisational structure, management tools, production systems, etc. These dimensions are governed by the principles of economic utility, efficiency, technological necessity and practicality.

By contrast, the "soft" elements are harder to capture and are often not quantifiable, but their importance is equally crucial in shaping organisational culture. They include, for example, elements such as skills, workforce, (management) style, the

skills, explicit and implicit knowledge, training, skills of employees and managers, and the values and norms of the organisation. In the case of safety culture, the core values are commitment, awareness and a 'safety first' approach.

Based on this model, the elements of a safety culture can be divided along similar lines:

- hard elements: regulatory framework, laws, directives, legislation, standards, control strategies, security governance, methods, management, strategy, IT systems, security specialised systems, quality assurance systems, etc.
- soft elements: organisational behavioural factors, attitudes, safety awareness interventions, methods, education, training, sensitisation, values, etc.

2.4 Schwartz's value dimensions model

According to Schwartz [20], the different value dimensions are organized into ten value classes along two major value axes. The idea of the theory is that a validated value test can be used to identify and rank people's value preferences and by aggregating these at different scales, value systems of different cultures can be described and compared. The 10 universal values are also relevant for the security culture: (1) power, (self-actualization), (2) achievement, (self-actualization), (3) benevolence, altruism (self-enhancement), (4) universalism, (self-enhancement),

(5) conformity, (conservation), (6) tradition, (conservation), (7) security, (conservation), (8) self-reliance, (openness to change), (9) stimulation, risk-taking, (openness to change), (10) hedonism.

3 Description of the primary research

3.1 Organisations involved in the research

In connection with the safety culture survey, I contacted 41 organisations (sectors: security, defence, services, energy, transport, IT, consultancy, trade, infocommunications, pharmaceuticals, chemicals). I conducted a questionnaire survey in 8 companies (security, defence, services, trade, transport, energy, nuclear). 301 employees completed the questionnaire, of which 280 were assessable. Respondents were purposively surveyed using an expert sampling procedure.

3.2 Research questionnaire

In the course of my research, I developed a self-designed questionnaire consisting of 45 items, which includes attitudes, motivations, values, and elements and characteristics related to safety, as formulated in the safety culture models. My measurement instrument asks about the organisational reality as perceived by employees, focusing primarily on organisational behaviour. Respondents were asked to rate the extent to which the statements in the questionnaire were

representative of their own and the company's operations, using a 7-point Likert scale.

3.3 Sample characteristics

Of the questionnaires that could be evaluated (N=280), 70.4% were completed by employees of large companies (64.6% public) 197, the remaining participants (83 employees) work in the SME sector, of which 41.1% (N=113) are in managerial and 57.9% (N=162) in non-managerial positions. (Five questionnaires did not have an evaluable answer to this question.) The companies surveyed are characterised by a Hungarian ownership background (85.4%) and a German ownership background (14.6%). The demographic distribution of respondents is as follows: the largest proportion (63.8%) belongs to Generation X, followed in descending order by Generation Y (30.1%), Baby Boomers (5.1%) and Generation Z (1.1%). 91.1% of the survey respondents work in the field of security, while 8.9% of the demographic question indicated a non-security related occupational field. In this quantitative research, statistical analysis was conducted using SPSS 20 software. The comparative analyses sought to answer, among other questions, whether there is a significant difference between the security culture characteristics of domestic large companies and SMEs and, if so, which elements differ most.

4 Correlation test with T-test

4.1 Category variables by size of organisation: SME vs large enterprise

In the statistical analyses, I examined for which variables there is a significant difference between the subgroups I have defined. For the analyses, I used the following categories of variables:

(1) Ownership background: Hungarian / German, (2) Company size: SME / large company, (3) Owner: private / public, (4) Hierarchy: manager / subordinate, (5) Company security area: security / defence

In this article, I present the results obtained on the basis of the variables in the large enterprise, SME category, which are summarised in the tables below.

	SMEs (n=83)		Large company (n=197)		Level of significance of difference
	mean	deviation	mean	deviation	
You are familiar with the Organisation's security policy.	3,82	1,761	4,26	1,723	0,054
Safety instructions, standards and documents are appropriate and up to date.	3,72	1,603	4,45	1,364	0
Security depends on standards and the regulatory system.	4,02	1,689	4,04	1,353	0,956
The Organisation spends enough to increase safety.	3,55	1,540	4,14	1,339	0,002
Your priority is to earn a lot of money with the Company.	4,23	1,140	4,29	1,243	0,68
Safety is a value.	5,18	1,261	5,26	,954	0,547
It is important to work in safe conditions.	5,49	,802	5,53	,773	0,74
The security standards, regulations and technology used in the Organization are consistent.	3,78	1,415	4,20	1,245	0,014
At the root of the errors are organisational process problems.	3,53	1,501	3,35	1,371	0,322
Workplace conditions contribute to errors.	3,59	1,554	3,58	1,578	0,974
Your managers will occasionally make you aware of the Organisation's safety.	3,35	1,817	4,24	1,542	0
You apply the guidelines set out in the Organisation's security policy in your daily work.	4,33	1,586	4,60	1,416	0,148
Security standards are reported to the Organisation.	3,67	1,740	4,23	1,636	0,012
Safety training contributes to the achievement of the Organization's security objectives.	4,36	1,722	4,68	1,259	0,13
Safety is everyone's responsibility.	5,19	1,477	5,42	,909	0,203

