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Research Articles

Research Articles

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THE ROLE OF PYRAMIDAL ORGANIZATIONAL STRUCTURE IN ORGANIZATIONAL EFFICIENCY AND EFFECTIVENESS

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Abstract

The purpose of this article is the theoretical treatment of organizational structuring aspect, with special emphasis on the role of pyramidal organizational structure in organizational efficiency and effectiveness. More broadly, it talks about the importance of the organizational structure for the division of tasks, roles, responsibilities, authority and so on, as well as the importance of the optimal breadth of management in the success of organizations, respectively in the correct and clear understanding of roles of each member within the organization. Likewise, it is intended that through the study carried out in 50 enterprises in Kosovo, the importance of applying an adequate organizational structure that ensures their success will be presented. The study made it clear at what level the pyramidal organizational structure is applied by these enterprises and how much efficiency and effectiveness this structure has provided to them.

Keywords

Organizing; Pyramidal organizational structure; Efficiency; Effectiveness; Kosovo enterprises.

Introduction

Over the past decades, organizations have changed the ways in which they are structured and managed. The classical theory of organizational structure, influenced by researchers such as [1] and [2], was about the universal principles of the organizational model. Organizational theorists and practitioners wanted to find a better way of organizing [3] or to more effectively match employees with the right jobs [4]. However, the goal of finding the most efficient and productive methods [3] was contested by contingency theory in the 1960s and 1970s, claiming that there is no single best approach, but that organizational design must be tailored to specific contextual requirements [5].

Organizational structure is necessary for the organizational activity of any business enterprise. Business companies always try to present themselves in the market and strengthen their positions. However, not every company achieves the desired goal. There are a number of external and internal factors that make some companies successful, and some others not. In this aspect, the management of the company and especially, one of its main functions, organizing, is extremely important [6]. According to [34], organizing means arranging and structuring work to meet organizational goals. It is an important process during which managers design the structure of an organization. Organizational structure is the formal arrangement of affairs within the organization [34]. It is the function of an organizational

structure that determines how successfully and efficiently the company will allocate or use its resources. A clear reflection of the function of the organizational structure is the organizational model, which is a set of official duties, authorizations and responsibilities that must be discharged by individual employees and structural units of the company on the one hand, and defined standards and management levels of the hierarchy and effective employee coordination systems on the other hand [6].

The design of an organization has a significant impact on the performance of the organization [7]. So, it is important to know how to design a particular organization [8]. The unpredictable, global and dynamic work environment requires the organization to focus on learning and design appropriate structures that facilitate coping with these conditions. Therefore, it is clear that organizations must design their structures in accordance with internal and external conditions and emphasize learning. Accordingly, it can be said that the structure which is planned to take into consideration the organizational culture, goals, values, characteristics of the industry and employees is thought to influence the performance of the individual and some positive attitudes such as commitment, involvement, commitment and fixation etc. [9]. The organizational management structure should be formed taking into account the company's development strategy. Only in this case the strategy can be implemented effectively. It is related to that relevant group of functions, the relevant communications, the relationship, in the sense of reporting, is necessary for the realization of the strategy. All this creates a basis of any management organizational structure, without which it is impossible to build an effective decision-making system [10].

Every organized human activity, from the manufacture of dishes to the landing of a man on the moon, gives rise to two fundamental and opposing requirements: the division of labor into different tasks to be performed and the coordination of these tasks to carry out the activity. The structure of an organization can be simply defined as the total sum of the ways in which it divides its work into separate tasks and then achieves coordination between them [11].

Structuration theory identifies three types of actions (interactions) that interact with three types of social structures. People perform (produce and reproduce) three specific types of interactions: (1) intelligible communication, (2) exercising power, and (3) sanctioning each-other. There are three types of social structures: (1) meaning, (2) dominance, and (3) legitimation. Meaning involves the effective use of language. Dominance involves control of materials and resources. Legitimation includes moral rules that determine the appropriateness of behavior. The three interactions correspond separately to the three social structures: (1) the combination of meaning with communication, (2) the dominance of power with strength and (3) the combination of legitimation with sanction [12]. According to the theory, people enter into structures in order to help them determine what to do and what to say to each-other [12].

1 Research Subject

Thus, the purpose of this article is to address the importance of the organizational structure for enterprises, with emphasis on the pyramidal organizational structure. The article aims to present a valuable theoretical overview of the aspect of designing organizations and determining the adequate organizational structure. The theoretical part is enriched with the study carried out in 50 enterprises in Kosovo for which we analyzed what organizational structure they apply and how much efficiency and effectiveness the applied structure brought.

The research question that is intended to be answered through the conducted study is:

What role does pyramidal organizational structure play in the efficiency and effectiveness of enterprises in Kosovo?

2 Literature Review

This section provides a theoretical overview of organizational structuring, levels of organizational hierarchy, and the pyramidal organizational structure. Given that this article specifically addresses the role of the pyramidal organizational structure in enhancing organizational efficiency and effectiveness, a detailed theoretical elaboration on these aspects is presented here.

2.1 Important Concepts About Organizational Structure

Organization design, as opposed to organization theory, is a prescribed body of knowledge. It aims to make alternatives on how to organize and manage the institutions and to serve these to the leaders entrusted with the administration of these institutions. These organizations exist for certain reasons: they are created to fulfill specific goals and objectives. Organizational design focuses on creating organizations through which these goals and objectives can be achieved [13]. An important element in any system that has a strong influence on other elements is the understanding of the reason for the very existence of the organization. What purpose does the organization exist for? And why and how does it create value for its various parties? Only if these questions can be satisfactorily answered can the organizational model be further explored to see how sustainable any competitive advantage arising from its value proposition will be. To answer these questions about the "raison d'être", the literature on strategic management proposes to develop vision and mission statements of the organization, goals and objectives statements of organizational design [14]. Some strategists spend almost every moment of every day in administrative and tactical concerns, and strategists who rush quickly to set goals and implement strategies often consider developing a vision and mission statement. This problem is widespread even among large organizations. Many corporations in the United States have not yet developed a formal vision or mission statement. However, an increasing number of organizations are developing these statements [15].

The knowledge base underlying the choice of organization models is rooted in scientific management and classical management principles. Practitioners and researchers who developed knowledge in these areas were looking for the best way to organize. Those early thinkers created many of the principles, such as span of control, and many useful forms, such as centralization, that we still use today. However, it was not difficult to find effective organizations that violated many of classical management principles. As a result, modern organization design grew out of efforts to explain these remarkable observations [13].

Organizations today are increasingly focused on improving efficiency and effectiveness to achieve their established goals. In a dynamic and competitive environment, their progress requires an enhanced approach to management and operations. According to [34], efficiency refers to getting the most output from the least amount of inputs or resources and is often referred to as "doing things right," that is, not wasting resources, while effectiveness is often described as "doing the right things," that is, doing those work activities that will result in achieving goals [34].

Modern organization design emerged from a variety of studies in the 1950s and 1960s. One current, developed in the United States, is best exemplified by the work of Alfred Chandler in his book "Strategy and Structure" [2]. He found that the different organizational structures we had observed could be explained by differences in companies' strategies. Therefore, different strategies lead to different organizations. This stream, referred to as strategic organization design, is a top-down design process that begins with the entity's strategy and can be applied at the enterprise, business unit, geographic, and functional levels. A second stream of thought developed in Europe around the work of Eric Trist and his followers [16]. It is referred to as

the socio-technical systems approach. It was from the bottom up. It focused on the alignment of the technology involved in doing work and the social system that can be created to do that work. Socio-technical systems thinking and tools are best in designing organizations at lower levels of the structure. Strategic thinking and design tools are best used for designing high levels of organizations [13].

Organizational theorists often claim that organization arises when people learn what they can achieve if they pool their efforts, resources, knowledge, and/or identities. Of all the theoretical concepts that organization theory has produced, social structure has probably been the longest. The term structure refers to the more or less stable relationships between the parts of any system or entity. For example, the relationships between a building's foundation, frame, roof, and walls give it the structure it needs to stand and provide shelter for its occupants, just as the relationships between bones, organs, blood, and tissues structure a human body and enable its many life support functions - mobility, digestion, respiration, circulation, etc. [17].

Organization theorists are particularly interested in two types of structure: physical and social. Physical structure refers to the spatiotemporal relationships between the material elements of an organization such as its buildings, their geographic locations, and the heritage and other symbolic meanings they embody. Meanwhile, social structure refers to the relationships between people and the roles and responsibilities they assume within the organization, such as the groups or units to which they belong (e.g., functional departments, divisions). Of course, the physical and social structures of organizations are not completely separate; they overlap in the same sense that people have both physical bodies and social identities [17].

2.2 Organizational Hierarchy Levels Development

An organization's hierarchy begins to emerge when managers find it increasingly difficult to coordinate and motivate employees effectively [18]. As an organization grows, employees increase in number and begin to specialize, performing widely different types of tasks; the level of differentiation increases and this makes it more difficult to coordinate the activities of employees [19]. Similarly, division of labor and specialization produce motivational problems. When each employee performs only a small part of a total task, it is often difficult to determine how much he or she actually contributes to the task, and thus it is often difficult to evaluate each individual’s performance. Furthermore, if employees collaborate to achieve a goal it is often impossible to measure, evaluate and reward them based on their individual level of performance. For example, if two servers work together to serve tables, how does their boss know how much each contributed? If two chefs work together to cook a meal, how is each person's individual impact on the quality of the food measured and rewarded [20].

An organization does two things to improve its ability to control, namely it coordinates and motivates its members by:

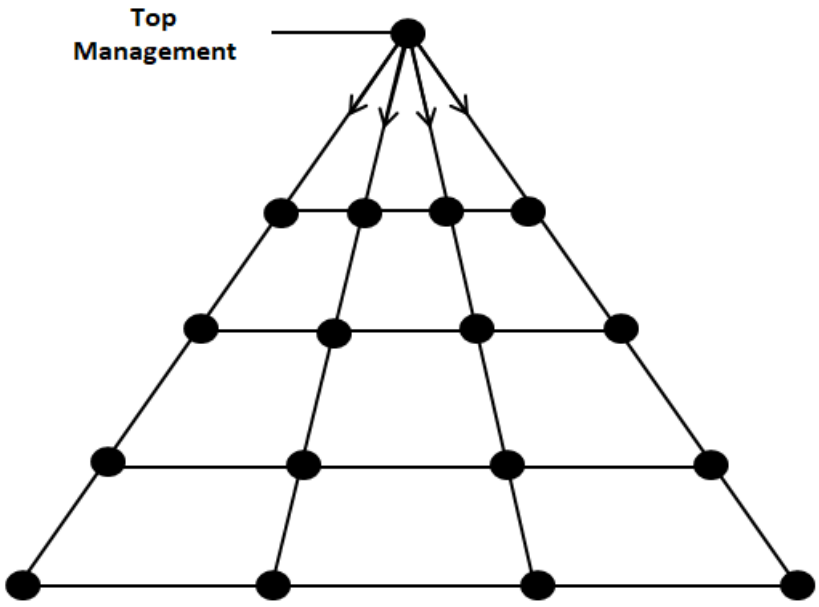
1. Increasing the number of managers, it uses to monitor, evaluate and reward employees; and
2. Increasing the number of levels in its managerial hierarchy so that the hierarchy of authority becomes longer over time [21].

