LIETUVOS VERSLO KOLEGIJA
LITHUANIA BUSINESS UNIVERSITY OF APPLIED SCIENCES

VADYBA

2022 Nr. 1 (38)

Journal of Management

Klaipėda
2022

Turinys / Contents

EDITORIAL

"Journal of Management" is periodically published applied sciences journal by Lithuanian Business University of Applied Sciences. The journal is constantly publishing articles since 2002 and has gained significant experience and international recognition. This year the journal is celebrating its 20 years anniversary. It has been well renowned by foreign scientists and number of international scholars publishing continues to increase. Currently, 38th number of the journal is released to readers.

Editorial board of "Journal of management" seeks for published academic researches to cover different economic directions and to be relevant to different industries and countries around the world. At the same time, the focus remains on ongoing changes in various industries, human resources, and governance. Based on these criterions, articles are chosen for publication in the journal. Focusing on relevant areas of change is expected to encourage further scientific discourse and development of social science ideas.

The largest part of scientific articles are prepared by foreign researchers residing in different scientific institutions. This situation creates conditions for research from different perspectives in different fields of science. One of such researches is made by Ukrainian scientists Y. Us, T. Pimonenko, O. Lyulyov and E. Ziabina. Colleagues in this research analyse the main gaps in the scientific treatises with regards to country's green brands. Even though scholars agree that forming a strong brand is essential for national development, the literature review results shows that typically scholars investigate the green branding, mainly on the product or corporate level and not on country level. Therefore, mentioned study aims to assess how well the existing literature on country branding is explored from the perspective of green development. Extensive literature review has been made and obtained results revealed 545 papers in total, with 225 publications on green branding and 320 publications on country branding. The findings of bibliometric analysis show that the studies on green branding mainly address the corporate level. The green brand concept is investigated mostly regarding green brand attachment, green brand attitude, green brand image, green brand love, green brand trust, green loyalty, green satisfaction, green perceived risks, value, and environmental sustainability. Therefore, it indicates the necessity to expand research on the national level.

It is also worth mentioning other article by Slovak scientists P. Kováčová and O. Drahotský, where authors analyse interpersonal communication in retail. Authors discuss the importance of effective communication in the organization and its impact as being the basis for achieving the goals of the organization and motivating colleagues. However, authors identified the gap in the literature that does not focus on retail, when discussing the effectiveness of communication in an international retail organization. Research uses a questionnaire where respondents indicate answers on a Likert scale. Based on the research, it is possible to point out the strengths and weaknesses in the communication process between managers and subordinates. This paper shows how employees and managers communicate and their mutual satisfaction. The benefit of this research is seen for HR professionals, managers and scholars who may get an overview of the pros and cons of interpersonal communication based on results from a questionnaire focused on the way of communication at the company and between supervisor and his/her team and team members.

Another article in current Journal release scientists L.Mura, N. Fóthy and V. Pásztóová focus on state support for small and medium-sized enterprises in pandemic period, where they analyse evidence from Slovakia. As COVID-19 pandemic broke-out throughout the world, it had significant negative impact on whole world economy, but especially on the SME sector worldwide. Slovakia was no exception, as its' economy was also impacted by the pandemic. Therefore, this study is addressing the question to what extent the small and medium-sized enterprises in Slovakia utilized the subsidy schemes introduced by the state. Authors analyse relevant scientific literature and support the findings by in-depth look at the statistical findings.

However, Editorial cannot review all of the researches, therefore we encourage familiarizing with them in the Journal, which currently is under the indexing process with Scopus and WoS.

We invite scientists to actively publish in the Journal, share their research results and methodological insights. We expect for close cooperation.

Prof. Dr. (HP) Valentinas Navickas, Editor-in-Chief

COUNTRY'S GREEN BRAND: THE MAIN GAPS IN THE SCIENTIFIC TREATISES

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Abstract

Forming a strong brand is essential for national development. The country's brand gives the direction for its long-term economic growth, contributes to increment in assets value and the competitive advantages, attracts more investments, tourists, etc. In the view of growing concern on climate change, environmental protection issues boost its influence on worldwide decision-making processes. In turn, the scientific community has more decisive in their statement to create a unique and robust country's brand considering the green perspectives. However, the literature review results showed that the scholars investigate the green branding, mainly on the product or corporate level. Therefore, this study aims to assess how well the existing literature on country branding is explored from the perspective of green development. The research questions are as follows: 1) What are the main research directions in the scientific literature concerning the country's green branding? 2) How far has the country's green brand been investigated? 3) What research gap should be covered in the future? This study operated with the scientific documents published in the highly ranked scientific journals indexed in the Scopus database to answer the research questions. The study period covered 2000-2022 (until April 2022). The search for relevant publications was run by the keyword combinations "green brand", "country brand", and "nation brand" in the documents' titles, keywords, and abstracts. The boolean operator' OR' was used to include the papers specified at least with one keyword. The obtained results revealed 545 papers on the investigated topic (225 publications on green branding and 320 publications on country/nation branding). In the frame of investigation, the authors applied Scopus analytical tools to detect the publication dynamic of a designed sample of documents, identify the most engaged authors, and assess the contributions of the affiliations and countries. To build the networks of scientific collaboration worldwide and detect the main research streams in studies on country/nation green brands, the authors used the method of the low-dimensional visualization. This study selected the keywords with the greatest total link strengths based on the calculation of the total link strengths of the co-occurrence's links with other keywords. The counting method was full counting. The findings of bibliometric analysis confirmed that the studies on green branding mainly address the corporate level. The green brand concept is investigated mostly regarding green brand attachment, green brand attitude, green brand image, green brand love, green brand trust, green loyalty, green satisfaction, green perceived risks, value, and environmental sustainability. Therefore, it indicates the necessity to expand research on the national level. The main limitation of this study is operating with publications retrieved only from the Scopus database. However, the findings could be value-added for scholars investigating the country's green brand issues. The authors consider the obtained results to be a starting point for designing the country's green brand model and its assessment in the future.

KEYWORDS: assessment; bibliometric analysis; brand models; green competitiveness; green brand; sustainability.

Introduction

Nowadays, country branding is considered to be an effective marketing tool to increase the competitive advantages and development prospects of a particular country on the global market. It strengthens the country's reputation, protects its national interest, builds a strong international relationship, attracts more investments, tourists, competent labor forces, etc. It is worth mentioning that the country's brand mostly depends on the political, economic, and social pillars. However, the rapid adverse climate changes require society to be aware of environmental protection. This issue is sensitive for many developed and developing countries. The high burden of environmental pressure gains power in today's context worldwide.

Dealing with the mentioned problem requires the governments to take decisive actions to improve the economic effectiveness without additional environmental pressure. The pride of place goes to energy efficiency, environmental friendliness, sustainability, circularity, etc. (Us et al. 2020). Therefore, the above-mentioned provokes the popularity of the green branding concept. It stands to note that each country has its own green branding strategy, which depends on its location, country size, industrial development, economic performance, etc. (Chygryn et al.

2021). Therefore, the scientific literature addresses more the issues of designing the country' green brand and identifying its main determinants.

Theoretical background

The economic crisis and climate changes are on the global agenda. These issues are inseparably associated and impact the life quality of the current and future generations. Indeed, providing economic growth without environmental damage requires new forms of cooperation between government, business, and society (Kubatko et al. 2021; Letunovska et al. 2020). Therefore, the academic communities sound a particular alarm about the necessity to develop the country's green brand from a perspective of sustainable development (Tovmasyan 2022; Huseynov et al. 2021; Veckalne and Tambovceva 2021; Brych et al. 2021; Cabelkova et al. 2021; Lyulyov et al. 2019; Bilan and Pimonenko 2020).

It stands to mention that the systematization of scientific literature showed that country's green brand models are hardly investigated in the studies. Thus, the scholars mostly analyzed the general country brand models while the environmental issues remain hardly uninvolved.

With reference to the literature on country brands, Fetscherin (2010) proposed to assess the country's brand strength based on the analysis of product and service export, tourism attractiveness, immigration, and governmental environment. The scholar noted that proper assessment of the country's brand strength detects the country's position in the international market and increases its competitive advantages. However, Fetscherin's country brand index doesn't include the environmental determinants and the country's progress towards sustainable development.

Further, Buhmann and Ingenhoff (2015) designed the 4D Model to measure the country's image based on the national attitude, identity theories, and reputational management. In this line, it stands to mention the study by Anholt (2005). The scholar developed the Anholt Nation Brands Index, which is built on the people's perception of the nation's competencies regarding government policy, human capital, exports, tourism, culture and heritage, and business attractiveness (investment and immigration). Further, Kalamova and Kai (2010) emphasized the nation's brand has an enormous impact on the investors' decisions. Having applied the methodology by Anholt Nation Brands Index, the scholars confirmed that the countries with higher nation brand index attract higher incoming investment flows.

Salmones et al. (2022) proved that the country's micro image concerning the specific products depends on its macro image formed by the political situation, cultural specifics, technological development, emotional aspects, etc.

In turn, Mariutti and Mariutti (2019) proposed to measure the country brand equity using the classical country brand model (country brand awareness, perceived quality, and loyalty) but including the country brand reputation dimension. In the other study, Mariutti and Giraldi (2020) developed the multidimensional country brand equity framework. The scholars emphasized the importance of developing the country's brand reputation, image, and associations, increasing country brand awareness, loyalty, perceived quality, and promoting channel relationships. Besides, there are more studies that considered the country's brand reputation as one of the country's brand model dimensions (Revilla-Camacho et al. 2022; Vasquez 2021; Cubillo-Pinilla et al. 2017; Foroudi et al. 2016).

On the other hand, there is a large stream of literature devoted to investigating the green brands on the corporate level (Starchenko et al. 2021; Chygryn and Pimonenko 2014). Zameer et al. (2019) proved that the development of green image, green creativity, and green production contribute to the growth of competitive advantages. Noteworthy here, the scholars emphasized that customer pressure is one of the crucial drivers of galvanizing green initiatives among decision-makers. Konuk et al. (2015) applied the structural equation modeling to confirm that consumers' green behavioral intentions help companies achieve green competitive advantages in a global marketplace.

Insch (2011) examined the concept of a green destination brand to detect the possibilities of adopting it at the national level. The findings highlighted the importance of avoiding greenwashing, criticism, and cynicism in designing the marketing strategy of the green nation brand.

Tapia-Ubeda et al. (2021) presented a novel framework for assessing sustainability in industries. The authors identified the critical aspects in economic, social, and environmental spheres which should be improved to green the macro-productive processes.

It is worth mentioning that an international country's ratings influence the country's brand strategy, practices, and standards on a global scale. In this line, it is appropriate to mention the Environmental Performance Index by Yale University (EPI 2022), Sustainability Index by Foundation Eni Enrico Mattei (EVI 2022), Environmental Vulnerability Index by South Pacific Applied Geoscience Commission (FEEM 2022), etc.

The systematization of scientific treatises demonstrates the scholars' interests in green branding, mainly concerning the products or corporates. In turn, it has yet been a little applied to the context of the country brand. Therefore, this paper aims to assess how well the existing literature on country branding is explored from the perspective of green development.

Therefore, based on the study goal, the research questions are as follows:

RQ1: What are the main research directions in the scientific literature concerning the country's green branding?

RQ2: How far has the country's green brand been investigated?

RQ3: What research gap should be covered in the future?

Methodology

This study operates with the scientific documents published in the highly ranked scientific journals. As of April 1, 2022, a literature search was conducted in the largest international scientometric Scopus database. The study period covers 2000-2022 (until April 2022). The search for relevant publications was run by the keyword combinations "green brand", "country brand", and "nation brand" in the documents' titles, keywords, and abstracts. The boolean operator' OR' was used to include the papers specified at least with county brand or nation branding. Therefore, the search results revealed 225 publications on green branding and 320 publications on country/nation branding.

This study used Scopus analytical tools to detect the publication dynamic of a designed sample of documents, identify the most engaged authors, and assess the contributions of the affiliations and countries.

Moreover, the method of visualization of similarities was applied to build the networks indicating the collaborations between scholars worldwide. Besides, it allowed detection of the main research streams in studies on country/nation green brands based on the low-dimensional visualization.

Noteworthy here, the co-authorship analysis by countries was used to build the network of scholars' collaboration worldwide. The counting method is full counting. Besides, this study ignored the publications that are co-authored by many countries. Thus, the maximum number of countries per document was ten. In turn, the

minimum number of documents per country was five. Therefore, 37 out of 77 met the above thresholds.

On the other hand, co-occurrence analysis was applied to design the network map of keywords' co-occurrences. The counting method is full counting. The minimum number of keywords occurrences was five. Then, the total link strengths of the co-occurrences links with other keywords were calculated to select the keywords with the greatest total link strengths. Thus, 104 keywords out of 2393 met the above threshold.

Results

At the first stage of this study, it is appropriate to consider the publication activity on the investigated topic. Fig. 1 compares the number of scientific papers addressing the green brand and country/nation brand in the Scopus database published from 2010 to 2022 (as of April 2022). According to the statistical data, the number of publications on country/nation brands exceeds the one on the green brand by 1.4 times. However, it stands to note that since 2021 scholars have more focused on the green brands. Furthermore, for Q1 2022, the topic of the green brand has been more popular among scientists worldwide.

Therefore, based on the findings above, it could be hypothesized that the main trigger of scientific interest in green branding could be the pandemic crisis (COVID-19). Indeed, some scientists highlight that the post-pandemic economic recovery should rely on the green deal policy (Pimonenko et al. 2021).
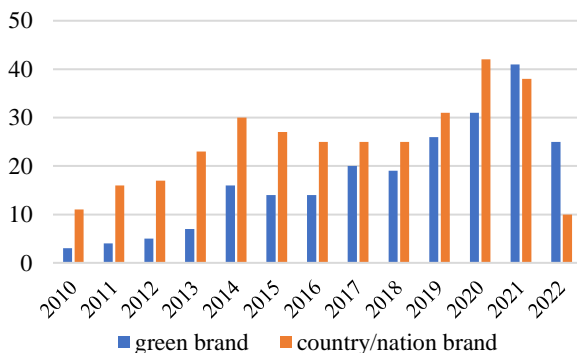
Fig. 1. The dynamic of publication activity
Source: developed by authors based on the Scopus data.

In the next stage, this study unveils the scientific collaboration between scientists worldwide. Figure 2 visualizes four clusters of collaboration between the researchers from different countries. The first cluster (red) consists of 13 countries. The tightest collaboration is noticed among the scientists from the United States, Asian countries (China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Taiwan, Thailand, and South Korea), Canada, Sweden, and Portugal.
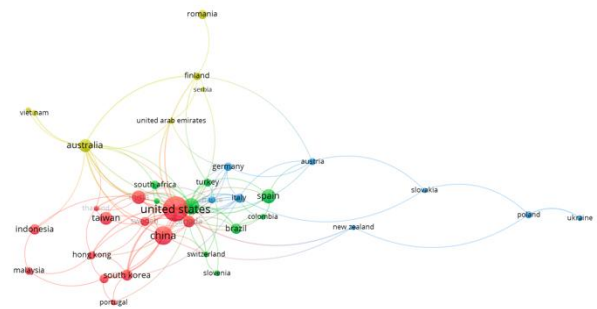
Fig. 2. The network of worldwide scientific collaboration
Source: developed by authors using VOSviewer software tools.

The second cluster (green) links 9 countries such as Brazil, Colombia, Ghana, Slovenia, South Africa, Spain, Switzerland, Turkey, and United Kingdom.

The third cluster (blue) shows the collaboration between the scientists from EU countries (Austria, France, Germany, Italy, Poland, Slovakia), Ukraine, and New Zealand. At last, the fourth (yellow) cluster shows the connection between the scholars from Australia, Finland, Greece, Romania, Serbia, UAE, and Vietnam.

Noteworthy here, the most productive researchers were from the United States. They have published 114 documents. Besides, these works were cited by 2467 times. Therefore, the above suggests that the United States is the pure leader in researching the country's green brand. In turn, the second place is occupied by researchers from China. They published 64 papers that were cited by 484 times. Even though the Chinese researchers published more studies, 47 papers by scientists from the United Kingdom were cited 3.7 times more (1780 citations). Herewith, the Spanish scientists published 37 documents (cited by 686 times), while Indian researchers published 33 documents that were cited by 1323 times.
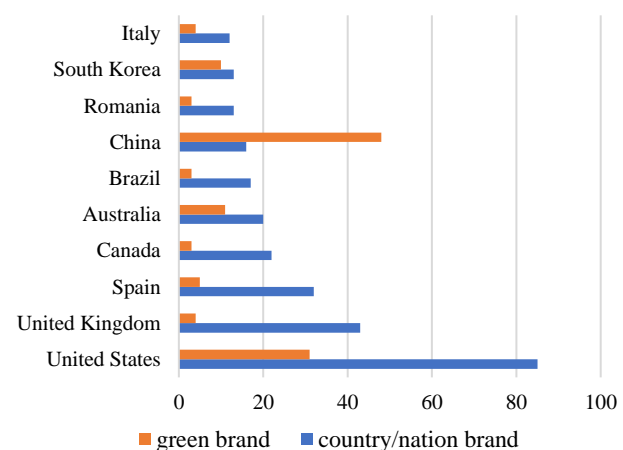
Fig. 3. TOP-10 countries in researching country/nation brand and green brand
Source: developed by authors based on the Scopus data.

Fig. 3 shows that American scholars were most productive in country/nation brand issues (85 documents), while Chinese scholars were in green brands (48

documents). Therefore, according to the above, it could be stated that the Chinese scholars are most interested in green brand investigations. In turn, the United Kingdom scientists published 43 documents on the country/nation brand research and only 4 – on green brand, Spanish scientists – 32 and 5, Canadian – 22 and 3 documents, Australian – 20 and 11 documents, Brazilian – 17 and 3, Romanian – 13 and 3 documents, South Korean – 13 and 10 documents, and Italian – 12 and 4 documents, respectively.

In this case, it is appropriate to specify the researchers who could be considered the most engaged in the green brand investigation. Therefore, the first place in rank is occupied by Yushan Chen (h-index: 32) from the National Taipei University in Taipei (Taiwan) published 7 articles addressing green branding (the total number of publications is 75). In the second place is Ruo Gui (h-index: 5) from the China University of Geosciences in Wuhan (China) devoted 6 articles to the investigated topic (the total number of publications is 21).

To detect the most influential affiliations in developing the investigated topic, this study analyzed the number of documents published by affiliations. Table 1 shows that the country/nation brand was investigated mainly by Universidade de São Paulo scholars in Brazil (15 papers).

Table 1. TOP-10 most engaged affiliations in country/nation brand investigation (2000-2022)

№	Affiliation	Country	No. of publications
1	Universidade de São Paulo	Brazil	15
2	Carleton University	Canada	8
3	Sprott School of Business		7
4	Brunel University London	United Kingdom	6
5	Cape Peninsula University of Technology	South Africa	5
6	Hankuk University of Foreign Studies		5
7	Bournemouth University	United Kingdom	5
8	Univerza v Ljubljani	Slovenia	5
9	Brunel Business School	United Kingdom	5
10	University of California, Irvine	United States	4

Source: developed by authors based on the Scopus data.

On the other hand, Table 2 shows that the most productive researchers in green branding were from the China University of Geosciences (China) and National Taipei University (Taiwan). Each of these affiliations published 6 papers, which is the biggest number of publications among the analyzed affiliations.

Table 2. TOP-10 most engaged affiliations in country/nation brand investigation (2000-2022)

№	Affiliation	Country	No. of publications
1	China University of Geosciences	China	6
2	National Taipei University	Taiwan	6
3	Swinburne University of Technology	Australia	6
4	Chinese University of Hong Kong	China	5
5	Universitas Diponegoro	Indonesia	5
6	Fo Guang University	Taiwan	5
7	Hong Kong Polytechnic University	Hong Kong	4
8	Sumy State University	Ukraine	4
9	Wuhan University of Technology	China	4
10	Shenzhen University		3

Source: developed by authors based on the Scopus data.

To detect the research streams and gaps in the investigated scope of literature, this study conducted a bibliometric analysis applied the approach of visualization of similarities. The findings of bibliometric analysis allowed determining eight clusters of intercrossing research streams (Fig.4).
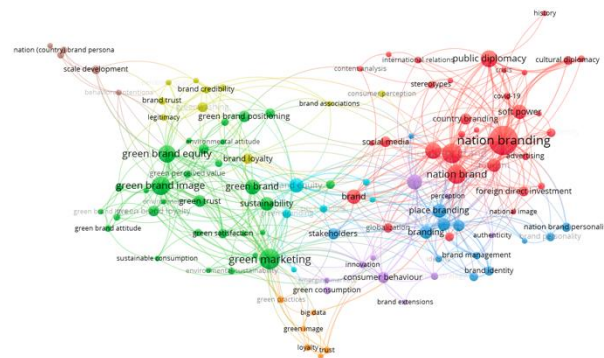
Fig. 4. The network map of keywords' co-occurrences (2000-2022)

Source: developed by authors using VOSviewer software tools.

Thus, the first cluster consists of 23 items (red). This cluster is built under the issues of green marketing (34 links with total link strength of 65). In this line, the scholars addressed mainly studies on the green brand in view of green brand attachment, green brand attitude, green brand image, green brand love, and green brand trust. The particular attention was focused on green loyalty, satisfaction, green perceived risks, and value and environmental sustainability. Besides, the results showed that the first cluster covers the investigations on green branding conducted mainly on the corporate level.

The second cluster is formed with 17 items (green) covering the studies on country branding (24 links with total link strength of 37). Under this research stream, the scholars considered the country's image, national identity, reputation, etc. The particular focus was on consumer perception, ethnocentrism, and behavior. Moreover, it

could be hypothesized that the main drivers of the country's brand are tourism, investments and, particularly, foreign direct investment, brand association, nation stereotypes, etc.

The third cluster consists of 14 items (blue) assessing the green brand equity (25 links with total link strength of 53) in line with brand credibility, scale development, greenwashing, perceived risks and value, positioning, legitimacy, etc.

The fourth cluster is formed with 13 items (yellow). Most studies are developed around the concept of country of origin. In this research direction, the scholars bring up a point of globalization, authenticity, ethnocentrism, innovation, national image, green consumption, etc.

The fifth cluster (purple) underlines the studies on country brand equity concerning the green image, green supply management, green practices, big data, etc. The sixth cluster (turquoise) focused on destination branding. In turn, the seventh cluster (orange) mainly addresses green trust issues (11 links with total link strength of 26). This cluster shows the studies that explored branding in the view of environmental concern, international relationships, politics, etc. The smallest eight cluster (brown) includes the studies on the nation branding in the view of historical aspects, crisis (particularly COVID-19), cultural and public diplomacy, soft power, etc.

Table 3. TOP-10 keywords most occurred in the study sample (2000-2022)

№	Keyword	Occurrences	Total link strength
1	Nation branding	69	102
2	Green marketing	37	85
3	Country brand	33	46
4	Nation brand	31	47
5	Sustainability	28	88
6	Green brand image	28	76
7	Green brand equity	24	57
8	Public diplomacy	23	46
9	Country image	22	47
10	Green brand	19	40

Source: developed by authors based on the Scopus data.

Table 3 shows the calculation results of the total link strengths of the analyzed keywords. Therefore, the greatest total link strengths of the co-occurrences links with other keywords are nation branding, green marketing, country brand, nation brand, sustainability, etc. The concept of green brand closes the list of TOP-10 keywords most occurred in the study sample. Therefore, it indicates that the topic of the green brand is underinvestigated but processive.

Conclusions

This paper presents the results of a bibliometric analysis of the existing scientific literature addressing the country's green brand in the Scopus database. The findings showed while the scholars are more focused on the country's branding, there is a theoretical gap in exploring the country's green brand. However, it stands to mention the rapidly growing tendency of publication activity addressing the green brand issues since Q1 2022.

The obtained results showed that the scholars considered the green brand concept in view of green brand attachment, green brand attitude, green brand image, green brand love, green brand trust, green loyalty, green satisfaction, green perceived risks, value and environmental sustainability. Noteworthy here, the studies on green branding were conducted mainly at the corporate level. That indicates the necessity to expand research on the national level.

TOP-5 countries engaged in the green brand investigation were China, the United States, Australia, South Korea, and Spain; in the country/nation brand topic – the United States, the United Kingdom, Spain, Canada, and Australia. Herewith the approach of visualization of similarities allowed detection of four clusters of collaboration between the researchers worldwide as follows: 1) the United States, Asian countries (China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Taiwan, Thailand, and South Korea) Canada, Sweden, and Portugal; 2) Brazil, Colombia, Ghana, Slovenia, South Africa, Spain, Switzerland, Turkey, and United Kingdom; 3) the EU countries (Austria, France, Germany, Italy, Poland, Slovakia), Ukraine, and New Zealand; 4) Australia, Finland, Greece, Romania, Serbia, UAE, and Vietnam.

On the other hand, the most productive affiliation in exploring country/nation brand was the China University of Geosciences, in the green brand – Universidade de São Paulo in Brazil. However, the United States was the pure leader in researching the country/nation brand issues, while China was in green brands.

This study has a limitation because of operating with publications retrieved only from the Scopus database. Therefore, it is appropriate to consider the papers presented in other international scientific databases (Web of Science, Google Scholar, etc.) in future studies. The results could be value-added for scholars interested in the country's green brand issues. It could be a starting point for boosting the studies on designing the country's green brand model and its assessment.

Funding

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WELL-BEING AND EMPLOYMENT OF OLDER PEOPLE IN THE COUNTRIES OF THE VISEGRAD GROUP AND THE EUROPEAN UNION

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Abstract

Population aging brings phenomena and challenges for which adequate strategies and solutions are sought. One of the challenges is to use the employment potential of older people in the labor market by extending their working lives in retirement age. The motives of older people who opt for active aging by continuing their working lives are diverse. Increasing well-being through employment at retirement age can be a logical step for older people who want to protect themselves against a drop in their standard of living or raise it. The article is focused on the comparison of employment and well-being of older people aged 65 and over development in the Visegrad Group countries (V4 includes Czech Republic, Hungary, Poland, Slovakia) and the European Union. The data for the employment category come from the Eurostat database and a well-being index is created to detect the development of the well-being index level, in which data from the UNECE Active Aging Index database are used. Both categories are monitored for the periods 2008, 2010, 2012, 2014, 2016 and 2018. The methods used are literature analysis, induction, deduction and comparison by regions, the whole cohort of older people aged 65 and over and gender. It is found that the employment of older people aged 65 and over has a growing trend in all regions throughout the period under review. The development of the well-being index in the countries of the Visegrad Group and the European Union in the period under review has a predominantly increasing trend, but after 2016 there has been a general decline. There is a decrease in the well-being index for older people aged 65 and over after 2014, also by sex for males after 2012 and for females after 2016 in the Czech Republic which is caused by decline of the indicators relative median income and no poverty risk. The phenomenon that has emerged in Slovakia is exceptional in that the employment of females aged 65 and over fluctuated around the level of 3% in the observed period, but it is in this category that the highest increase of the well-being index of all countries and sex in 2016 by 9% is recorded what was caused by increase of the indicators relative median income and no severe material deprivation.

KEY WORDS: ageing; employment; older people; quality of life; retirement; well-being.

Introduction

The global aging of populations (Dudel & Myrskylä 2017; Neary, et al. 2019; Ćwirlej-Sozańska, et al. 2018; Horváthová & Éhn 2020; Jeníček & Foltýn 2003; Vaňo 2020) carries various phenomena for those are sought adequate strategies and solutions in societies. One of the most discussed topics connected with the phenomenon of population aging is the use of employment potential (Gregar & Pejřová 2014; Gregar & Pejřová 2013; (Gregar, et al. 2015; Shatalova 1999) or prolonging the active working life of older people in the labor market (Lakomy 2019; Taylor 2019; van der Mark-Reeuwijk, et al. 2019; Bartek 2020). Setting up social security systems in the Visegrad countries (V4) has proved problematic in the long run and would fail to guarantee the pensions of a growing cohort of people in older age groups and thus the retirement age has been prolonged through legislative reforms (Hardy, et al. 2018). The relationship between population aging and social security (Ulander-Wanman 2016) is subsequently reflected in the quality of life of older people.

The dimension of quality of life is the subject of research on active aging, where one of the factors is the well-being of older people, which is threatened by decline and poverty in retirement age (Fonseca, et al. 2014; Swain, et al. 2020; Lu, et al. 2021), lack of quality food (Gajda & Jezewska-Zychowicz 2021; Radermacher, et al. 2010; Knight, et al. 2020), worsened housing affordability (Riedy, et al. 2019; Alidoust & Khalaj 2021; Costa-Font 2013), lower savings on old age (Pienkowska-Kamieniecka 2018). Financial security is the second most important after health (Hackert, et al. 2019), anxiety and insecurity about financial security has been expressed by older people with medium economic resources (Mansvelt, et al. 2014), while financial literacy reduces financial security uncertainty (Kadoya, et al. 2018).

The article is focused on the factor of employment of older people as a basic factor in prolonging working life in retirement age 65 and over and on the factor of well-being of older people aged 65 and over, because it is considered to be important indicators of the use of employment potential and active aging of older people in the labor market. The aim of the article is to compare employment and welfare indicators and evaluate their development in the V4 countries and the European Union (EU). To monitor the well-being development of older people aged 65 and over, ther is set a well-being index which is composed of the categories: relative median income, no poverty risk, no severe material deprivation. The article further contains chapter on methodology, findings and conclusions.