A risk, a "safety gap", if the Organisation is not able to learn from its mistakes.	5,13	1,187	5,37	,950	0,075
An inadequately trained worker contributes to errors.	5,47	,846	5,37	,880	0,36
You can learn company security rules and applications, but there are not always ready-made guidelines for dealing with uncertain and unexpected situations.	4,55	1,318	4,32	1,405	0,195
At all levels of the organisation, they are actively seeking solutions to ensure safe operations.	3,65	1,573	4,11	1,364	0,015
You are expected to follow the rules "blindly".	3,96	1,427	3,62	1,640	0,078

Table 1.

Summary table for SME and Large Enterprise categories (with 1-20 basic variables), values in red indicate significantly higher values for large enterprises

	SMEs (n=83)		Large company (n=197)		Level of significance of difference
	mean	deviation	mean	deviation	
You are conscious about safety.	4,29	1,534	4,44	1,461	0,426
are characterised by your concern for the safety of others.	5,36	,820	5,16	,990	0,099
He strongly believes that people should protect their environment. Preventing environmental risks is a priority.	5,19	,943	5,22	1,034	0,847
People working in your environment follow safety procedures even if their supervisor cannot check.	4,04	1,452	4,44	1,203	0,017
Perceives the risk if errors are not treated fairly.	4,89	1,334	4,88	1,161	0,958
Individual personality traits and characteristics affect safety.	4,86	1,128	4,64	1,168	0,155
Human error is influenced by an individual's lack of motivation and preparedness.	5,25	,809	5,07	1,127	0,184

It's important for you to be modest and understated. You try to work in a way that doesn't distract others from your safety.	3,66	1,720	4,24	1,393	0,007
It is important for you to be respected by others. You want them to do what you say when the situation is uncertain.	4,23	1,434	4,24	1,317	0,928
It is important for you to come up with solutions when you encounter a security problem.	4,76	1,164	4,24	1,475	0,002
It's important to feel good about yourself, even if it creates uncertainty.	2,04	1,663	2,66	1,611	0,004
I have the autonomy to decide how to solve security problems.	2,58	1,768	2,36	1,815	0,356
I am adventurous and likes to take risks.	1,89	1,593	2,28	1,709	0,077
It's important for you to demonstrate ability to deal with organisational issues related to security.	3,84	1,573	3,55	1,621	0,159
In case of danger, all the conditions (human, technical) are available to remedy the fault.	3,49	1,565	4,16	1,361	0,001
It is typical to get help to solve a safety problem.	4,16	1,604	4,42	1,425	0,181
Management is committed and does its utmost to ensure safety.	4,13	1,629	4,50	1,391	0,055
Risks are increased by power differences within the organisation.	3,60	1,814	3,52	1,753	0,708
Information about security is shared within your Organisation.	3,58	1,815	4,43	1,464	0
Do you think it is typical for members of the organisation to work together to solve security problems, they prefer to help others.	3,93	1,621	4,51	1,231	0,004
It is important that all workers are treated equally when it comes to safety.	5,06	1,075	5,09	1,960	0,839
Honest disclosure of undesirable security incidents is rewarded, and the organisation's remuneration system includes appropriate management of	5,47	1,801	5,47	1,878	0,98
	2,34	1,823	3,14	1,825	0,001

security incidents.					
Factors outside the Organisation (social, economic, political, press, public opinion, authorities, etc.) have a strong influence on safety.	3,34	1,734	3,73	1,550	0,06
It influences risks if the Organisation is flexible and able to adapt to the external and internal environment.	4,05	1,962	4,50	1,369	0,057

Table 2.