Increasing the number of managers and management levels increases vertical differentiation and gives the organization direct face-to-face control over its members, managers personally control their subordinates [22].

2.3 Pyramidal Organizational Structure

In any organizing effort, managers must choose an appropriate structure. Structure refers to the defined relationships between management system resources. Its purpose is to facilitate the use of each resource, individually and collectively, as the management system strives to achieve its objectives. The two basic types of structure within management systems are formal and informal structures. Formal structure is defined as the relationships between organizational resources as described by management; the formal structure is mainly represented by the organizational chart. In contrast, informal structure is defined as the patterns of relationships that develop due to the informal activities of organizational members. It evolves naturally and tends to be shaped by individual norms and values and social relations. Basically, the informal structure of an organization is the system or network of interpersonal relationships that exist within, but are usually not identical to, the formal structure of the organization [23]. Every organization has a formal structure. The formal structure consists of departments, divisions, tasks and relationships within the organization. It also defines the line of authority, responsibility and communication channels [24].

The pyramidal type represents the most authoritative type of management with very strict subordination. Command functions, information and the decision process move in one direction (from the highest point of the organizational pyramid) (see Fig. 1). The process of movement of orders and information starts from the top management (general director, chairman and similar) through the first line of management (members of the governing council), then through the middle line in the executive functions, up to the head of administration or the foreman in production [25].



Source: [25, p. 147]

Fig. 1: *Pyramidal organizational structure*

The pyramidal organizational structure has its advantages and disadvantages. The advantages of this structure are:

- Simplifying and not duplicating the lines of command, so that it is precisely known who is responsible for which decisions [25];
- Governing functions are separated from performing - executive functions [25];
- Opportunity for employees to specialize and develop expertise in their field;
- Close supervision of employees through a narrow span of managerial control;

- A culture of loyalty to teams, departments and the organization as a whole.

As disadvantages the pyramidal organizational structure we mention:

- Centralized decision-making system [25];
- Complicated chains of command that can slow down decision-making;
- Inconsistencies in management at different levels which can hinder work;
- Delays in communication vertically through levels and horizontally between teams;
- Less flexibility to adapt and react to environmental and market pressures;
- Separation of employees from senior management;
- Lack of autonomy can cause strain in employee-manager relationships;
- Difficult cooperation outside the team circle or related to team rivalry;
- Significant amount of corporate overhead to support multiple layers of management.

2.4 The Breadth (Volume) of Management and Its Impact on Pyramidal Organizational Structure

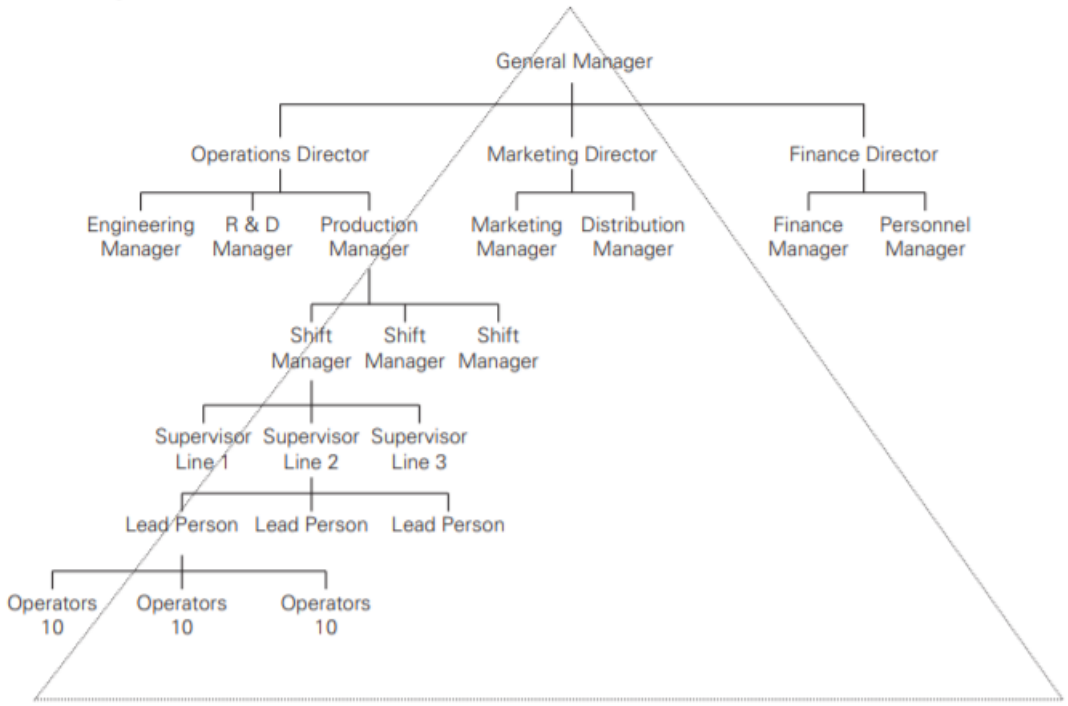
Based on the fundamental reason for division into sectors, which stems from the ever-increasing demand for communication with different organizational levels, management breadth represents the number of lower units that a manager can efficiently oversees them. The horizontal extension of the organization may reach a limit beyond which it is not possible to supervise all personnel belonging to that organizational extent. The breadth (volume) of management essentially represents the breadth of control, but because of the implications of new things in the organization, the term breadth of management is more reasonable. New implications related to the breadth of management as a concept include leadership style, communication, motivation, and the like. Meanwhile, the expansion of the said concept essentially constitutes not only control as a process, but also a series of new elements [25].

Among the factors that affect the volume of management is undoubtedly communication as a fundamental variable, which affects the definition and limitation of management volume. From this derive several components that affect the volume of management:

- Organization level;
- Ability and qualification of employees and managers;
- Attitude and personality of the manager;
- The degree of interconnectedness of jobs [25].

The volume or breadth of management, although it depends on various factors, has an impact on the organizational structure. From this also emerges the phenomenon of interconnection between the division into sectors and the distance (width) of management. The influence of the breadth of management on the organizational form or pyramidal structure can be seen based on the narrowing or expansion of management (conditionally understood in the hierarchical structure). The general structure can change in different ways depending on the combination of small or large distances, respectively expansions or narrowings of management [25].

If the orientation in management takes the direction of narrowing, the result will be a narrowed pyramid with a sharp tip [25] (see Fig. 2).



Source: [17, p. 97]

Fig. 2: *Pyramidal organizational structure (narrowed)*

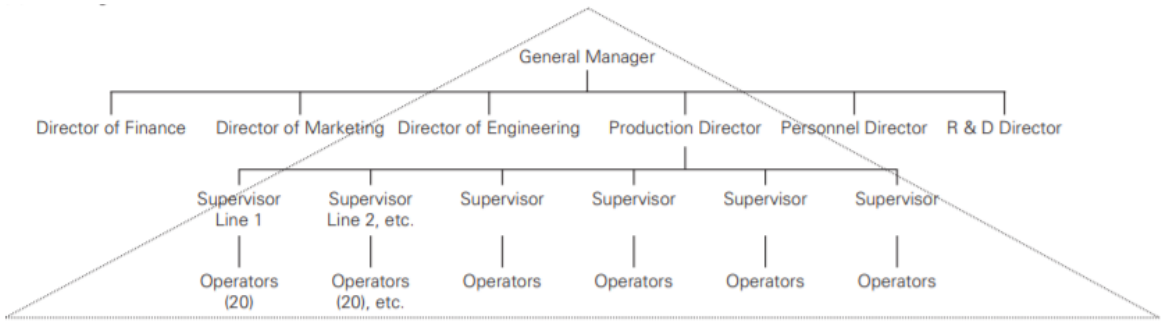
If we analyze the advantages and disadvantages of the narrowed pyramidal structure, then we say that the advantages it:

- A better surveillance;
- Better control;
- Superior-subordinate communication is faster because a manager has subordinates first [26].

The disadvantages are:

- Increase in administrative expenses;
- Excessive involvement of superiors in the affairs of subordinates;
- Communication of plans, procedures and policies can be distorted and misunderstood as a result of the steps [26].

Whereas if the management philosophy is oriented towards expansion, the result will be a low but expanded pyramid [25] (see Fig. 3).



Source: [17, p. 96]

Fig. 3: *Pyramidal organizational structure (expanded)*

If we analyze the advantages of the extended pyramid, we will see that this structure enables:

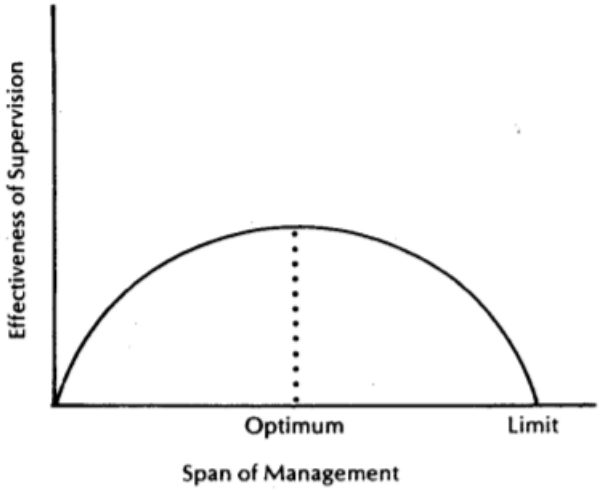
- A more effective communication between different levels;
- The organizational structure is maneuverable, enables the delegation of authority to subordinates;
- It has low cost [26].

The disadvantages of this structure are:

- The inability to control everyone;
- The impossibility to supervise everyone frontally;
- The risk of creating a "bottleneck" as a result of heavy workload [26].

We can illustrate the change of the organizational structure with concrete examples as shown in Figures 2 and 3. The narrowing or expansion of pyramidal organizational structure has an impact on the efficiency and effectiveness of management, as well as on personal development. Different modifications and variants in different conditions and circumstances have shown the need to find the balance between structure and behavior that in the last instance also represents the primary concept of optimal harmonization between different variables in the field of management [25].

Although there is no ideal range of management, since it is influenced by many factors that must be taken into account before defining the range of management, it is worth mentioning the authors Van Fleet and Bedeian, who are proponents of the optimal breadth of management [26] (see Fig. 4).