Methodology

Research methods of the researched problem of development of employment and well-being of older people aged 65 and over in the V4 (Czech Republic, Poland, Hungary, Slovakia) and the EU are literature analysis, induction, deduction and comparison of the obtained data.

The employment data are set for the periods 2008, 2010, 2012, 2014, 2016, 2018 and are obtained from Eurostat databases. The data for well-beig index are obtained data from the Active Aging Index (AAI) from the UNECE database for the same period. The well-being index is composed of three indicators: relative median income, no poverty risk and no severe material deprivation. The definitions of the indicators are according to AAI UNECE.

"*The relative median income ratio is defined as the ratio of the median equivalised disposable income of people aged 65 and over to the median equivalised disposable income of those aged below 65.*" (UNECE 2019)

No poverty risk is defined as a "*percentage of people aged 65 and over who are not at risk of poverty (people at risk of poverty are defined as those with an equivalised disposable income after social transfers below the at-risk-of-poverty threshold, which is set at 50% of the national median equivalised disposable income after social transfers).*" (UNECE 2019)

No severe material deprivation contains a "*percentage of people aged 65 and over who are not severely materially deprived. Severe material deprivation refers to a state of economic and durable strain, defined as the enforced inability (rather than the choice not to do so) to afford at least four out of the following nine items: to pay their rent, mortgage or utility bills; to keep their home adequately warm; to face unexpected expenses; to eat meat or proteins regularly; to go on holiday; a television set; a washing machine; a car; a telephone.*" (UNECE 2019)

Mathematically the well-being index is formulated according to Eurostat (2019) as follows:

$$I_n = \frac{x_n + y_n + z_n}{q} * 1$$

Herein I = well-being index, x = relative median income, y = no poverty risk, z = no severe material deprivation, q = value for the base year 2008, n = year.

Findings

The evaluation of the data is done by comparison within the well-being index of people aged 65 and over and employment of people aged 65 and over individually by sex and country. The values of the monitored indicators are evolving and the changes in the well-being index are only at the level of hundredths of a point, while the changes in employment are at the level of a single digit number.

Comparing the data in Fig. 1. according to the countries, it is found that the development of the well-being index of people aged 65 and over is different

compared to the base year 2008 during the period under review, but it is not significantly variable, the growth or decrease of points is at the level of hundredths of a point. The index of Czech Republic had a slightly growing trend until 2014, when it began to decline until it recorded the lowest values in 2018 among all countries. Hungary had been declining since 2010, with the sharpest decline of all countries in 2012, when the index began to rise. Poland records a drop in the index until 2010, then rised and fell again in 2016. Slovakia records the highest increase in the index among all monitored regions. The index rose until 2010, fell until 2012, rose again until 2016, when it began to fall. The EU had a similar course of index values as the Czech Republic, but with higher values of the point when it grewand then decreased by 2014. In 2016, except for Hungary, the index was declining in all countries.

	2008	2010	2012	2014	2016	2018
Czechia	1,00	1,02	1,02	1,03	1,01	0,99
Hungary	1,00	1,00	0,97	0,99	1,01	1,01
Poland	1,00	1,00	1,01	1,05	1,05	1,03
Slovakia	1,00	1,03	1,03	1,07	1,08	1,08
EU	1,00	1,04	1,05	1,06	1,05	1,04
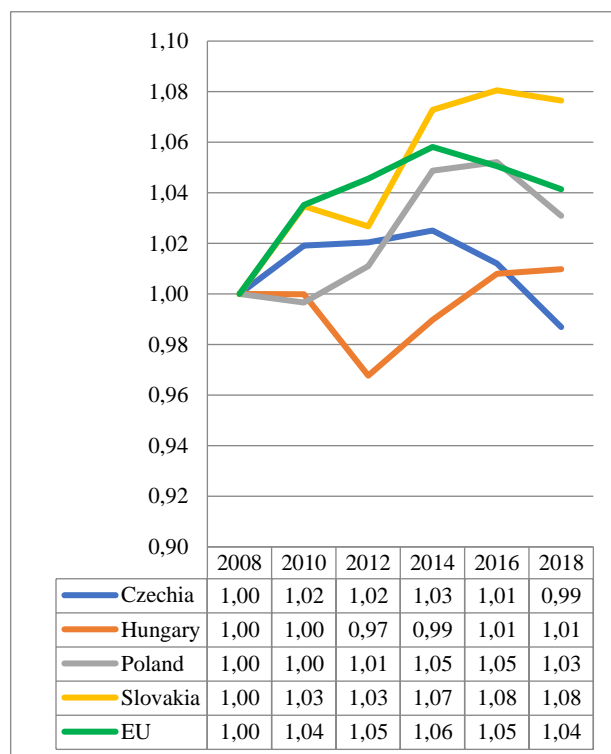
Fig. 1. Well-being index of people aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
Source: Own calculations based on data from UNECE (2020)

Fig. 2. monitors the employment development of people aged 65 and over in the specified interval. The Czech Republic was the highest among the V4 countries in terms of employment of older people, and even in 2016 and 2018 it was above the EU average. Hungary was continuously growing in the employment of older people with a slight decrease in 2014. Poland had a slightly growing trend in the employment of older people throughout the period under review. Employment in Slovakia was growing continuously throughout the period under review. Slovakia had the lowest employment of older people except in 2016 and 2018, when Hungary is the last. The EU average was at its highest level until 2014, after which the Czech Republic outgrew it.
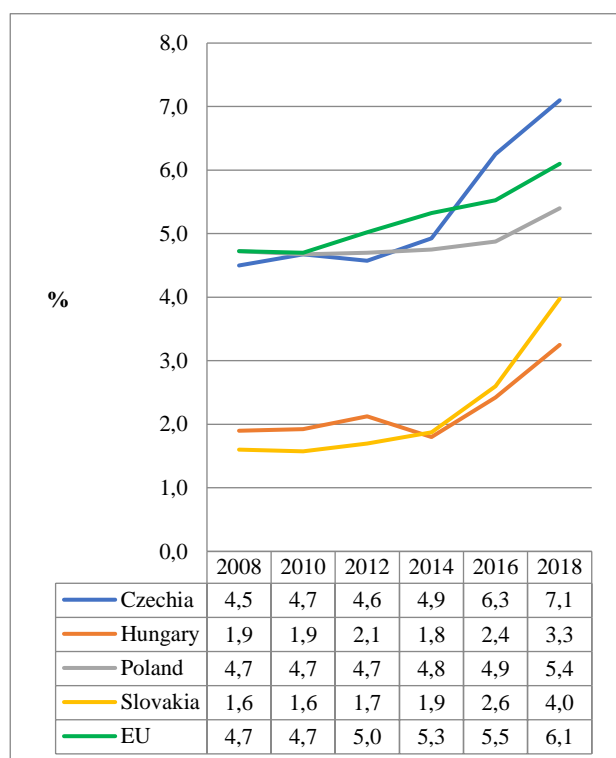
Fig. 2. Employment of people aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
Source: Eurostat (2022)

	2008	2010	2012	2014	2016	2018
Czechia	4,5	4,7	4,6	4,9	6,3	7,1
Hungary	1,9	1,9	2,1	1,8	2,4	3,3
Poland	4,7	4,7	4,7	4,8	4,9	5,4
Slovakia	1,6	1,6	1,7	1,9	2,6	4,0
EU	4,7	4,7	5,0	5,3	5,5	6,1

Fig. 3. Well-being index of males aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
Source: Own calculations based on data from UNECE (2020)

	2008	2010	2012	2014	2016	2018
Czechia	1,00	1,01	1,03	1,02	1,01	0,99
Hungary	1,00	1,01	0,99	0,99	1,01	1,02
Poland	1,00	1,01	1,02	1,04	1,05	1,03
Slovakia	1,00	1,03	1,02	1,06	1,06	1,06
EU	1,00	1,03	1,04	1,05	1,04	1,04

Comparison of values in Fig. 1. and Fig. 2. by country is as follows. The Czech Republic saw a sharp increase in employment since 2014, but the values of the well-being index started to decline that year. In Hungary, the values of employment and the well-being index grew after 2014. In Poland, employment was growing slightly throughout the period under review, but the decline in the welfare index was after 2016. Slovakia had a low employment rate of older people, but achieved the highest increase in the values of the well-being index. In the EU, the well-being index of older people started to fall already in 2016, while the employment of people aged 65 and over continued to grow until 2018.

The course of the well-beibg index for males aged 65 and over in Fig. 3. is almost identical for the Czech Republic, Slovakia and the EU as in the well-being index of population of older people in Fig. 1. However, in Hungary, the level of the well-being index for males 65+ is at an equally low level in both 2012 and 2014, after this year it increased, while in the population 65+ it increased after 2012. This can be explained by the increase in well-being index among females 65+ (cf. Fig. 5.). In 2018, males had a higher index than the entire population of 65+ in Hungary, and at the same time this year they were one of the other countries where the index rose, while elsewhere it had already fallen. In Poland, the males well-being index had been rising linearly to a peak in 2016, after which it declined.

Fig. 4. Males employment aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
Source: Eurostat (2022)

	2008	2010	2012	2014	2016	2018
Czechia	7,0	6,8	7,3	7,7	8,0	8,6
Hungary	7,1	7,1	6,6	7,0	8,7	9,8
Poland	3,0	2,9	3,3	2,8	3,8	5,0
Slovakia	7,5	7,6	7,5	7,7	8,2	8,8
EU	2,8	2,5	2,7	3,0	3,7	5,6
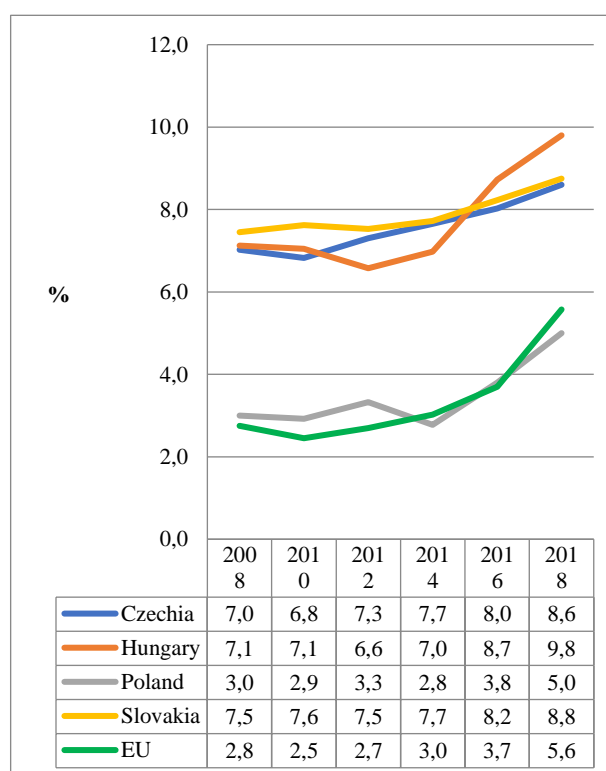
Values of employment development of males 65+ years old in Fig. 4. were higher in the Czech Republic,

Hungary and Slovakia than in the total population aged 65+ and at the same time in comparison with the employment of females aged 65+. Poland and the EU had lower employment for males 65+ than as a whole, but higher employment for females 65+. From 2014 until 2018 the employment of males 65+ grew in all V4 countries and in the EU.

When comparing the development of the well-being index of males 65+ (cf. Fig. 3.) and the employment of males 65+ (cf. Fig. 4.), a decrease in the well-being index after 2016 was recorded (except for Hungary, where it was growing), while employment in V4 grew. The decline in well-bein of the EU was already in 2014 and employment was growing until 2018.

	2008	2010	2012	2014	2016	2018
Czechia	1,00	1,02	1,02	1,02	1,02	0,98
Hungary	1,00	1,00	0,96	1,00	1,01	1,00
Poland	1,00	0,99	1,00	1,05	1,05	1,04
Slovakia	1,00	1,04	1,03	1,08	1,09	1,08
EU	1,00	1,04	1,05	1,06	1,05	1,04
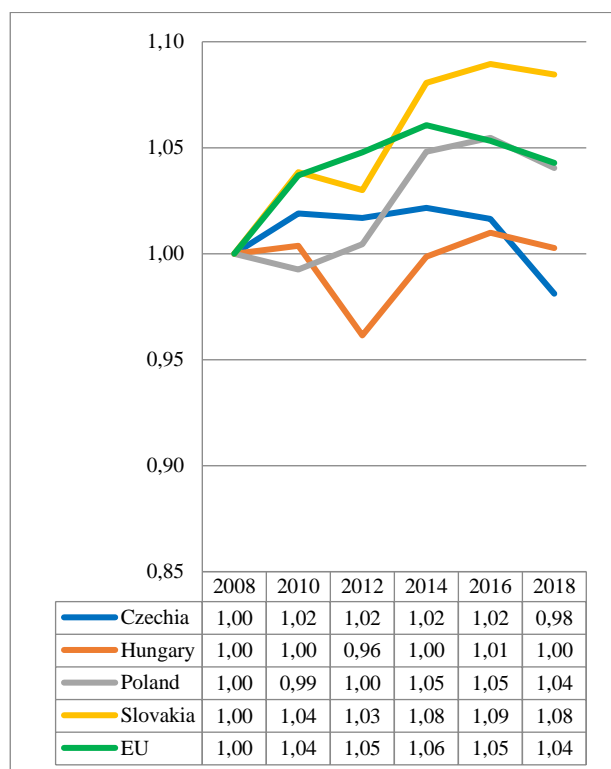
Fig. 5. Well-being index of females aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
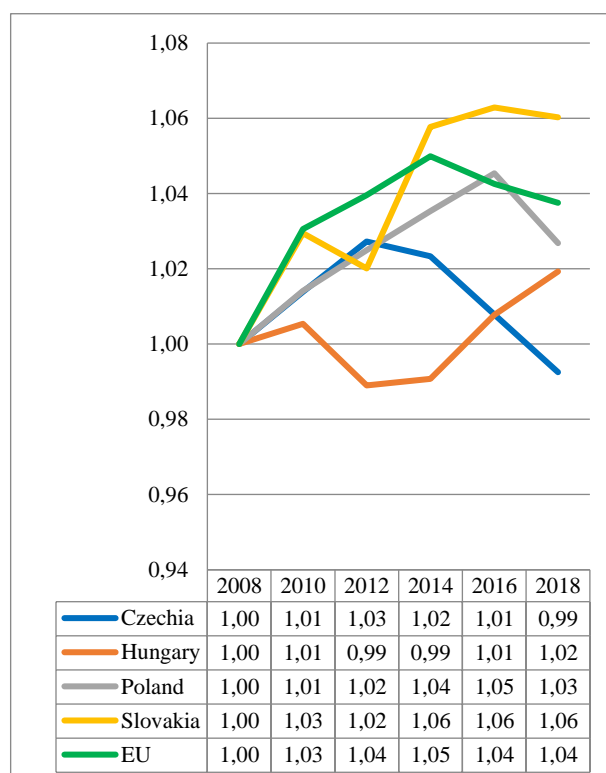Source: Own calculations based on data from UNECE (2020)

Development of the well-being index of females 65+ in Fig. 5. is similar to the total population of 65+ (cf. Fig. 1). The lowest value among all countries was recorded in Hungary in 2012. After 2016, the well-being index of females 65+ was declining in all countries. The highest increase was recorded in Slovakia by 9% in 2016 compared to the base year 2008. This value was also the highest among all well-being indices (cf. Fig. 1. and Fig. 3.).

Development of employment of females aged 65+ in Fig. 6. had a generally growing trend, except in Slovakia, where employment was at almost the same level and was slightly declining in 2014 and 2016. By far the highest increase in employment of females 65+ was in Hungary among all the regions under review.

The employment values of females 65+ are lower compared to the total (cf. Fig. 2) and to males 65+ (cf. Fig. 4) in the Czech Republic, Poland and the EU, while the

employment rate of females 65+ is higher than the total population 65+ in Hungary throughout the whole period and in Slovakia except 2018.

	2008	2010	2012	2014	2016	2018
Czechia	3,1	3,2	3,4	3,5	3,7	4,2
Hungary	2,8	3,1	3,2	3,5	4,5	5,2
Poland	1,3	1,3	1,4	1,3	1,6	2,2
Slovakia	3,1	2,9	3,0	2,9	2,7	3,2
EU	0,9	1,0	1,1	1,2	1,9	2,9
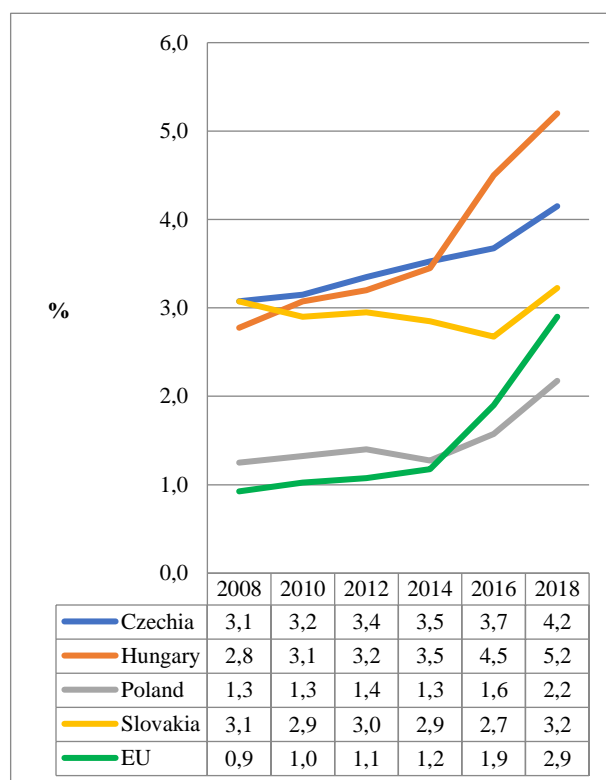
Fig. 6. Females employment aged 65 and over, Czechia, Hungary, Poland, Slovakia, EU
Source: Eurostat (2022)

Conclusions

The development of employment of older people 65+ had a growing trend in all regions, what is considered to be a positive trend with regard to the policy of active aging, prolonging working life and using the employment potential of older people in the labor market. The development of the well-being index in the Visegrad Group and the European Union in the period under review had a predominantly increasing trend, but after 2016 there was a general decline, which is not positive in terms of motivation for continuous employment in retirement age. However, it should be noted that the decline in the well-being index was only at the level of one hundredths of a point.

There was a decrease in the well-being index for the older people 65+ and also by gender in the Czech Republic, as in the only country among the V4, caused by decline of the indicators relative median income and no poverty risk. The phenomenon that emerged in Slovakia is exceptional in that the employment of females aged 65+ in the period under review fluctuated around the level of 3%, but it was in this category that the highest increase in the well-being index of all countries and sex in 2016 was recorded by 9%, also at the level of one hundredths of a point compared to the base year 2008 what was caused by increase of the indicators relative median income and no severe material deprivation.

How to explain these phenomena? We do not claim to explain these phenomena entirely but only partially, as it would need to be examined in more detail way. We suppose that in the monitored years, processes that were not taken into account in the well-being index probably took place in selected countries, such as: life expectancy, mortality, divorce rate, population health, etc. These phenomena could be the subject of further research.

The well-being index as a category of quality of life or active aging and the employment of older people 65+ as a category of use of the employment potential of older people or active aging are important indicators in assessing the phenomenon of aging populations. It is found that the employment of older people was growing in selected regions during the period under review. The well-being index grew along with employment, except for the mentioned phenomena in the Czech Republic and Slovakia. The question is, will there be such a trend after the end of the COVID-19 pandemic and the end of the war in Ukraine?

Although increasing the well-being rate can be a motivating factor for prolonging the working life of older people and thus exploiting their employment potential in the labor market, it might be beneficial in other aspects such as: higher social security contributions, multiplier effects of human capital quality on economic performance and competitiveness of economies, improving the health of the population, etc. We suppose that for the majority of older people aged 65 and over, especially those who, for various reasons, can no longer or do not want to work, increasing the well-being rate depends mainly on the state. Strategies and solutions for the phenomena associated with the aging of the population like universal basic income, trainings of financial literacy, improving environmental performance will have to take into account not only the development of employment of older people, but also the risk of declining well-being of them so as not to fall to lower quality of life caused by e.g. lack of quality food (Radermacher, et al., 2010; Knight, et al., 2020; Gajda & Jezewska-Zychowicz, 2021), inaccessibility of housing (Costa-Font 2013; Riedy, et al. 2019; Alidoust & Khalaj 2021) or a higher degree of anxiety due to financial uncertainty (Kadoya, et al. 2018). On the other hand, according to predictions, it is the aging and declining population in the V4 that can be a source of stabilizing the economic growth of the countries (Bendarzsevszkij, 2021) and solving many burning questions about the problems associated with aging and well-being today.

Acknowledgements

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THE EFFECTS OF THE COVID-19 PANDEMIC ON UNEMPLOYMENT IN SLOVAKIA AND HUNGARY

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Abstract

Covid-19 pandemic has affected almost in every aspect peoples' personal and professional lives. Employment losses have become an everyday occurrence during the pandemic period. As an outcome of the global coronavirus crisis of 2020, unemployment has risen significantly worldwide. In the article, we try to quantify the effect of coronavirus pandemic on the development of the unemployment and unemployment rate in two EU member states. The aim of the article is to evaluate the impact of Covid-19 crisis on the labor market in the Slovak Republic and Hungary. In order to highlight the impact of the pandemic and make comparisons between the mentioned countries, concretely comparative research method was used. Analyses are based on labor market data during the pandemic (2019-2021). Differences in unemployment by gender were examined based on annual data. Differences in unemployment by age, economic sectors and territorial units were analyzed on a quarterly basis. The results of the study indicate a noteworthy increase in the unemployment rate in the Slovak Republic and in Hungary during the Covid-19 pandemic. As a result of the coronavirus crisis, the spreading of unemployment in territorial terms has been more unbalanced for both the Slovak Republic and Hungary. Furthermore, we found that the highest unemployment rate during the considered time period was reached in the industrial sector. The pandemic has significantly impacted the unemployment of the economically active people with a lower level of education. In Slovakia have been introduced stricter anti-pandemic measures, due to which more business enterprises have closed. Also, it has led to more intensive growth of unemployment rate.

KEY WORDS: Covid-19 pandemic; unemployment rate; labor market; level of education; sectors of the economy; territorial units.

Introduction

In December 2019, a new disease had spread throughout China which was called Coronavirus or Covid-19. The disease became a global pandemic within a few days (Agarwal et al. 2020). The coronavirus pandemic arrived even to Europe at the beginning of spring 2020 and created an unprecedented emergency situation with important consequences on health policies, economic and social policies (Wolff & Ladi, 2020). As a result of the pandemic and the adopted anti-pandemic measures, unemployment has been rising sharply in the EU since March 2020.

The issue of unemployment is an eternal problem and it has become an even more important topic in the recent years. For this reason, examining the impact of the Covid-19 crisis on the labor market is a highly relevant issue. Several researchers have studied the effects of the coronavirus pandemic on unemployment. Lambovska et al. (2021) analyzed the impact of the Covid-19 pandemic on the unemployment rate under the age of twenty-five in the EU. Aidukaite et al. (2021) documented and compared the social policies (extensive protection for jobs and enterprises) that the governments of Hungary, Lithuania, Poland and Slovakia implemented to combat the first wave of Covid-19 pandemic. Acheampong (2021) investigated whether the coronavirus epidemic impacted men and women in the Hungarian labor market differently. Svabova et al. (2021) examined the impact of anti-pandemic measures on the development of the registered unemployment rate in Slovakia. However, a detailed comparison of unemployment during the corona crisis in Hungary and Slovakia is not achieved.

The aim of the article is to evaluate the impact of Covid-19 crisis on the labor market of the Slovak Republic and Hungary. In case to illustrate the effects of the coronavirus pandemic on the labor market in the mentioned EU member states, the progress of the unemployment rate by sex, age, level of education and economic sectors was analyzed. We also analyzed the territorial and temporary distribution of unemployment during the time period 2019 and 2021. We have collected information from the data collections of the Statistical Office of the Slovak Republic and the Hungarian Central Statistical Office. Our analyses focus on the years 2019-2021, because these years have been directly affected by the pandemic. In our work we have used quantitative and even qualitative research methods. As a qualitative method, we have studied the related literature. After processing the relevant domestic and foreign literature sources, we used a comparative research method to process data. The results of the study can be perfectly used in practice to understand better the effects of the pandemic and anti-epidemic measures on unemployment rate.

Theoretical background

The first infected person with the Coronavirus or called SARS-CoV-2 was identified in December 2019. The rapid spread of the virus has caused a worldwide pandemic named as COVID-19. The virus is originated from animals, but its mutation has allowed its spread among humans through droplet infection as well. The disease is mostly associated with symptoms of various severity such as fever, cough,

breathing difficulties and muscle aches. The symptoms of the disease are unpredictable, in some cases the patient is asymptomatic, occasionally symptoms may be mild, but there are cases when the disease is fatal (Hopkins Medicine 2022). While the appropriate treatment was established, WHO has recommended mandatory mask wearing, social distancing and quarantine in case of infection on the global level.

All the states of the world have responded to curb the spread of the virus immediately, strict actions have become a new normal in people's daily lives. The restrictive measures have led to significant reductions in energy consumption. As a result of the lockdown, people had reduced their time of driving and travelling, clubs and restaurants had closed, factories were holding back their production to protect the health of their workers, and employees had been working remotely.

The significant decline in production has reduced energy consumption in all industries. The decrease in electricity demand in Europe is reported to be situated between 2.5% and 4.5%. The residential sector was the only industry reporting an increase in energy consumption. The reason is that people stayed at home for the biggest part of the day, since their work, and education process took place online (Priya, Cuce & Sudhakar 2021)

The epidemic has had a negative impact on almost all sectors. The decline in demand for crude oil has hit oil extraction. The three largest customers of oil industry - US, China, and India (39.14% of world oil consumption) - reported the highest number of cases during the epidemic. The second major oil consumers are the airlines. They have also been forced to reduce their use due to the travel bans. Out of all the industries, the manufacturing industry was the most affected. The epidemic started in China, which is an important supplier of raw materials and components to manufacturing plants all around the world. The shutdown of the Chinese factories has caused disruptions in the supply chain worldwide. The other severely affected sector is the sector of tourism, which is the third largest fare category after the oil and chemical industries. They are providing jobs to 1 out of 10 individuals in developed and developing countries as well (Thomas, Chakole 2021).

According to the analysis made by S&P (2022), the five most affected industries by COVID-19 between 2 January 2020 and 15 January 2022 were the Airlines, the Automotive Industry, the Energy Industry, Tourism, Restaurants and Leisure, and Specialty Retail. All five industries peaked in April 2020, but by January 2021 they had suffered a significant decline. Air traffic fell by almost 40% during the pandemic compared to pre-epidemic levels, which also negatively impacted the performance of tourism and hospitality. Automotive operators had to ignore their JIT principles and had to adapt to longer lead times and uncertainties. Due to the lack of a global semiconductor, excess orders and general stockpiling were observed in the automotive industry, generating price increases and inflation. The five the least affected sectors by COVID-19 were telecommunications, healthcare equipment and products, life science equipment and services, pharmaceutical products and mortgage and equity management.

According to the survey made by Statista (2022) in 2022 the five most affected sectors in Germany, Austria and Switzerland were the automotive industry, machine and plant construction, transport logistics and tourism, textile & clothing, and retail (Fig.1).

Fig. 1. Negatively impacted sectors by COVID-19
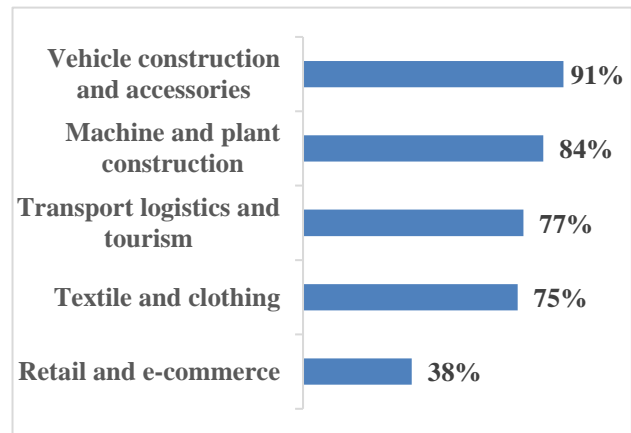
according to respondents, in percent, Source: based on Statista (2022)

The empirical results of Gavrilut, Grecu, and Chiriac (2022) showed a significant correlation in the financial situation of young people living in one of the 28 member states of the European Union. The most affected social group by the economic effects of the COVID-19 pandemic were young people with primary or secondary education. Education is an important variable in employability that needs to be considered in effort to maintain the balance of the labor market during the critical period. Based on the results of the research, higher level of education has a positive effect on employability. Other important factors are gender equality, economic and business freedom, which can also have positive effect on rising employability. By encouraging the private sector to invest in the economy and by supporting entrepreneurship the government plays an important role in reducing unemployment rate and inflation.