Summary table for SME and Large Enterprise categories (with 21-45 basic variables), values in red indicate significantly higher values for large enterprises

In the case of large corporate culture, soft elements of organisational security are significantly more prevalent than in SMEs. These include safety awareness at management level towards employees, proactive behaviour towards safety at all levels of the company, compliance with rules, a safety-conscious attitude, modesty and restraint, which is part of the value dimension of conservation, information sharing, including honest disclosure of adverse events and cooperation for safety. In summary, therefore, the elements of a culture of development, learning, justice and meaning. The perceptions of the respondents suggest that the underlying causes of human error are organisational culture, non-compliance with formal rules, regulations and standards, and the area and circumstances of work. Among the hard culture elements, it is perceived that instructions, standards and documents related to safety are up to date, that they are in line with the technology used and that all conditions are in place to prevent errors in case of danger. Workers in a large company environment perceive that the organisation spends enough to increase safety and that managers not only make safety standards known but also hold them accountable. Thus, according to Westrum's model, bureaucratic culture plays a role in addition to development. In addition, uncertainty avoidance means that secure solutions are sought at all levels of the organisation. At the same time, employees also consider the value dimension of hedonism to be important, so it is an essential aspect to feel good about oneself, even if this may create uncertainty. However, this result raises further questions which are not covered by this research.

In the case of large companies, therefore, safety preservation and risk reduction are determined by (1) a safe organisational environment, (2) responsible, committed behaviour and (3) safe operating rules. To maintain these three pillars, it is necessary

to increase security awareness, which, in addition to training, means organisational learning, including the operation of a culture of reporting and fairness, i.e. honest disclosure of security incidents and sharing of information, which presupposes the presence of trust in the organisation. Learning is therefore at the heart of this development, closely linked to management commitment and responsibility for security, proactivity at all levels of the organisation, consistency of standards and technology, and the financial resources to achieve this.

In contrast, the SME sector shows significantly higher scores on the dimensions of autonomy and openness to change, which mainly means that workers consider it important to find new solutions to solve security problems. There are also significantly higher values for actively seeking good solutions (innovation) for safety, or being cooperative in preventing mistakes, and altruism (looking out for the safety of others). Thus, the most important characteristics of SMEs are attitudes at the individual level, mainly helpful, supportive and cooperative behaviour (goodwill and altruism value dimensions). In addition, employees believe that it is mainly personality traits, individual characteristics, motivation and preparedness that determine organisational safety and that human error depends on organisational culture. Compared to large companies, uncertainty avoidance is high in private firms, with respondents' perceptions showing that they are expected to follow rules "blindly", while for employees here, the ability to make decisions autonomously to solve safety problems is also an important aspect.

Summary, conclusion

Overall, it can be concluded that the elements of the security culture of the large companies and SMEs operating in Hungary that participated in the present study differ significantly. While in the case of large enterprises, a strong emphasis is placed on safety-conscious attitudes, compliance, information sharing (soft elements), and the up-to-date existence and operation of safety-related instructions, standards and documents in the organisations (hard elements), in the case of SMEs, the importance is attached to actively seeking good solutions for safety at the individual level, the role of cooperative, altruistic behaviour and individual personality characteristics in relation to safety. This is due to the smaller size, flatter organisational structure and greater flexibility of the SMEs surveyed. The results also point out that a common feature of both types of companies is that employees perceive the existence of soft elements rather than regulatory systems as the main factor in the safety of their company.

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Rethinking of the Value Chain model

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Abstract: Industry 4.0 solutions have fundamentally transformed the value creation processes of business organisations. By enabling IT processes, and thus automated high-precision data collection, the functions performed by business organisations, the way in which various business processes are carried out and the architecture of the calibre and ICT infrastructure used have been fundamentally changed. Thus, in these farming organisations, real economic and IT (partly virtual) processes are integrated and inseparable. Drawing on Porter's value chain, I will examine how these results have induced changes in the life of the business organisations. The result is a modified version of Porter's value chain model that provides a unified assessment of the functioning of business organisations that apply Industry 3.0 and Industry 4.0 technologies.

Keywords: Value Chain model, Industry 4.0, digital tranformation)

1 Introduction

When we consider the impact of the evolution of IT infrastructure services on business organisations, we often make the misconception that we are looking at a radical shift from Industry 3.0 to Industry 4.0 [1]. We do this because comparing the two eras reveals the well-known significant distinct features, so that their impact can be easily examined. (Regretfully, few authors get to the point of identifying the transition period [2].) This has the inconvenience of presenting the process of what is commonly referred to as 'digital transformation' with a simple narrative. As a result, it is harder to articulate why the development of the informatics infrastructure has had such an ambivalent impact on the operations and structure of profit-driven organisations.