Source: [27, p. 360]

Fig. 4: *The concept of optimal management breadth*

The 1950s were a period of ongoing controversy regarding the breadth of management. Numerous systematic empirical studies were conducted to determine its validity and the concept of an "optimal" breadth instead of a "limited" breadth emerged. This allowed the breadths or extents to be "too large" and "too small" in existing organizations. Both Davis and Newman commented on the breadth of management [27]. Having previously acknowledged a variation in optimal breadth at different levels of supervision, Davis offered guidelines to follow [33]. He thought that the stretches or divisions at the top of the pyramid should go from three to eight and the divisions at the bottom from ten to thirty [28].

Newman also provided guidelines to help determine optimal breadth at various levels of the organization. With a similar reason to advocate slightly different figures or patterns, Newman

suggested three to seven divisions at the top of the pyramid and fifteen to twenty for the bottom [29], [30].

Following Davis and Newman, Drucker modified the concept and introduced what he referred to as the "managerial responsibility space" [31]. Drucker considered that this "space" was much wider than the regular management space and that it had no fixed size. Drucker seems to argue in favor of large spans when he says that organizations should have the fewest possible number of levels [32].

3 Methodology

This article has been compiled on the basis of reviews made in various relevant sources, such as:

- Books by different authors, foreign and local;
- Scientific articles published in relevant scientific journals;
- Internet resources, to obtain additional information necessary for certain clarifications in the relevant field;
- Primary data collected through a structured questionnaire for research purposes regarding the application of pyramidal organizational structure in Kosovo enterprises.

Mixed methods in scientific research correspond to the methodology used in this article. For data collection, a structured questionnaire was used which was addressed to the managers of 50 different enterprises in Kosovo, be they manufacturing, commercial or even service offering ones. Most of the research sample was purposive, while the rest was a random sample. With the help of these enterprises managers, it was possible to achieve the purpose of this article, presenting the results from the direct market study.

The collected data were analyzed and systematized through the Statistical Package for the Social Sciences (SPSS), version 23, and are presented in tabular and graphical form. All the results obtained from the study are supported by additional clarifications and interpretations based on the conversations we conducted with the managers of the surveyed enterprises.

4 Results, Findings and Discussion

Based on all that was said above, this part presents the results of the study from the primary data. Since the topic of this article is related to the pyramidal organizational structure, then the focus here was on how much this organizational structure is applied in these enterprises in Kosovo, as well as how this structure provides efficiency and effectiveness to the enterprises in question.

Table 1 presents the general information about the surveyed managers and the enterprises they lead, namely their formal position, enterprises activity and enterprises organization form.

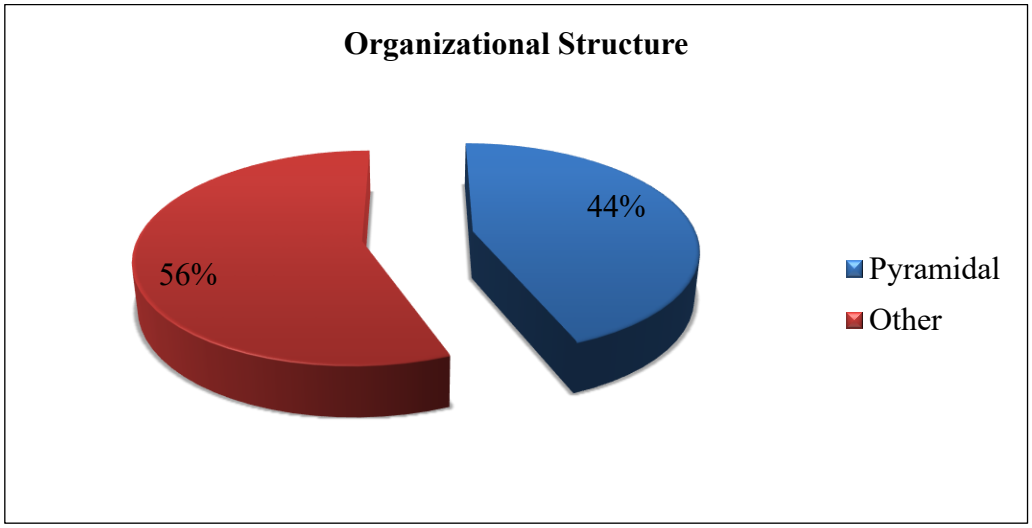
Figure 5 presents the results related to the application of pyramidal organizational structure in enterprises in Kosovo. In the question "What organizational structure do you apply in your organization?", pyramidal or other structure, the results show that for the 50 enterprises taken as a study sample, 44% of their managers stated that they apply a pyramidal organizational structure, or 22 of them, and 56% stated that they apply other organizational structures, or 28 of them.

Figure 6 shows the results related to efficiency and effectiveness of the organizational structure in enterprises in Kosovo, whether it is a pyramidal organizational structure or another structure.

Tab. 1: *General information about the surveyed enterprises*

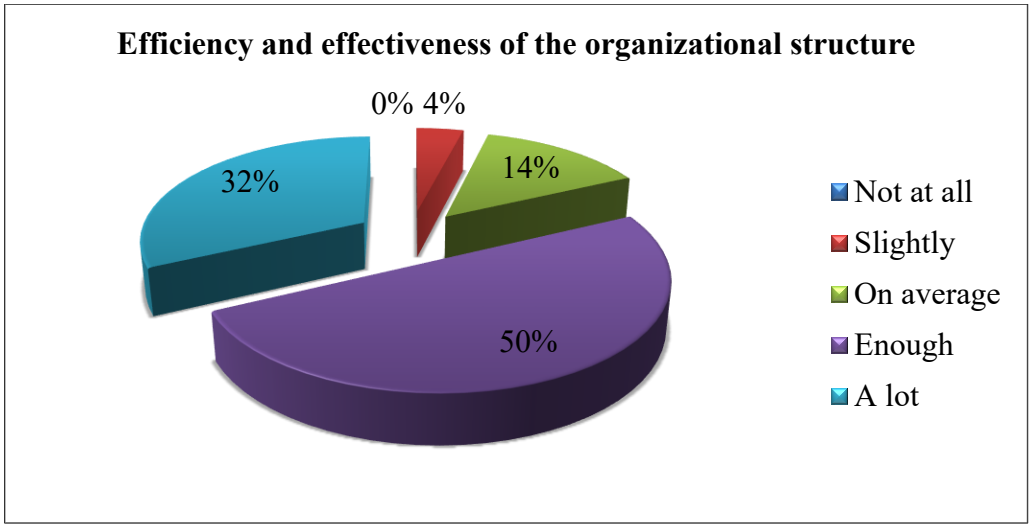
Variables	Categories	Frequency	Percent
Formal position in the enterprise	Owner	15	30.0
	Manager	35	70.0
	Total	50	100.0
Enterprise activity	Manufacture	7	14.0
	Service	16	32.0
	Commerce	27	54.0
	Total	50	100.0
Form of enterprise organization	Individual	33	66.0
	Partnership	7	14.0
	Corporation	10	20.0
	Total	50	100.0

Source: Own processing (2022)



Source: Own processing (2022)

Fig. 5: *The application of pyramidal organizational structure in enterprises in Kosovo*



Source: Own processing (2022)

Fig. 6: *Efficiency and effectiveness of the organizational structure in enterprises in Kosovo*

In the question "As a manager of the organization, how much do you estimate that the applied organizational structure has ensured efficiency and effectiveness?" it has resulted that the applied organizational structure has generally ensured efficiency and effectiveness in the enterprise, namely in 4% of cases the applied organizational structure has provided a low level of efficiency and effectiveness, in 14% of cases it has provided an average level of efficiency and effectiveness, in 50% of cases it provided an above average level of efficiency and effectiveness and in 32% of cases it provided a high level of efficiency and effectiveness. From the respondents, this question required an answer categorized according to the Likert scale, where: 1 = not at all = no efficiency and effectiveness; 2 = slightly = low level of efficiency and effectiveness; 3 = on average = average level of efficiency and effectiveness; 4 = enough = above average level of efficiency and effectiveness; 5 = a lot = high level of efficiency and effectiveness.

Table 2 presents the results from the cross-tabulation of the data on pyramidal organizational structure and organizational efficiency and effectiveness. So, in order to directly see the efficiency and effectiveness of pyramidal organizational structure, we analyzed such an issue for 44% of the enterprises (or 22 enterprises) in which the pyramidal organizational structure was applied. As we can see, in 18.2% of cases the application of the pyramidal organizational structure has provided an average level of efficiency and effectiveness, in 40.9% of cases it has provided an above average level of efficiency and effectiveness and in 40.9% of other cases it has provided a high level of efficiency and effectiveness.

Tab. 2: *Pyramidal organizational structure and organizational efficiency and effectiveness*

Efficiency and effectiveness					
Pyramidal Organizational Structure		**On average**	**Enough**	**A lot**	**Total**
	Count	4	9	9	22
	% within Pyramidal Organizational Structure	18.2%	40.9%	40.9%	100.0%

Source: SPSS Output, version 23 (2022)

As in the explanation for Figure 6, also for the answers to the question "As a manager of the organization, how much do you estimate that the pyramidal organizational structure has ensured efficiency and effectiveness?", responses were categorized according to the Likert scale. Also, we emphasize that this question was valid only for those managers who declared that they applied pyramidal organizational structures in their organization.

In general, this study has proven that the application of pyramidal organizational structure in the aforementioned enterprises has influenced the increase in organizational efficiency and effectiveness. More precisely, the managers who have declared that they apply the pyramidal organizational structure in their organizations have stated that this structure provides a high level of efficiency and effectiveness. Organizational efficiency and effectiveness also come as the fact that the applied organizational structure is quite flexible, implying here that these enterprises are open systems that interact with the environment or with their external surroundings, accepting the changes that come and being flexible in fulfilling of market requirements and needs.

Also, it is worth mentioning that the relevant organizational structure applied in these enterprises has influenced the overall success of their managers. Respectively, with a fairly high figure of 88%, it was stated by the managers that the success of them is not missing, being as an indicator here the organizational structure applied, since as mentioned the efficiency and effectiveness of the organization was high relying on the type of organizational structure that applies to the mentioned enterprises.

Conclusion

Organizing as a management function has an important role for any organization that aims to operate successfully in the market. This assertion derives from the explicit delineation, inherent in the organizational process, of distinct assignments, roles, responsibilities, and authority among various members. These elements are systematically apportioned within the organizational structure, a predetermined framework unique to each entity. The organizational structure, emblematic of the arrangement of all members, facilitates the systematic development of the business by establishing and distinguishing various hierarchical levels. In this context, the concept of departmentalization emerges prominently, referring to the deliberate establishment of discrete departments or divisions within the organizational framework.

In the nascent stages of development, the pyramidal organizational structure manifested as a rudimentary arrangement comprising solely two hierarchical strata: the management level and the operative employee level. Despite the ostensibly simplistic nature of this structure, a significant challenge emerged in tandem with the intricate nature of tasks. This intricacy stemmed from the convoluted communication dynamics between these two hierarchical tiers, resulting in a divergence between the knowledge and skills possessed by management and operational employees. This disjunction impeded the translation of strategic plans into actionable operational activities, thereby giving rise to challenges associated with task complexity.