Slovakia has introduced critical restrictions on citizens' rights very quickly right after the outbreak. Measures included the reintroduction of border control and limited entry into the country, mandatory quarantine, restrictions on the free movement of citizens, and limited access to hospitals, prisons, and social facilities. Depending on the number of cases, the government opted for periodic blackouts and the possible activities of citizens were dependent on negative antigen tests. Restrictions on opening hours have been extended to sports facilities, libraries, galleries, shops, markets, services and retail. Thanks to the early epidemiological responses, the country has achieved positive preliminary results in terms of mortality in the first phase of the spread of the virus (Nemec Spacek 2020). According to WHO (2022) by 8th April 2022, the total number of people infected by the coronavirus were 1,745,268 of whom 19,523 cases were fatal. As a result of austerity measures, Slovakia's GDP fell from 2.6% in 2019 to -4.4% in 2020 (Slovak Statistics 2022b).

The first case of COVID-19 in Hungary was confirmed on March 4, 2020. Measures were introduced at the very early stage in case to curb the spread of the virus, such as

social distancing, switching to online education and wearing masks, have shown a drastic reduction in the number of contacts and mobility. The SARS-CoV-2 virus has caused problems in health care facilities and long-term care facilities. Nearly two-thirds of reported cases showed a similar pattern to other countries, 89.1% of deaths reported by 10 May belonged to the population of age group +65. Strict social distance measures, such as school closures and staying at home, also have a very serious impact on society and the economy and are therefore unsustainable in long term (Röszt et al 2020). According to WHO (2022) by 8th April 2022, the total number of confirmed cases in Hungary were 1,868,007 of whom 45,721 cases were fatal. Hungary's GDP fell from 4,55 % in 2019 to -4.67 % in 2020 (World Bank Data 2022)

According to Eurostat (2022) data, Slovakia and Hungary followed the European Union in terms of GDP, which showed a sharp decline in the first year of the covid 19 pandemic in 2020 (Fig. 2.).
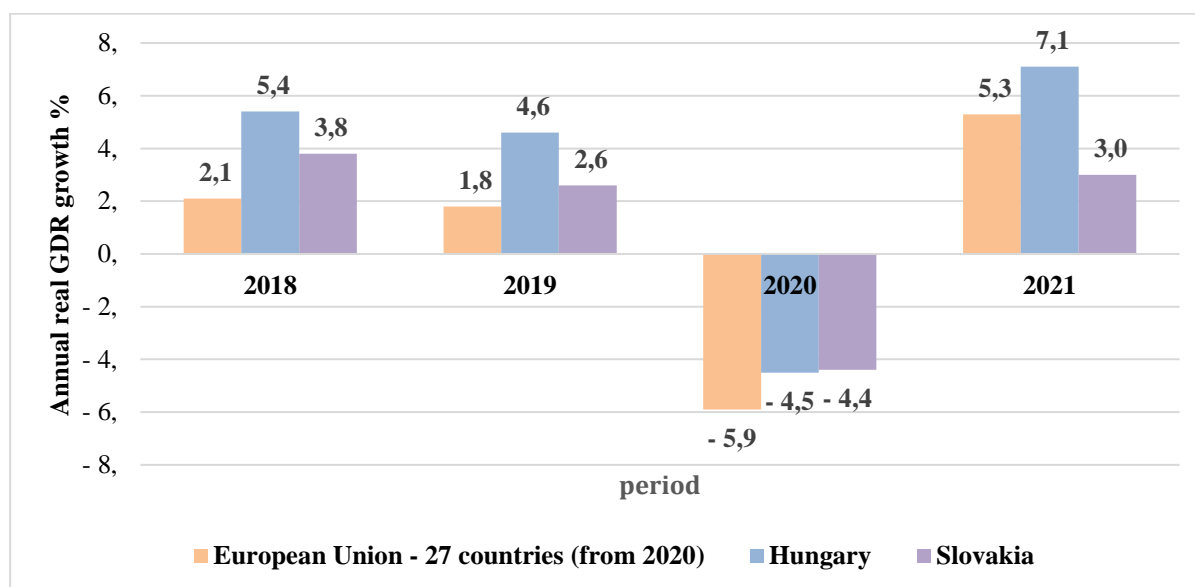
Fig. 2. Annual GDP growth rate % in selected countries
Source: based on Eurostat (2022)

Mitigation strategies and policies during Covid-19 have had a significant impact on the level of employability and on the whole labor market. Macroeconomic indicators provide the framework for a deep economic crisis characterized by economic turndown and unemployment. According to the theory of latent deprivation, employment serves universal psychosocial needs, so involuntary unemployment - also identified as a lack of work - is expected to have a negative impact on the mental and physical well-being of individuals. According to other theories, unemployment can be seen as a disruption for life plans designed to prevail. Unemployment limits workers of the resources they should meet, social needs and achieved goals set by the society. The psychological impact of unemployment depends on whether employment plays a central role in determining the social identity of workers. More and more longitudinal panel studies are drawing attention to the fact that the psychological impact of getting unintentionally unemployed lasts even for years. The longer the unemployment period of a person lasts, the lower people's satisfaction with life get (Mousteri Daly Delaney 2018).

Job availability can be considered as a conditional resource that helps individuals to access other types of resources such as objects and energies (i.e., food, housing, money) and personal resources (e.g., a sense of control). Without the right conditions and enough energy, individuals are unable to cope with environmental threats and they suffer from the declining well-being. Furthermore, individuals with only few resources become more vulnerable as they lose some of their existing resources. While those with greater resources source have access to additional resources. To sum up, those with low levels of resources are expected to experience greater anxiety during the unemployment period compared to the individuals with more resources (Achdut Refaeli 2020).

Considering the past recessions and the current pandemic situation, all macro indicators have been affected in each case. Research on previous financial crises highlights that the recession during the economic crisis is having severe impact on the employment of young people, women, and the low-skilled workers. Employers to minimize their losses caused by the drop in demand began to compensate with layoffs. Slovakian industry, as the driving force of the Slovakian economy, is particularly exposed to foreign market developments. Measures taken by the Slovak government to mitigate the negative effects of pandemic were compensation for the ones with declining income, concretely among the self-employed. The government has adopted legal changes in the field of employment such as working in home office or 'kurzarbeit'. Several support instruments have also been

adopted in the field of loans to businesses, such as lending loans with low interest rate or deferrals of ongoing loan repayments (Svabová et al 2021).

Methodology

For our study we analyzed the data of the Hungarian Central Statistics Office and Datacube. However, we had to take into account some difficulties. In Slovakia, the number of unemployed is usually available in thousands. For efficient comparison, we analyzed the rate calculated from the number of unemployed and the number of economically active population. When it came to comparing data by regions, it should be taken into consideration that in Slovakia the data for the capital city are included in the regional data. In Hungary, Budapest and Pest regions represent separate values. We study the mentioned region in the time period between 2019 and 2021. Differences according to genders were analyzed on annual basis, and differences by age, industry, and region were analyzed on quarterly basis. In case the provided information is not clearly visible from the tables extra information can be provided and shared with other parties in interest.

Results of the research

Table 1. was prepared based on several statistical databases in Hungary and Slovakia. Our goal is to compare the average annual unemployment rate by gender. First of all, let´s take a look at the last year of peace before the COVID-19 pandemic started. At that time, typically female unemployment is higher in Slovakia and male unemployment is higher in Hungary. The probable reason is that the majority of women usually works in the hospitality sector, and the mentioned sector was struggling with a labor shortage in Hungary (Zerényi, 2019). The fact in 2019 the unemployment was higher for both sexes in Slovakia, but it does not mean that the economy was operating at a lower level. It is well known that unemployment rate and inflation rate move in opposite directions (Nordhaus, Samuelson, 2021). The high rate only can be cause by that the Slovak government's economic policy has focused on keeping inflation low. In Slovakia, by 2020, the unemployment of men has increased by 0.78 percentage points, while for women it has increase by 1.1 percentage points. In Hungary, the situation is very similar in the case of the men population, it was 0.7 percentage points for men and 0.83 percentage points for women. The explanation for the observed changes is that stricter restrictions have been introduced in Slovakia, also more enterprises had to be closed, and this has ultimately led to a higher rise in unemployment. Furthermore, the closure did not affect the car factories, construction companies, machine-building plants, but rather the trade and hospitality dominated by the female workforce. In 2021, only few restrictions remained, Hungary was characterized by greater freedom in the virus-free period, however, the overall unemployment rate was 1.22 times higher than in 2019, while in Slovakia it was 1.18 times higher compared to the pre-pandemic period. The unemployment rate for men in 2021 was 1.15 times higher than in 2019 and 1.19 times higher than in Slovakia. The unemployment rate for women in 2021 was 1.08 times higher than in 2019 in Hungary and 1.17 times higher than in Slovakia. Hungarian women felt the boom in labor market demand the most. Partial opening in 2021 has also created more opportunities for men.

Table 1. Comparison of unemployment data in Slovakia and Hungary based on various indicators, 2019-2021

Indicator	Country	Man			Woman			Total		
		2019	2020	2021	2019	2020	2021	2019	2020	2021
Number of unemployed (1000 persons)	Slovakia	83,9	94,5	97,4	73,9	86,9	90,2	157,8	181,4	187,6
	Hungary	86,1	104,2	99,9	72,8	93,4	95,8	158,9	197,6	195,7
Number of economically active (1000 persons)	Slovakia	1501,2	1481,4	1457	1240,2	1231,3	1291	2741,4	2712,7	2748
	Hungary	2566,2	2566,3	2571,7	2237,3	2234,5	2258,6	4803,5	4800,8	4830,2
Unemployment rate (%)	Slovakia	5,6	6,4	6,7	5,9	7,1	6,9	5,8	6,7	6,8
	Hungary	3,4	4,1	3,9	3,3	4,2	4,2	3,3	4,1	4,1

Source: prepared by the authors based on Datacube and the Hungarian Central Statistics Office (2022)

The distribution of unemployment was neither territorially nor temporally identical (Table 2). Maximum values per row and per column are highlighted in bold in the table. In 2019, before the implementation of the restrictions, the highest unemployment rate was measured in Q3 in Jász-Nagykun-Szolnok county, and in Q4 Szabolcs-Szatmár-Bereg county took over this negative leading role. This year, the highest regional unemployment rate was 8.8%, related to Q1. The mentioned counties are engaged in agricultural activities in a higher proportion than the others. For this reason, the

decline in employment rate at the beginning of the year is understandable. Restrictions began in Q1 of 2020, that time we measured 9% unemployment rate in Baranya county. The stated county borders with Croatia, which is bordered by Italy, and the unemployment has risen significantly in the initially affected area by the virus and the epidemic. In the other quarters of 2020, Szabolcs-Szatmár-Bereg county provided the worst data (8.5%, 9.1%, 8.8%). The situation changed significantly in Q1, Q2, Q3 of 2021. In this period, Nógrád county holds the negative record (11%, 11.3%, 11.4%). The reason is that the counties economy is strongly connected to the neighboring areas of Slovakia in virus-free periods.

Unfortunately, in 2021 these connections were broken due to the protection of health. During this period, the obligation for a compulsory vaccination for the possibility of crossing the border also emerged as an obstacle. In the Q4 of 2021, the highest value was measured again in Szabolcs-Szatmár-Bereg county. Looking at the summary, we can state that the Q2 of 2020 was the weakest period for Budapest and Western Hungary. The worst datas of Somogy, Tolna and Heves, Szabolcs-Szatmár-Bereg, Békés, Baranya and Jász-Nagykun-Szolnok county are connected to the beginning of 2020. In the last quarter of 2021, Borsod-Abaúj-Zemplén county struggled the most with unemployment.

Table 2. Unemployment rate in Hungary by county, quarterly, 2019-2021 (%)

Counties	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
Budapest	2,5	2,2	2,1	2,6	2,5	**3,8**	3,1	3,5	3,5	3,0	2,4	2,8
Pest county	2,4	2,4	2,7	1,7	2,5	3,5	3,5	3,4	**3,8**	2,9	2,6	2,5
Fejér county	3,1	2,4	2,8	2,4	1,5	**3,2**	2,7	2,5	2,5	1,9	2,3	2,0
Komárom-Esztergom county	2,2	1,7	1,1	1,1	2,9	**4,5**	2,9	1,4	1,9	3,2	2,3	1,2
Veszprém county	0,8	1,0	1,2	1,9	2,5	**3,9**	2,1	2,5	2,7	2,3	1,4	1,5
Győr-Moson-Sopron county	1,5	0,7	1,1	1,1	0,7	**2,6**	2,1	1,4	1,0	1,4	1,7	1,6
Vas county	3,0	2,4	2,4	1,9	1,3	**3,1**	1,6	1,9	2,5	2,7	2,5	1,2
Zala county	2,1	2,5	1,9	1,9	2,9	**4,7**	4,4	2,5	4,7	4,0	3,2	3,2
Baranya county	6,4	5,9	5,8	7,7	**9,0**	7,2	6,4	6,3	6,2	5,1	5,1	5,8
Somogy county	3,1	4,1	3,4	3,8	5,2	4,2	4,3	3,4	5,6	**6,2**	4,9	5,0
Tolna county	3,1	2,3	3,3	3,4	2,3	2,7	3,4	3,0	**3,7**	1,2	3,5	2,2
Borsod-Abaúj-Zemplén county	4,7	4,7	4,3	3,5	4,3	4,4	5,6	5,0	5,0	5,0	7,0	**7,1**
Heves county	2,2	2,8	2,5	2,8	2,1	3,5	3,6	3,3	3,6	**4,1**	3,1	3,7
Nógrád county	6,7	7,4	7,3	6,0	7,4	6,2	8,8	8,6	**11,0**	**11,3**	**11,4**	8,6
Hajdú-Bihar county	4,6	5,0	4,4	3,8	4,1	4,7	**6,4**	5,5	5,1	6,2	5,3	5,1
Jász-Nagykun-Szolnok county	5,3	4,7	**7,8**	4,7	**8,2**	7,1	7,8	7,2	7,2	6,1	6,5	5,3
Szabolcs-Szatmár-Bereg county	**8,8**	**8,2**	7,4	**7,8**	8,7	**8,5**	**9,1**	**8,8**	**9,6**	9,4	8,6	**9,2**
Bács-Kiskun county	2,0	2,6	3,3	3,6	4,5	**5,9**	4,3	4,2	4,6	4,0	4,7	4,6
Békés county	6,2	4,3	6,7	5,0	4,5	7,0	5,8	6,0	**8,2**	7,0	5,7	4,8
Csongrád-Csanád county	2,5	1,7	2,0	2,5	2,5	3,4	3,5	3,4	**4,9**	3,0	2,4	1,1
Country in total	**3,4**	**3,2**	**3,4**	**3,2**	**3,6**	**4,5**	**4,3**	**4,1**	**4,5**	**4,1**	**3,9**	**3,7**

Source: prepared by the authors based on the Hungarian Central Statistics Office (2022)

Already in October 2021, Russian tanks were gathering along the Ukrainian border (The Washington Post, 2021). Investors reacted sensitively to this, and no new job-creating investments were made along the border. Throughout analyzing the unemployment rate in Slovakia by regions and quarters, was noted that the lowest productivity was observed in Prešov region until 3Q of 2021 (Table 3) (World Bank, 2019). Maximum values per row and per column are highlighted in bold in the table. It is probably caused by the lack of vaccination which led to the strong negative effects of the third wave in Banská Bystrica region. In this region the unemployment rate was weightier than in Prešov region (today 7SK, 2021). Regarding to the COVID regulations at the end of May and at the beginning of June 2021, Trnava region was significantly in a bigger risk than its neighbors. In addition, in the surrounding areas, like Trenčín, Bratislava and Nitra districts, we could observe a reduction of local restrictions and a boom in tourism. The worst period in the districts of Bratislava, Trenčín, Nitra and Žilina was the Q3 of 2020. These districts rely deeply on tourism, but it did not welcome and receive the traditional number of visitors during this period.

Table 3. Unemployment rate in Slovakia by regions, quarterly, 2019-2021 (%)

Region	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
Bratislava region	2,0	2,4	2,7	2,3	3,2	3,1	**3,6**	3,5	3,4	2,4	2,6	1,9
Trnava region	4,9	4,8	4,6	4,0	3,4	5,0	5,8	5,7	6,1	**6,3**	6,2	5,4
Trenčín region	3,0	3,0	2,8	2,6	2,9	3,4	**5,1**	4,2	3,7	3,7	3,7	3,4
Nitra region	4,5	4,7	4,6	4,7	4,4	5,0	**6,8**	4,8	4,6	4,7	4,7	3,9
Žilina region	3,5	4,4	5,1	4,9	4,8	5,6	**5,9**	5,8	5,6	4,6	5,0	4,5
Banská Bystrica region	8,7	8,1	7,4	7,2	7,4	8,5	8,1	7,8	9,8	9,8	10,2	**11,0**
Prešov region	**10,4**	**9,4**	**10,1**	**10,6**	**11,7**	**12,0**	**12,2**	**12,6**	**12,4**	**12,3**	**10,6**	10,4
Košice region	8,2	7,7	8,4	7,2	8,1	8,9	8,8	9,6	9,7	10,4	10,2	**10,8**

Source: prepared by the authors based on the Statistical Office of the Slovak Republic (2022a)

Unemployment rate data divided and focused on the economic sectors were found only in the Slovak statistical database, broken down by quarters. Looking at the disaggregated data, we can state that the highest unemployment rate was always observed in the industrial sector during the period analyzed by us. The worst situation was reached in the Q3 of 2020, concretely 50.8%. We also observed consistently high unemployment rate in the wholesale and retail trade sectors, where we found the highest rate of 21.2% in the Q2 of 2021. In the accommodation and food sector, the unemployment rate was low in 2019, with 22.2% in Q1 of 2021.

If we are observing the table by age in Hungary, it is noted that the economically active population with age 15-19 has low level of education, therefore the unemployment rate is always the highest among them in the under reviewed period (Table 4). Maximum values per row and per column are highlighted in bold in the table. For the 20-24 and 25-29 age groups, the worst statistics were observed in Q2 of 2020. For the population group aged 39, the Q1 of 2021 was the period with the worst results, for the age group 40-49, the Q1 of 2020, for the age group 50-54, the Q2 of 2021, and for the population over 55, the Q3 was the period which has resulted the highest unemployment rate. The explanation for the previously mentioned facts is that the very first actions in the companies, when it comes to firing, hit the younger and the middle-aged people. The most important people and the main drivers of the companies are between 30 and 39. During this period, companies with the pre-retirement age groups acted with empathy and they were less affected by the downsizing. In the Q1 of 2021, people between 30 and 39, who were previously the pullers, started to receive their letter of resignation as well. In the Q2 of 2021, the unemployment rate among the working age groups 15-19 and 50-54 has increased.

To sum up, this period has been very difficult for both employers and HR professionals in a human and corporate way. Unfortunately, by the time humanitarian interests were forced to be ignored and company's long-term interests were no longer decisive.

Table 4. Unemployment rate in Hungary by age groups, quarterly, 2019-2021 (%)

Age group	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
15-19	**26,3**	**20,6**	**21,0**	**25,3**	25,8	27,0	23,4	23,6	30,5	32,5	30,4	24,0
20-24	8,9	9,3	9,9	10,4	9,6	**13,2**	11,7	9,9	11,8	11,2	12,2	11,1
25-29	4,3	4,2	4,8	4,2	4,8	**6,6**	5,5	5,9	5,8	5,5	4,6	4,1
30-34	2,6	2,3	2,4	2,5	2,8	3,7	3,8	3,3	**5,2**	3,9	3,6	3,7
35-39	3,1	2,8	2,3	2,5	3,6	3,5	4,2	3,9	**4,4**	3,8	3,5	3,2
40-44	2,8	3,0	3,3	2,3	2,9	**3,9**	3,5	3,4	3,4	2,7	2,9	2,9
45-49	2,8	2,6	2,2	2,6	3,1	**3,7**	3,3	2,8	3,3	2,9	2,3	2,5
50-54	2,7	1,7	2,7	2,5	2,5	3,3	2,7	2,7	2,6	**3,5**	3,1	2,9
55-59	2,5	2,8	2,1	1,7	2,0	3,2	3,5	**3,8**	3,0	2,9	3,1	3,5
60-64	2,1	2,5	2,1	1,9	2,3	2,4	2,9	**3,4**	3,2	2,9	2,3	2,1

Source: prepared by the authors based on the Hungarian Central Statistics Office (2022)

Also, Slovakia in age group 15-19 had the highest unemployment rate. These values exceed those in Hungary (Table 5). Maximum values per row and per column are highlighted in bold in the table. The highest data was reached in Q1 of 2021. For age group 30-34, the COVID-19 pandemic did not cause an increase in unemployment, the worst results were observed in Q1 of 2019. The Q3 of 2020 caused the most significant increase in unemployment for age group 60-64, which sometimes led to tragedies due to the hopeless situation. In Q3 of 2020, 35-39-year-olds were laid off in terms of redundancies; Q2 of 2021 was a period of rising job losses for people aged 50-54 and the Q3 for age group 55-59. In Q1 and Q2 of 2020, companies refrained from layoffs, and in the Q3 of 2020, they started the line with those ahead of retirement.

Table 5. Unemployment rate in Slovakia by age group, quarterly, 2019-2021 (%)

Age group	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
15-19	**35,8**	**39,5**	**46,8**	**56,1**	41,9	41,1	50,1	43,0	60,4	52,7	41,0	51,5
20-24	11,8	12,1	14,8	13,3	13,4	16,6	18,7	18,6	19,0	18,1	**19,5**	15,9
25-29	6,5	6,1	5,9	5,8	6,1	8,9	9,7	9,7	**9,8**	9,2	8,4	8,9
30-34	**7,6**	7,4	6,8	7,0	6,6	5,6	7,2	6,2	5,5	6,0	6,3	6,5
35-39	5,5	5,0	5,8	5,9	7,3	8,0	7,6	**8,1**	7,2	7,1	5,6	5,4
40-44	4,7	4,3	4,0	4,1	4,5	6,0	6,3	6,0	**7,4**	6,5	6,0	6,0
45-49	4,2	4,6	4,2	4,0	4,2	5,0	4,8	4,8	**5,6**	5,3	5,4	5,3
50-54	3,7	4,4	5,0	4,5	4,5	4,7	4,9	3,9	4,1	**5,4**	5,0	5,1
55-59	6,2	5,8	5,2	4,3	5,2	4,5	4,6	5,7	5,8	5,9	**6,3**	5,7
60-64	3,2	3,0	3,2	3,4	4,4	4,2	**5,5**	4,1	4,0	4,3	4,9	4,3
65-74	0,0	0,0	0,4	0,3	0,8	1,3	0,8	0,9	0,0	0,9	1,4	**1,7**

Source: prepared by the authors based on the Statistical Office of the Slovak Republic (2022a)

Based on Figure 3, we examined Hungary's unemployment rate over the past three years. The number of unemployed people with higher education level was extremely low as a starting point, and the values of those with high school diploma and a vocational qualification are very low. As expected, the population with elementary education level found it harder to find work. As a result of the COVID-19

pandemic, we could observe a minimal increase in the unemployment rate among the unskilled in the first year. However, there was a significant increase in the other groups. In 2021, we detected a minimal decrease in the case of graduates and a more significant decrease in the case of those with a vocational qualification. Unemployment rate of the population with diploma and the population with less than eight classes has risen minimally.
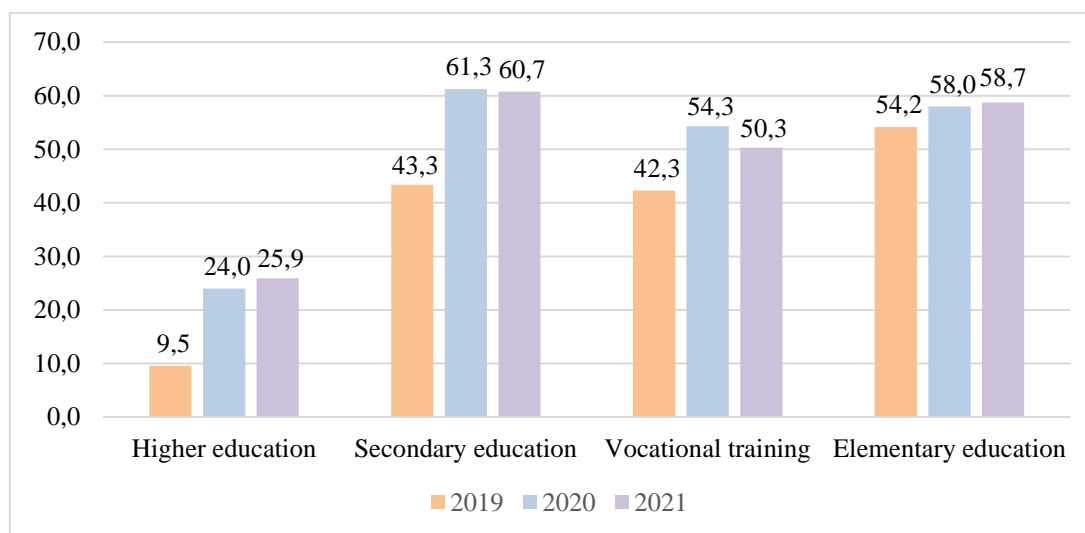
Fig. 3. Unemployment rate in Hungary by level of education, 2019-2021 (thousand people) in percent
Source: prepared by the authors according to the Hungarian Central Statistics Office (2022)

According to Figure 4, unemployment among the population with diploma was also low in Slovakia, with a slightly higher value for skilled workers. Remarkably, the unemployment rate of high school graduates and graduates of up to eight grades was essentially the same. In the first year of the crisis caused by the coronavirus, unemployment among the population with elementary school fell, for two possible reasons. First, the fear of stricter controls, since not all the employees were legally

employed. Secondly, according to our previous research, we can declare that the role of hygiene has increased during a pandemic. Therefore, the demand after cleaners has increased significantly. Noteworthy growth can be detected in the other groups. In 2021, the unemployment rate of the population with higher education, i.e. with at least high school diploma decreased, while the rate of skilled workers and those with up to eight classes increased.
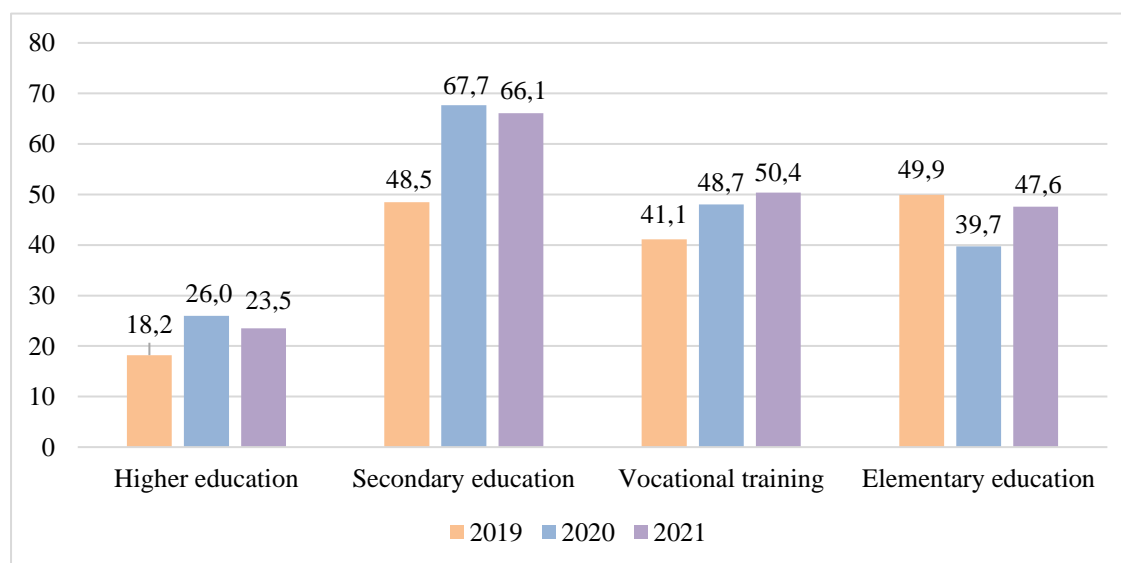
Fig. 4. Unemployment rate in Slovakia by level of education, 2019-2021 (thousand people) in percent
Source: prepared by the authors based on the Statistical Office of the Slovak Republic (2022a)

Conclusion

Although both countries publish comprehensive statistical analyzes, it was difficult to find data with the same duration and dimension or to edit them with calculations. Sometimes the transformation process of the information has become the limit of our study. In the future further publication could be done by comparing the V4 country group (Hungary, Slovakia, the Czech Republic, Poland) and by comparing the unemployment data of the countries with a historical past and innovation potential along the Baltic Sea (Latvia, Lithuania, Estonia).

We were able to discover interesting regional connections. In Hungary, the two counties with the worst unemployment rates maintained their negative positions. The employment rate was the most favorable in Veszprém and Győr-Moson-Sopron counties in Q1 2019. In the fourth quarter of 2021, Csongrád-Csanád county took the first place, and Komárom-Esztergom county and Vas county finished in second place.