If we focus on the period from the 1960s to the turn of the millennium, which is marked by the term "Industry 3.0", we can conclude that by the end of the era, the various enterprise management systems were aiming to cover the entire range of corporate activities [30]. In principle, these solutions made it possible to support the IT support of organisational operations, preferably with a single large system. These integrated systems were based on a more financial approach, but for those organisations with significant fixed assets (e.g. production lines), there was a need to operate systems that would optimise the organisation's operations by optimising strategies for the life cycle of fixed assets and the investment and work organisation decisions that were taken instead [4-5]. The proliferation of computer-aided design (CAD) and production management (CAM) solutions has begun to radically transform the enterprise value creation process through automated operations that minimise the need for human intervention [3], but these too can be seen as isolated solutions [6]. Industry 3.0 has focused primarily on automation within plants, substituting machines and computers for human labour to optimise production lines. The aim was to improve both productivity and efficiency

Prior to the turn of the millennium, the spread of TCP/IP-based networks made B2B and B2C transactions more efficient, and the spread of the TCP/IP-based Internet and the http protocol and its web-based technologies allowed the various custom EDI solutions to be replaced by vendor-independent standardised B2B solutions, usually based on XML. This opened up the possibility of integrating the supply chains of different market actors [7] and of automating the purchase transactions. Technological developments since the early 2000s have blurred the sharp boundaries (legal and geographical) between the different business partners, and human intervention is no longer always required to carry out certain transactions. As a result of these developments, companies that follow "classic value creation processes" are increasingly digitising their business processes. At the same time, business models have emerged that have introduced purely online-based products and/or services [8]. The development of communication networks across the spectrum of services - and not just the internet - has made it possible to integrate supply chains within a sector, formed by companies (often in competition with each other) that need to cooperate with each other. Two examples of this are the financial services and civil aviation industries, where integrated and interoperable supply chains had already emerged before the dawn of the Industry 4.0 era discussed in this article [9-10]. Technological advances since the early 2000s have blurred the sharp boundaries (legal and geographical) between the different parties to a transaction, and human intervention is no longer always required to complete certain transactions. As a result of these developments, companies that follow "classic value creation processes" are increasingly digitising their business processes. (This development was also somewhat reversed by the bursting of the dot-com bubble, which can be seen as a failed attempt to transition between the era of Industry 3.0 and Industry 4.0 [11])

Almost all publications agree that the automated, sometimes IT-supported, production process in Industry 3.0 is undergoing a fundamental architectural change in the course of digital transformation. This will enable production to be monitored with much greater frequency and much more accurate sampling, automated decision-making and decision validation through automated control. Production equipment capable of exchanging and receiving IT data and control data can be organised into a single system, but M2M, i.e. peer-to-peer machine-to-machine communication and autonomous decision-making, can make this ICT infrastructure partially or entirely decentralised. It should be stressed that this change is not only affecting formerly technology-intensive industries, but is permeating almost all segments of the economy. When we answer the question of how this transformation is taking place, we are confronted with the fact that it involves a multi-technology group. Without being exhaustive, the technologies related to Industry 4.0 include [12-13]: IoT devices, cloud computing, augmented reality, big data, artificial intelligence (AI), autonomous devices and vehicles [14-15]. If we look at the relevant qualitative research, we can see that indeed, there are significant differences in the uptake of these technologies. In this research, I will examine the issues of whether the Value Chain Model, which is the most common model of the structure and operation of business organisations, can and will reflect these changes, and which changes are required.

2 Methodology

The constantly evolving range of IT solutions and the ever-intensifying scientific clarification of the question of how for-profit organisations the role of these solutions in the life of a profit organisation. This analysis is based on the value chain model developed by Michael Porter [16]. Since the author of the model has not changed his model despite technological and economic developments in the meantime [17], I will examine how other authors have adapted the value chain model and, based on my experience, propose a unified model in which both Industry 3.0 and Industry 4.0 technology-systemising business organisations can be interpreted and analysed.

3 The Value Chain model

The original version of the value chain model [16-17], created by Michale Porter, is shown in Figure 1:



Figure 2.
The Value Chain model (source [16-17])

The following observations can be made with regard to the value chain model and its unchanged form:

- The model only considers the classical value creation process. It does not reflect the digital value creation process mentioned earlier and, as a consequence, it cannot deal with hybrid solutions [18].
- On the one hand, the logic of the model assumes that acquisition takes place in some form, that transformation takes place, but that the buyers are in any case end-users. In practice, this model does not distinguish between B2B and B2C marketing activities, nor is it prepared for the fact that solutions rather than products are sold to end-users: it is difficult to understand the sectoral cooperation. [19]
- The model does not make a distinction between material and information flows. This is worth highlighting because the importance of information sharing in pull supply chains is well known [20].
- It is not made clear at which stage of technological development (Industry 3.0 vs 4.0) each part is. Consequently, neither the automation of the processing of the data generated in the production process nor the automation of the processing of the data generated in the production process can be identified [1].
- The model treats the infrastructure underlying the company's operations as a whole. It ignores the significance of the split between the infrastructure managed by business organisations into classical and IT infrastructure, and the integration of a new actor in the role of the operator into the life of the enterprise with the spread of cloud-based solutions [21].

The model presented in the following chapters aims to address these problematic issues.