However, with the evolution of organizational development at the departmental level, these challenges and incongruities progressively diminish. The pyramidal organizational structure assumes more intricate configurations, expanding the hierarchical composition to four discernible levels. These include three managerial echelons - comprising top, middle, and lower management - and a non-managerial tier encompassing operational employees within organizational frameworks.

In conclusion, the survey of 50 enterprises reveals that 44% employ a pyramidal organizational structure, while 56% adopt alternative frameworks. Managerial assessments indicate a nuanced view of efficiency and effectiveness: 4% reported low levels, 14% average, 50% above average, and 32% high. Specifically, the pyramidal structure resulted in 18.2% average, 40.9% above-average, and 40.9% high levels of efficiency and effectiveness. These insights highlight the complexity of organizational effectiveness, warranting further investigation into the impact of organizational structures on operational outcomes.

The observed prevalence of the pyramidal organizational structure underscores its perceived efficacy as a mechanism for optimizing organizational performance. By delineating hierarchical roles and responsibilities, this structural paradigm aims to enhance the functional coherence of enterprises, contributing substantively to their competitive standing in the market. Consequently, the ensuing discussion contends that the deliberate choice of the pyramidal organizational structure among a significant proportion of the surveyed enterprises is indicative of a strategic commitment to leverage its perceived benefits in fostering heightened operational efficacy and overall success in targeted market segments.

Organizations, as a fundamental imperative, must exhibit a heightened level of adaptability to accommodate alterations in both organizational structure and the evolving demands and preferences of consumers. In succinct terms, aligning with contemporary market dynamics and trends is a decisive factor influencing the success trajectory of organizations navigating today’s dynamic marketplace.

The inherent dynamism of the contemporary market necessitates an organizational ethos characterized by flexibility and responsiveness. Embracing changes in both structural paradigms and consumer requirements is not merely a reactive approach but a proactive strategy that positions organizations strategically within the competitive landscape. Such adaptability is integral to navigating the complexities and uncertainties inherent in today's dynamic market milieu.

Arguably, organizations that demonstrate an astute awareness of and receptivity to the latest market developments are poised to not only survive but thrive. The argument advanced here contends that organizational success in the present-day market is contingent upon the capacity to anticipate, embrace, and effectively respond to emergent trends, thereby underscoring the paramount importance of organizational adaptability in the pursuit of sustained competitiveness and success.

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ROLE PYRAMIDÁLNÍ ORGANIZAČNÍ STRUKTURY V ORGANIZAČNÍ ÚČINNOSTI A EFEKTIVNOSTI

Účelem tohoto článku je teoretické zpracování aspektu organizačního strukturování se zvláštním důrazem na roli pyramidové organizační struktury v organizační efektivitě. V širším měřítku hovoří o důležitosti organizační struktury pro rozdělení úkolů, rolí, odpovědností a pravomocí; dále o významu optimální šíři řízení v úspěšnosti organizací, respektive ve správném a jasném pochopení rolí každého člena v rámci organizace. Studie provedená v 50 podnicích v Kosovu svědčí o důležitosti uplatnění adekvátní organizační struktury, která zajistí jejich úspěch. Tato studie jasně ukázala, na jaké úrovni tyto podniky uplatňují pyramidovou organizační strukturu a jakou efektivitu jim tato struktura přinesla.

DIE ROLLE DER PYRAMIDALEN ORGANISATIONSSTRUKTUR IN DER ORGANISATIONSAKTIVITÄT UND –EFFEKTIVITÄT

Sinn und Zweck dieses Artikels ist die theoretische Bearbeitung des Aspektes der organisatorischen Strukturierung mit besonderer Betonung auf der Rolle der pyramidenförmigen Organisationsstruktur in der Organisationseffektivität. Im breiteren Maßstab spricht er über die Wichtigkeit der Organisationsstruktur für die Verteilung der Aufgaben, der Rollen, der Verantwortlichkeiten und der Befugnisse, außerdem über die Bedeutung der optimalen Steuerungsbreite im Erfolg der Organisationen bzw. im richtigen und klaren Begreifen der Rolle eines jeden Mitglieds im Rahmen der Organisation. Die in 50 Unternehmen im Kosovo durchgeführte Studie zeugt von der Wichtigkeit der Anwendung adäquater Organisationsstrukturen, welche deren Erfolg sichert. Diese Studie hat klar dargelegt, auf was für einem Niveau diese Unternehmen die pyramidale Organisationsstruktur zur Geltung bringen und was für eine Effektivität ihnen diese Struktur gebracht hat.

ROLA PIRAMIDALNEJ STRUKTURY ORGANIZACYJNEJ W SKUTECZNOŚCI I EFEKTYWNOŚCI ORGANIZACJI

Celem niniejszego opracowania jest teoretyczne omówienie aspektu strukturyzacji organizacyjnej, ze szczególnym uwzględnieniem roli piramidalnej struktury organizacyjnej w efektywności organizacji. W szerszym ujęciu omówiono w nim znaczenie struktury organizacyjnej dla podziału zadań, ról, odpowiedzialności i kompetencji; a także znaczenie optymalnego zakresu zarządzania dla sukcesu organizacji lub prawidłowego i jasnego zrozumienia ról każdego członka w ramach organizacji. Badanie przeprowadzone w 50 przedsiębiorstwach w Kosowie potwierdza znaczenie stosowania odpowiedniej struktury organizacyjnej dla zapewnienia ich sukcesu. Badanie to wyraźnie pokazało, na jakim poziomie przedsiębiorstwa te stosują piramidalną strukturę organizacyjną i jaką efektywność przyniosła im ta struktura.

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DOES THE SIZE AND EXPERIENCE MATTER? EMPIRICAL RESEARCH ON SELECTED BARRIERS TO ECO-INNOVATIONS IN SLOVAK SMES

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Abstract

Enterprises face several challenges when it comes to their innovation activities. Often, they encounter a number of barriers that impede the creation, introduction, use, and diffusion of eco-innovations, particularly for small and medium-sized enterprises (SMEs). SMEs have significant innovation potential, and hence it is crucial to identify, clarify, and reduce the barriers that hinder their innovative activity and the development of eco-innovations. The aim of the article is to assess the barriers that negatively affect the eco-innovation activities of Slovak SMEs, to find out which of them are perceived as the most significant in the SMEs studied, and to identify the relationship between the perception of barriers, the size of the enterprises and their previous involvement in eco-innovations. The empirical data were collected in 2023 from a sample of 487 randomly selected Slovak SMEs. The representativeness of the sample was confirmed by the Chi-square goodness of fit test. The authors of the article formulated three hypotheses, which they tested using non-parametric tests. The first two hypotheses assumed a statistically significant effect of the size of the enterprises and their previous experience in implementing eco-innovation on the intensity of the perception of barriers to eco-innovation. These were not confirmed. The third hypothesis was related to the overall ranking of the importance of the barriers to eco-innovation and confirmed that the cost of eco-innovation is the most important barrier for SMEs in Slovakia.

Keywords

Sustainability; SMEs; Significance of barriers; Cost of eco-innovation; Bureaucracy in introducing eco-innovation.

Introduction

Global rise in intensity of economic activity is having a negative impact in terms of degrading the environment. Its critical state and the urgent need for its protection and improvement are also reflected in the current challenges the business sector is facing and in a more responsible approach to the management of corporate activities. The shift to a green or circular economy necessitates the development of new environmentally friendly goods, services, technologies, or procedures due to the growing significance of sustainable development. An effective way to move humanity towards sustainability is through ecological innovations, also known as eco-innovations, which lower the consumption of natural resources and raw materials in general, cut down on harmful emissions, and enhance people's quality of life. As a result, they are frequently referred to as green, responsible, or sustainable. The transformation towards

sustainable production requires solutions that meet the current demanding needs of customers while being both cost-effective for the enterprise and environmentally friendly. Business practice shows that eco-innovations are an essential component of these solutions, enabling enterprises to increase their competitiveness in the market while respecting the environment. Small and medium-sized businesses (SMEs), which are regarded as the foundation of any economy and an accelerant of the shift towards environmental sustainability, should receive special attention. Despite the growing recognition of the importance of eco-innovation in SMEs, there are still several research gaps on the barriers that SMEs face in their introduction and implementation [1]. They include a better understanding of the different types of barriers that SMEs face, their relative importance and the relationship between the perception of those barriers, and some important characteristics such as the size of the enterprise, its previous involvement in eco-innovation, and others. Therefore, we have decided to fill this knowledge gap by addressing this issue in more detail. In this article, we aim to assess the barriers that negatively affect the eco-innovation activities of Slovak SMEs. We will determine which barriers are considered the most significant among the SMEs studied, and examine the relationship between the perception of barriers, the size of the enterprises, and their previous involvement in eco-innovations.

The article is structured as follows: The first part outlines the theoretical background of barriers to eco-innovation. In the second part, the aim of the research is presented. The third part covers the methodology of the research. The fourth part summarizes the results of the empirical investigation on factors negatively influencing eco-innovation activities, along with a discussion. Finally, the last section of the article presents the conclusions drawn.

1 Literature Review

According to the win-win scenario for both the economic and environmental perspectives, eco-innovations are defined as a change in economic activities that improve the economic and environmental performance of society [1]. Businesses need to play a proactive role in this shift that alters patterns on the way to sustainability [2]. Eco-innovations are anticipated to be essential in the pursuit of more sustainable, environmentally friendly, and competitive societies [3].

Eco-innovations is becoming a more expansive field. Several authors [4] [5] have emphasized the many facets of the eco-innovation concept, including its social, organizational, technological, financial, managerial, and other aspects, demonstrating its complexity and broadness. Eco-innovation is often more complex than other types of innovations since it is driven by potentially contradicting motivations and faces multiple challenges, including double externality and the proper ways to capture and monetize the value it provides [6]. The complexity of eco-innovation implies a variety of factors influencing eco-innovation activities, also depending on the type of business [7]. For this reason, they must be taken into account independently in the SMEs segment. On the one hand, SMEs, with their lean structures and intrinsic entrepreneurial approach, are more likely to produce radical innovations than rigid large companies [8] are; however, the highly variable environment that SMEs now operate in, along with frequent and abrupt changes, does not provide enough support for the introduction of new ideas [9]. These businesses are encountering more and more issues and challenges as they strive to innovate. Gaining knowledge about the factors that influence eco-innovations in SMEs could offer a deeper understanding of their actual situation [10].