There has been no change in the regions with the highest employment rates in Slovakia. Bratislava is in the best position, followed slightly by Trenčín region. The most disadvantaged before the pandemic was the Prešov region, with a similar but lower unemployment rate in Banská Bystrica region. The former mining area slipped back to the last place after the pandemic and in the penultimate place finished Košice region. The reasons for the change of order are manifold. These include proximity to borders, infection, vaccination, economic expectations.

Restrictions imposed due to the coronavirus can be interpreted as negative demand, amplified by supply-side weaknesses. The sudden cessation of manufacturing activities has triggered the collapse of the global supply chain, which has spread to areas less affected by the virus. Production processes in countries with higher economic exposure have also collapsed. As a result of the mandatory distance measures, the catering industry was closed down and tourism ceased, which distributed an immediate blow to businesses and workers in the tourism sector. During examining the labor market data in Slovakia, the decline in employment rate was most noticeable in the industrial sector, followed by retail and wholesale trade, and finally in the tourism and catering industry.

Similar results can be observed in the two analyzed countries in terms of age groups and educational level. The highest unemployment rate was detected in the young adult age group. In terms of education, both countries have the lowest unemployment rates in tertiary education. Based on the data, we observed the problem of compatibility of the company's short- and long-term interests with the humanitarian aspects poses for the experts in charge of labor relations. The most interesting result of the study, which is also true in both countries, is that the most difficult group to employ is the group with secondary education, in which the unemployment rate is even higher than in primary education level. Based on the data, we saw that employers evaluate professional qualifications, only if the knowledge covers innovative procedures, the ability to document the work done by computer, and professional language skills. It would be worthwhile to examine in which field the unemployment rate with diploma was the highest and whether there is a link between job loss and language skills. The analysis confirms the theories and statement of other researches, in the long-term resources invested in education contribute to the stability of the country and reduce the vulnerability of workers in recession.

Working capital investment is extremely beneficial for the host country, but there is a serious disadvantage compared to nationally owned companies. During the recession, the capital received may retreat to the mainland. Like previous financial crises, the pandemic highlights the vulnerability of industry and export-driven economies during the recession and highlights the importance of diversification.

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STATE SUPPORT FOR SMALL AND MEDIUM-SIZED ENTERPRISES IN PANDEMIC PERIOD: EVIDENCE FROM SLOVAKIA

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Abstract

In the past two years, the world had to face and fight against the new infectious respiratory disease – COVID-19. Shortly after the emergence of the disease, it had become declared a pandemic by the WHO (World Health Organizations). Millions of deaths were reported caused by the pandemic, affected were different age groups of people. In addition to the decline of the health situation, the pandemic had significant impact on the functioning of the social and economic mechanisms. COVID-19 also influenced the situation on the labour market. It had negative impact on the SME sector worldwide. This trend applies in Slovakia as well, where introduction of home office proved to be a sensible solution in order to minimize the physical presence and contact of the employees, especially in the sectors where home office was a possible solution. Teleworking is a work done away from the office/site, so the work is done using information and communication technologies. The main goal of this study to present the impact of COVID-19 on the Slovak labour market, which focuses on transition to remote work (home office). At the same time, the state introduced several forms of subsidies to ease the burden of entrepreneurs. This study is addressing the question to what extent the small and medium-sized enterprises in Slovakia utilized the subsidy schemes introduced by the state. We put special emphasis on the service sector. The theoretical background of the study is based on the summary of the relevant scientific literature, which is followed by the presentation and introduction of secondary data. Since the amount of collected data is limited, we focus on the presentation of data from 2020. Secondary data are collected using relevant databases of Eurostat, OECD, Statista, the Slovak Business Agency, Association of Hungarian Entrepreneurs in Slovakia and the Ministry of the Economy of the Slovak Republic (MH SR). The SME sector is the biggest victim of the economic crisis caused by the epidemic, with 9.8% of businesses closed due to the hopeless situation. With the introduction of Lex Corona 2020, the Slovak government has sought to preserve jobs, keep businesses alive and prevent negative effects. In Slovakia, the proportion of people working from home increased by 2% compared to the period before the coronavirus epidemic, while workers were satisfied with the technological conditions and quality of their work at home. The government has prioritized support for industry, while the service sector and trade have benefited from only 20% of state support. All in all, businesses in the service sector and trade were dissatisfied with the support provided to them. The results of the research and the conclusions and findings of the data analysis can provide useful information for researchers working in a similar field as a result of the pandemic and for those interested in the SME sector.
KEY WORDS: coronavirus; Slovakia; teleworking; SMEs; state subsidy.

Introduction

Small and medium-sized enterprises (SMEs) are the backbone of the economy, as they create workplaces and increase profit. In Slovakia, 99,9% of the business organizations were categorized as small and medium-sized businesses in 2019. The unexpected emergence and spread of COVID-19 had also reached Slovakia in the early 2020 and had negative impact on the social and economic life of the country. The devastating effects of the health and economic crisis had influenced the businesses as well. The restrictive measures introduced by the government to curb the pandemic resulted in complete shutdown of many businesses. Some of them could continue their business activity respecting the introduced measures. Businesses operating in service sector that requires physical presence of the employee had suffered the most. The future of these businesses became uncertain, the turnover of the companies decreased. Nevertheless, a certain percentage of business operating in service sector were able to introduce teleworking, which resulted in introduction and a widespread use of information communication technologies. The goal of the present study is to explore the measures of the transition from physical presence at workplaces to home office in Slovakia during the pandemic COVID-19. The further goal is the analysis of the amount and quality of state subsidies the Slovak SMEs applied for. The research is based on collection, presentation and comparison of secondary data, using relevant databases of Eurostat, Statista, OECD, the Slovak Business Agency and the Ministry of the Economy of the Slovak Republic – MH SR. Since the amount of collected data is limited, we focus on the presentation of data from 2020. The results collected and published in this study provide a comprehensive overview of the effects of the pandemic COVID-19 on the Slovak SMEs. Our research, based on secondary data, aims to provide a comprehensive view of the impact of the epidemic, including support from the Slovak government focusing on SMEs in the service sector, and to mention the government's provisions on traditional work as a result of the epidemic.

The impact of COVID-19 in Slovakia

The coronavirus pandemic COVID-19 emerged unexpectedly, which had negative impact on societies and economies worldwide. The coronavirus is the well-known „black swan" in the economy since it occurred as an unexpected turn and had serious consequences (Jusko, 2020). One of the most serious problems of the future will be the long-term unemployment, affecting not only Europe but the other continents and economies as well (Beno, 2021). COVID-19 caused not only social and economic problems, but it has had an impact on the physical and mental health of people as well. In order to reduce the social contact, the complete closure of the service sector

and educational institutions proved to be the appropriate solution (Tomšik, Rajčániová, Ferenčíková 2021). The first person infected with the respiratory disease COVID-19 was registered in March 2020 in Slovakia (Capíková, Burda, Nováková 2021). A state of emergency was declared in the country since the number of infected and deaths associated with COVID-19 had dramatically increased. In terms of death rates, Slovakia reported the worst data at the beginning of 2021 (Laca, Laca 2021). The health crisis caused by COVID-19 had hit harder the economies than the economic crisis in 2018. The spread of the pandemic affected the normal operation of businesses, which was restricted by the government measures to curb the spread of the virus (Belánová 2021). In the first month, Slovakia was characterized by unity and fight against the virus. However, the situation also highlighted the weaknesses of the Slovak government. It has led to the reform of the government in autumn 2020 (Turska-Kawa, Csanyi, Kucharčí 2022). As far as sales are concerned, the Slovak SMEs were in the most vulnerable position (Belanová, 2021). Due to their flexibility, workplace creation ability and implementing innovative technologies, SMEs are the driving force of the economies (Hitka et al., 2021). The biggest negative impact of COVID-19 is the financial collapse and the increase of unemployment rate. The Slovak government provided similar measures to boost economic growth as it was introduced by other countries as well. These measures were different in terms of quantity and time span (Krásna, 2021). In order to overcome the challenges caused by COVID-19 in the SME sector, the first step is to modernize and provide quick access to subsidies (Belanová, 2020). Following the outbreak of the pandemic, people paid more attention to maintain their health condition, which also influenced the spread of the respiratory disease (Čvirik, 2021). The Slovak mainstream media had a quick reaction on the spread of the pandemic and provided up-to-date information, while the spread of fake news had significantly influenced the confidence of people. Selection in the flood of information required open-mindedness and critical thinking (Vyšňovský, Rosinská, Mináriková, 2021). The pandemic had significant impact on the labour market as it affected the way of working. In certain sectors, the employees were trying to maintain their activities and save workplaces with the help of state subsidies (Štalmachová, Strenitzerová, 2021). In order to revitalize the Slovak economy in the near future, it is necessary to ensure conditions for the businesses that promote and help economic growth and help them to be prepared for the crisis situation (Kufelová, Raková, 2020).

The role of ICT (Information Communication Technologies) and digitalization in the business sector

Information and Communication Technologies (ITC) have a prominent role in the socieites nowadays, since their presence has changed the communication channels and possibilities between the people, as well as the access to and acquisition of new knowledge. ICT has a significant impact on our everyday life and the economic development, contributing to enhancement of quality of life (Roztocki, Soja, Weistroffer, 2019). It is the basic pillar of sustainable business activities. The absence of efficient ICT might result in operational problems, as it is a catalyst of performance saving time (Ejemeyovwi et al. 2019). Digitalization allows the use of technological innovations that affect the operation of business and provide new opportunities to gain profit or remain profitable (Stalmachova, Chinoracky, Strenitzerova, 2021). Most of the studies addressing the issue of ICT are aimed at successful operation of businesses and the increase of performance and competitiveness (Zecevic, Radovic Stojanovic, Cudan, 2019). There are two categories distinguished of ICT devices, according to which there are portable and non-portable devices (Mesaros et al., 2020). ITC devices can be defined as any set of electronic tools that enable sharing knowledge and information with others. They contribute to economic improvement as they ensure efficient workflow, create new workplaces and resilient in competition. The information and communication technologies cannot be exclusively linked to the ICT sector (Fabová, 2014). Strenitzerová (2016) emphasized that the ICT sector has not been addressed adequately in Slovakia. There are many positive benefits using ICT, e.g. the company is successful in competition, ICT provides efficient operation of the business (Mandičák, Mésaroš, Spišáková, 2021). Satisfying consumer needs, the ICT tools provide flexibility, while the production and service cycle will be shorter (Mésároš et al., 2021; Drábik et al., 2020). Maintaining and increasing competitive advantage in the service sector is essential. Digitalization is important in terms of market penetration as well. However, technological innovations are constantly changing and require continuous investment (Hušek, 2019). Companies use a wide range of ICT solutions in an extensive way, as they ensure quick information access and transfer (Hallová, Hanová, 2019

). The biggest benefit of electronic technologies is that they ensure innovative solutions, but attention has to be addressed to the relevance of data protection. This is the greatest threat of technological innovations. It is necessary to emphasize that in terms of Industry 4.0 as well as the ICT, Slovakia lacks behind the Western European countries (Snieška et al., 2020). Recently, due to the result of pandemic COVID-19, the ICT technologies have become widespread in the companies, as well as the shift to electronic work proved to be a successful solution (Bolek, Zelina, 2021). Teleworking as a possible form of atypical work was recognized by Slovakia in 2007, which has been used as a best practice in different fields of work (Murray Svidroňová, Mikušová Meričková, Stejskal, 2016). Teleworking means working from home or remotely using modern technologies, providing flexibility for the employee (Como, Hambley, Domene, 2021). According to the Slovak law, ensuring these conditions and technological resources is the responsibility of the employer, as well as minimizing the negative feelings as a result of separating employees is the task of the employer (Sládek, Sigmund, 2020). In order to minimize the physical contact, teleworking proved to be a rational solution, which would be supported by significant ratio of employers after the pandemic is over. However, it is important to pay adequate attention to performance and

work-life balance of employees (Pásztóová, 2021). Seven times more workers did their work in their home environment than before the pandemic. Positive benefits of teleworking had significant impact on the employee satisfaction as well (Karácsony, 2021).

The service sector in Slovakia

The presence of coronavirus pandemic in Slovakia was confirmed in March 2020. The pandemic had significant impact on the business environment and economy of the country. Although all the consequences of COVID-19 are difficult to forecast, it can be declared that the effects of the pandemic are mostly felt and visible in the SME sector of the country. Self-entrepreneurs are also affected (Dvorsky et al., 2020). Although COVID-19 affected all types and sizes of businesses, the biggest difficulties were faced by the SME sector. According to the statistics, the number of small and medium-sized enterprises has increased by 4,8% in 2020 to 258 174. SMEs accounted for 73,8% of the Slovak employment in 2019 (Belanova, 2021). Services become an increasingly important in the SME sector. They have significant impact on the GDP and contribute to workplace creation. Although services accounted for a small share of the economic performance in the 1960s, currently they account for more than 70% of the GDP in developed countries, dominantly produced by the SME sector. This ratio is steadily increasing (Benesová, Husek, 2019; Michálková et al., 2021). Service sector accounts for 65,1% of the GDP in Slovakia (OECD, 2021). The service sector is difficult to define due to the diversity of activities, but has several common characteristics. According to Bryson and Daniels (2007), there are different groups: group of natural activities (based on NACE classification), grouping based on functions performed (production, distribution, personal and social services), services based on the method of implementation (market based services, social and economic needs), services based on target service markets, COPNI classification (classification of services based on target) (Bryson, Daniels, 2007).

Subsidy schemes for SMEs, the Slovak business environment

The uncertain economic environment caused by COVID-19 pandemic has posed challenges to small and medium sized enterprises. How successful a business can remain in a challenging business environment depends on how well the business can adapt to the unfavourable business environment (Buganova, Moricova, 2017; Bazo et al, 2019). According to the results of the Monitoring Business Environment survey (2020), a total of 53 243 small and medium-sized business fall to the vulnerable category caused by pandemic restrictions. 8,9% of the SMEs were forced to close. The most vulnerable businesses are those employing less than 10 employees. It accounts for 96,2% of the SMEs (Belanova, 2020). The unemployment rate was also affected by the pandemic. Taking into account the number of job seekers in 2020, the unemployment rate has increased by 2,12% (Svabova et al., 2021).

GDP decline caused by the pandemic stood at 6,3% in Slovakia in 2020. At the same time, the strong government measures forecasted economic growth (OECD, 2020). The first pandemic measure adopted was the postponement of income tax payment, immediately after announcement of emergency on 15th. March 2020. Financial contribution was provided for enterprises as well as financial subsidy to settle employee salaries. One of the measurements introduced was the postponement of the deadline paying the income tax advance for those businesses that suffered more than a 40% drop in revenue due to the pandemic. Gross 55% of the salary of parents staying in quarantine or were quarantined with children was financed by the state. State financial subsidy was provided for the employees of those businesses and self-entrepreneurs who recorded a decrease in revenue. In April 2020, the state contributed to salary with 180 EUR/employee in those companies, where the revenue decreased by more than 20% during the pandemic. The companies recording more than 40% decrease in revenue received 300 EUR subsidy/employee from the state. In the case of those companies, where the revenue decreased by 60%, received 420 EUR/employee. This amount of subsidy increased to 450 EUR/ employee in the case of 80% decrease in revenue (OECD, 2020). Measures taken in the country were focusing on three fields (Belanova, 2021):
- maintaining employment
- postponement of payments
- financial subsidies

Research results – telework in Slovakia during the pandemic COVID-19

In July 2020, the Slovak government approved the "Lex Corona", a package of 115 provisions, the largest package of measures aimed at restoring the business environment in Slovakia. Paragraph 44 of the provision package discusses in details the switch to telework ensured for employees by their employer (Lex Corona 2020). Based on the data of Eurostat, before the outbreak of pandemic COVID-19, the number of employees working from home accounted for 3,7% in Slovakia (Eurostat database). According to the 2020 data available in Statista database, employees working from home accounted for 5,7%. Only 5,9% of the employed worked in home environment in 2020 (Statista 2020).

Ensuring information and communication technologies to work from home is considered an essential resource (López, Rodríguez-Modroño, 2020). It enables the access to information and easier communication with others (Braukmann et al., 2018). Table 1. Presents the data from June-July 2020, based on the data of Eurofound database. It shows how employees working from home were adequately equipped to conduct their work in a home environment. The data presents the satisfaction of employees in active employment, regardless to their gender. According to the data, 24,7% of the Slovak employees working from home felt absolutely satisfied with the ICT equipment provided for their work from home. 40,9% of the employees expressed that they were satisfied, while 17,2% had rather mixed feelings. Only 8,6% of the respondents expressed dissatisfaction, while 8,7% felt absolutely dissatisfied.

Table 1. Satisfaction with work equipment provided for employees working in home office

Absolutely satisfied	24.7%
Satisfied	40.9%
Neither satisfied nor dissatisfied	17.2%
Dissatisfied	8.6%
Absolutely dissatisfied	8.7%

Source: https://www.eurofound.europa.eu/data/covid-19/working-teleworking

Table 2. presents the satisfaction of employees working from home in Slovakia. The data obtained from Eurofound database is referring to data of June and July, 2020. The data presents the satisfaction of employees in active employment, regardless to their gender. According to the data, 21,4% of the employees were absolutely satisfied with their work. 40% of the employees felt satisfied. 21,3% of the respondents felt neither satisfaction nor dissatisfaction about home office. 9,6% of the employees were dissatisfied, while 7,7% felt absolutely dissatisfied with working from home.

Table 2. Employee satisfaction with home office in Slovakia

Absolutely satisfied	21.4%
Satisfied	40.0%
Neither satisfied nor dissatisfied	21.3%
Dissatisfied	9.6%
Absolutely dissatisfied	7.7%

Source: https://www.eurofound.europa.eu/data/covid-19/working-teleworking

Research results on state subsidy provided for the service sector in Slovakia during the pandemic COVID-19

In 2019, before the outbreak of COVID-19 pandemic, the economic development of Slovakia could be characterized with an upward tendency. The services provided and goods manufactured in 2019, totalled 147.615 mil. EUR. The largest increase was in the fourth quarter (26.16%; 38.618 million EUR), and in the second quarter of the year (25.20%; 37 204 million EUR). Immediately after the outbreak of pandemic, the growth was replaced by decline, especially in the first quarter of 2020. Lex Corona approved in 2020 provided several different forms of subsidies for enterprises in order to compensate the revenue losses. However, the measures introduced helped many businesses, not all businesses applied for subsidies. The table below summarizes the business applying for state subsidy based on the sector they operate in.

Table 3. Utilization of state subsidies
Source: http://monitoringmsp.sk

	Yes, absolutely	Yes, partly	No, the revenue loss was higher than the subsidy	No, did not apply for subsidy
Total	1,40%	17,60%	49,40%	31,70%
Accommodation services	2,40%	21,40%	56,30%	19,80%
Catering	1,80%	17%	64,50%	16,70%
Recreation	1,10%	14%	51,80%	33,20%
Education	2,60%	14,30%	41,60%	41,60%
Small shop	0,40%	22,30%	29,40%	47,90%

As it is presented in the table above, 31,7% of the surveyed companies did not apply for state subsidy compensating their revenue losses. According to 49,4% of the respondents, the revenue loss was higher than the amount of subsidy they could apply for.

Based on the survey conducted by the Slovak Business Agency, most of the companies applied for subsidy scheme to save workplaces. 14,3% of the business applied for the subsidy scheme to compensate their revenue loss, while 6,2% of business used the state subsidy to pay the rental cost for the site or offices.
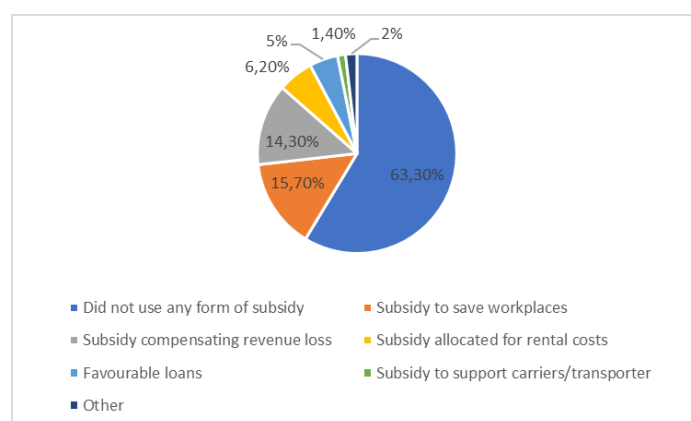
Fig. 1: Utilization of subsidies
Source: Slovak Business Agency

Based on the figure above, the highest amount of subsidy in 2020 was received by businesses operating in industry sector. Trade received 16% of the subsidies and the commercial services received 12%. The lowest amount of subsidy was received by the agricultural sector. It accounted only for 1%.
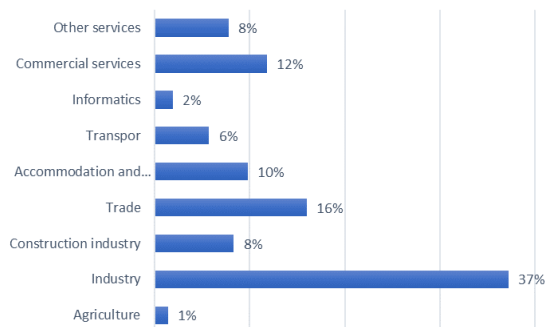
Fig. 2: Subsidies allocated to different sectors in 2020
Source: http://monitoringmsp.sk

This research aims to present the experience of the service sector during the pandemic. The survey was made by the Association of Hungarian Entrepreneurs in Slovakia on 869 SMEs. This association is recognised association, provides an institutional base for the SMEs. Based on the survey conducted in 2020, 25% of the businesses operating in commercial and service sector did not apply for state subsidies, 45% of these companies had negative attitude towards the subsidy scheme. 10% of the business had positive attitude toward the financial support provided by the state.
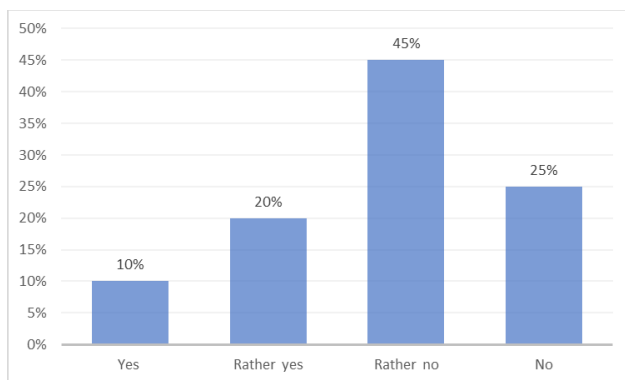
Fig. 3: Opinion of the service and commercial sector about the state subsidy schemes
Source: Association of Hungarian Entrepreneurs in Slovakia
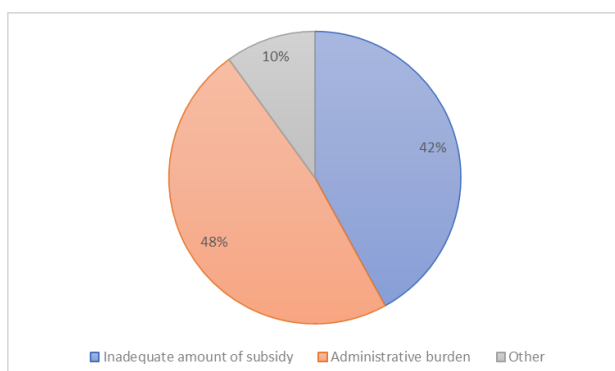
Fig. 4: Reasons for refusing the subsidy schemes by the representatives of trade and service sector
Source: Association of Hungarian Entrepreneurs in Slovakia

The graph above shows the reason of negative attitude of the service and trade sector. Based on the survey results, most of the respondents argued that utilization of subsidies provided for the business would put high administrative burden for the company. 42% of the respondents were dissatisfied with the amount of subsidy, while 10% provided other reason for refusal.

Conclusions

The acute respiratory disease caused by COVID-19 escalated into a pandemic in 2020, thus affecting the social, economic and healthcare situation in Slovakia. The infectious disease affected the life of everybody worldwide, regardless to age of individuals. The governments introduced various measures restricting the free movement of people in order to minimize the spread of the respiratory disease. Slovakia joined the group of countries by introducing similar restriction measures. Such a defensive step in Slovakia was the introduction of home office provided by the employers.

The small and medium-sized enterprises suffered the most from the coronavirus crisis. More than 50,000 businesses had to close. 9,8% of the Slovak businesses falls into this vulnerable category. In order to decrease the revenue loss and other burdens, Slovakia introduced the „Lex Corona 2020". The aim of the introduction of these measures was to mitigate the impact of the pandemic, maintain the operation of businesses and save workplaces. The provisions provided financial support to businesses and a possibility of postponing payments due.

Limited amount of data was available during the secondary research, so we selected the ones we found useful from different databases. Data presented refer to year 2020. Teleworking as an atypical form of employment was not popular before the pandemic in Slovakia. In 2019 (3,7%) and 2020 (5,7%), the ratio of employees working from home increased by 2%. A necessary condition to effective home office is the ICT technology ensured for the employee working from home. More than half of the respondents working from home were satisfied with the ICT conditions provided by their employer as well as with their performance working from home.

The respondent opinion in service and trade sector remained divided about the state subsidies. In our research we were interested in what kind of subsidies did the businesses apply for, more specifically we examined the service sector. Regardless to the sector the businesses represent, 49,4% of the companies reported that the state subsidies did not cover their revenue loss caused by the crisis, and 31,7% of the businesses do not plan to apply for any form of state subsidy. The largest amount of subsidy was provided for the industry sector in 2020. The service and trade sector received 20% of the subsidies allocated for them. Businesses that applied for subsidy scheme were mainly focusing on type of subsidy maintaining workplaces. Many companies claimed compensation because of revenue loss. 70% of the business operating in service and trade sector had negative opinion about the state subsidy schemes in 2020. Most of the respondents complained about the heavy administrative burden and felt the amount of subsidy insufficient for business operations.

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INTERPERSONAL COMMUNICATION IN RETAIL

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Abstract

Communication is a very important part of a manager's job. Every manager communicates with their team, colleagues and his/her manager. Effective communication in the organization is the basis for achieving the goals of the organization, motivating people and creating trust environment. If a manager is able to motivate his/her team, people are willing to do more for the company and themselves. Also, a trust environment supports achieving the company goals, working environment in a team and the whole company culture as well. People communicate nonstop, they share their ideas, opinions, discuss basic daily issues, talk to friends and family members and similar. Even if they do not talk, they communicate because they send non-verbal signals to other people. The best way of communication is face-to-face in real-time. Nowadays, there are many ways how to communicate using modern technologies. These technologies can help if there are long distances between people, e.g., for conference calls with more countries, but this paper focuses on interpersonal face-to-face communication. Communication should enable smooth cooperation with others, e.g., by active listening, managers may get more information about their team members than just listening without paying attention. No less important is non-verbal communication in the interpersonal communication process between two or more people. Different signals may improve added value to the whole conversation, highlight the main information, keep people interested in listening, and tell more than just expressing by using words. Communication is a complex process. Many researchers spend their lives researching this field and looking for ways of effective communication. Everybody can learn how to communicate more effectively and lead the team towards the company goals. The main goal of this paper is the identification of the effectiveness of communication in an international retail organization and to cover the gap in the literature that does not focus on retail. The research took place in its branch in Germany. This research used a questionnaire consisting of questions where respondents indicated answers on a Likert scale Based on the research, it is possible to point out the strengths and weaknesses in the communication process between managers and subordinates. This paper shows how employees and managers communicate and their mutual satisfaction. 48 employees participated in the research of a total of 187 employees, which means the return rate of the questionnaire is 25.67%. The communication process in the selected organization is at a good level, however, with some deficiencies. Among the positive aspects, there is an openness in interpersonal communication and in the department as well, moreover a clear and unambiguous communication of the manager, active listening and understanding of messages that support the effective communication process in the organization. On the other hand, there are some deficiencies, for instance, employees lack more feedback, another issue occurs in the communication process between the manager and his/her team, which is about information flow, where only about a quarter of the information the employees receive from their manager. The benefit of this research is seen for HR professionals, managers and scholars who may get an overview of the pros and cons of interpersonal communication based on results from a questionnaire focused on the way of communication at the company and between supervisor and his/her team and team members.

KEY WORDS: Interpersonal communication; effective communication; active listening; manager; employees.