4 The proposed model

The proposed model is presented in Figure 2:

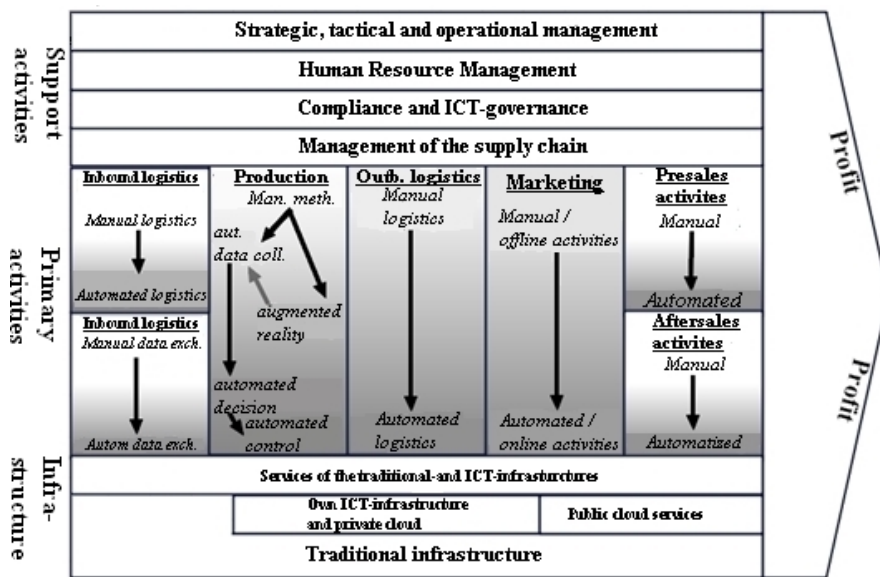


Figure 3.

The proposed model (Source: [22])

Since Industry 4.0 solutions have first and foremost transformed the value-creating (primary) processes of the farmer organisations, I will first examine the steps of these processes and complement them with the lessons learned from the review of the preparation models, which are complemented by the theory of vertical and horizontal integration that Industry 4.0 has developed [23]. Subsequently, and in light of this, I will examine the different parts of the supporting activities.

Inbound logistics: in the original model, this was understood as the purchase of all inputs that the business entity obtains in the process of creating value. This is the point at which suppliers come into contact with the entity and is considered the boundary of the taxonomy unit. This remains the case in the revised model, but it is necessary to go into more detail in several respects. - The strategic importance of customer-supplier relationships is paramount in the era of Industry 4.0, i.e. turnover is slowing down and there is a need to automate operational processes. That is, from

the perspective of a company, the question is whether it can generate data automatically and transfer it to its supplier partner in an automated way [24].

Operation: by definition, this is the area that has been radically transformed by the Industry 4.0 mega-solutions. Regardless of whether we are looking at the production of tangible and/or intangible products/services, there are several aspects to keep in mind: advances in sensor technology and the related mindsets of ICT infrastructure (e.g. data transmission) have made it possible to capture the data generated in value creation processes more frequently and accurately than was previously the case (i.e. manually, with human intervention). Advances in information technology have enabled automated decision making, usually based on artificial intelligence (AI) (even if the use of AI today raises ethical questions.) The fact that decision making can be performed autonomously in the production tool and can take place in the 'centre' of a centralised ICT infrastructure, on servers, makes it difficult to manage AI-based unified models. Finally, a word about control. This can be done manually, semi-manually (decision is made automatically but requires human approval), or automatically (centralised or non-centralised).

Outbond logistics: the key point of outbond logistics is that it integrates the role of another actor, the transport partner, in cases where the transport is outside the responsibility of the entity under consideration. Whether the relationship is B2B or B2C, real-time or at least quasi-real-time data reporting is expected. Therefore, not only the contractual delivery of the product is expected, but also in many cases data on the circumstances of the transport, which is provided by an external partner performing the forwarding tasks.

Marketing and sales: the main question in this section is the ability to integrate external and internal data into marketing activities and to use data mining and artificial intelligence solutions (recommendation systems, churn analysis, other predictive techniques) for marketing purposes.

Operations: includes activities directly related to the sale of a product (e.g. customer service). The service itself can be broken down into two parts: these are services during delivery and services after delivery. Services during delivery are firstly related to Outbound logistics and Marketing and sales. Post-delivery services are more complex, as they include a range of additional online services, online administration (e.g. in case of warranty), this part can even go back to the "Production" function.

After the overview of the primary activity, the analysis of the supporting activities follows: in my proposed model, the range of supporting activities has undergone a significant change. Corporate infrastructure has been removed from this scope and is a new category, the reasons for which will be discussed later.

Strategic, tactical and operational management: this replaced the former "business infrastructure" activity. This category includes all corporate management functions, i.e. all management activities that do not affect other areas of responsibility covered

by the supporting activity, from the design of the organisational hierarchy to accounting controls. These are mandatory functions and should therefore be included in the revised model.