Barriers that impede eco-innovation may have similarities with traditional innovation barriers. However, due to the changing overlap between 'policy-driven' and 'market-driven' eco-innovation, there are specific characteristics of eco-innovation barriers and how enterprises

respond to them [11]. According to [12], there are three levels at which these barriers operate – macro, meso and micro. The macro-level barriers include limited access to external funding, subsidies, and financial incentives, as well as a lack of government support through tax incentives. The meso-level barriers include uncertain demand, a lack of disclosure of subsidies to reduce material and energy use, the market dominance of traditional companies, and a lack of a specialized supply chain. Lastly, the micro-level barriers include a lack of skilled personnel and technological capacity, limitation by self-funding of projects, a lack of information on technology and work, a lack of appropriate business partners, and a lack of cooperation with research organizations.

The barriers to eco-innovation can be categorized based on the degree of radicality. This classification has been explored in depth by [13]. Additionally, such barriers can be classified as either internal (e.g. a lack of financial resources, a lack of innovation-oriented management, inadequate access to knowledge, and insufficiently skilled employees) or external (e.g. innovation-related government policies, difficult access to external finance, high innovation costs, and intense market competition), as researched by [14]. [15] summarized the main barriers to eco-innovations, including market and customer-related barriers, technological barriers, human resource barriers, economic barriers, political barriers, information barriers, managerial barriers, and stakeholders and external partnership barriers while stressing that the economic barrier is the most significant in SMEs. Other authors (e.g. [16]) rank the high costs of eco-innovations among the most important barriers to their implementation. [17] consider administrative and bureaucratic burdens and a lack of environmental culture in SMEs as significant barriers. Some authors (e.g. [18] and [19]) cite a lack of capital, government support, effective legislation, appropriate information, and technical or technological knowledge as significant barriers to the implementation of eco-innovation strategies in SMEs.

Numerous studies have examined how various characteristics influence people's perceptions of barriers to eco-innovation activities; size of the business and prior experience with eco-innovations are frequently mentioned. [20] contend that an enterprise's performance in terms of eco-innovation and the challenges related to these activities are correlated with its size. Small businesses typically have fewer financial, human, and technological resources than larger businesses and may therefore a lack the internal expertise to develop eco-innovations or the internal financial resources to purchase innovations available on the market. Moreover, they may suffer from disadvantages of scale because their size prevents them from making good use of certain green technologies that require a minimum installation size [21]. [22] also point out that smaller enterprises tend to perceive more difficulties and problems in implementing eco-innovations than larger ones. Other authors attest that a company's prior experience with innovations, particularly eco-innovations, may have an impact on its future participation in this field as well as the incentives and challenges it faces [23]. In this regard, [11] suggests that when dealing with data on perceived barriers to innovation, it is necessary to take into account prior experience with innovation activities, as businesses only encounter certain problems when they actually face them as part of their innovation activities. The authors point to ‘revealed’ and ‘deterring’ barriers; the former refers to the obstacles that enterprises face when they innovate, while the latter refers to the obstacles that prevent them from engaging in eco-innovation.

2 Aim of the Research

The aim of the research is to assess the main barriers to eco-innovations among SMEs in Slovakia and to verify if the selected characteristics of SMEs (size and previous experience with eco-innovations) are correlated with the importance of barriers to eco-innovations. We

focus on the barriers that prevent SMEs from becoming more involved in eco-innovation activities.

3 Methodology

The online survey was used to gather empirical data. We asked respondents (SMEs categorized in accordance with EU recommendation 2003/361) to rank the barriers to eco-innovation on a Likert scale from 1 to 5, with 1 denoting the least importance of barriers and 5 denoting the greatest importance. In addition to the barriers selected in the questionnaire, respondents were free to add additional barriers; however, none of them took advantage of this feature. The Finstat database was used to randomly select the SMEs (respondents) for the research sample. Online distribution of the questionnaires was done, and they were gathered between November 2022 and April 2023. SMEs in the Slovak Republic responded to our survey in total with 672 responses. We did not accept 185 questionnaires because of missing responses or untrustworthy information. The research sample consisted of 487 Slovak SMEs (see Tab. 1).

Tab. 1: *Characteristics of the SMEs sample*

Size of enterprise	**Frequency**
micro	465
small	17
medium	5

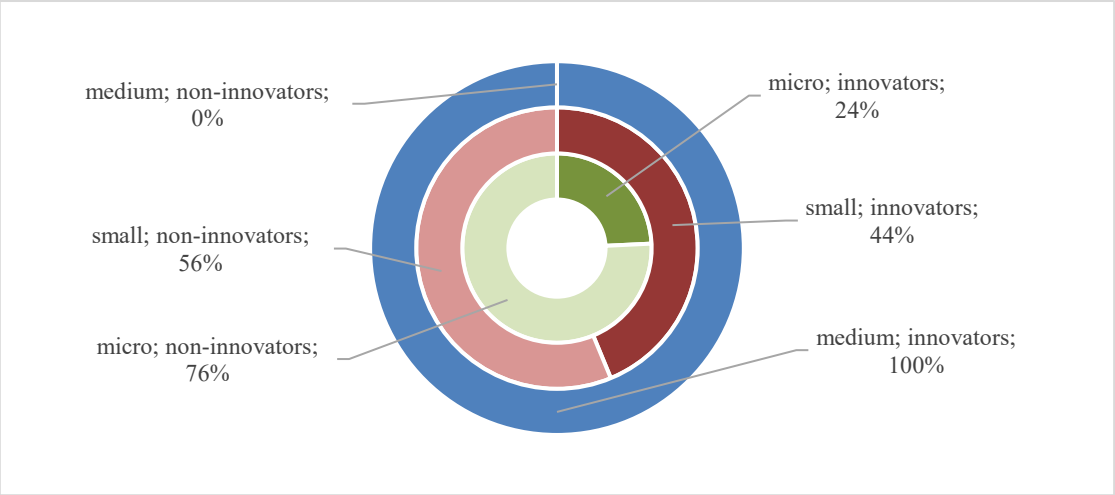
Source: own processing according to [24]

We used the Chi-square goodness of fit test to confirm that the research sample was representative. Based on the size criterion, we were able to confirm that the research sample was representative of Slovakia's SMEs population with a *p*-value of 0.08.

We analyzed the correlation of barriers' importance and the characteristics of selected SMEs (size and previous involvement in eco-innovation), and we also investigated the order of perceived importance of barriers in the research sample. Relying mainly on the theoretical background and the results of the studies carried out so far, we formulated the following three hypotheses for our research.

First, we made the assumption that smaller businesses would face distinct obstacles than larger ones because they would have fewer financial resources or fewer human resources available for eco-innovations. Hypothesis H1 supported this assumption: The significance of the obstacles to eco-innovations is largely dependent on the size of the business.

Second, we examined the SMEs in the research sample with regard to their prior participation in the eco-innovation initiative (refer to Fig. 1). Businesses that adopted eco-innovation prior to 2022 are classified as "innovators", while those without prior experience are classified as "non-innovators". Merely 24% of micro enterprises had innovators; 44% of small enterprise respondents had innovators, and 100% of medium-sized respondents had some eco-innovation.



Source: Own processing according to [24]

Fig. 1: *Structure of the research sample*

We established the following hypothesis, H2: Prior experience implementing eco-innovation influences SMEs' perception of the significance of eco-innovation barriers. This hypothesis aims to investigate any potential relationship between SMEs' prior experience with eco-innovations and their perception of the barriers' importance.

We examined the normality of the response distribution in the research sample using the Shapiro-Wilk test. We moved on to the nonparametric tests since the test's outcome did not support normalcy. We used a Spearman's correlation test to look into the relationship between the size of the company and prior eco-innovation involvement and the perception of barriers to eco-innovation.

In the end, we chose to investigate hypothesis H3: The largest obstacle to eco-innovations in Slovak SMEs is the high cost of implementation. We conducted a separate analysis of the relative importance of each barrier to eco-innovation, excluding the effects of size and prior eco-innovation experience. We applied the Friedman test in this way. The Wilcoxon signed rank test was used to assess the overall rank (order of barriers) among Slovakia's small and medium-sized enterprises. We arrived at the ranking of eco-innovation barriers in Slovak SMEs at the 0.05 level of significance, as shown in Tab. 4. The most significant obstacles are those that surveyed enterprises ranked highest.

4 Results of Research and Discussion

The findings of the evaluation of the importance of obstacles to eco-innovations in Slovak SMEs are shown in the following tables. The Likert scale average values of specific barriers' importance are displayed in Tab. 2 in relation to the respondents' enterprises' sizes.

Tab. 2: *The mean values of the importance of the barriers to eco-innovations according to the size of respondents*

Barrier	**micro**	**small**	**medium**
Lack of internal financial sources	4.00	4.24	4.00
Difficult access to external sources of funding for eco-innovations	3.94	4.29	4.00
The high cost of eco-innovations	4.16	4.35	4.20
Lack of qualified staff to create or implement eco-innovations	3.51	3.59	3.60
Lack of willingness of business's management to innovate	3.07	2.82	2.00
Lack of cooperation with other businesses	2.93	2.59	3.40
Lack of cooperation with research institutions and universities	2.91	2.82	3.40
Insufficient state policy to support innovative activities of businesses	3.66	3.59	3.80
The high level of bureaucracy (when drawing financial support, dealing with various permits, etc.)	4.14	4.47	4.60
Lack of awareness of the benefits of eco-innovations in a business	3.54	3.65	4.00
Uncertain returns on investments in eco-innovations or a too long payback period	3.76	3.88	3.40
Limited access to external sources of information and knowledge on eco-innovations	3.53	3.53	4.20
Lack of support services (from state institutions) for the introduction of eco-innovations in a business	3.77	4.00	4.40
Uncertain customers' demand for eco-innovations in the current market	3.34	3.18	3.80
Existing technical and technological constraints in the economy (e.g. outdated technical infrastructure)	3.50	3.41	3.40
Existing legal restrictions in a country	3.30	2.82	3.00
Macroeconomic uncertainties (COVID-19, war in Ukraine, inflation, etc.)	3.70	3.35	3.80

Source: Own processing according to [24]

The main obstacle for the respondents' size categories was the high degree of bureaucracy. According to SMEs, it is the biggest barrier (4.47 and 4.60, respectively, on a Likert scale of 1 to 5). The biggest obstacle to eco-innovation, according to micro enterprises, is the high cost of it; the second biggest obstacle is the amount of bureaucracy. When we separate businesses into innovators and non-innovators, we find that, similar to small and medium-sized businesses, businesses that had previously implemented eco-innovation saw bureaucracy as the biggest obstacle, while non-innovators, like micro enterprises, were primarily hampered in their eco-innovation endeavors by the high cost of eco-innovation [24].

The mean values of the chosen barriers' level of importance are shown in Tab. 3 based on respondents' classifications as "innovators" or "non-innovators".