Introduction

Effective communication in the organization is the basis for achieving the goals of the organization. Through it, information is spread, opinions are exchanged, new ideas are created, it is negotiated, strategies are created and implemented, and similar. According to the latest studies of managerial competencies, communication represents a significant part of the skills needed for a successful manager. Hence the importance of communication in the work of the manager. Many, to be more successful, take communication training or courses so that they can properly pass out information to their employees. The content of such courses is verbal communication, non-verbal communication, barriers to effective communication, argument management, assertive conflict resolution and practical solutions to case studies. In any organization, effective communication is very important because it affects virtually every aspect of organizational behavior. Employees are motivated when information is provided to them clearly and when they can express their opinion. Effective communication supports the proper functioning of the company's organizational culture. Every

employee brings their own habits to work and each organization has its own differences. Many companies seek open communication. Open communication means that the communication partners share all the information necessary for them. It allows employees to be more engaged, motivated, perform better, understand the company goals, and needs and are willing to go beyond their daily work. Managers should encourage open communication in the workplace, they can ask employees for their input, respect their opinions and ideas, actively listen, and also engage on a personal level. Active listening keeps the conversation partner interested in the conversation, which can be seen by paying attention, providing feedback, showing that the person is listening ad responding appropriately. Except of mentioned above, non-verbal communication plays a crucial role in the communication process. Non-verbal communication refers to the ways of communication without using words such as facial expressions, gestures, body language, proxemics (distance between communication partners) and others. It gives valuable information to communication partners about what is going on under the surface, how the person is feeling, how the person agrees or disagrees with what was said. Good communication can

increase teamwork and productivity. Hence, maintaining effective communication ensures the effective communication flow within the organization which means that the management and teams are working on the same goal. Communication is part of everyday life, but effective communication needs to be learned, therefore the main goal of this paper is the identification of the effectiveness of interpersonal communication in an international retail organization. This research was conducted due to a lack of literature focusing on interpersonal communication between managers and their teams in retail.

The structure of this paper is following: (1) Literature review – introduces the main topic of this paper and the latest results of research in this area. (2) Methodology – describes the data used in research and the whole methodology. (3) Discussion – presents the results of the survey. (4) Conclusion – shows concluding remarks about employee development and the limits of the research.

Literature Review

The word "communication" came from the Latin words "communicare" and "communis" which mean to share, participate or make common (Ansari, 2021). Communication expresses the sharing of words, messages, intents, ideas and emotions (Alshenqeeti, 2016; Lamichhane, 2016). People communicate their messages to their communication partners through verbal or non-verbal skills, which means interpersonal communication skills, which are essential for retaining a healthy relationship and smooth running of an organization (Ansari, 2021). It is an open-ended process, not only to pass out the information but also to create meaning (Lamichhane, 2016). The communicator's acceptance of each other's differences and different forms of messages that show the attitude is the base of interpersonal communication (Nehal, 2017). If verbal or non-verbal communication is missing, it can be a challenge to lead a meaningful conversation (Venter, 2019). There is a need to set communication rules for effective information exchange (Naumovski et al., 2016). Two-way communication is expected in the communication process as an indicator of effective communication (Lusiawati, 2019). Interpersonal communication can determine success in the future and is an important tool for understanding each other, delivering instant feedback, solves moments of misunderstanding, ambiguity or confusion (Purnomo et al., 2021, Naumovski, 2016). Effective communicators are able to recognize the needs of communication partners, generally, people who are engaged in communication hope for an outcome such as trust, psychological well-being or mutual satisfaction, each conversation can bring a positive or negative effect on the emotions and the manager can improve communication and employees' feeling about their work (Naumovski, 2016). Effective communication is not about what makes the speaker feel good or passing out the information to another person or what sounds good or just about facts and data it is about goal-oriented, intentional and meaningful communication. It includes any engagement with an employee, even silence (Saadi, 2018). Another important aspect of effective communication is emotional intelligence. According to Nguyen et al. (2019), managers

should continuously improve their emotional intelligence because of its huge effect on communication, furthermore, it can positively influence communication with employees regardless of the complexity of the company structure. Executing the communication effectively is the base of an organization's overall success. Emotional intelligence helps managers to use the right communication style while communicating with their team, regulate the flow and resolve the optimal communication towards employees who are then able to achieve the wished outcome. Deep diving into emotional intelligence topic advantages managers to become more effective managers and help organizations to be more successful. Whether the message is delivered and understood correctly is also influenced by emotional intelligence in the communication process. Continuously improving emotional intelligence leads to an increase in communication skills, productivity and better team environment. Another interesting aspect is the role of self-confidence in the communication process. Self-confidence is one of the factors that determine interpersonal communication, the persons having self-confidence will be more experienced in communicating. High self-confidence increases the ability owned by a person, including communication (Rais, 2020). It is good to remember that managers need to have more than the technical skills to be strong leaders (Nguyen et al., 2019). In the workplace, it is important to take employees seriously which requires to respect their point of view, curiosity to learn what is important to them and learn how to gain their trust. Effective leaders are able to connect with other people by acting according to their needs and interests (Saadi, 2018; Fred Garcia, 2012).

Methodology

The subject of the survey is the identification of the effectiveness of communication in the organization. This paper shows how employees and supervisors communicate and their mutual satisfaction. The survey was conducted in a selected international company in Germany.

This research answers the questions of how the managers communicate with their team, do they use active listening and non-verbal communication while communicating with their communication partner, are the team members able to understand what their manager says, what issues occur in the communication process or any misunderstandings, do the employees receive feedback from their manager. In order to gain anonymous answers to these questions from employees working at the company, for this research was created a questionnaire consisting of questions where respondents indicated answers on a Likert scale from one to five, where one indicated that they fully agreed with the statement and five indicated complete disagreement with the statement. As a part of pre-research, the questionnaire was discussed with HR professionals from the company. The collected data were analysed with data analysis, abstraction, synthesis, and deduction.

Of a total of 187 employees, 48 participated in the questionnaire survey, of which 32 were women and 16 men. The return rate of the questionnaire is 25.67%. According to the position in the organization, 9 team

leaders, 1 team assistant and 38 co-workers participated in the survey.

Results

The first part of the questionnaire focuses on the way of communication in the organization. The first questions highlight how employees obtain information in the organization. One way is to receive information from a supervisor, 27.1% of respondents receive information this way, 18.8% obtain information from their colleagues and the rest (10,5%) of employees obtain information on their own. The question followed the flow of information within the organization. Neely and Mosley (2018) found out that most managers assume they are effective in giving information to their team members, but the employees disagree and managers do not realize it. Effective communication can be developed by managers and their goals can be achieved through communication (Oladiran and Burghate, 2016). On the other hand, 70.9% of employees think that communication in their department is open. 79.2% of employees responded that they have the opportunity to speak openly with their supervisor. When asked if their supervisor provides enough information to perform their work, only 10.5% of employees responded that they do not receive enough information.

In the next section are provided answers to questions in which employees evaluate themselves as they think they are communicating. Self-reflection is an important ability of employees. Being able to evaluate oneself truthfully facilitates the work of the manager, who must give the employee negative feedback. Based on own self-reflection, a person is able to learn from own mistakes and bring corrective measures. In Figure 1, the answers "strongly agree" are shown by the dark blue bar (Answer 1) and the light blue bar (Answer 5) shows the answer "strongly disagree". According to the answers, it can be seen that employees tend to evaluate themselves positively. They perceive their communication as clear and unambiguous (89.6%), and they also try to get rid of their own prejudices (84.4%) during the communication process. 75% of respondents will clarify what their goal is before the talk. In the area of non-verbal communication, they expressed that they are noticed by the conversational partner and they also manifest it. On the other hand, employees are not sure about the distinction between emotional and material aspects. Doubts also arose as to the acceptance of the other's needs, even if they did not agree with their content. Interpersonal communication is beneficial for enhancing cooperation, creating cohesion between employees and conducive climate (Hustagalung, 2017; Raut, 2011).
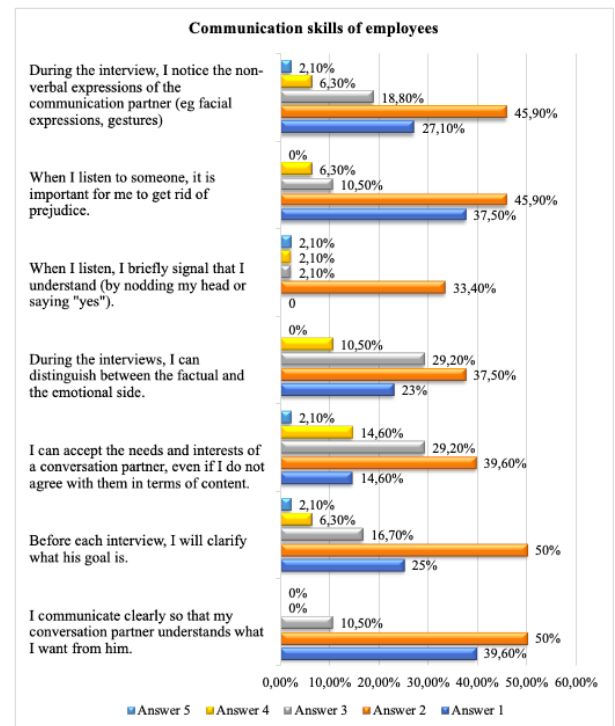
Fig. 1. Communication skills of employees

The following section is devoted to the evaluation of direct supervisors by employees, how the employees evaluate the communication skills of their supervisor from various points of view, such as clear expression, providing feedback, devoting time to employees, or accepting the needs of the employee.

First of all, it was found that the supervisor communicates clearly and distinctly because it is the basis of effective communication. 89.7% of employees agree that their supervisor communicates clearly. Moreover, the supervisors are able to accept the needs and interests of their employees. Providing feedback is an important factor in communicating with the supervisor. On the one hand, whether the employees received enough feedback from their supervisor about their work performance, their evaluation, satisfaction and dissatisfaction, and on the other hand, whether the employees noticed the supervisor's feedback provided through non-verbal communication. From the responses, it can be stated that 60.5% of employees would like their supervisor to provide them with more feedback regarding their work performance. 62.6% of employees in the communication process notice feedback from their supervisor mediated by non-verbal communication. According to research conducted by Neely and Mosley (2018), communication cannot be effective without feedback. Feedback is an important part of the communication process and managers should adopt it in their daily work. Feedback should work in two ways, it is important to seek feedback and increase the clarity of the message (Oladiran and Burghate, 2016). Furthermore, active listening is a key part of the daily business of every manager, therefore one of the questions asks if the supervisor is able to respond to the employee's questions, provide feedback and is able to paraphrase the employee. 79.3% are convinced that their direct supervisor listens actively to them in the

communication process. Active listening is higher and goes beyond the listening skills with the purpose to gain a better understanding of the message and whole context (Jonsdottir and Fridriksdottir, 2019). Listening is seen as a granted skill of managers and in the interaction between manager and their employees (Sharifirad, 2013). Welch and Mickelson (2013) confirmed in their research that listening competence is a key to the effective communication process. However, according to Lloyd et al. (2015), there are not enough empirical studies on active listening and its influence on managerial work. The study conducted by Jonsdottir and Fridriksdottir (2019) tries to gain an understanding of the manager's perception of active listening as an effective management tool in the communication process. According to their study, the participants agreed on the importance of active listening in managerial work and for an organization. Ala-Kortesmaa and Isotalus (2015) determined a positive relationship between listening competence and subjective perception of well-being at work. What is more, the managers should always keep in mind these factors for effective communication: the reason why they are communicating, paying attention to the communication partner, understanding and respecting the other side and keeping an open mind (Oladiran and Burghate, 2019). Regarding the time of sufficient time for a talk between an employee and his/her supervisor, 58.5% of employees agree that their supervisor always has enough time for them, while 16.8% stated that they do not have enough time for them. Time plays an important role in the work of a manager, so it is good to control own "time management". Despite the time stress, every manager should set aside time for his/her team, his/her co-workers. One of the questions focuses on whether the employee has a problem understanding the information he/she receives from his/her supervisor. The purpose of this question is to find out whether employees understand their supervisors correctly and know what is expected of them. A correct and unambiguous assignment is in the competence of the supervisor, who is ultimately responsible for the results of the entire team. 81.3% of employees have no problem understanding their supervisor.

According to the results, 50% of employees are satisfied with the way of communication in the organization, of which 2.1% are very satisfied. 18.8% of employees are on the interface, neither satisfied nor dissatisfied, 25% are not very satisfied and 6.3% are dissatisfied employees in the organization. Based on the results, the communication process in the organization would need to undergo changes to increase employee satisfaction.

Only 4.2% of employees said they did not understand the terms used by their supervisor. It follows that 89.7% of employees have no problem understanding the terms used by their supervisors.

Only 10.5% of employees encounter misunderstandings with their supervisors in the communication process. However, as many as 35.5% answered indefinitely, which is why they partially encounter this and do not partially encounter this problem. Over time, this can become a threat and the percentile can increase.

Conclusion

The research aimed to identify the effectiveness of communication in an international retail organization. The communication process in the selected organization is at a good level, however, with deficiencies present in every company. The openness of communication in the department is a positive aspect of the communication process at the company. Also, the clear and unambiguous communication of the supervisor, active listening and understanding of messages supports the effective communication process in the organization. In terms of deficiencies, employees lack more feedback, although the supervisors themselves admit that they would like to provide more, but due to time constraints, they are not doing well enough. On the positive side, supervisors are at least aware of this issue. Another issue occurring in the communication process between the supervisor and his/her team is that only about a quarter of the information the employees receive from their supervisor, on the other hand, the employees perceive it as sufficient.

This research has several implications for theory and practice. At the theoretical level, it complements research about interpersonal communications and provides a summary of the communication process in an international company in Germany. HR professionals, managers and scholars may get an overview of the pros and cons of interpersonal communication based on results from a questionnaire focused on the way of communication at the company and between supervisor and his/her team and team members.

This research required to address several limitations. Firstly, the present study has a small sample size. In particular, the survey sample consists of only 25,67 % of the company's employees, which may lead to skewed results. If the survey will be conducted repeatedly with a higher number of employees, it could verify the results obtained. Secondly, the survey was conducted before the COVID-19 pandemic crisis has started, therefore it is recommended to compare the current situation in the organization. Thirdly, although the questionnaire survey was designed to cover all necessary areas of research, there is still room for improvement and some questions could be examined further or need some explanation.

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STOCKPILE MANAGEMENT THROUGH THE EVERYDAY OPERATION OF A PHARMACEUTICAL COMPANY

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Abstract

In this article, the stock management activities and stock levels of a pharmaceutical wholesaler will be analysed. Stocks play a significant role in both material flow processes and the supply chain. If the quantity of stocks is not adequate, stockout or overstocking may occur. Companies can take various measures to ensure uninterrupted supply, and also prevent shortages and stockouts. Therefore, the objective is to reach an optimal level of stock. The aim of the present study is to find an answer to how stockouts may be reduced or minimized in the future, identify which aspects of stock management activity play a major role in minimizing shortages, as well as analyse strategically important decisions pertaining to stockpiling. Another issue is to find out why it is crucial for us to know our strategic product groups, why it is important to conduct a more pronounced measuring regarding stocks of these products, and reduce the shortages to zero. The competitive situation of the market allows for a company to retain its customers for the long term, and to this end, providing quick and flexible service and ensuring the availability of products are of key importance. Today, immediate availability is particularly important. Consequently, time is a crucial factor as people have high expectations and do not tolerate long waiting times, thus inventory and inventory management are especially important where deficiencies are not allowed. As the central topic of the current paper stock levels at various sites of a wholesaler have been examined focusing on the product scopes with low stockpiles on the basis of the calculated turnover rate. Generally, stock analysis methods that would result in the successful decrease of shortages were sought after. The analysis pertained to the context of turnovers and stock levels, seeking parallels between stock levels as well as the size and spatial distribution of the customer base . Corporate inventory management and demand forecasting are two interrelated areas of management that can directly and significantly affect the efficiency and economy of operations What is more, an adequate stock level can signal a competitive supply chain.

KEY WORDS: stock management; stock level; stock analysis; strategies; supply chain.

Introduction

Nowadays, the question of how to reduce and minimize company stockouts is a particularly critical issue that needs to be addressed. Every company is trying to meet consumer demands at the highest possible level. To this end, precision, flexibility and speed are vital. On the whole, customer demands are changing. This statement may seem generic but if we examine it, we must be aware that the level of consumer expectations is increasing, and the values are changing. The wide variety of products on the market and the wide range of goods on offer provide us with many choices what to lift off the shelves. Excessive amount of information is on offer day by day. Product life cycles are being shortened, and while the global economic and competitive forces continue to generate further uncertainties, volatility is becoming increasingly common for markets (Christopher 2000). In turn, companies are trying to meet and, in particular, anticipate demands, since this is how they are capable of providing a suitable range of products, and even more importantly, goods that are readily available. Our accelerated lifestyle brought about the immediate fulfilment of demands. This is why satisfying needs have instantly become more important, for which available stocks and support services are indispensable. The question of what kind of solutions we can find to reduce stockouts may arise, which would also reduce company stockout costs, the loss of customers trust, and the number of dissatisfied customers. The research was carried out between September 2021 and December 2021. One pillar of this research consists of the domestic and international academic elaborations closely linked to this topic, which support the areas being presented The results of the primary research are presented through the case study of a pharmaceutical wholesaler, for which the prioritized aspects include the place and role of the pharmaceutical wholesaler in the supply chain, its stock management activity, stockpiling strategies and decisions. In today's market competition, the analysis of inventories and good inventory management are particularly important for companies. By examining the current stockpiling policy of Pharma, the results are supported by analysing market criteria and stock levels. In the case study, inventory analysis methods are also presented.

Literature review

According to literature, wholesale trade includes any sales activities of goods or services that are conducted by resellers or professional users. This does not include producers and farmers engaged primarily in production, or retailers (Kotler-Keller 2012). Hence, wholesale trade is the commercial sale of procured goods to resellers. Its purpose is the purchase and storage of goods, the establishment of an assortment of goods to meet the demands of retail trade, as well as the organization of the relation of goods between production and retail trade (Gelei 2013). Its goal is to bridge the temporal and spatial difference between consumption and production

via stockpiling. The pharmaceutical supply chain consists of primary producers of raw materials (suppliers), secondary producers (pharmaceutical manufacturer), logistics providers/wholesalers, health care providers and retail stores (Savage et al. 2006; Zahiri et al 2017). Pharmaceutical wholesale trade is the sum of all pharmaceutical supply activities that result in the medicine going from the producer directly to the retail medicine supplier. This includes the acquisition, quality assurance, quality assessment, storage, stockpiling, and package disassembly of medicine, delivery to the client, performing product withdrawals, as well as providing data regarding the medicine and information to the distributor (SOTE 2020). Current pharmaceutical wholesale trade has multiple channels, which means that more and more wholesalers provide connections between pharmaceutical companies and pharmacies. The integration of suppliers, producers and traders, the spatial clustering of customers, and even the dominance of certain products, are all observable (Nagy 2005; Rácz-Kummer 2009).

The rapidly changing market environment and volatile customer demands require the effective operation of logistics processes (Kovács – Kot 2016). In recent years, globalization processes have accelerated, and with the development of the markets, it has become increasingly important for companies to have a good grasp of the supply chains and the connections between them (Kot 2012). With regard to the supply chain, we can say that various participants operate on an "everyone for everyone," or in other words, "all for each other" basis. Strategic cooperation can increase the quality of the products of companies, as well as the services provided to the customers (Bititci et.al 2004). The supply chain is, in fact, a series of value-creating production and logistics processes across co-operating organizations, which create products and services capable of responding to the needs of consumers (Chikán 2008). Participants are considered parts of the supply chain, if they cooperate in the process of the procurement, production and delivery of goods (products or services) to the customer (Harland 1996). As the timely accommodation of consumer demands has become increasingly prominent in the competition of products manufactured by companies, we can not only see products compete on the markets, but also a competition of supply chains, as well (Markovits-Somogyi – Ulechla 2016).

The proper distribution of resources and cooperation across company boundaries provides the essence of successful supply chain management (Fawcett at al., 2014). Every company belongs to a supply chain, often to a supply network as well, with multiple suppliers and partners (Morley, 2017). Within the supply chain, the procurement, storage, stockpiling, quality control and delivery of medicine to pharmacies, as well as providing quick and flexible service to pharmacies, are important and high-priority tasks of the wholesaler. As such, the market factors that affect every participant within the supply chain impact the operation and stock management activity of the pharmaceutical wholesaler. Companies within the supply chain must pay attention both upstream and downstream, as well as be agile and react to the changes they observe (Pulcini et al 2018). The pharmaceutical industry has grown recently, and this growth has necessitated to expedite transport and logistical challenges. Pharmaceutical industry is a global industry. The importance of a coordinated and flexible supply chain cannot be overstated (Venkateswaran 2018).

As a result of the deteriorating profitability of retail trade, a decrease in pharmacy stock levels can be observed. Pharmacies do not keep stock of medical products that have a lower and less predictable turnover and/or are expensive. With regard to the wholesaler, the decrease in customer (pharmacies) stock levels result in pharmacies ordering small quantities multiple times and wishing to receive those within the shortest deadline possible. As referenced above, the decreasing profitability of retail trade, the increasing expenses of pharmacies, the rapid expansion of the range of products, and especially the exponential increase in the number of generic products with the same active agent, the stockpile reductions of pharmacies have caused the task of stockpiling to largely be transferred from pharmacies to pharmaceutical wholesalers due to regular changes to prices and subsidies. Pharmacies do not possess proper, adequately designed and equipped spaces for storing large quantities of goods, and it is also important to observe that the pharmacist does not have the time and economic expertise to address stockpiling and its optimization thereof. The interdependency of supply chain participants is especially relevant in this industry. Providing patient care and stock availability in the pharmacy is more of a task for the wholesaler, who is an important connecting link between the manufacturer and the pharmacy. The consistent servicing of customers without the issue or shortages is dependent on the stock management of the wholesaler. One of the most important tasks is to ensure a safe supply of medicine, without any shortages. Future supply chains will have to improve upon affordability and availability to patients and health care providers alike (Srai et al 2014). Knowledge of the number of pharmacies is a decisive factor in maintaining a high level of service. According to a survey from 2020, there are a little over 3,000 pharmacies operating in Hungary, of which we can presumably consider 2,500-2,600 actively operating pharmacies.

A wholesaler has around 2,400 purchasing partners, while the daily incoming orders exceed 9,000. The number of boxes sold per year is around 150-180 million. Based on this data, we can infer how much stock and storage capacity a pharmaceutical wholesaler needs to have. We can say that the number of products marketed is around 14,000-17,000 pieces for a single wholesaler,. As a result of the market demand for an increasing supply level, the quality of service standards has become a crucial factor in the competition between wholesalers. The requirements pertaining to time, and the greater amount of flexibility from the logistics provider with regards to that, is becoming more and more important within customer expectations (Anderson et al 2011). In the competition for final consumers, service standards have a key role as the supply chains compete for the same customers, and the decisions of

these customers depend primarily on these two factors, i.e., stock size and quality of service (Balogh et al 2020). Immediate availability, available products and quick delivery are all important. It is especially important for a wholesaler to be capable of immediately satisfying daily needs, without any shortages, or at the very least minimize them. Purchase orders, stock status, coordination of deliveries and timeliness form the basis of successful sales activities (Dubey-Jain 2014). The past 10 years have seen constant developments for trading houses and warehouses, which consisted of increased storage capacity, improvement to storage technologies, the use of automated pickers and powered track picking systems, as well as radio frequency picking. All of this comprises an enormous support structure for managing incoming goods. This is because the logistics system, including the warehouse, can contribute to improving the performance of logistics, the company or the supply chain, by supporting an increase in sales volume and revenue. (Gelei 2017) The methods for submitting orders have changed, the use of various electronic channels has become widespread within the field of order submissions, and transport capacity has also been expanded and revamped. The vehicle fleet performing deliveries has around 210 cars available, which have the temperatures required for the storage of pharmaceutical products. This is not a competition of prices, but a competition of services. One of the reasons for this is a government decree that specifies the margins wholesalers may operate under when selling prescription-only medicinal products. The applicable margin rate is digressive, meaning that the higher the price of a product, the lower the margin rate will be. This rate is 8% for products with producer prices of under HUF 500 (of which there are very few), but if the price of the medicinal product is HUF 2000, the margin is 4.4%. When selecting products and services, the availability of the product and/or service, as well as the time between the order and its delivery (lead time) have become increasingly prominent, in addition to product price and quality. (DeTreville 2004; Leng-Parlar 2009) The basis for achieving customer satisfaction is good logistics service, the timely arrival of the goods ordered at the customer's premises, following strict quality control without any shortages or bad deliveries, and without any interruption in medicine supply. A pharmacy with an average turnover operates with 3-5 thousand products and 10-14 days of stocks; therefore, a wholesaler background and fast service are important for it, which require for the issue of stockouts to have strategic importance. A supplier that is capable of guaranteeing delivery times (within a specified tolerance) has a clear advantage over its competitors. (Oláh et al 2017) Meeting promised delivery deadlines, up to 3 times within 24 hours when delivering for a pharmacy can only be possible if there are stocks available.

Material and method

Stock management activity of the pharmaceutical wholesaler

Stock management is the process of planning, organizing and controlling stocks, with the aim of "minimizing stock investments, while balancing supply and demand" (West 2009). Effective stock management increases both gross and net profits by reducing the cost of sourced pharmaceuticals and all related operating expenses (Hidayat-Saleh 2020). In this industry, safe sourcing and the prevention of counterfeits take priority. Only registered medicines can be placed on the market, as the wholesaler will serve as the guarantee for the pharmacy that a safe product will be placed on the shelves. The stockpiling activity itself is complex, and involves the procurement, quality control and storage of stock, and the assessment of optimal stock levels. The presence of stocks is validated by physical and economic constraints (Benkő 2018). Bad stock management may result in harmful consequences to the safety of the patients. Such results can be attributed to the availability of expired, counterfeit, substandard or spoiled products, the unavailability of basic products, and the existence of unclaimed prescriptions (Hidayat-Saleh 2020). Stock levels are controlled at all times, and stockpiling policies come into effect when determining minimum and maximum stock levels. After all, it is very important for stocks (a passive resource) to be at the optimum level for the operation of the company. Overstocking is economically disadvantageous, while low stock levels can jeopardize the safe operation of the business (Hajós et al. 2007; Nagy 2002).

When creating a stockpiling policy, the following factors should be evaluated:

- the nature of the output process (demand, ordering, service)
- the nature of the input process (source, ordering)
- the costs
- the operating policy principles, decisions (Benkő 2018)

Company stock management and demand forecasting are two interrelated management areas, which may have direct and significant impacts on the efficiency and profitability of operations (Dobos-Gelei 2015). The driving force behind stockpiling is essentially demand, as demand is what causes changes in the stock (Benkő 2018). Demand is difficult to forecast, although prior sales data and expected market movements may provide a good reference point. The wholesaler, hereinafter referred to as Pharma, relies on prior sales data to help determine the quantity it should order. Demand forecasting forms the basis of good supply chain management. The tactics for demand planning rely on two principal areas of business practices: forecasting and data sharing, in order to match supply and demand. As soon as a reliable demand forecast is available, companies can take a number of measures to ensure uninterrupted supply, as well as prevent shortages and stockouts (Cogan et al 2018). The goal is to reach an optimal level of stock. As a wholesaler, Pharma has interest in ensuring that the procured goods are delivered as quickly as possible.

With a faster turnover, it is possible to achieve higher revenue and higher profits, with less stock. The factors that determine the optimal level of stocks include the volume of sales and its fluctuation over time, the frequency and quantity of procurement, transport distances, the nature and variety of goods placed on the market, as well as the range of goods that substitute each other, storage capacity, costs associated with stockpiling, and the financial situation of the business (Herbáth-Stágel 2009; Föli-Török 2018).

Procurement also needs to address forecasting, planning and assessing demands. Since stocks are in a constant rotation, demands are usually fulfilled from stock, rather than directly. The primary purpose of stocks is to ensure that the received demands can be fulfilled in the time, quantity and quality requested by the entity that places the order (Hirkó et al 2008). The stock management of a company is considered effective if the capital invested in stocks is quickly recovered through the sale of goods (Vincze-Földi 2015). Modern companies may keep stock of many different goods. With regard to stock management, the questions of how much and when are both important (Ravinder-Misra 2014). In order to determine the order date (t) and the ordered quantity (q), it is necessary to know the stock level, which can be achieved via control measures. There are two basic methods of controlling stock levels: continuous and periodic stock monitoring. With continuous stock monitoring, reordering is immediate as soon as the stock falls to a predetermined level. Periodic stock monitoring means that stocks are only monitored at the end of discrete intervals, such as at the end of each month, and the decision to order is only made at this time (Benkő 2018). Stock size should be considered in conjunction with sales. An increase of stocks can be considered unfavourable if the turnout has either not increased or increased at a lower rate. Successful stock management is achieved by attaining a specific revenue, while keeping stocks as low as possible (Vincze-Földi 2015). It is indeed important to define demand and sales with regard to stockpiling, since the first step is customer demand emerging on the market, which Pharma must be able to meet. This customer demand generates the continuous monitoring of stock, the replenishment of stock and procurement from the manufacturer. Procurement is a typically complex and multistage process. This is because procurement is an integral part of the logistics process (Mankovits et al 2015). The procurement activities of Pharma comprise an integral part of the material flow process, as it is responsible for the supply of nearly 2,500 pharmacies and the patients using them. Procurement demands can be managed in the following ways (Szegedi-Prezenszki 2003):

• centralized procurement

• decentralized procurement

Pharma practices both centralized and decentralized stock management. Depending on product turnover, deliveries may be split per site, or centralized, in which case part of the incoming goods are dispatched to rural logistics centres, but there are also certain products that are only stockpiled in the central warehouse. The reason behind this also relates back to demand, and to invoke the writings of János Benkő (Benkő 2018) again, "the

driving force behind stockpiling is demand". Delivery times are within 24 hours, which means that if a rural pharmacy in the western part of the country places an order for a product that is stocked only in the central warehouse, they will be able to receive it within 24 hours. A common dilemma for companies with multiple sites or a divisional structure, is the question of which tasks should be handled centrally and which by the departments, i.e., to what extent procurement should be centralized or decentralized. It is rare to encounter a fully centralized or fully decentralized organizational solution as companies usually utilize a mixture of the two (Vörösmarty 2006).