Human Resources Management: this activity remains autonomous (and not integrated into the previous activity) because, although Industry 4.0 technologies may trigger human work through automation, there may be an increased demand for knowledge from employees, which will probably need to be updated more frequently than in the past [25]. As a result, human resource management will have to deal with more sophisticated, controlling activities than before [26].

Compliance and IT-Governance: the main characteristic of Industry 4.0, as I pointed out in the introduction, is that the physical environment and IT (information) systems are symbiotic entities. This situation is complicated by the fact that with cloud-based solutions, the ICT infrastructure used by the business organisation is (at least partially) outside the control of the business organisation in terms of operation, but the user bears the operational risks. In the proposed model, this category includes all ICT Governance, IT Management and Compliance dimensions [23].

Supply chain management: this activity has replaced procurement. This was necessary because several authors have argued that supply chains are becoming more integrated and it is becoming more common for an entity to pay more attention than before not only to buying/selling but also to working with other market partners [1, 2, 8]

In the version of the value chain model I have revised, infrastructure has become a separate activity, consisting of three parts: own physical infrastructure, own ICT infrastructure and some (partial) ICT infrastructure of the cloud service partner. I have considered it necessary to treat these three elements separately and in a coherent structure because these three elements provide the infrastructure framework for business organisations in the era of Industry 4.0

Conclusion

Two important properties of the model based on the theoretical derivation, summarized in Figure 2, are that the original value chain model can be made asymmetrically equivalent to the new model. Accordingly, each component of the original model can be uniquely assigned to one or more components of the new model. In this way, it has been possible to achieve a model that can be applied to enterprises using Industry 3.0 and Industry 4.0 generation technologies. This model can be interpreted in the same way for integration in classical, digital and hybrid supply chains. In this model, it is not a specific solution that has been identified directly, but the objectives and sub-objectives that could be achieved by applying each solution.

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Development Assessment of self-driving cars in developed and developing countries (UK, Hungary, Malaysia & Pakistan)

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Abstract: As Technology is increasing, human life and perception are also changing. Automotive industry is one of the major sector of technology revolution. This sector keeps attracting public and investors towards it by bringing advance technology in the form of self-driving cars. Developed countries are progressing in this area because researchers, investors, Governments and interlinked organizations are visioning something fruitful for the public, social, environmental and technology in the near future. These developments are also impacting on the developing countries to think about this technology system in the transportation system. Although, developing countries are far behind from this advancement. It also influences about the people conceptions and life style.

It is all depend on the country's economic, social, political and environment structure because they have limited resources, inconsistent legal and social norms. In the developed countries, they are facing advance technology, cyber security and public issue. In this research paper total no. of people are 310 who respond to the questionnaire. To know about the development in the self-driving cars, four countries (UK, Hungary, Malaysia, Pakistan) have been selected to do the study. To find the relationship among the dependent and independent variables, I have used descriptive statistics analysis and correlation matrix to prove hypothesis and what will be the current situation going on regarding the self-driving cars through this observation analysis. During the measurements of the relationship in the variables, I have found no relationship dependency in the variables.

1 Introduction

The perception of self-driving cars has been in progress for many years, but latest development in technology, specifically in artificial intelligence, sensor systems, Industry 4.0 and connectivity, have brought the concept in physical existence. According to the statistical data 94% accidents happened due to the human error during the driving. In 2022 Kislring, Nestico & Redick LLC, Automakers reported nearly 400 crashes of vehicles with partially automated driver-assist systems to the National Highway Traffic Safety Administration (NHTSA).

Sometime people are drunk in some countries, most of the countries followed zero tolerance against alcohol such as Hungary, Malaysia and Pakistan. Few of countries allowed to drink a glass of beer during the driving. Sometime people are tired and upset while driving. Countries, US, Germany, Japan, and China are mainly investing in the self-driving cars. This study also helps to assess level of preparedness where we are standing in this journey of self-driving cars mainly in UK, Hungary, Malaysia and Pakistan developed and developing countries respectively.

The size of the global market for autonomous vehicles was estimated at USD 121.78 billion in 2022 and is expected to reach USD 2,353.93 billion by 2032, growing at a projected CAGR of 35% from 2023 to 2032. The demand of Level 1 and 2 are increasing in the market which are the major caused to increase in the investment in level 4 and 5 of the self-driving cars. OEM plans to launch level3 semi-autonomous cars models and conduct testing of level 4 cars. This will take leap of growth in the car industry in the coming years. (Carlier, 2023). Currently, 20.3 million units are working in automotive industry. By 2030, 62.4 million units will be expected to function in the car industry at compound annual growth rate(CAGR) 13.3% in near future as per recent forecast period. Moreover, there are chances of shared mobility and growing partnership in the self-driving cars.