Tab. 3: *The mean values of the importance of the barriers to eco-innovations according to the previous experience with eco-innovations*

Barrier	**Innovators**	**Non-innovators**
Lack of internal financial sources	4.18	4.03
Difficult access to external sources of funding for eco-innovations	4.11	3.95
The high cost of eco-innovations	4.22	4.21
Lack of qualified staff to create or implement eco-innovations	3.51	3.54
Lack of willingness of business's management to innovate	2.91	3.17
Lack of cooperation with other businesses	3.04	2.91
Lack of cooperation with research institutions and universities	3.13	2.86
Insufficient state policy to support innovative activities of businesses	3.78	3.64
The high level of bureaucracy (when drawing financial support, dealing with various permits, etc.)	4.30	4.15
Lack of awareness of the benefits of eco-innovations in a business	3.49	3.63
Uncertain returns on investments in eco-innovations or a too long payback period	3.72	3.86
Limited access to external sources of information and knowledge on eco-innovations	3.47	3.65
Lack of support services (from state institutions) for the introduction of eco-innovations in a business	3.98	3.79
Uncertain customers' demand for eco-innovations in the current market	3.29	3.47
Existing technical and technological constraints in the economy (e.g. outdated technical infrastructure)	3.44	3.52
Existing legal restrictions in a country	3.30	3.24
Macroeconomic uncertainties (COVID-19, war in Ukraine, inflation, etc.)	3.87	3.63

Source: Own processing according to [24]

The significance of barriers to eco-innovation as seen from the perspectives of "innovators" and "non-innovators" shows that "innovators" view bureaucracy, low state support, lack of funding, and lack of collaboration with research institutions as more significant barriers than "non-innovators". However, obstacles such as a lack of knowledge, hazy demand, a questionable return on eco-innovations, and unclear advantages from eco-innovations are more significant for "non-innovators". Both sets of respondents had similar opinions about the exorbitant costs associated with eco-innovations and the scarcity of skilled workers. Given the nature of the top barriers between "innovators" and "non-innovators", state institutions and academia have a great deal of potential to both coordinate cooperation between businesses (the supply side) and academia and pique customers' interest in eco-innovative products (e.g. innovation vouchers, tax reliefs, etc.) [24].

The Likert scale is used to examine the barriers to eco-innovation in SMEs, and the results show some variation in perception depending on the size of the businesses and their prior eco-innovation experience. Nevertheless, the findings of a statistical analysis of dependence using the Spearman correlation test demonstrated that the enterprises' size or prior eco-innovation

experience had no bearing on how these barriers are perceived. At the 0.05 level, this result is statistically significant. As a result, we disprove H1 and H2.

When we look at the overall ranking of barriers in Slovak SMEs, which was created independent of other factors and statistically verified (see Tab. 4), we can see that the main obstacles to eco-innovations, according to Slovak SMEs, are the high cost of eco-innovations and the high degree of bureaucracy. However, businesses were still able to implement eco-innovations to a significant degree despite their management's lack of innovation-drivenness and lack of collaboration with universities, research institutions, and other businesses.

Tab. 4: *Overall rank of the importance of the barriers to eco-innovations*

Barrier	**Overall rank**
The high cost of eco-innovations	1
The high level of bureaucracy (when drawing financial support, dealing with various permits, etc.)	1
Lack of internal financial sources	2
Difficult access to external sources of funding for eco-innovations	3
Uncertain returns on investments in eco-innovations or a too long payback period	4
Lack of support services (from state institutions) for the introduction of eco-innovations in a business	4
Lack of qualified staff to create or implement eco-innovations	5
Limited access to external sources of information and knowledge on eco-innovations	5
Uncertain customers' demand for eco-innovations in the current market	5
Existing technical and technological constraints in the economy (e.g. outdated technical infrastructure)	5
Insufficient state policy to support innovative activities of businesses	5
Lack of awareness of the benefits of eco-innovations in a business	5
Macroeconomic uncertainties (COVID-19, war in Ukraine, inflation, etc.)	5
Existing legal restrictions in a country	6
Lack of willingness of business´s management to innovate	7
Lack of cooperation with research institutions and universities	8
Lack of cooperation with other businesses	8

Source: Own processing according to [24]

According to the statistically representative sample of Slovak SMEs, the most pressing barrier to introducing eco-innovations is the high cost of implementing such innovations. This confirms the hypothesis H3 at a 0.05 level of significance. High cost has also been consistently ranked as one of the most significant barriers to eco-innovation [25]. It also seems to be the biggest obstacle for Slovak SMEs that are not innovative; in terms of scale, it is the biggest obstacle to eco-innovation in microbusinesses, although small and medium-sized businesses also listed it as one of the top three obstacles. The main ones, according to some authors [26] who looked at obstacles to eco-innovation in developing nations, are process bureaucracy, bad governance, a lack of support and incentives, and a lack of coordinated action between businesses, government organizations, and academic institutions. While excessive bureaucracy and associated poor governance have been confirmed as the most significant barrier (together with high cost) in Slovak SMEs, a lack of support services does not appear among the top barriers but is still in the first third of the most intensely perceived barriers [24]. The results of our empirical investigation are consistent with the findings of [27]. The authors, who, based on a cross-sectional survey of European SMEs,

identified regulatory obstacles—that is, the existence of complex administrative and legal procedures and the cost of complying with regulations —as the main barriers enterprises face when promoting the circular economy. On the other hand, when the authors [27] distinguished between revealed and deterring obstacles, their results indicated that regulatory obstacles and a lack of human resources are examples of revealed barriers that enterprises engaged in innovation activities face. On the contrary, enterprises not involved in these activities face deterring barriers such as a lack of expertise in new technologies and the capability to change their mindset in the long term. Our research indicates that administrative barriers are significant not only for innovating businesses but also for non-innovating ones. This implies that Slovak entrepreneurs are very sensitive to this obstacle, which discourages them from engaging in eco-innovation activities more than their limited knowledge of eco-innovations.

The next-highest barriers are those pertaining to inadequate sources of capital. The relevant authorities will need to search more thoroughly for solutions to remove these barriers. Taking the initiative and making financial resources from EU funds easier to use is one way. Slovakia's long-standing issue with excessive bureaucracy and a lack of progress in this area has been widely criticized. One of the primary obstacles, according to many academics, is the challenge of allocating capital in a qualitative and quantitative way [4] [28]. Slovak SMEs are also having trouble finding both internal and external sources of funding at the moment, ranking the difficulty of obtaining capital as their second most urgent issue, behind the high expense of eco-innovations and the high degree of bureaucracy. Conversely, our research indicates that Slovak SMEs consider networking with research institutions and other businesses to be among the least pressing barriers to eco-innovation, despite the fact that this is frequently mentioned as a major obstacle [1]. Remarkably, micro-enterprises tend to view obstacles to eco-innovation initiatives less keenly than do small and medium-sized businesses.

According to our research, there is no statistically significant correlation between Slovak SMEs' size or prior eco-innovation involvement and how they perceive obstacles to eco-innovation. Nonetheless, we think that even incomplete data indicating variations in the way that various enterprise groups in the study sample perceive obstacles may be intriguing and helpful to people who have an impact on the business environment. These results may also be helpful for future studies, particularly if other developed nations have previously confirmed similar dependencies. Therefore, an important task of the new Slovak political establishment will be to seek solutions in the area of support for eco-innovation activities of SMEs, which are an important accelerator and carrier of innovation potential, the support and development of which is essential for the competitiveness of the economy and its long-term sustainable development.

Conclusion

Our study’s findings showed that Slovak SMEs view the largest obstacles to implementing their eco-innovation initiatives as being the high expense and degree of bureaucracy. One distinctive characteristic of Slovak businesses is that, in contrast to the findings of multiple international studies, they do not view a management team's reluctance to innovate or a lack of collaboration with universities, research institutions, and other businesses as major obstacles. Taking a closer look at the ranking of the individual barriers, we find that there are slight differences depending on the size and prior eco-innovation activities of the businesses. It was not possible to confirm a statistically significant correlation between these traits and the degree of perceived barriers to eco-innovation (the H1 and H2 hypotheses have been disproved).

The article’s added value is found in its identification of the primary obstacles that SMEs currently face when attempting to introduce and implement eco-innovations more intensively.

Policy makers may find these findings useful in their search for suitable instruments to address obstacles to eco-innovations.

Our research has a number of limitations, the most significant of which is the state of the world today. The Covid-19 pandemic, war in Ukraine, and the ensuing economic hardships, such as a shortage of raw materials and other supplies and a high rate of inflation, all seem to have had a direct impact on the research findings, emphasizing the urgent need for eco-innovations and the significance of obstacles pertaining to their costs and availability of funding.

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JE VEĽKOSŤ A SKÚSENOSŤ ROZHODUJÚCA? EMPIRICKÝ VÝSKUM VYBRANÝCH BARIÉR EKO-INOVAČNÝCH AKTIVÍT V MALÝCH A STREDNÝCH PODNIKOCH NA SLOVENSKU.

Podniky čelia viacerým výzvam v oblasti ekologických inovácií. Často sa stretávajú s množstvom prekážok, ktoré bránia vytváraniu, zavádzaniu, využívaniu a šíreniu ekologických inovácií, najmä v prípade malých a stredných podnikov (MSP). MSP majú významný inovačný potenciál, a preto je nevyhnutné identifikovať, objasniť a obmedziť prekážky, ktoré bránia ich inovačnej činnosti a rozvoju ekologických inovácií. Cieľom článku je posúdiť bariéry, ktoré negatívne ovplyvňujú eko-inovačné aktivity slovenských MSP, zistiť, ktoré z nich sú v skúmaných MSP vnímané ako najvýznamnejšie a identifikovať vzťah medzi vnímaním bariér, veľkosť podnikov a ich predchádzajúce zapojenie do ekologických inovácií. Primárny výskum sa uskutočnil v roku 2023 a zahŕňal vzorku 487 náhodne vybraných slovenských MSP. Reprezentatívnosť vzorky bola potvrdená testom dobrej zhody. Autori článku stanovili tri hypotézy, ktoré overili prostredníctvom neparametrických testov. Prvé dve hypotézy predpokladali štatisticky významný vplyv veľkosti respondentov ako aj predchádzajúcich skúseností na intenzitu vnímania bariér pri eko-inovačných aktivitách. Tieto hypotézy sa nepotvrdili. Tretia hypotéza súvisela s celkovým poradím významnosti prekážok eko-inovácií a potvrdila, že náklady na eko-inovácie predstavovali najvýznamnejšiu prekážku pre MSP na Slovensku.