The fundamental question of stock management strategies is when (time) and how much (quantity) should be ordered. The order interval depends on whether orders must be placed every fixed "t" intervals, or whether stock replenishment is decided when the stock level falls to a specific "S" minimum stock level (reorder point). The order item size may be a fixed "Q," or the order item may refer to quantity that will result in the stock reaching a predetermined maximum "S" level after receipt (Benkő 2018). Its stockpiling strategy has a profound effect on operating efficiency. Stock is the physical stock held in order to fulfil a forecast demand or production, which requires a financial sacrifice on the part of the company. According to lean, stockpiling equals wastage, which is also an incentive for stockpile reduction and optimization. This approach is definitely true, as stockouts can cause just as much damage as when the stock levels are high (Balogh et al 2020; Szász – Demeter 2017). The four types of stockpiling strategies known from the academic literature are not completely clear-cut in practice, but they overlap. A steady stockpiling strategy, otherwise known as the "sawtooth" model, works well for products with a balanced turnover, such as medicines for cardiovascular diseases. The procurement of OTC products shows some fluctuations, particularly with regard to seasonal products, for which a cyclical stocking model is commonly utilized, wherein the quantity of items that need to be ordered varies from season to season, and there can be significant differences in the quantities purchased and stockpiled over the course of a year. The stock levels of certain vitamins, nutritional supplements and immune boosters need to be topped up well before the season. During and at the end of the season, it is of paramount importance to adjust the level of the indicator and safety stocks to the appropriate level, otherwise shortages and/or unreasonably high stock levels may be expected. The establishment of safety stocks may serve to improve the level of consumer service (Hauck 2015).

We can encounter a minimum stock level in the two-warehouse strategy, and it is particularly important for Pharma's stock management to set the indicator and minimum stock levels, as well as to monitor and if necessary, adjust them. These provide reference points for reviewing the order cycle time. With a consignment contract, rented storage procurement is conducted and a different stockpiling policy is followed where usually identical quantities are received at unspecified intervals and stock levels are not dependent on minimum stock levels. Pharma, as the recipient, does not bear the direct

costs of managing and maintaining the stock, and may use it according to its needs, only ever buying the amount it needs at any given moment. Due to seasonal demand, stocks for smart bandages (wound coverage + healing aids) do not always need to be replenished to the same level, as their consumption fluctuates constantly and are difficult to predict. This also needs to follow a new strategy in terms of stockpiling. Stocking risks increase significantly in the case of excessive amounts of stockpiling, the extent of which depends on the value of the stock, the obsolescence period, and the uncertainty of supply and demand. The quality factor is more in favour of low stock levels which stockpiling can typically only worsen rather than improve. This is because the more time a finished product spends in the warehouse, the bigger the chance that it begins to lose its value. However, the risk that the low stock levels as a result may prove insufficient in the event of a sudden surge in demand, should also be considered (Hauck 2015).

Stock analysis of the Pharma company

For effective stock management, it is essential for a company to continuously analyse and evaluate the size and composition of its stocks, as well as the relationship between changes in stock and turnover (Vincze-Földi 2015; Váradi 2008). Efficient use of resources can be achieved with proper stock levels, but it is necessary to regularly analyse each element of the stock by revenue, margin and volume. Choosing the right stockpiling mechanism aims to establish a shortage-free state of stocks, as well as for the quantity of stocks not to be too large (Balogh et al 2020). The company provides the stock of goods for sale as part of the procurement activity. In order to effectively manage trade without interruptions, it is important to have as large of a range of stocks as possible, as a sufficiently large quantity and selection can surely meet the demands of customers (Pap 2009). Pharma is a commercial entity, which means cost-effective management is important for it. Because of this, the goal is to allocate a smaller stock, since stockpiling incurs significant costs, such as storage costs, administrative costs, storage losses and the reject rate. The stock levels are determined by the volume and composition of the turnover, the resupply time of the stock, and the order item sizes. Adequate stock levels determine the availability of the company, its market position and the perception customers in the supply chain have of it. The stock also determines the flexibility of the company, which is one of the most important expectations of the customer, i.e., it is a tool for providing satisfaction. Efficient use of resources can be achieved with proper stock levels, but it is necessary to regularly analyse each element of the stock by revenue, margin and volume. Choosing the right stockpiling mechanism aims to establish a shortage-free state of stocks, as well as for the quantity of stocks not to be too large. An adequate stock level can signal a competitive supply chain (Balogh et al 2020).

Efficient stock management ensures that customer and patient demands are met (Carroll 1998). The goal in every case is to keep the level of stock-related expenditures as low as possible. (Csipkés 2018) The aim is to reduce shortages, and as the academic literature puts it, "achieve a stock status that is without shortages" and, more importantly, to maintain this status in the long term. A lack of finished product stocks can result in a loss of market share for the company, which will also lead to revenue loss (Szász – Demeter 2017). It is important that we determine and clarify what the participants within this industry understand as a product shortage. The concept of a shortage has different interpretations for the manufacturer, the wholesaler and the pharmacy, albeit with overlaps. In Europe, shortage in the pharmaceutical industry is interpreted in one of two ways. The pharmacy cannot acquire the product within 72 hours from any wholesaler. Only 65% of the next month's estimated quantity of a specific product is available in the warehouse of the wholesaler. In the event of a product shortage or supply issue, the manufacturer is primarily obliged to report this shortage to the National Institute of Pharmacy and Nutrition (Országos Gyógyszerészeti és Élelmezés-egészségügyi Intézet - OGYEI). This is the case if the reason for the product shortage is a manufacturing problem. The issue of safety product supply can be found with the manufacturer. Today, OGYEI can register a product as in short supply within its own competence and can announce this to pharmacies and wholesalers.

For manufacturers, this shortage means that the patient cannot acquire the product in the pharmacy. The close link in the supply chain between manufacturer and wholesaler is also evident here, as the flow of information allows the manufacturer to immediately see which products from its portfolio have become unavailable at the wholesaler at a given moment, which it could not deliver to the pharmacy and which the patient did not receive, as a result. Pharma, as a wholesaler, defines a shortage as something that occurs when none of its customers (pharmacies, hospitals) have received the product they would have needed at a specific time. It is possible that the wholesaler was unable to deliver the specified product to the pharmacy or hospital from any of its warehouses. The customer of the pharmacy is the patient, and for them, a shortage means that the needs of the customer/patient will not be met, as the pharmacy is presently out of stock, while no other wholesaler in Hungary has any stock available. This shortage is a symptom of fragile supply chains, since there are few competitors at various stages of the chain, the failure or departure of a single factory, manufacturer or intermediary can result in the collapse of the entire supply chain (Cogan et al 2018). This also highlights the key role the pharmaceutical wholesaler plays in this issue, and in the prevention of shortages. Its available stocks will be available to the pharmacy, as well as the end user, and this provides reassurance for the manufacturer, in that their product can be ordered from the wholesaler and the patient will receive the product they need. Using this thought as a baseline, it is important to talk about addressing shortages, and to propose solutions to them. Shortages are particularly important metrics for evaluating the procurement activity and performance. The wholesaler is responsible

for informing the pharmacies about the shortage, the reason for it, and the expected time of delivery. What causes these shortages?

- supply difficulties, problems during manufacturing, the manufacturer being unable to transport
- sudden increase in turnover, for which neither the manufacturer nor Pharma is prepared for
- issues with storage capacities, problems with "parking" products, i.e., products that cannot be placed in storage or provided
- quality assurance issue, products that cannot be released or are quarantined
- unpredictable transport delay (medicines created biologically in reactors for treating rare diseases, wherein the transport time provided cannot be upheld)
- lack of stock management strategy

However, stockout costs comprise a significant amount of costs incurred. Moreover, additional transport costs can also accumulate. If a rural warehouse has a shortage of a requested product and the pharmacy has to be provided for from the central warehouse, the order generates a so-called stock transfer, meaning that if the central warehouse has available stock, it will transfer the quantity. The product will be transported from the central warehouse to the pharmacy, increasing labour capacity, transport costs and serves to decrease time efficiency. The most often used metric for stock analysis is the turnover rate of stocks. Stock turnover rate is the average time (number of days) in a specific period that the average stock lasts for, i.e., the number of days it takes to replace the stock (Balogh et al 2020). The turnover rate metric depends on the type of product, as well as its marketability and the demand for it. The changes in the turnover rate of each commodity group helps procurers decide on the frequency of procurement. The turnover rate in days shows the average number of days the stock is replaced in a given period. Effective stock management is characterized by the lower metric. Fsn = (Average stock x days in a specific period) / Sales (days) (Vincze– Földi 2015). In the case of Pharma, the calculation of the turnover rate involves comparing 3 months of stock values and sales numbers. Based on the turnover rate calculated during the analyses, existing stocks may be classified into the following categories. (Table1 own creation based on Pharma wholesale trader database).

Table 1. Turnover rate categories

A - Low	0-14 calendar day
B - Normal	15-45 calendar day
C - High	46-179 calendar day
D - Very high	180+ calendar day

In order to answer questions regarding the reduction of shortages, it is important to examine products that have too low stock levels. Stocks that are kept too low are at risk of shortages. Here we would once again refer back to literature stating that stocks are moved as a response to demand, (Benkő, 2018) as such, it is necessary to examine how much turnover has changed/increased compared to the past, the reasons behind this change, and whether this change in turnover, if any such can be observed, will be permanent and long lasting. Or if demand remained constant, procurement and supply from the manufacturer was deficient and problematic.

Research results

It is important to monitor stocks regularly the level they are at in relation to turnover, and monitor stocks in each warehouse separately as well. It could be possible that a particular product may be classified as normal in terms of stock category based on its turnover rate, but outliers could become visible once the per site breakdowns are analysed. For this case study, the available stocks in a given period were analysed while observing the average stock over a year. Let us see how the periodic stocks of the products are classified based on their calculated turnover rate. (Table2, Table3 own creation based on Pharma database)

Table 2. Stock ratio (pcs)

stock categories	Site1	Site2	Site3	Site4	Site5	amount in pieces
A -Low	130 235	150 341	92 630	265 125	130 952	769 283
B - Normal	614 118	567 129	434 657	2 742 051	657 319	5 015 274
C - High	389 958	387 581	328 959	2 605 022	413 927	4 125 447
D - Very high	11 500	16 990	10 375	730 525	12 704	782 094
amount in pieces	1 145 811	1 122 041	866 621	6 342 723	1 214 902	10 692 098
A - Low	11,37%	13,40%	10,69%	4,18%	10,78%	7,19%
B - Normal	53,60%	50,54%	50,16%	43,23%	54,10%	46,91%
C - High	34,03%	34,54%	37,96%	41,07%	34,07%	38,58%
D - Very high	1,00%	1,51%	1,20%	11,52%	1,05%	7,31%
total	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

Table 3 Stock ratio (value)

stock categories	Site1	Site2	Site3	Site4	Site5	total (Hungarian forint)
A - Low	284 242 787	359 593 436	226 923 151	1 196 518 848	369 203 313	2 436 481 535
B - Normal	699 986 640	625 819 199	449 323 558	5 933 014 522	710 197 207	8 418 341 126
C - High	373 884 535	388 133 331	313 193 635	5 071 250 384	412 944 083	6 559 405 968
D - Very high	24 558 675	30 489 910	37 126 649	1 776 031 762	17 948 346	1 886 155 342
total (Hungarian forint)	1 382 672 637	1 404 035 876	1 026 566 993	13 976 815 516	1 510 292 949	19 300 383 971
A - Low	20,56%	25,61%	22,11%	8,56%	24,45%	12,62%
B - Normal	50,63%	44,57%	43,77%	42,45%	47,02%	43,62%
C - High	27,04%	27,64%	30,51%	36,28%	27,34%	33,99%
D - Very high	1,78%	2,17%	3,62%	12,71%	1,19%	9,77%
total (Hungarian forint)	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

ABC analysis test

The ABC analysis (Pareto analysis) is a common method of analysis in practice, which can also be used to successfully determine procurement priorities. ABC analysis was published in 1951, in which Ford developed the effects of pareto principles on stockpiling systems and processes (Ford 1951). This method is useful in identifying materials of greater or lesser importance with regard to the material management system. (Földesi 2006) Above all, efforts should be focused on the selected few items that constitute the bulk of the turnover. (Hirkó et al 2008) This method of analysis allows us to identify strategically important products that need their stockpiling to be of special importance, and prioritize the availability of such products from permanent stock, as well as reducing shortages to 0. ABC classification categories in the case of Pharma:

- **Category "A": goods that account for the first 80% of the total daily turnover**
- Category "B": goods that account for the following 10% of the total daily turnover
- Category "C": goods that account for the subsequent 10% of the total daily turnover

The number of products being traded, regardless of how many are available of each product at each site, is close to 10,000 pieces. Based on the turnover numbers the results were the following (Table4 own creation).

Table 4. ABC categorization distribution in % terms

Category	Products (pcs)	% of the total daily turnover amount
A	1254	13%
B	936	10%
C	7604	78%

Products classified as Category "A," which account for 80% of the total daily turnover only amount to 13% of the total range of products. Utilizing additional stock analysis methods, these products can be classified into more categories. According to the FMRW category classification:

- Category "F": sales happen at least every 2 days or more often
- Category "M": sales happen at least every 2 weeks or more often, but less than every 2 days
- Category "R": sales happen at least every 2 months or more often, but less than every 2 weeks
- Category "W": sales happen less often than every 2 months

We have identified 304 products in Category A, Class F. Further analysis was conducted to see how the stocks of the 304 Category A, Class F products change over time is, as these are considered the most important products, which are sold daily and represent a major part of the total daily turnover.

When analysing the types of material in the context of the sale of pharmaceutical products, those which are sold daily and account for a considerable proportion of total daily turnover are blood products, cardiovascular medicine, as well as respiratory products and those used in diabetes treatments. This reflects the fact that a significant percentage of the Hungarian population suffers from some form of cardiovascular disease, and the rate of people with diabetes is also quite high. After stock and turnover rate calculations, 136 products were identified as strategic but with low stock levels, i.e., with a supply lasting for no more than 14 days. These products are sorted by turnover, first by number of items sold, followed by value in descending order.

name of the product	group of substances	sale (pcs)	sale (hungarian forint)	turnover rate
MEFORAL 1000MG FILMTABLETTA 60X	SPE-ATAP	780	536 655	6,4
MILURIT 100MG TABLETTA 50X	SPE-MVÁZ	724	362 852	12,6
MILURIT 300MG TABLETTA 30X	SPE-MVÁZ	718	431 732	11,6
COVEREX AS 5MG FILMTABLETTA 30X	SPE-CSZIV	704	475 095	11,9
NEBILET 5 MG TABLETTA 28X	SPE-CSZIV	629	629 222	9,6
COVEREX AS KOMB 5MG/1,25MG FILMTABL 30X	SPE-CSZIV	571	800 360	11,9
TENAXUM 1MG TABLETTA 30X	SPE-CSZIV	560	766 789	12,9
MALTOFER FOL RÁGÓTABLETTA 30X	SPE-BVÉR	527	762 505	0,4
FRONTIN 0,25MG TABLETTA 100X	SPE-NKIDP	499	300 964	11,4
NOOTROPIL 1200MG FILMTABLETTA 60X	SPE-NKID	470	544 936	13,1
CANESTEN 10MG/G KRÉM 1X 20G	SPE-DBŐR	423	365 366	12,3
VENTOLIN EVOHALER SUSP TÚLNYOMÁSOS 200AD	SPE-RLÉGZ	416	262 566	13,8
COVERCARD 5 MG/5 MG TABLETTA 30X	SPE-CSZIV	415	532 130	14,4
SALVUS GYÓGYVÍZ 1X 1,5L	VTA-GYHAT	414	150 193	13,4
COVEREX-AS KOMB FORTE FILMTABLETTA 30X	SPE-CSZIV	406	694 666	11,3
MILURIT 300MG TABLETTA 30X	SPE-MVÁZ	368	221 208	14,9
ASPIRIN PROTECT 100MG GY-ELL BEV TBL 56X	SPE-BVÉR	326	301 134	14,0
COVEREX AS KOMB 5MG/1,25MG FILMTABL 30X	SPE-CSZIV	298	416 798	12,8
CLEXANE 4ENE/0,4ML 40MG INJ 10X ET FECSK	SPE-BVÉR	93	544 093	0,4
CLEXANE 4ENE/0,4ML 40MG INJ 10X ET FECSK	SPE-BVÉR	294	1 715 468	5,6
	SUM		10 814 732	

Fig. 1. Low stock products ranked according to number of items sold, source: own creation" based on Pharma database

name of the product	group of substances	sale (pcs)	sale (hungarian forint)	turnover rate
CLEXANE 4ENE/0,4ML 40MG INJ 10X ET FECSK	SPE-BVER	294	1 715 468	5,6
NOVORAPID PENF 100E/ML INJ 10X3ML PATRON	SPE-ATAP	74	1 123 382	2,3
SYMBICORT TURBUH 4,5/160MCG INH POR 120X	SPE-RLÉGZ	149	1 100 807	5,1
ACTRAPID PENF 100NE/ML INJ 5X 3ML PATRON	SPE-ATAP	168	878 398	2,1
SPIRIVA RESPIMAT 2,5MCG INHAL OLD 30 AD	SPE-RLÉGZ	89	816 823	13,7
COVEREX AS KOMB 5MG/1,25MG FILMTABL 30X	SPE-CSZIV	571	800 360	11,9
ULTIBRO BREEZHALER 85/43MCG POR KAPS 30X	SPE-RLÉGZ	56	790 650	11,1
TENAXUM 1MG TABLETTA 30X	SPE-CSZIV	560	766 789	12,9
MALTOFER FOL RÁGÓTABLETTA 30X	SPE-BVÉR	527	762 505	0,4
SPIRIVA INH POR 30X KKAP HANDIHALER KÉSZ	SPE-RLÉGZ	82	755 420	12,1
APIDRA 100NE/ML INJ 5X 3ML TOLL SOLOSTAR	SPE-ATAP	100	699 810	2,1
COVEREX-AS KOMB FORTE FILMTABLETTA 30X	SPE-CSZIV	406	694 666	11,3
VELMETIA 50 MG/1000 MG FILMTABLETTA 56X	SPE-ATAP	72	668 377	12,4
NEBILET 5 MG TABLETTA 28X	SPE-CSZIV	629	629 222	9,6
IDEÁL TESZTCSÍK 50X	GYS-DIAB	270	620 284	14,0
MÉRY TESZTCSÍK VÉRCUKORMÉRŐHÖZ 50X	GYS-DIAB	271	598 813	0,5
CARDURA XL 4MG MÓD HA LEAD FILMTABL 30X	SPE-CSZIV	238	551 742	11,4
NOOTROPIL 1200MG FILMTABLETTA 60X	SPE-NKID	470	544 936	13,1
CLEXANE 4ENE/0,4ML 40MG INJ 10X ET FECSK	SPE-BVÉR	93	544 093	0,4
MEFORAL 1000MG FILMTABLETTA 60X	SPE-ATAP	780	536 655	6,4
			SUM	15 599 200

Fig. 2. Low stock products ranked according to turnover value

Sorting by sales value produces a higher total value. It is important to look at the goods not only in terms of the number of items sold but also consider the average price and the closing stock value key factors. Based on this, the range of products may also change. The analysis has identified the products wherein stock levels are low compared to turnover, thus there is a possibility and risk of stock shortages. Henceforth, the stock and turnover of these products per site is also worth analysing, looking at the distribution of stocks at each site, and possibly revealing whether an uneven distribution of stocks results in one site having more stock of a specific product, while the other has less. The question is also whether this low stock level persists at all sites, and if so, whether the cause is an indicator stock adjustment or a manufacturer supply issue. Stocks are always a status at a given moment, as the next order or expected receipt, or moving the amount being received to storage, will change the current stock level. The results of the analysis have shown which products need to have their stocks put into focus and maintained at an optimal level, as these are the strategic goods of the company.

XYZ analysis

XYZ analysis is also useful for predicting turnover, and thus facilitating the planning of stocks. Categorization according to the fluctuation of demand and the accuracy of the prediction is called an XYZ analysis. Instead of demand, the quantities used can also be examined. In terms of the temporal utilization of materials, three groups can once again be identified. There are materials which are used in near-constant quantities, while the use of other products shows some fluctuation. There are also certain materials wherein their use is completely irregular. The aspects comprise the categorization of materials into categories „X," „Y" and „Z" (Földesi 2006., Hirkó et al 2008) As Pharma can manage its medicinal products with a constant turnover rather well, a balanced turnover can be assumed, and these will form Group X. These include prescription medicine for blood pressure and other vascular diseases, diabetes medication, thyroid medication and cholesterol-lowering medicines. Referring back to the results gained from the ABC analysis, it is clear that these medicinal products are considered strategic goods, and their stockpiling is easy to plan for, but requires

special attention. Group Y is the group of products where use showed a greater amount of fluctuation. Its turnover can be decently planned, as well as predicted by examining previous turnovers. This product group mainly consists of nutritional supplements, "winter, fall" vitamins, immune boosters, and various items on sale. Considering the changes during the COVID period, it is particularly important to monitor the turnover of vitamins C and D, as well as immune boosters, as higher stock levels should be considered at the moment, yet it is necessary to check whether this is sustained or not, to avoid the risk of permanent overstocked levels. Certain products that are procured only on demand (very expensive products, products with irregular use), or only have a few items in stock, are considered Category Z, as per the literature classification. Category Z, and especially the very expensive products, make up for a significant percentage of the daily average gross profits. The question may arise on how the stockpiling of these products could me optimized and what exactly counts as low stocks. Stockpiling depends on multiple factors. Stockpiling is worthwhile when there is a weekly, or at the very least monthly demand for a specific medicinal products, and its use is for the long term. As the original cost is high, only a minimum stock is required to be stored. If the order is placed at the same interval and the quantity is constant, the product can be ordered from the manufacturer, and if so, stocking is not necessarily due to the price of the product and the turnover figures. It should also be taken into account whether the product in question is a vital product or not, since this range of these products is mostly life-saving, particularly important and urgent. The figures support the above statement when looking at Pharma's stocks of products for which the moving average is above HUF 1 million, the average stock is 8 items. Stocks are only found in the central warehouse.

The effects of COVID on stockpiling

The global coronavirus pandemic has also made a significant impact on the lives of pharmaceutical wholesalers, not only in terms of new demands and increased sales of certain products but also because customer habits on the market had also changed considerably. This also had an effect on the lives of wholesalers. A rearrangement of the market and turnovers is observable. The number of purchase transactions has decreased, people went the pharmacies less often, but bought in larger quantities. The growth of original medicinal products and the stagnation of generic medicines became typical. During the height of COVID, the prescription market grew by 1.5x, while the non-prescription market doubled. The average customer cart value increased from the previous HUF 6000 to HUF 9000 nationwide. The turnover of immune boosters (4x), vitamins (2.5x) and pain medication (2x) had increased. Demand for larger retail packs of products increased, and prevention became even more important. Above all else, vitamins C and D, as well as immune boosters saw an increased turnover. It was also observed that due to the use of masks, antiseptics and a higher vitamin intake, there was a decrease in products

for the flu season (colds, cough suppressants). Overall, the statistics have shown that the non-prescription market increased my 14% across the nation, while this increased on the prescription market amounted to 6%. (Purmann-Németh 2020) The growth of the medicine market can be seen as average, but the turnover for nutritional supplements within the medicine supply chain increased by 30.4%. The figures highlight these changes should be identified in stockpiling as well, and the current stock levels should be reviewed. The increased turnover over the last 2 years justifies higher stock levels of these products, but it is important to monitor whether this trend will continue in the long term, and whether some items will be added to the strategic goods category, such as ABC analysis.

County level pharmacy distribution versus stock value at specific sites

The following figure provides a good illustration of the distribution of pharmacies per region. We can see that the number of municipalities without a pharmacy is much higher in the western part of the country than in the eastern.
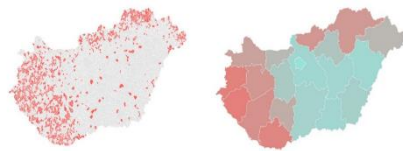

Fig 3. Municipalities in Hungary without pharmacies
Source: KSH, 2018

This analysis is aimed at observing the ratio of pharmacies per county. Then we looked at which pharmacies in each county are served by which trading house. Part of the calculation looks at the proportion of pharmacies provided for by a specific site, relative to the total number of pharmacies while the other part examines at the stock percentage of a specific site, relative to the total Pharma inventory. We wanted to find out whether comparing these two ratios shows a near equal distribution, because if so, this could support the idea that the stock distribution between sites is proportional to the number of pharmacies served.
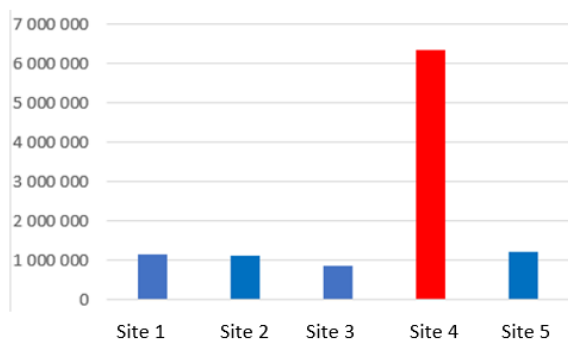
Fig 4. Stock distribution between sites in pcs, *"Source: authors' own editing based on Pharma database*
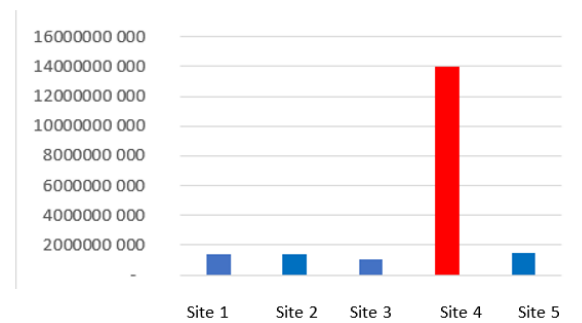
Fig 5. Stock distribution between sites, in value (Hungarian forint) *Source: authors' own editing based on Pharma database*

Table 7. Comparative table regarding the ratio of served pharmacies and stocks on site

| Sites	Site 1	Site 2	Site 3	Site 4	Site 5	total
number of pharmacies by sites	651	581	383	1002	752	3369
ratio of pharmacies served by the site to total pharmacies	19%	17%	11%	30%	22%	100%
Sites	Site 1	Site 2	Site 3	Site 4	Site 5	
stock ratio between sites	7%	7%	5%	72%	8%	100%

The results indicate (Table7 own creation) that the stock percentages show a similar distribution (%) at each site. We can observe that the central site (Site 4) possesses the largest stock in both quantity and value, which amounts for 72% of the total Pharma stock while at the same time, it is observable that the central warehouse provides service for the highest number of pharmacies meaning that 30% of pharmacies are provided for via the central warehouse of Pharma. The stock of Site 3 is the lowest , which is also reflected in the number of pharmacies it serves. In all the other sites, the ratio of stock and the ratio of the pharmacies they serve is nearly equal.

Stock efficiency analysis

Stock efficiency refers to the turnover achieved with a specific unit of stock as well as how much stock was necessary for a specific unit of turnover. Stock efficiency increases if the stock decreases while turnover remains constant, or if turnover increases while the stock level remains the same, or if turnover increases by a greater degree when both of them increase. The size of the stock per site, as well as the turnover per site were compared. The following table shows the results. (Table 8 own creation based on Pharma database)

Table 8. Stock value and monetary turnover

	closing stock value (Hungarian forint)	average daily turnover (Hungarian forint)	rotate	stock rate
site1	1 382 672 637	66 290 429	20,9	7%
site2	1 404 035 876	72 032 254	19,5	7%
site3	1 026 566 993	48 084 285	21,3	5%
site4	13 976 815 516	462 226 199	30,2	72%
site5	1 510 292 949	72 245 479	20,9	8%
Total	**19 300 383 971**	**720 878 646**	**26,8**	**100%**
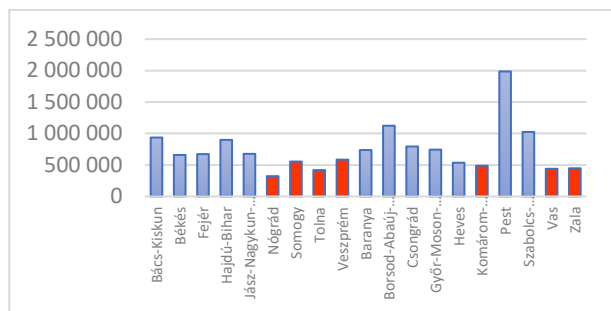
Fig 4 Medicine trade in Hungary per month (box),
Source, "authors' own creation" based on NEAK, 2020

This means that the available stock lasts for 27 days; this is considered a normal condition, not too high and not too low. We checked how many boxes of medicine were sold in total per county and on a national level. The following table and chart show the monthly turnover. This data was compiled on the basis of December 2020 statistics, and the lowest number of boxes were highlighted with red. In 2020, pharmaceutical sales in Hungary were 14,050,726 boxes per year, which means 168,608,716 boxes per year.