2 Assumptions

1. Relationships between age, gender, education, and nation with technology will be revealed by certain factors.
2. The relationship will give information on the difficulties and effects on the nations and their citizens.
3. The demographic section's features differ from nation to nation.
4. The steering, pedal, environmental decision-making, and wheel functions of the car will also be linked.

Problem 1. What are the factors contributed to prefer self-driving cars?

<i>Descriptive Statistics</i>	<i>afraid</i>	<i>buy</i>	<i>emission</i>	<i>society</i>	<i>redu_acci</i>	<i>love_try</i>	<i>sup_ini</i>
Expected Value	2.9226	3.1581	3.0194	3.0032	2.9355	3.3516	3.1387
Standard Error	0.0811	0.0788	0.0748	0.0780	0.0797	0.0780	0.0753
Median	3	3	3	3	3	3	3
Modus	1	4	3	3	1	5	3
Standard Deviation	1.4280	1.3879	1.3169	1.3736	1.4035	1.3732	1.3257
Relative Standard Deviation / Coefficient Variation	0.4886	0.4395	0.4362	0.4574	0.4781	0.4097	0.4224
Variance	2.0393	1.9264	1.7343	1.8867	1.9699	1.8857	1.7574
Skewness	-1.3528	-1.1936	-1.0535	-1.2101	-1.2872	-1.1382	-1.1010
Kurtosis	0.0565	-0.1906	-0.1128	0.0319	0.0093	-0.3058	-0.1479
Range	4	4	4	4	4	4	4
Relative Range	1.3687	1.2666	1.3248	1.3319	1.3626	1.1935	1.2744
Minimum	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5
Sum of Example	906	979	936	931	910	1039	973
Nr. Of Example	310	310	310	310	310	310	310
Confidence Level (95%)	0.1596	0.1551	0.1472	0.1535	0.1569	0.1535	0.1482

Firstly, People love to try new technology in self-driving cars as score is 3.3. Secondly, buying and support initialization of self- driving cars get 3.1 score, so it means that people will buy and are in the favor of self-driving cars. Thirdly, people will prefer self-driving cars due to environment protection and society change as per score show 3.0. Fourthly, afraid in the environment and less in accident get score 2.9. so, it means that people will not afraid of self-driving cars. In this data standard error is close to the zero which means that data of the population is true. It shows that mean of the population is true.

Problem 2. What are the impact of self-driving cars in the countries UK, Hungary, Malaysia and Pakistan?

<i>Descriptive Statistics</i>	<i>hackers</i>	<i>sys_brk_dn</i>	<i>cr_dciddf</i>	<i>6_B</i>	<i>prof.</i>	<i>C_not_gain</i>	<i>2_xpennsv</i>	<i>joy</i>	<i>Pers_data</i>
Expected Value	3.1581	3.1516	2.8968	2.8290	3.0968	3.0355	3.0742	2.9581	3.1032
Standard Error	0.0817	0.0803	0.0788	0.0754	0.0788	0.0769	0.0790	0.0789	0.0772
Median	3	3	3	3	3	3	3	3	3
Modus	5	5	3	3	3	3	2	3	3
Standard Deviation	1.4383	1.4141	1.3873	1.3268	1.3878	1.3541	1.3903	1.3893	1.3590
Relative Standard Deviation / Coefficient Variation	0.4554	0.4487	0.4789	0.4690	0.4481	0.4461	0.4523	0.4697	0.4379
Variance	2.0688	1.9996	1.9246	1.7603	1.9259	1.8337	1.9330	1.9303	1.8469
Skewness	-1.2984	-1.2657	-1.2225	-1.0924	1.2216	-1.1404	1.2636	1.2253	-1.1949
Kurtosis	-0.1285	-0.1395	0.0836	0.1583	0.0866	-0.0568	0.0171	0.0462	-0.0092
Range	4	4	4	4	4	4	4	4	4
Relative Range	1.2666	1.2692	1.3808	1.4139	1.2917	1.3177	1.3012	1.3522	1.2890
Minimum	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5
Sum of Example	979	977	898	877	960	941	953	917	962
Nr. Of Example	310	310	310	310	310	310	310	310	310

Confidence Level (95%)	0.1607	0.1580	0.1550	0.1483	0.1551	0.1513	0.1554	0.1553	0.1519
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This analysis of self-driving cars in UK, Hungary, Malaysia and Pakistan shows about the impact on the countries in the economic, social, technological and safety but more related with the technology factors.

Firstly, Technological impact: Hackers, system break down during the driving and personal data safety issue score 3.1, it means that this statement is more significant in the eye of the people.