SIND GRÖSSE UND ERFAHRUNG WICHTIG? EMPIRISCHE FORSCHUNG AUSGEWÄHLTER HINDERNISSE FÜR ÖKO-INNOVATIONEN IN SLOWAKISCHEN KLEINE UND MITTLERE UNTERNEHMEN

Unternehmen stehen bei ihren Öko-Innovationsaktivitäten vor mehreren Herausforderungen. Sie stoßen häufig auf eine Reihe von Hindernissen, die die Schaffung, Einführung, Nutzung und Verbreitung von Öko-Innovationen, insbesondere für kleine und mittlere Unternehmen (KMU), behindern. KMU verfügen über ein erhebliches Innovationspotenzial. Daher ist es von entscheidender Bedeutung, die Hindernisse zu identifizieren, zu klären und abzubauen, die ihre Innovationstätigkeit und die Entwicklung von Öko-Innovationen behindern. Ziel des Artikels ist es, die Hindernisse zu bewerten, die sich negativ auf die Öko-Innovationsaktivitäten slowakischer KMU auswirken, herauszufinden, welche von ihnen bei den untersuchten KMU als am bedeutendsten wahrgenommen werden, und den Zusammenhang zwischen der Wahrnehmung von Hindernissen, dem Größe der Unternehmen und ihre bisherige Beteiligung an Öko-Innovationen. Die Untersuchung wurde im Jahr 2023 durchgeführt und umfasste eine Stichprobe von 487 zufällig ausgewählten slowakischen KMU. Die Repräsentativität der Stichprobe wurde durch den Chi-Quadrat-Anpassungstest bestätigt. Die Autoren des Artikels stellten drei Hypothesen auf, die sie durch nichtparametrische Tests überprüften. Die ersten beiden Hypothesen gingen von einem statistisch signifikanten Effekt der Größe der Befragten und ihrer Vorerfahrungen auf die Intensität der Wahrnehmung von Hindernissen für Öko-Innovationen aus. Diese wurden nicht bestätigt. Die dritte Hypothese bezog sich auf die allgemeine Reihenfolge der Bedeutung von Hindernissen für Öko-Innovationen und bestätigte, dass die Kosten das größte Hindernis für KMU in der Slowakei darstellten.

CZY WIELKOŚĆ I DOŚWIADCZENIE MAJĄ ZNACZENIE? BADANIA EMPIRYCZNE WYBRANYCH BARIER DLA EKOINNOWACJI W SŁOWACKICH MAŁYCH I ŚREDNICH PRZEDSIĘBIORSTWACH

Transformacja w kierunku zrównoważonej produkcji wymaga rozwiązań, które zaspokoją aktualne, wymagające potrzeby klientów, a jednocześnie będą opłacalne dla przedsiębiorstwa i przyjazne dla środowiska. Praktyka biznesowa pokazuje, że ekoinnowacje są nieuniknionym elementem tych rozwiązań, umożliwiając przedsiębiorstwom zwiększenie ich konkurencyjności na rynku przy jednoczesnym poszanowaniu środowiska. Działania innowacyjne przedsiębiorstw są w wielu aspektach trudne i często towarzyszy im szereg barier, utrudniających tworzenie, wprowadzanie, wykorzystywanie i rozpowszechnianie ekoinnowacji, w szczególności w przypadku MŚP. Ze względu na znaczny potencjał innowacyjny MŚP, bariery te należy zidentyfikować, skonkretyzować i zniwelować. W artykule skupiono się na identyfikacji i ocenie barier, które negatywnie wpływają na działalność innowacyjną MŚP i utrudniają rozwój ekoinnowacji. W szczególności analizuje dane empiryczne z próby słowackich MŚP dotyczące dostrzeganych przez nie barier i bada bardziej szczegółowo korelację barier z wielkością przedsiębiorstwa i wcześniejszymi doświadczeniami we wdrażaniu ekoinnowacji.

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THE EFFECT OF THE COVID-19 PANDEMIC ON ECONOMIC GROWTH AND R&D SPENDING IN CZECHIA, GERMANY, AND POLAND

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Abstract

The article investigates the impact of the COVID-19 pandemic on economic growth, specifically focusing on research and development (R&D) expenditures in the Czech Republic, Germany, and Poland. The analysis spans the periods preceding, during, and following the pandemic. The central objective of the article is to examine whether the pandemic, considering the implemented restrictions and associated financial aid, influenced the economic growth trajectory and the allocation of resources to research and development in the aforementioned Central European countries. The research utilizes time series data from 2011 to 2022, sourced from Eurostat, to track the evolution of Gross Domestic Product (GDP) and Gross Expenditure on Research and Development (GERD). Key indicators under scrutiny included GDP, GERD, and R&D intensity – GERD as a percentage of GDP. A chain index was constructed to facilitate not only cross-country comparisons of these indicators but also an examination of year-to-year changes and an analysis of the growth rate of the GERD indicator. The research findings reveal that that COVID-19 really affected not only the development of the monitored economies but also the R&D area; however, it was not the same in all the monitored countries. The impact of the pandemic can be seen in the decline in GDP in all three countries in 2020, but GERD decreased in only two of them – the Czech Republic and Germany. Poland experienced a significant increase in research and development funding in real terms. Both indicators (GDP and GERD) immediately resumed their growth in 2021 in all analyzed countries. From that it can be concluded that the impact of the COVID-19 pandemic on the GDP and GERD of the Czech Republic, Germany and Poland was not of a long-term nature.

Keywords

GDP; GERD; R&D; Innovation; COVID-19.

Introduction

After completing an extensive research article titled "The Effect of the COVID-19 Pandemic on Economic Growth and R&D Spending in the EU Countries" (see [1]) for LEF 2023, the

authors are now focusing their attention to the national level, applying the same analytical approach on three particular Central European countries: Czechia, Germany, and Poland. The rationale behind this decision is multifaceted and aims to further refine our understanding of how the pandemic has affected economic growth and R&D spending. This involves assessing the impact on both the entire EU and specific member states individually.

Geographic and Economic Diversity: These three countries were selected due to their diverse economic characteristics within the EU. Germany represents one of the EU's largest and most robust economies, serving as a benchmark for economic performance [2]. Poland, on the other hand, has been experiencing significant economic growth in recent years, making it an interesting case for examining the pandemic's effects on emerging economies [3]. Czechia, with its dynamic economy, provides an additional perspective on Central European dynamics [4]. Studying these countries can capture a more comprehensive view of the pandemic's repercussions across different economic landscapes within Europe.

Variability in Pandemic Response: Each of these countries adopted distinct strategies and policies to combat the COVID-19 pandemic [5]. These strategies included restrictive measures and tools such as lockdowns, travel restrictions, and stimulus packages that had varying impacts on economic activity and R&D spending. Analysing these differences in responses will shed light on the role of government policies in shaping economic and innovation outcomes during crises.

R&D Investment Patterns: These three countries also exhibit diverse patterns in R&D investment, with Germany being a renowned global leader in innovation, Czechia having a growing R&D sector, and Poland seeking to bolster its innovation capabilities [6]. Examining how the pandemic influenced R&D investments in these countries will provide insights into the resilience and adaptability of their innovation ecosystems [7].

Regional Implications: Czechia, Germany, and Poland are located in Central Europe, sharing geographic proximity and close economic ties [8]. Understanding the impact of the pandemic in this regional context can be valuable not only for these particular countries and their individual regions but also for their neighbouring nations and the broader EU [9].

By focusing the research on these three Central European countries, the authors aim to deepen their analysis and draw more nuanced conclusions regarding the pandemic's impact on economic growth and R&D spending. This investigation will encompass detailed case studies of each country to discern the intricate relationships between government policies, economic resilience, and innovation in the face of adversity.

The COVID-19 pandemic has wrought profound alterations in our daily lives and the operational paradigms of businesses worldwide [10]. Governments across the globe have enforced an array of measures, including lockdowns, remote learning, travel constraints, and social distancing protocols, to curtail the virus’s spread [11]. These measures have engendered considerable disruption across various industry sectors, significantly affecting their functioning. In tandem with these operational hurdles, businesses have been compelled to navigate an inherently uncertain economic terrain [12].

The pandemic has led to substantial economic upheaval, compelling businesses to quickly adjust to shifts in demand and supply chain dynamics. Despite the challenges, many enterprises have demonstrated resilience and a willingness to innovate in response to the crisis. The innovative approaches taken by these businesses have been truly remarkable. Businesses have had to swiftly embrace novel modes of operation, sales, and service delivery [13]. This transformation has ushered in the rapid adoption of cutting-edge technologies and digital platforms, such as e-commerce, contactless payments, and remote work tools [14],

[15]. Moreover, several businesses have realigned their operations to address the distinctive exigencies arising from the pandemic. In sum, the COVID-19 pandemic has introduced profound alterations and challenges for businesses while providing an opportunity for innovative adaptation to novel circumstances [16].

Amidst the pandemic, numerous countries introduced substantial bailout packages to buttress various businesses. These packages have furnished financial sustenance to companies spanning a spectrum of sectors. Innovations, knowledge, and R&D are widely regarded as quintessential drivers of economic growth, elevating standards of living and economic performance [17], [18]. The affirmative impact of R&D on innovation output and productivity has been substantiated by a wealth of studies (e.g. [19]–[22]). Technology is the linchpin that empowers businesses to secure a competitive edge in the market [23], [24]. Consequently, businesses invest in R&D to amplify their productivity and profitability.

Roper and Turner [25] posit that the impact of COVID-19 is particularly pronounced in the case of Small and Medium-sized Enterprises (SMEs), whose financial robustness tends to be more fragile, rendering their capacity to invest in R&D vulnerable to disruption [26]. However, enterprises that can sustain such investments stand a better chance of survival, heightened economic growth and enhanced profitability. Biswas [27] likewise substantiates that R&D investments can mitigate the negative repercussions of a pandemic on a company. Guan, Tienan, and Tang [28] add that the ability to embrace digital technology plays a pivotal role in bolstering resilience to a pandemic; higher R&D investment correlates with a higher level of digital technology adoption, ultimately enhancing resistance to external crises.

1 Aim of the Research

The authors have expounded upon the role of innovations in the developmental process in numerous research articles (e.g. [26], [29], [30]). In this article, the focus is on exploring the innovations within the ongoing context of the COVID-19 pandemic. The objective of this article is to scrutinize its ramifications not only on R&D funding but also on the broader economic performance of nations.

As mentioned above, the selection of Czechia, Germany, and Poland as focal points for further study is motivated by their economic diversity, divergent pandemic responses, R&D investment patterns, and regional significance. Through this focused analysis, the authors aspire to contribute valuable insights to the ongoing discussion of the pandemic's repercussions on European economies and innovation ecosystems.

2 Methodology

The data for the analytical part of the article is drawn from Eurostat [31]; it is mainly about the intensity of research and development, both at the macroeconomic and microeconomic levels. In the first case, research and development intensity is derived as the share of GERD on the monitored countries' GDP. In the second case, intensity represents the percentage of companies' revenues reinvested in their research and development. The article deals with a macroeconomic point of view, so the first of the abovementioned approaches will be introduced in formula (1)

$$R\&D\ intensity = \frac{GERD}{GDP} \tag{1}$$

where
GERD = gross domestic expenditure on research and development
GDP = gross domestic product.

Tab. 1 provides an overview of indicators and data sources used, as well as the time series under review within the conducted research.