In the previous analyses we have seen that Pharma's total stock is just over 10 million boxes/month, and once compared to the monthly turnover of boxes, we can certainly say that stock availability falls below statistical sales (the sales data includes "on-demand only" products).

The current sales figures recorded by Pharma during this period are as follows and based on this calculation we can also calculated with a 30-day supply, where the figures are similar to those of the statistical sales. If we project the daily turnover onto the monthly turnover, the resulting number is nearly equal with regard to the statistical monthly turnovers of boxes. (Table9 own creation based on Pharma database).

Table 9. Stock and turnover comparison based on boxes sold

	closure set (pcs)	average daily turnover (pcs)	rotate
site1	1 145 811	46 943	24,4
site2	1 122 041	49 194	24,3
site3	866 621	33 001	263
site4	6 342 723	181 217	35
site5	1 214 902	48 591	25
Total	10 692 095	355 946	30

4. Conclusions and recommendations

Time has become an increasingly important requirement on the market in terms of customer demands, and the decisions made by consumers nowadays are mostly based on the availability of stocks and the quality of service. If competing companies in the industry recognize this, they can gain a competitive advantage by using the right stockpiling mechanisms. Timeliness will be a decisive factor along with immediate availability, available stocks, flexible and fast service, and the operation of efficient logistics processes. Product availability and delivery times determine the market position of the company, its customer perception and its flexibility. Stock shortages cause a loss in market positions and may result in diminishing turnovers as well. The problems arising from constant stock shortages will decrease the sense of security and the trust of customers. Shortages are a symptom of a fragile supply chain, which must be remedied. Particular emphasis should be given to stock analysis, and in connection with that, any changes in turnovers. In the long term, a proper stockpiling mechanism should be established with the purpose of achieving a no-shortage state of stocks.

In terms of reducing shortages, prioritizing and reviewing strategic goods more frequently are recommended, as it is important to observe how the range of these products changes, or if any of the changes proves to be significant. It is essential to keep track of stocks of these goods and to constantly monitor their turnover in order to explain the reasons for any changes. Stock management can only be effective if stock analysis and the monitoring of turnovers are performed continuously. In addition, communication is important so preparations may be made in observance of the expected manufacturer forecasts for the planned period using the necessary stocks. Consignment storage is preferred as the delivery times shorten while quick restocking may also become possible if needed. Preventing and reducing shortages is only possible if we pay attention to market changes, predict the expected demands and continuously analyse our stocks. In addition to the automatic ordering processes, a control process should be added to prevent shortages.

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INVESTIGATION OF THE STRENGTH PROPERTIES OF COMPOSITE MATERIALS BASED ON PAPER HONEYCOMB

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Abstract

Composite materials based on paper honeycomb structure do have a potential in today's fast changing markets and within the present context as sustainable products the demand for more economical and environmentally friendly products is highly increasing and stands out for environmental issues but must outstand the strength properties as the alternative products used in packaging industry. Strength properties of composite materials made of paper honeycomb were investigated experimentally. Static compression tests were made using testing machines "Zwick/Roell". Composite materials were made with different honeycomb properties: cell high, cell size, various grammage of laminate layer. Honeycombs were dried and soaked before testing their strength properties. It was confirmed and determined that moisture is important factor for paper honeycombs. It was determined that strength properties are quite different for dried honeycombs and depend signific on the drying time which was adjusted for the specimens. Dried honeycombs hade higher resistance to compression up to 70% and depended on the increased drying time and other honeycomb structure aspects as the cell height and the laminated layer in the composite structure. Strength of all investigated composite materials was higher using honeycombs with smaller size cells (with same cell high). Sandwich panels with bigger laminated layer grammage had higher strength characteristics especially panels with smaller cell high honeycombs.

KEY WORDS: honeycombs; composite material; sandwich; compression; strength properties.

Introduction

The main factor determining industry growth is the demand for products. If production of some products decreases in the case of composite materials it increases, new ones appear in the market. Promotional and packaging products take even bigger place in the market. With a consumption of about 40% of plastics and 50% of paper in Europe, the packaging sector is a large use of materials (Coelho et al. 2020). The packaging materials stand out with the variety of construction, design, and the required specifications. Among them become more prominent strength properties. But the unique issue now is the sustainability of reusable packaging products and paper honeycomb packages are among them with other eco-friendly materials - based packages.

The concept of composite material can be used for paper and cardboard honeycombs (Fig. 1). Characteristic feature of composite material is that it has the main component – matrix, which determine the main properties of material, which can be changed intentionally by addition of other components.

Fig. 1. Composite material based on paper honeycomb

Such structure ensures unique consumption properties, which can be changed in the large range by changing composition and structure of matrix as well as fillings and other addiadditives.

Theoretical framework

Potential of composite materials made from honeycombs are widely investigated and used in various industry types used in packaging industry for low weight, high strength, and good preservation characteristics (Han et al. 2016). Such materials are also used in aviation making fuselage of the plane. In furniture industry it is material for doors and table decks. In logistics composite materials with honeycombs are used as preservative materials by absorbing it from vibrations and bumps (Dongmei et al. 2015).

Honeycomb structures are widely used in structural, architecture, aviation, and packaging applications due to their efficient energy absorption capacity and high specific strength and stiffness (Li et al. 2021). Honeycomb structure can be used as a shield providing space from fragments flying supersonic speed. Also important for cosmic satellites and other research equipment. In its work (Liu et al. 2015) uses double aluminum honeycomb simulation using point method to find best distance between honeycomb sheets.

Composite materials with honeycombs can be used for better sound absorption (Yang et al. 2016). Some investigation observed that smaller cell sizes and thicker cell walls improved the insulation performance (Jung et al. 2018).

Geometric complexity of the honeycomb structure is defined as challenging the traditional manufacturing technology (Chen et al. 2021). Current scientific advances in micro- and nanotechnologies hold great promise for bioinspired honeycomb structures (Mishra et al. 2019).

Some research was made consisting of honeycomb structure and its interaction with environment. As today's market is focused on changing rapidly around the world within the present context as sustainable products, the demand for more economical and environmentally friendly products is highly increasing and stands out for environmental issues (Zaini et al. 2018).

It is important to to know that design of core structures depends in the application of the final composite material. Was stated that form of honeycomb cells and directions between them decide their strength properties (Smardezewski, 2019, Tekoğlu, 2007; Veltin, 2009). Mechanical properties also depend on the direction of the load and relative dencity (Khan et al. 2020, Erjavec, 2011). Tounsi et al. in his work made compression tests by changing the angle of load interacted to honeycomb. Composite materials with hybrid honeycomb showed higher compression resistance (Han et al. 2016). With increased compression we can see increased density of honeycomb (Deqiang et al. 2010). Deformation stages were investigated and defined elastic zones where packages could be damaged (Wang, 1991). More, over some authors indicate that rhombus indentation and cross-indentation has the greatest influence on the compressive strength of cartons (Gong et al. 2020).

Moisture is important factor for paper honeycombs. It was studied that strength properties decrease with increase of relative humidity (Phol, 2009). In this research also was found that impregnated honeycombs have higher strength properties than unimpregnated.

The aim of this work was to investigate in detail the strength properties of composite materials based on paper honeycombs changing comb properties. These properties are cell height, cell size, grammage of laminated layer and moisture of honeycomb.

Materials and Methods

Composite materials were made using designed device for honeycomb mounting, so that desirable cell size and height could be made. Using this device 6 composite sheets for compression tests can be made at one time. Compression samples: length – 140 mm; width – 140 mm. Amount of glue was measured with electronical scales. Paper surface was covered with glue and pressed.

Testing conditions were determined by using IKEA IOS-P-0010 and ASTM-393-00 standards. These standards are used to determine strength properties for composite materials made with paper honeycomb. Glue layer used for laminated layer was found in scientific articles (for compression tests - 2 x 2.61g). Standards and scientific articles also refer necessary amount of testing samples. Each test must be repeated at least three times.

Compression experiments were made using provided methods. Some parameters of honeycombs were changed in tests. Cell size of honeycomb 10 – 28 mm; laminated layer grammage 125 – 160 g/m²; height of honeycomb cell 15.2 – 46.6 mm. Honeycomb height was changed from 15.2 to 46.6 mm and size of cell from 10 to 28 mm when compression tests were performed. 111 tests were made during this investigation: 54 –compression of composite materials, 57 – compression oh honeycomb.

Compression tests were performed using "Zwick/Roell" universal testing machines Z020 and Z100 (Fig 2 and Fig. 3).
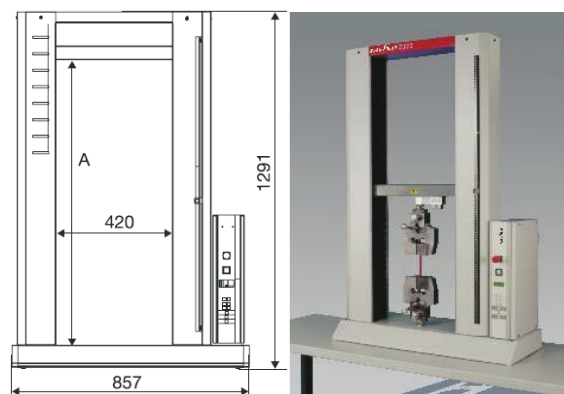

Fig. 2. Zwick/Roell Z020 testing machine [Zwick/Roell, 2022]
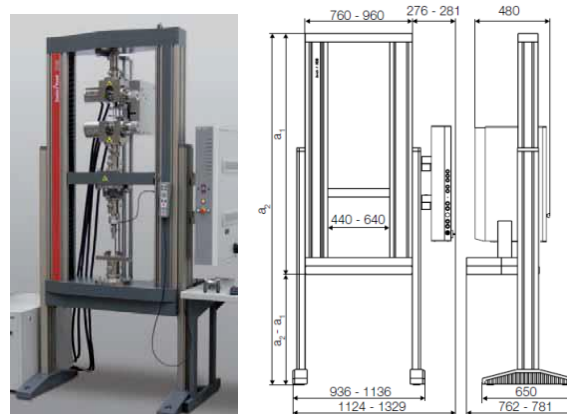

Fig. 3. Zwick/Roell Z100 testing machine [Zwick/Roell, 2022]

Results

During experiments it was decided to test that influence to honeycomb has absorbed amount of moisture. Honeycomb parameters for testing: grammage – 160g/m², high – 46,6mm, cell size – 22 mm. Sample weight – 19.21g. (relative humidity 62 %). First was determined maximum moisture weight that honeycomb can absorb. This experiment was made by soaking the sample for 5 min, weighting it after that and repeated till was no change in its weight. Same was repeated with dry honeycomb. Soaked sample was dried in 130°C temperature and weighted in 5 minutes. This was also repeated till was no change in weight. Results are showed in Fig. 4.
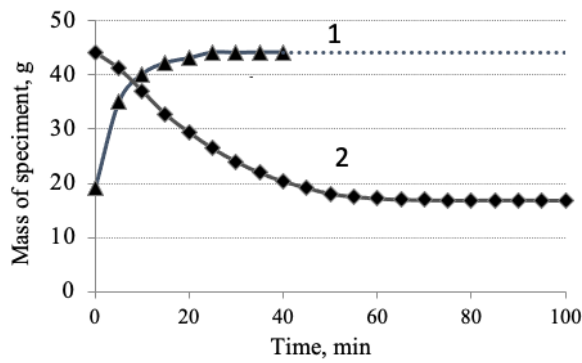
Fig. 4. Mass of specimen (1- moisture, 2 – drying)

Experimentally was tested how much moisture evaporates from honeycomb after dying process. Samples were tested in 19.5°C temperature and relative humidity was 63 %. Another test was made when samples were tested in 21.3°C temperature and relative humidity was 62 %. Results are showed in Fig. 5.
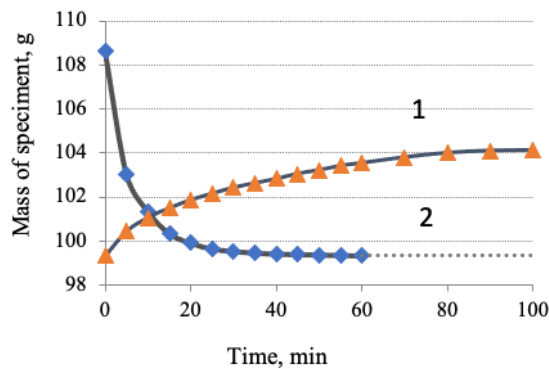

Fig. 5. Mass of specimen (1-moisture, 2-drying)

Before experiment sample weight oh honeycomb was 108.63g. From the results in picture, we can see that maximum amount of moisture (5.58g) evaporates in first 5 minutes. After 15 minutes 8.27 g of moisture evaporates from sample. Honeycomb drying process ends in 50 minutes (9,24g evaporated). After that were was no change in weight.

Compression tests were performed using samples with different amount of moisture. Test was made using undried, dried 15 min and dried 30 min honeycomb samples. Tests were made with honeycomb: grammage (K) – 160g/m^2, cell size (A) – 22 mm, high (H) – 15,2 mm; 32,2 mm; 46,6 mm. Compression results are shown in Fig. 6. and Fig. 7.

$$F = 28.895t + 2823.4$$
$$R^2 = 0.7902$$
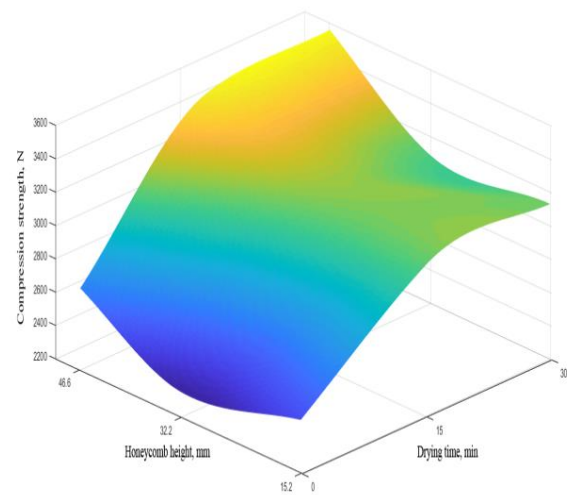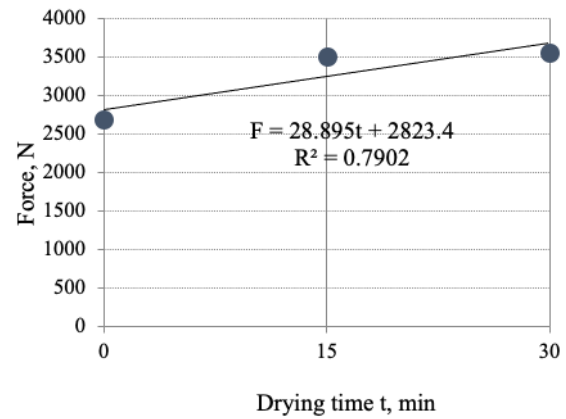
Fig. 6. Compression strength dependence on honeycomb cell height and drying time

Compression results showed in Fig. 6 refers that undried honeycomb resistance to compression is 2694.45 N, dried 15 minutes – 3514.67 N and dried 30 minutes – 3561.30 N. Compression loud increased 30.44% for honeycombs dried 15 minutes and, up to 32.17% for honeycombs dried 30 min.
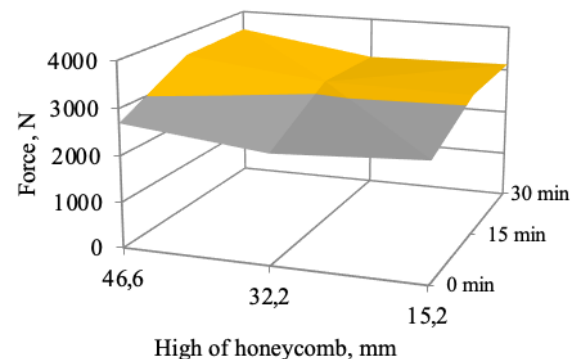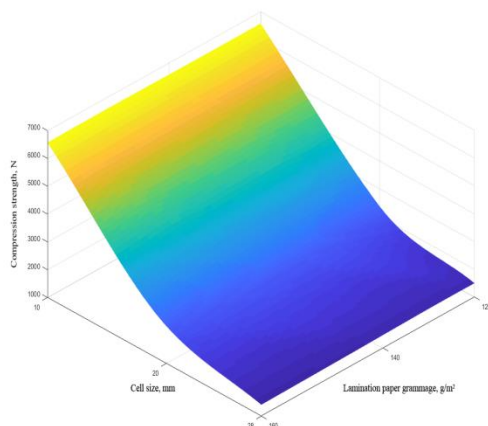

Fig. 7. Compression strength dependence on honeycomb cell height and drying time

65

Almost similar results we can see in Fig. number 7. Compression loud for honeycomb [K160_H15,2_A22] is about 2520,4 N, dried 15 minutes – 3104,2 N, dried 30 minutes – 3131 N. We can see those results for 15 minutes dried honeycomb samples increased 23.16% and 24.22% for dried 30 minutes. Data of honeycomb [K160_H32,2_A22] is the same. These results explain, that in 15 minutes most of moisture evaporates from sample and increase its resistance to compression. After additional 15 minutes evaporates relatively small amount of moisture and this is seen in compression results (1.06 – 1.73%). Suggesting these results additional tests were made using undried and dried for 15 minutes honeycombs.

Most important criteria for experiments with composite materials to determine resistance to compression is size of cell. Other parameters such as: amount of glue, laminated layer grammage, honeycomb structure grammage, form of cell and moisture stayed the same. Compression of material depends on surface area which is impact. That is why it was decided to change size of cell. In this experiment 0.0144m^2 honeycomb area was used. Honeycomb with lower cell size can resist higher compression strength.

For compression results was used honeycomb with these cell sizes: 10mm, 12mm, 16mm, 20mm, 28mm (Fig.8). Tests were made using undried and dried for 15 minutes honeycomb samples.
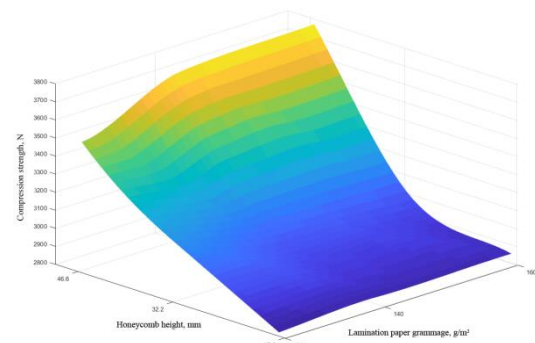

Fig. 8. Compression strength dependence on honeycomb cell size and laminated layer grammage

From results showed in figure 8 we can see that compressive strength results increase by lowering size of cell. Same results were stated for dried honeycomb samples, but in this case compression force values are higher. Compression resistance for 15 minutes dried honeycombs with 10 mm cells increased 70.06 %. For honeycombs with bigger size cells resistance to compression increased from 41.11 to 52.05 %. These results suggest that amount of moisture in honeycomb influence compression strength.

Laminated honeycomb samples were made using 3 different cell sizes: 10 mm; 20 mm; 28 mm. Also were used 3 different laminate layers (cardboard): 125 g/m^2; 140 g/m^2; 160g/m^2. Examined samples were named:

L125_H322_A10. A – honey bond cell size, mm; H – cell high, mm; L – laminated layer (cardboard) grammage, g/m^2. Results of examined samples are showed in Figure 9.

Fig. 9. Compression strength dependence on honeycomb cell height and laminated layer grammage

Results showed in Figure 9 suggest that strength compression results of laminated honeycomb are almost the same. Strength characteristics are almost the same using different grammage laminate layers (results vary from 0,04 to 2,37 %). Intermediate compression force values (honeycomb cell size 10 mm): 6568.65 N, with L125; 6573.74 N, with L140 and 6567.21 N, with L160. Similar results were found for honeycombs with 20 and 28mm cell size. It can be stated that grammage of laminated layer has no effect to compression. Another experimental fact is that low honeycomb size increases compression strength. Compression force increased 4.5 times (from 1459,94N to 6569,87N) using 2.8 times smaller size honeycomb cell.

Conclusions

Composite materials based on paper honeycomb structure do have a potential in today's fast changing markets and within the present context as sustainable products the demand for more economical and environmentally friendly products is highly increasing and stands out for environmental issues but must outstand the strength properties as the alternative products used in packaging industry.

It was confirmed and determined that moisture is important factor for paper honeycombs. It was determined that strength properties are quite different for dried honeycombs and depend signific on the drying time which was adjusted for the specimens. Dried honeycombs hade higher resistance to compression up to 70% and depended on the increased drying time and other honeycomb structure aspects as the cell height and the laminated layer in the composite structure.

In conclusions of the research results it may be maintained that strength characteristics were determined for composite materials with paper honeycombs. Experiments showed that compression strength depend on honeycomb cell size and height. Compression results showed that smaller size cells (cell high stayed the same) have higher resistance to compression. Honeycomb cell

size decreased 2.8 time and increased compression resistance 4.5 times.

Laminated layer has big influence on strength properties of composite materials. Experimentally it was found that laminated layer grammage has biggest influence on composite materials made with low cell high honeycombs (15.2 mm). For compression tests were no difference between grammage of laminated layer since all cases showed intermediate values.

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THE DEVELOPMENT OF SUSTAINABLE TRANSPORTATION FOR E-GROCERY

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Abstract

Growing demand for organic food products requires to rethink the current supply chain approaches for e-grocery. The shifting trend for e-commerce is requiring products to be delivered in small quantities, to multiple delivery points, which causes negative effect from sustainability perspective. The distribution of goods in urban areas, together with private traffics flow, are among the main sources of energy consumption, air pollution and noise. Thus, the goal of the research is to conduct a literature review on development of sustainable transportation for e-grocery. The literature analysis indicated that the majority of vehicle routing approaches are design for general transportation problems, not specifically related to e-grocery. Also, the changing economic trends related to growing urbanization levels and traffic congestions are not taken into consideration. Thus, the authors of the publication indicate the need to develop dynamic routing algorithms for autonomous vehicles to cope with the traffic congestions and maintain higher sustainability levels from social, economic, and environmental perspectives.

KEY WORDS: E-grocery; rout scheduling; sustainability; food quality.

Introduction

Growing demand for organic food products requires to rethink the current supply chain approaches for e-grocery. It is estimated that the world population is expected to reach 9.8 billion by 2050 (United Nations 2015), the average life expectancy in Europe will be 82 years by 2050 (Conrad, Alan, and Katherine 2015). These trends are leading to higher food demand. However, the rising awareness of healthy lifestyle is causing inefficiencies in the current supply chain processes of the food industry. Healthier lifestyle has influenced the demand for organic food products, which have short shelf life. The traditional retail distribution channel is not suitable for organic food products since it has a long supply chain. Thus, to maintain higher food quality levels the lead-time must be reduced (Euromonitor International 2017). The alternative distribution channel in this case is e-commerce. More people started to purchase grocery products online, and the growth even intensified during COVID-19 period. Euromonitor international in the "future of e-commerce" report stated that the absolute value growth of the global retail industry that will come from e-commerce during the period of 2020 – 2025 will represent in total 1.4 trillion USD (Euromonitor international 2021). The growth was even more intensified during the COVID-19 period. "Grocery was one of just a few retail subsectors that grew consistently in 2020: volume increased by around 8 percent and value by slightly more than 10 percent, in particular in categories related to the trend of spending more time at home." (Mckinsey 2021). For the food industry to shift from retail to e-commerce new logistic approaches must be developed.

The shifting trend for e-commerce is requiring products to be delivered in small quantities, to multiple delivery points, which causes negative effect from sustainability perspective. The distribution of goods in urban areas, together with private traffics flow, are among the main sources of energy consumption, air pollution and noise (Faccio and Gamberi 2015). The growing e-commerce sector, without any intervention, the number of delivery vehicles in the top 100 cities globally will increase by 36% until 2030 (World Economic Forum 2020). It was calculated that fossil fuels are contributing to excessive release of greenhouse gases over 2005-2018 period, 1.2 billion tons of CO_2 from transport were added across the world (Euromonitor International 2019). Thus, it is estimated the emissions from delivery traffic will increase by 32% and congestion will rise by over 21%, equaling an additional 11 minutes of commute time for each passenger every day (World Economic Forum 2020). The growing urbanization levels will cause even more issues for urban areas. Urbanization will continue at an accelerated pace, and about 70% of the world population will be urban, compared to 49% today (United Nations 2014), which will cause even higher traffic congestions and negative effect to the environment. Because of the mentioned issues companies are being pressured to use green vehicles, however, they require additional capital to purchase and maintain. However, the last mile logistics is the most inefficient part of the delivery supply chain, and is estimated to account for up to 28% of the total shipment cost (Euromonitor International 2019). There is a trade-off between economic and environmental aspects, however at the same time the social aspect must also be taken into consideration. Congestion not only causes higher CO_2 emission levels, but at the same time reduces the quality of the food products (Jouzdani and Govindan 2021), (Chen, Liao, and Yu 2021). Thus, the growing e-grocery market with current supply chain management approaches cannot achieve sustainability.

The European union strongly focuses on sustainability goals, however, lacks technological and management approaches to achieve these goals. In 2021 the European

union launched an urban mobility framework, which focuses on reducing environmental pollution from traffic by digitalization the public transport and promoting vehicle sharing. The framework also focuses on zero emission for last-mile delivery, since the COVID-19 pandemic has resulted in an increase in e-commerce activity and home deliveries. Thus, the deployment of rapidly developing and sustainable solutions using new distribution models, dynamic routing, and a better multimodal transportation network would support optimization of the use of vehicles and infrastructure and reduce the need for empty and unnecessary runs (European comission 2021). The European union has adapted the Sustainable Development Goals (SDGs) proposed by the United Nations and indicated key goals for 2030. For instance, one of the goals focuses on improving urban areas from the perspective of road safety and pollution (Humphreys 2017). The new program focusing on these aspects is called "Green Deal", which one of the goals is to further reduce net greenhouse gas emissions by at least 55% by 2030 (European Sustainable Development Network 2019). However, the report of European policy center stated that "The EU failed on almost all of its sustainability goals for 2020, including those regarding energy savings, biodiversity and air, water, soil and chemical pollution." (Centre European Policy 2021). Thus, there is a need to develop new technological and management approaches for e-grocery to achieve sustainability.

Some research indicated from theoretical level the need to develop new technological and management approaches for the e-grocery sector. Awad et al. (2020) conducted an extensive cold supply chain literature analysis, and indicated 20 publications, which used food quality, shelf life or similar metrics for optimization (Awad, Ndiaye, and Osman 2020). The review identified several research gaps. First, the review suggests that dynamic vehicle modeling and routing while considering products quality and environmental impacts is still an open area for research. Second, there is no consensus among researchers in terms of quality degradation models used to assess the freshness of transported cold food. As a result, an investigation of critical parameters and quality modeling is warranted. Third, and due to the problem complexity, there is a need for developing heuristics and metaheuristics to solve such models (Awad et al. 2020). Koc et al. (2020) conducted a literature review and indicated that researchers have given too little attention to the time-depended problems, to meet the challenges face in the city logistics, time-dependencies should be considered more widely (Koç, Laporte, and Tükenmez 2020). Suryawanshi and Dutta (2022) analysed a large number of scientific publications related to supply chain resilience and provided future research trends related to operation research aspects such as efficiently manage delays and disturbances, to enhance the operational flexibility of transport and warehouses (Suryawanshi and Dutta 2022). Thus, the approaches should integrate resilience and sustainability goals.

The scientific literature indicates that autonomous vehicles (AVs) and adaptive routing algorithms must be developed for the e-grocery sector. The demand for AVs is set to grow further after the pandemic as logistics and delivery companies aim to reduce costs, increase operating capacity and ease the shortage of drivers. According to DHL, time savings thanks to autonomous technologies will reduce transportation costs per km by 40% and part of these savings can be extended to logistics service buyers (Passport 2021). On the transportation analytics side, beyond the optimization of truck-fill rates, there has been a rising interest in dynamic routing (DR) solutions. The most advanced solutions optimize trucking routes in real time based on traffic conditions and disruptions, such as road accidents (Mckinsey 2021). The combination of AVs with dynamic routing algorithms could help companies achieve sustainability. Thus, the object of the study is sustainable transportation for e-grocery. The methodology of the paper consists of scientific literature analysis and synthesis. The goal of the research is to conduct a literature review on development of sustainable transportation for e-grocery. To achieve this goal the following objectives must be accomplished:

1. Identify key research aspects of vehicle routing approaches in e-grocery from the perspective of sustainability.

2. Investigate the application of vehicle routing approaches in e-grocery by considering traffic congestions.

The article consists of several main sections. The study starts with the introduction and the summary of the literature. Further, the authors present the scientific literature related to vehicle routing approaches from sustainability perspective. In the next section, the authors revised literature focusing on traffic congestion integration in vehicle routing solutions for e-grocery. Finally, the authors provided conclusions.