Secondly, Economical impact: people think that car will be expensive and driving profession will get effected from these self-driving cars as per score indicated 3.0. skewness is positive due to positive value, curve is longer and fatter to the right side.

Thirdly, score get 2.8 to the social and security factor as people will be happy to use self-driving car. Kurtosis negative values in the security scenario means that more value located near the mean and less value located on the tail. In the social factor kortosis has positive values.

Problem 3. How are the demographic differences feature affects the self-driving cars?

<i>Descriptive Statistics</i>	<i>gender</i>	<i>age</i>	<i>country</i>	<i>live</i>	<i>HE</i>	<i>c_study</i>	<i>obst</i>	<i>C_Work</i>
Expected Value	1.1419	6.0161	3.6774	3.3839	4.4839	4.4387	4.3355	1.4129
Standard Error	0.0438	0.1028	0.0856	0.0783	0.1167	0.1182	0.1243	0.0384
Median	1	7	3	4	5	5	4	2
Modus	1	7	3	5	7	7	7	2
Standard Deviation	0.7712	1.8105	1.5070	1.3787	2.0554	2.0811	2.1879	0.6759
Relative Standard Deviation / Coefficient Variation	0.6753	0.3009	0.4098	0.4074	0.4584	0.4689	0.5046	0.4784
Variance	0.5947	3.2781	2.2710	1.9007	4.2247	4.3312	4.7868	0.4568
Skewness	-1.2788	0.3917	-0.9147	-1.0346	-1.2484	-1.1975	-1.4243	-0.5938

Kurtosis	- 0.249 5	- 1.440 1	0.823 8	- 0.408 8	- 0.177 1	- 0.2152	- 0.161 8	- 0.7245
Range	2	6	6	4	6	6	6	2
Relative Range	1.751 4	0.997 3	1.631 6	1.182 1	1.338 1	1.351 7	1.383 9	1.4155
Minimum	0	1	1	1	1	1	1	0
Maximum	2	7	7	5	7	7	7	2
Sum of Example	354	1865	1140	1049	1390	1376	1344	438
Nr. Of Example	310	310	310	310	310	310	310	310
Confidence Level (95%)	0.086 2	0.202 3	0.168 4	0.154 1	0.229 7	0.232 6	0.244 5	0.0755

Based on the data, age get more score 6 as compared to the other independent variable and then higher education, currently study level get score 4.4. After it, country and residing destination get 3.6 and 3.3 score.

Standard error is low which shows that there is no relationship between dependent variable of self-driving cars such as safety, technical, social and economic factor and independent variable like age, gender, country, education, working and obstacles.

So, it means that demographic feature does not effect on the other factors of self-driving cars.

3 Results and Discussion

			Nr.	Share
Relation type	Pearsons type correlation coefficient value	Relation type	Cases	
Independent	$-0,25 < \rho < 0,25$	Independent	621	98.57%
Stochastic	$-0,75 < \rho < -0,25$ or $0,25 < \rho < 0,75$	Stochastic	9	1.43%
Deterministic	$\rho < -0,75$ or $0,75 < \rho$	Deterministic	0	0.00%
Sum			630	100.00%

Overall, Variation is low. Variable are independent. To achieve the results, Pearson correlation is measured to analyze the demographic factors and other factors related with technology, safety and human preference.

In the case of demographic scenario, level of significance is low and relationship does not exist among the Independent variable gender, age, education, location, country and working and dependent variable such as safety aspects, technical features, economic and social factors of the car.

In the case preference and conception of the self-driving car's impact in the future, this study shows that more education is required, special attribute related to the self-driving car must be specific, condition of area to get specific result and special technical features related with specific consumer and location requirements. I think that Generalized study is challenging in this specific area of the self-driving cars. Unfortunately, there is no strong relationship among the variables, so we have to focus on some other alternative ways to get the required results. Although, self-driving cars bring convenient in the society and help the traffic jam in the rush and peak hours as there is heavy traffic load in the Berlin, London, Budapest, Lahore and Kualalumpur.

If self-driving cars are the future, Communication lamp or tower must be integrated in the infra-structure. Uber mode must be introduced, formal public transportation system eliminates, if consumer use ride-sharing or Uber cab for the mobility.

Conclusion

There is no significance interlinked among dependent and independent variables. So, more research required to analyze the factors. self-driving cars must be manufactured on specific area, person and technology need. There is some more specification needs to be address. It also shows that there is no specific direction regarding the further improvement of the self-driving cars.

Recommendations

The findings of this study are data efficiency of observation is required for safety and public reliance. Advance method of deep learning are required in lidar, radar and camera in the external and internal side of the cars. Visualizations and sound identification issue needs to be addressed properly for the safety and security of the passenger. Awareness and practical knowledge must be given to the people. Trust and reliability needs to be created among the people. Cost of the cars, Pool car system, the ride sharing must be economical.

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