The role of vehicle routing in e-grocery from sustainability perspective

There are multiple review papers focusing on general vehicle routing problems (Tan and Yeh 2021), (Vidal, Laporte, and Matl 2020), (Awad et al. 2020), (Koç et al. 2020), (Guo, van Blokland, and Lodewijks 2017), (Malladi and Sowlati 2018), (Gunawan et al. 2021). Vehicle routing algorithms usually focus on shortest distance or delivery time, however, the in the case of food industry food quality must be taken into consideration. A vehicle routing problem which considered perishable products was conducted by Sovald and Stirn (2008), their research was based on using time-dependent optimization and included the costs of food waste in the goal function (Osvald and Stirn 2008). Another research conducted by Rong et al. (2011) focused on optimizing the supply chain by considering the process from production to retail, their main contribution is related to the measurement of food quality loss based on product flow and quantity (Rong, Akkerman, and Grunow 2011). A recent research analyzed the influence of food quality loss in urban logistics, with a focus on inventory management strategies and delivery time (Fikar 2018; Waitz, Andreas, and Fikar 2018). One of the research projects focused on such an approach was conducted by Haass et al (2015). It focused on the delivery of bananas by sea and not by land transport (Haass et al. 2015). Their approach measured initial food quality and decided routes by optimizing the quality level. Fikar and

Braekers (2022) developed a bi-objective optimization approach of e-grocery to determine the trade-offs between traveled distance and food quality losses (Fikar and Braekers 2022). The publication stated that joint routing and store assignment reduces travel distance, however, in some cases it is beneficial to increase traveled distance and consolidate more products if cooling equipment in store is not available. Also, it was highlighted that larger vehicle fleets and more direct deliveries can reduce food quality loss even more. The mentioned publications analyzed the food quality during their simulations, however, they did not consider traffic congestions.

Other research papers on vehicle routing took into consideration CO_2 emission levels. Increasing scale of direct delivery of organic food products to the end-consumer also raises concern about CO_2 emission level due to increased travel distance, therefore, new delivery techniques should be developed (Nabot and Omar 2016). Seebauer et al. (2016) analyzed the retail channels and determined that dominant car use on the last mile substantially contributes to overall footprint of carbon emission (Seebauer et al. 2016). Carling et al. (2015) research results indicated that consumers switching from traditional to e-retailing reduce their transport CO_2 footprint by 84% on average (Carling et al. 2015). Nabot and Omar (2016) conducted a comparative study of online retailing on the environment, their results indicated that online shopping plays an important role in minimizing CO_2 emissions due to last-mile deliveries and recommend investing into making delivery processes more efficient (Nabot and Omar 2016). Kellner (2016) analyzed the impact of traffic congestion on CO_2 emission, but did not consider the impact on food quality (Kellner 2016). Tan et al. (2019) proposed pollution routing algorithm designed for last-mile deliveries to reduce negative influence on the environment (Tan et al. 2019). Another research conducted by Velázquez-Martínez et al. (2016) included altitude, cargo weight and truck power when optimizing routes based on CO_2 levels (Velázquez-Martínez et al. 2016). Thus, it is important to consider not only food quality, but environmental impact such as CO_2 emission levels.

The role of congestions in vehicle routing

Some researchers consider traffic congestions a minor issue in vehicle routing problems, however minor disturbances in traffic and transport systems can also play an important part in reducing efficiency (Calvert and Snelder 2018). Research focusing on traffic congestions are growing, however some of them focus more on traffic flow management, rather than product delivery (Jabbarpour et al. 2018), (Isa, Mohamed, and Yusoff 2015). Jabbarpour et al. (2018) conducted a survey of computational intelligence approaches for traffic congestions, one of key insights were made stating that assessment and evaluation tools for real-world cases should be developed (Jabbarpour et al. 2018). Their research focused more on general analysis of traffic congestions. Xu et al. (2013) analyzed road congestion and proposed a method do develop a data cube of flow data, which allows to analyze spatial-temporal dependency (Xu, Yue, and Li 2013). Tang and Heinimann (2018) analyzed

congestion from resilience perspective, and proposed a resilience quantification method for intersections (Tang and Heinimann 2018). More recent research tries not only to analyze historical or current traffic situation, but to estimate future trends. For instance, Peng et al. (2020) proposed a neural network to forecast traffic flow (Peng et al. 2020). Estimation or analysis of traffic flow and congestions can provide management insights, however, this information should be integrated in vehicle routing process to improve decision making process.

Only a limited amount of research considered traffic congestion in vehicle routing problems. For instance, Xiao and Konak (2016) proposed a green vehicle routing method by considering traffic congestion (Xiao and Konak 2016). A more recent publication by Sabar et al. (2019) proposed a self-adaptive algorithm for vehicle routing by considering traffic congestions (Sabar et al. 2019). Koh et al. (2020) proposed a deep reinforcement learning approach for vehicle navigation by taking in to consideration traffic congestions (Koh et al. 2020). Nguyen and Jung (2021) proposed a swarm intelligence-based green optimization algorithm for route scheduling (Nguyen and Jung 2021). However, traffic congestion consideration in e-grocery has been analyzed even less. For example, Chen et al. (2021) proposed a route optimization technique for cold chain logistics of front warehouses by considering traffic congestions (Chen et al. 2021). Jouzdani and Govindan (2021) analyzed supply chain networks of food delivery from the perspective of sensibility and took in to consideration congestions (Jouzdani and Govindan 2021). Their analysis indicated that congestions impact all aspects of sustainability not only social. Thus, DR algorithms should be developed, which considers traffic congestions, food quality and environmental effect.

DR algorithms implementation in practice can be accomplished with AVs. Research focusing on autonomous vehicles started to emerge, which takes into consideration congestion risk. For instance. Rossi et al. (2018) analysed a congestion-free routing and rebalancing problem and proposed a con gestion-aware algorithm for AVs routing, which showed a good performance of network congestion and customer service time (Rossi et al. 2018). Bosona (2020) conducted an extensive literature analysis of last mile logistics, one of the main conclusions were that from management perspective it is important to develop algorithms and optimization techniques for last mile logistics and to consider real-time data, DR planning algorithms, fleet management algorithms and tracking (Bosona 2020). However, Zennaro et al. (2020) stated that it is important to consider warehouse configuration when dealing with outbound logistics and not only automation and picking strategies of the warehouses themselves (Zennaro et al. 2022). Ding et al. (2021) conducted a literature review about internet of things application in smart logistics and indicated that these technologies are essential for real-time vehicle routing and management (Ding et al. 2021). Shladover (2018) analyzed connected and automated vehicle systems, which application for urban logistics is important, since real-time decision making might be too difficult for people (Shladover 2018). Aktas et al. (2021) developed a simulation for grocery vehicle routing based on micro hubs and shared vehicles,

their research concluded that this approach reduced distance 15% and routes 22% (Aktas, Bourlakis, and Zissis 2021).

Table 1. Vehicle routing simulations of e-grocery

Environment	traffic congestion, time windows, demand, network, capacity constrained.
Goal function	delivery time, delivery distance, costs, CO_2 emission, food quality, multi objective.
Algorithms	hybrid simulated annealing and tempering algorithm, ant colony, bee algorithm, particle swam reinforcement learning, adaptive large neighborhood search.

Table 1 represents the literature analysis summary of vehicle routing simulations for e-grocery. The majority of simulations takes into consideration some type of supply chain network, which can represent of distribution center, and households. Some research considers the processing stages and not only last mile deliveries. For e-grocery distribution usually time windows are set for customer orders, with random demand patterns. Practically all simulations implement constrains for truck, warehouse, or production capacity. However, only a limited amount of simulations model dynamic environment i.e. traffic congestion. The goal function of routing usually focuses on delivery time, distance or costs, however recent publications focus more on CO_2 emission level or food quality. Only a few publications analysis multiple goals functions during the vehicle routing. Vehicle routing simulations for e-grocery usually focuses on the model itself and not the optimization technique, thus the majority use neighborhood search, simulated annealing. Part of the research implements more advanced optimization techniques based on ant colony, bee, particle swarm or other type of evolutionary or genetic algorithms. However, DR approaches which focuses on vehicle routing not only daily, but real-time was not tested in e-grocery sector but were analyzed more in general routing problems related to traffic congestions.

Conclusions

The literature analysis indicated that the majority of vehicle routing approaches are design for general transportation problems, not specifically related to e-grocery. Classic goal functions for route scheduling usually takes into consideration shortest distance or duration, some paper focus on service levels. These approaches are suitable for general supply chains, however food products are sensitive to shelf-life. Thus, route scheduling for e-grocery should take into consideration not only classic approaches, but also shelf-life or food quality. Aspects of sustainability must also take into consideration environmental effect such as co2 emission level. Thus, there is a trade off between product consolidation, frequency of deliveries, and food quality.

Growing world population and increasing urbanization levels increased the attention of researchers, who started to focus on analysis of traffic congestions. More research started to take into consideration system resilience and amplifies that traffic congestions can cause minor disruptions to the supply chain, which can reduce the efficiency of deliveries. However, this research mainly focusses on traffic flow analysis, and only limited amount includes traffic congestions in to route scheduling process. Thus, there is a need to develop dynamic vehicle routing

approaches for e-grocery, which would take into consideration congestion and sustainability aspects such as economic, social, and environmental.

To develop a routing algorithm for e-grocery by considering sustainability, new multi-criteria goal functions should be developed which would integrate food quality, CO_2 emission level and operational costs. The routing algorithm should analyses historical traffic congestions, and create possible routes by considering their influence. An analysis should be completed to test the efficiency of the dynamic routing algorithm by analyzing is usage weekly, daily and in real-time. The re-scheduling frequency should influence the efficiency of the algorithm, however the trade-offs should be analyzed and quantified. In future research, such algorithm will be developed and tested for e-grocery processes in an abstract environment, which will reproduce traffic congestions and stochastic food demand. During the simulation different goal functions and optimization algorithms will be tested. A focus on the rescheduling approach will made to identify the trade-offs related to weekly, daily, and real-time scheduling. Later, the same approach will be implemented and tested in a case study, to emphasize the benefits and importance of dynamic routing algorithms even more for e-grocery.

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TECHNOGENY: THE GENIUS LEARNING UNIT

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Abstract

Fragmented knowledge, the lack of adequate synthetic learning units, its forms and content, the contradiction of the Education faces humans to nowadays existential problems, like global challenges of climate change, pandemics, wars, poverty, international terrorism, migration, etc. In the article the author presents more than 40 years of sociogenic innovation on the author science Technogeny, dedicated to construction of virtual models of the origin and development of learning and self-improvement seeking to gain necessary for success practice skills and arts. Grounding on the Virtualics, as virtual modelling metatheory and World development spiral virtual models, it gives opportunity to apply virtual approach to the Learning phenomenon and its transition qualities from the Past through Nowadays and towards the Future. Anthropogenic analysis of gaming as a learning procedure enabled to define the action programme of an animal or human as the natural learning unit, which is also a practical Natural knowledge unit. Composed learning virtual model evidently confirmed transition of the form of learning from the Education to Self-Improvement through Education contradiction resonance sinusoid. The learning form transits three qualitative leaps of a virtual trichotomy: autocratic face-to-face education, democratic blended learning, and virtual liberal Self-Improvement. The content of learning is transiting from Metaphysics (academic scholastics) to Virtualics (Smart Innovation). Matrixes of learning form and content fixed clear trends from an Old to the New qualities of the learning. Genius learning unit and virtual Self-Improvement tools innovations and application for forty years of international pedagogic innovations enabled to confirm the right path to the future of learning towards virtual Smart Innovation. COVID-19 pandemic gave additional confirmation of this learning development direction.

KEY WORDS: technogeny; natural learning unit; gaming; education contradiction; natural knowledge unit; Genius learning unit..

Introduction

The main problem. More as forty years of sociogenic research and international programming on innovations give right to state, that the Humanity nowadays faces to global existential problems, mainly related to fragmented knowledge, aged understanding of the sense, links and origins of human it-self, its being, relations with environment and paths to the Future. This is the problem of lack of adequate knowledge of these challenges' synthetic knowledge, its forms, content, and contradictions. Seems, that Humanity don't want to know the truth about it-self. Because modelling of the World is still on a verbal level of metaphysical scholastics, which is grounded on ancient dogmas and uncertain economic, political, religion and variety of other disconnected from practice world outlooks. Moreover, such aged outlooks are stored and defended by high intellectual groups and institutions of science, education, and legal authorities. Isn't any secret that schools, and universities nowadays become work organisations of teachers and professors, for whom main learning actors – schoolboys and students frequently still mean for employed staff wellbeing. This phenomenon is called the Education *contradiction pendulum*. Because education must be dedicated to the success of society and its members, but not for educators at first.

In each country problems of education are discussed permanently, a lot of monographs, new educological concepts and practical initiatives are applying into the practice of education. The most frequent authors of such innovations are educators and authorities, who can't think out of the box at their own interest. Fortunately, progress is above such not perspective practical interests. The problem of education is deciding through natural transition from past to new forms and content of learning.

Virtualics, as virtual modelling metatheory and World development spiral virtual models give opportunity to apply virtual approach to the Learning phenomenon and its transition qualities from the Past through Nowadays and towards the Future (Paulauskas S. (2017) Virtualics: Where did the Dialectic? / Management - Journal of Management. Lithuania business university of applied sciences, ISSN 1648-7974. Klaipeda, Lithuania. 2017, № 2(31). -P.105-109). The *Technogeny* constructs virtual models of an origin and development of learning and self-improvement seeking to gain necessary for success practice skills and abilities.

Main subject of this article is the origin, development laws and its realisation mechanisms of the Learning with help of dichotomic, trichotomic and complex virtual models.

Main aim of the article is to present the technogeny as science in essence, origin, development laws and its realisation mechanisms of the Learning with help of virtual models.

Main tasks are:
1. To present the Technogeny as science in essence, origin and development of Self-Improvement.
2. To share discovered the Learning forms transition.

3. To show recognised the Learning content innovation.
4. To present the Genius programme as synthetic applications of learning innovation.

The Technogeny as science on the origin and the development of the Learning

The Technogeny (*techne – skills, arts; genie – origin, development, genesis; ancient Greek*) is the new science, created by Stasys Paulauskas, dedicated to construction of virtual models of the origin and development of learning and self-improvement seeking to gain necessary for success practice skills and abilities.

Permanent learning and Self-Improvement are genomic unavoidable abilities of each live organism. *Anthropogenic* self-regulation cycle evidently shows, how seeking to cover an actualised demand live organism is modelling and implementing own action, which after is assessing in matter of economy – lowest expenses of time and energy for cover a demand (Paulauskas S. (2020) Anthropogeny: HUMAN QUALITY VIRTUAL LEAP/ Management - Journal of Management. Lithuania business university of applied sciences, ISSN 1648-7974. Klaipeda, Lithuania. 2020, № 1(36). -P.61-66.). Applied action programme with success' indexes is placed into memory for next time to take from here the most efficient programmes. Moreover, genomes have the special ability to simulate action programmes in a brain without implementing it in real practice. This ability is *gaming*, which enables mentally accumulating and enriching personal libraries of action programmes. It's very important to know that when we sleep, a genome-like accurate librarian takes all newly created and applied action programmes and places them into certain places of the memory, classifies it each moment according to new criteria and convenience to find it's easier and quicker. Our learning programmes are like video games with signs of all human senses: vision, hearing, touch, smell, and taste. So, why after waking up in the morning, everything is clearer in our minds.

So, each realised action helps to gain improved action programmes, which has a sense of *learning* and *self-improvement*. In animals' world learning has a sense of copying and imitating by juniors' actions of adults. Its parents don't imagine that they are doing some special education programmes for the benefit of juniors. Education is a normal constituent of natural family relation. In human family verbal communication enables significantly increased efficiency of transferring of success programmes to younger generation in much shorter time, thanks to the *teaching* - verbal analysis and modelling of action programmes. Education and teaching become specialized human activity dedicated to transfer accumulated by previous generation experience to younger generations.

However, not seeing special technical means humans teach juniors – transferring experience to the younger generation one third of their life span – 25 years. The main reason for such a waste of time is lost understanding of the sense of learning. A human action programme is the *Natural Learning unit (NLU)*. NLU is a complex procedure on covering actualised demand and fixing it. However, specialised activities of science and education for analysis purpose divided and fragmented such learning units and forgot to collect it again for its synthesis in higher quality of practical use. So, growing exponentially mountains of fragmented knowledge worse opportunities for quick find of LU for practical needs. Big libraries, encyclopaedias, computers, big data bases, Google engines, etc. are developing to navigate in this ocean of fragmented knowledge. Therefore, attempts to transfer such knowledge disorder into the brains of juniors meets so big resistance.

Understanding the sense and practical purpose of the learning unit helps to collect fragmented knowledge into the Natural *Knowledge unit (NKU)* – universal element of the Knowledge, like the atom is the unit of physical World. Humans are nearing a significant choice between two general knowledge concepts: chaotic and unified. Chaotic fragmentedness towards infinity knowledge leads to nowhere. The progress leads to efficient activity towards defining and concentration into Knowledge learning and applying into human practice. According to Virtualics World development spiral, Anthropogenic quality leap synthesis of knowledge units leads to discovering and construction of artificial learning units, what has sense or creation of artificial intelligence. The smart quality of learning and self-improvement mean arrangement of humanity's self-management according to the genomics of a single human.

Going this way, the Genius learning programme was synthesised, and it's implemented for more than thirty years. The genius knowledge subject is Innovation. Each human like any other live organism is an innovator who creates and implements new action programmes on exceeding the time. So, innovation is the *craft of Genius, who gains success by* exceeding the time. We can do this for a shorter or longer future and can be less or more successful. So, let's become Geniuses, thanks to the synthesis of the Knowledge unit.
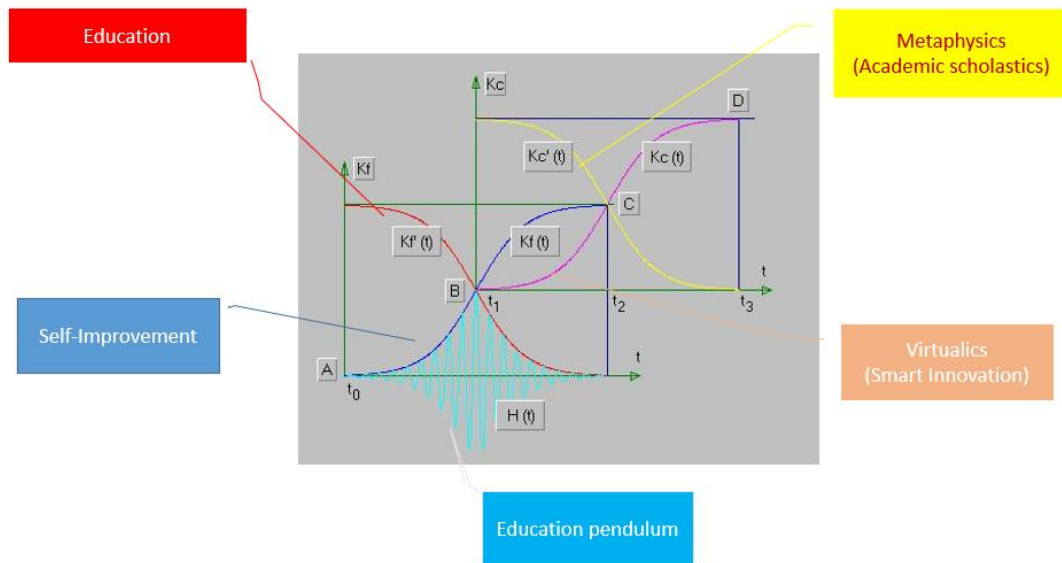
Fig. 1 Virtual model of Self-Improvement transition (Paulauskas, 1995)

Virtual model of Self-Improvement qualitative transition consists of dichotomies of the *form Kf(t), the content Kc(t) and contradiction between them H(t)* (Figure 1). The form of Self-Improvement replaces *Education* quality and creates conditions for changing learning content from *Metaphysics* (academic scholastics) to *Virtualics* (Smart Innovation) through contradiction in the shape of resonance sinusoid. The pendulum shows how is accelerating the fight between New and Old until culmination point B, after which New wins this competition and contradiction slightly disappears.

Transition of Old education quality to New one means *innovation of education* – creation and implementation of new forms and content (Figure 2).
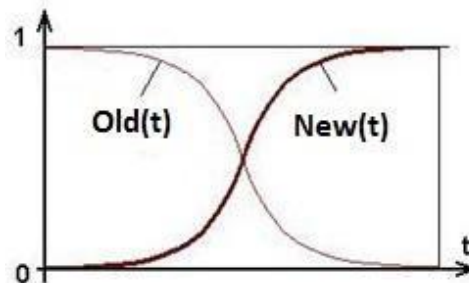

**Fig. 2 Learning innovation dichotomic virtual model (Paulauskas, 1995)**

It's important to understand that innovation of Self-Improvement is a natural permanently running process, which is going without targeted impact of humans. Humans have three choices or scenarios, how to deal with innovation trends: a) not follow them; b) follow and c) exceed the time.

The Learning form innovation

A learning form transits from education to Self-Improvement passing three qualitative steps of social relations: *A(t) autocratic face-to-face education*, *B(t) democratic blended learning and C(t) virtual liberal Self-Improvement* (Fig. 3).

Long-time Autocratic school with domination of a teacher and communal school was the main alone form of Education. Nowadays the democratic quality of Blended learning dominates, thanks to the opportunity to use some digitised PC and Internet tools in the learning process. The Future of education belongs to Virtual Self-Improvement, what significantly will change communal education. Giant push towards virtual Self-Improvement made COVID-19 virus.

Education transition quality is changing from group education to Individual Self-Education, which enables to avoid interests of educators versus interests of schoolboys. (Table 1).
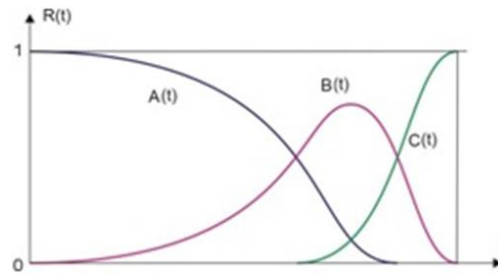
Fig. 3 The learning form quality transition trichotomic virtual model (Paulauskas, 1995).

Education tools in the shape of writable and verbal knowledge is replaced by virtual self-education tools (PC, Internet, etc.). Big expensive buildings are replaced by virtual surroundings at home, which enable reduced learning costs and assure personally oriented education. Designated teachers are replaced by chosen mentors according to individual needs and opportunities of a Self-Improving person.

Table 1. Learning form transition (Paulauskas, 2012)

Quality	Old	New	Earnings
Education quality	Group education	Individual virtual self-education	Avoiding impact of interest of pedagogues
Education tools	Verbal and writable knowledge	Virtual self-education tools (PC, internet)	Quickness, efficiency, personally oriented
Buildings	Big expensive buildings	Virtual surroundings	Cheap, personally oriented
Educator	Designate teacher	Chosen mentor	According to individual needs and possibilities
Organisation	State education	Private business	More rapid improvement
Market	Education institutions	Consumers	Responsible business
State education system	Non sustainable education	Sustainable self-education	More efficient self-improvement
Order	Management	Self-Management	More initiative
Politics	Autocracy (partocracy)	Direct democracy	More rapid development

Communal State education is replaced by private business service, enabling assure quickness of education according to individual abilities and opportunities. Communal education market is replaced by the consumer market, where market competition and social responsibility mechanisms accelerate creation of virtual self-improvement tools and mentor's quality improvement. Success of education form innovation also depends from modernisation of social relations in a community from Management to Self-Management and transition to digital direct democracy.

The Learning content innovation

Self-Improvement content is changing through innovation dichotomies with help of digitalisation needs and opportunities. If old education content is focused on analysis of learning subjects, needs of creation more efficient action programmes require finalise gnostic process by synthesis of such programmes. World view is changing from a metaphysical sphere of things to a virtual world development spiral, enabling foreseeing the future. Formal abstract logic is replaced by virtual logics, enabling virtualized mental images.

Ethics is transiting from loyalty to social responsibility, what increases personal freedom and longer life span opportunities. Nowadays human's race form is changing from speech to virtual images with the help of PC and Internet, which enables accelerated communication processes. Obligatory work is replaced by free creative activity towards freedom and longer life span of people (Campbell, 2007). Social relations transferring from Management to Self-Management, giving more initiative to a person. Technologic activities develop from belief to knowing and safety of the overall life cycle in matters of responsibility and controllability. The Economic paradigm is changing from economics to

sustainable development, what enables more quick development.

Table 2. Learning form transition (Paulauskas, 2012)

Quality	Old	New	Earnings
Cognition	Analysis	Synthesis	More efficient action programmes
World outlook	Sphere of things, element - atom	Development spiral, "universum" - leap	Opportunity to model past and future
Methodology	Scholastics (what is)	Virtualics (how to change)	Possibility to use knowledge in practice
Logics	Formal	Virtual modelling	Possibility to virtualise mental images
Ethics	Loyalty	Responsibility	Personality freedom, longer life span
Homo sapiens sapiens form	Speech	Virtual images	More quick communication
Homo sapiens sapiens content	Obligatory work	Free creative activity	Personality freedom, longer life span
Sociology	Management	Self-management	More of initiative
Technology	Belief	Knowing	More responsibility
Paradigm	Economics	Sustainable development	More quick development
Business	Production/service	Sustainable innovation	Freedom and responsibility

Understanding of business quality is changing from production and service to sustainable innovation, giving to humans more freedom and responsibility.

The synthesis of the Genius Learning Unit

The synthesis of the advanced form and content of the Learning enabled it to recognise the highest Learning unit as a success-oriented Genius programme of an Innovator. Nobody can repeat any action programme. Each next action needs an updated sequence of movements in new time, changed surroundings and renewed actors. So, each human programme is an innovation, which needs to be created and implemented. The Practical Knowledge unit is an Innovation programme. Consequently, the Learning unit is an Innovation programme. Simply, the smartness thing is to learn programming of innovations, which could be applied in different fields of human activities.

Innovator is *a Genius* – a human, who exceeds a time trough creation and implementation of novelties. Majority are short-term geniuses, able shortly exceed a time (Zhang & et., 2020). But exists persons, who exceed the time for tents and hundreds of years, who we named as Geniuses. As more you exceed the time and your colleagues as more you are a Genius. The Genius learning programme is constructing forty years and ir consists of 3 virtual learning tools: a) Psychological Self-Improvement on innovation iGenius (2015); b) Virtual Self-improvement portal with subject of Virtualics as the Innovation metatheory (1995) and c) Practical programme of innovation iMillioner (2007).

Such Genius programmes and virtual tools belong to the highest synthetic level of virtual Self-Improvement. They were checked and discovered great results during bachelor and master's degree studies in Klaipeda University, Lithuanian Business University of applied sciences, International Erasmus+ studies. Virtual Self-Improvement was applied in 4 Leonardo da Vici projects, dedicated for working out innovative learning programmes on Renewable and wind energy in 2006-2015 years. In 2019-2021 years, Strategic Self-management Institute initiated and is leading the international consortium on implementation of Erasmus+ programme strategic project Smart hospitality, where the Genius programme is applying for the tourism service SMEs sector.

The learning programme and virtual Self-Assessment tool iSAT were created to help tourism sector innovation. COVID-19 pandemic played a significant role in pushing learning quality towards virtual Self-Improvement in all countries and fields of education, by isolating schoolboys and students at home, which will be the best place for virtual Self-Improvement soon. The Genius programme will become a sweet cherry on the cake of smart Self-Improvement of humans and Artificial intelligence for smart machines and robots.

Conclusions

For forty years knowledge innovation was proven the hypothesis, that fragmented knowledge, the lack of adequate synthetic learning units, its forms and content, the contradiction of the Education faces humans to nowadays existential problems, like global challenges of climate change, pandemics, wars, poverty, international terrorism, migration, etc.

Created by Stasys Paulauskas science of Technogeny, dedicated to construction of virtual models of the origin and development of learning and self-improvement seeking to gain necessary for success practice skills and abilities. Grounding on the Virtualics, as virtual modelling metatheory and World development spiral virtual models, give opportunity to apply virtual approach to the Learning phenomenon and its transition qualities from the Past through Nowadays and towards the Future.

Anthropogenic analysis of gaming as a learning procedure enabled to define the action programme of an animal or human as the Natural Learning unit, which is also the practical Natural Knowledge unit. Composed learning virtual model evidently confirmed transition of the form of learning from the Education to Self-Improvement thought Education contradiction resonance sinusoid.

A learning form transits from education to Self-Improvement passing three qualitative steps of social relations: autocratic face-to-face education, democratic blended learning, and virtual liberal Self-Improvement.

The content of learning is transiting from Metaphysical scholastics to virtual Smart Innovation. Matrixes of learning form and content fixed clear trends from old to new qualities of the learning.

Genius learning unit and virtual Self-Improvement tools innovations and application for thirty years international pedagogic innovations enabled to confirm the right path to the future of learning towards virtual Self-Improvement. COVID-19 pandemic gave additional confirmation of this learning development direction.

The article gives certain knowledge for constructive update of the traditional Education to virtual Self-Improvement and accelerates creation of Artificial intelligence systems on the ground of the Natural Learning unit.

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