Tab. 1: *Data used in the research*

Indicator		Source	Time series
GDP	Gross domestic product	Eurostat [32]	2011–2021
GERD	Gross domestic expenditure on R&D	Eurostat [33]	
R&D intensity	GERD as % of GDP		

Source: Own

The first cases of Coronavirus disease were reported towards the end of 2019, and in 2020, the 27 member countries of the European Union (EU-27) implemented restrictive measures in response. For the purpose of this research, the period from 2011 to 2019 is considered the "pre-covid" era, while the year **2020** is referred to as the "covid" year (in the figures, this year has been underlined), and 2021 is denoted as the first "post-covid" year.

The research works with data related to three EU member countries – Czechia, Germany, and Poland. Additionally, data covering EU-27 have been used to compare the development of some indicators (R&D intensity and chain index constructed for this variable) with the EU benchmark. Even though the research covers the period of 2011–2021, the United Kingdom (UK) was excluded from the analysis, and its data were not taken into account for the entire period covered by the research due to Brexit.

Firstly, GDP, GERD and R&D intensity development were separately analysed and compared among the countries (see Fig. 1, 2, 3 in section 2). Further, to compare the development of R&D intensity, the chain index (2) of the time series was calculated. This index compares two immediately consecutive values – year-on-year changes – and thus, it enables to analyse the growth rate of the indicator.

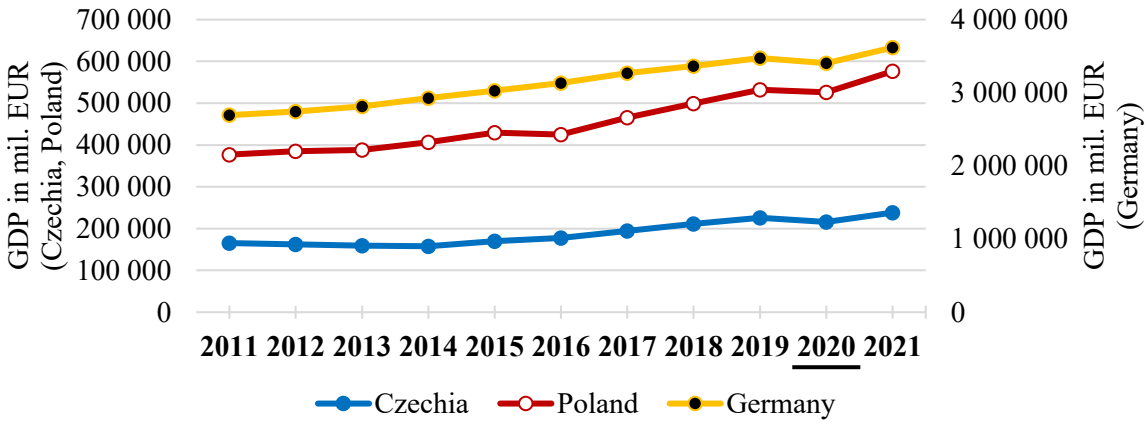
$$Ti = \frac{x_{i+1}}{x_i} \tag{2}$$

where Ti is the chain index in the year i, and x is the value of the analyzed indicator.

3 Results of Research

In this part of the article, the research results are presented. The research findings are summarized in four figures (Fig. 1–Fig. 4) on the development of gross domestic product (GDP), gross domestic expenditure on R&D (GERD), R&D intensity (GERD as a percentage of GDP), and the chain index development in the analyzed period (2011–2021).

Fig. 1 presents the development of GDP in Czechia, Germany, and Poland over the examined period (2011–2021). The values are measured in current market prices.

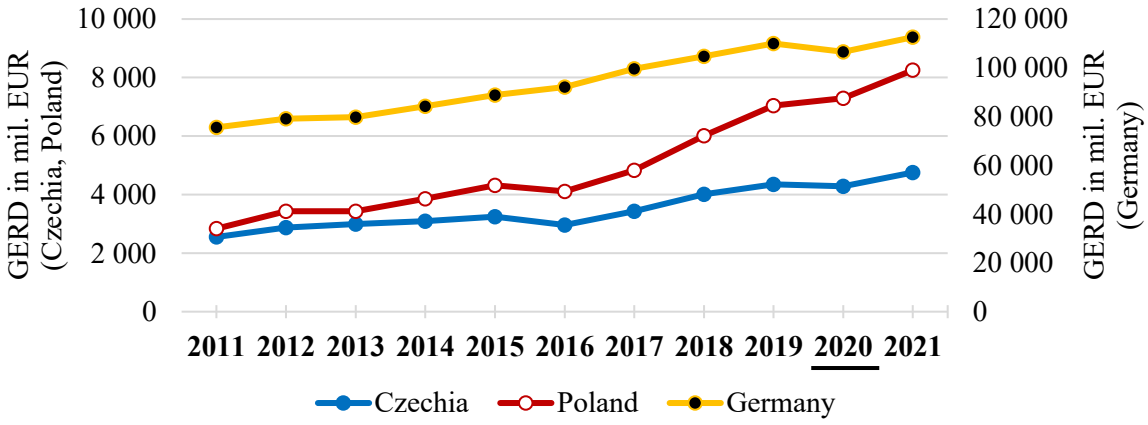


Source: Authors' own processing of data from Eurostat [32]

Fig. 1: *GDP in Czechia, Germany, and Poland (2011–2021; mil. EUR)*

The countries' GDP grew slowly during the analyzed period, with a 3.9% average growth rate for Czechia, 4.4% for Poland, and 3.0% for Germany. However, all three countries reported a significant decline in the pandemic year 2020. The year-on-year change was -4.4% in Czechia, -1.2% in Poland, and -2.0% in Germany. Even though these noticeable declines, the GDP growth was revived right away in 2021, with the strongest growth in the case of Czechia (a 10.4% year-on-year change compared to the previous year), a 9.6% change in the case of Poland and a 6.3% change in the case of Germany.

Fig. 2 captures the development of GERD in Czechia, Germany, and Poland over the examined period (2011–2021).

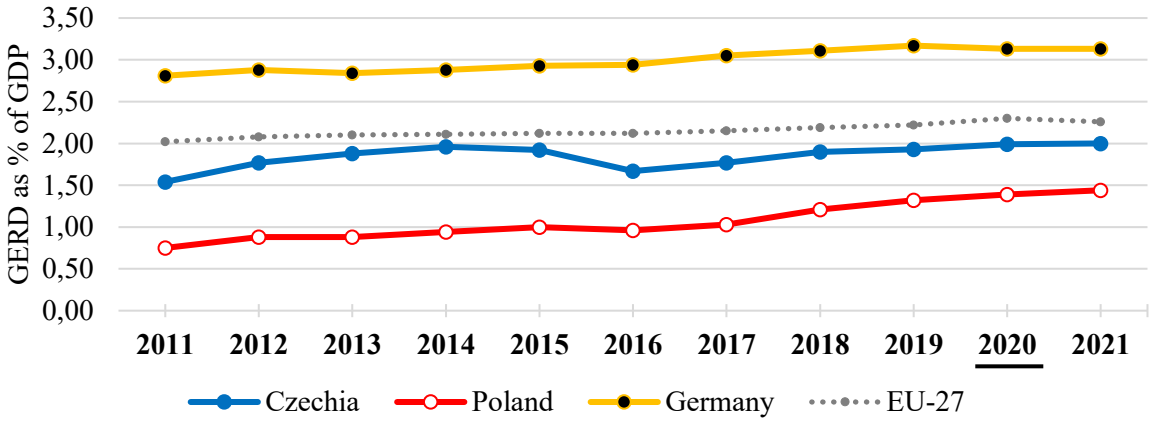


Source: Authors' own processing of data from Eurostat [33]

Fig. 2: *GERD in Czechia, Germany, and Poland (2011–2021; mil. EUR)*

The development of GERD largely follows changes in GDP. The development of GERD in the case of Czechia reported a slight decline in 2020 (-1.4% year-on-year) and a more noticeable slump in Germany (-3.1%). However, a significant year-on-year increase of 3.5% was reported in Poland. In all three cases, the average growth rate (long-term year-on-year development) in GERD was higher than GDP (6.7% vs. 3.9% for Czechia, 11.6% vs. 4.4% for Poland, and 4.1% vs. 3.0% for Germany). A strong positive development for Poland continued in 2021 (+13.2% compared to 2020), and a noticeable recovery came in the two remaining countries (+11.0% in Czechia and +5.6% in Germany compared to the 2020 values).

The data presented in the previous two figures are further used in Fig. 3, where GERD as a percentage of GDP is expressed using the formula 1 presented in section 1. Moreover, Fig. 3 provides a comparison of the analyzed three countries with the EU-27 values.

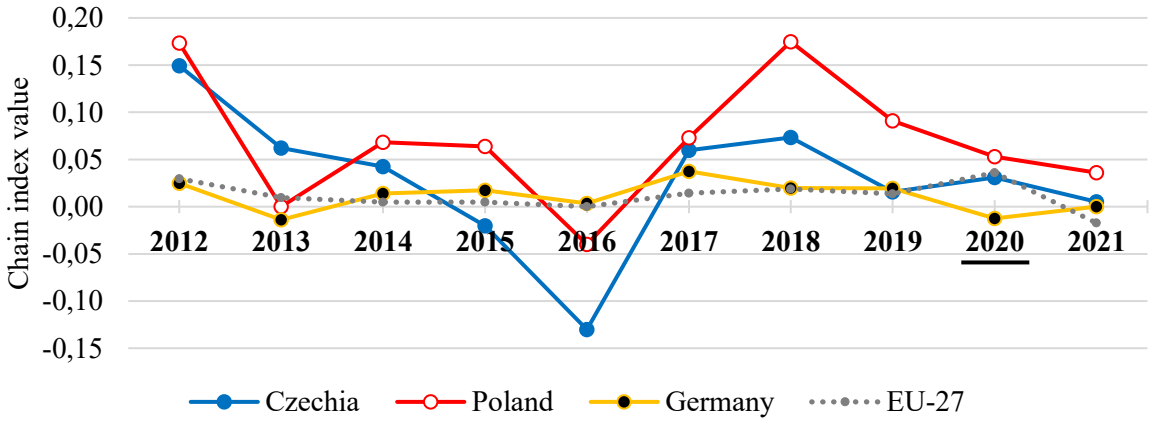


Source: Authors' own processing of data from Eurostat [33]

Fig. 3: *R&D intensity in Czechia, Germany, and Poland (2011–2021 in % of GDP)*

As depicted in Fig. 3, the share of GERD in GDP increased slowly over the period under review. The highest increase can be seen in Poland, where the share of GERD in GDP increased from 0.75% in 2011 to 1.44% in 2021 (+0.69%). In Czechia, the share changed by +0.46%, and in Germany, it was only 0.32% over the analyzed period. The most significant drop appeared in Czechia in 2016. In the given year, GDP grew by 4.7% compared to the previous year 2015, while the support of R&D was reduced by -8.8% in the same period. This is the reason behind the substantial decrease in the share of GERD in GDP, thus the fall of R&D intensity in Czechia. The figure shows that only Germany reported a small reduction in R&D intensity in 2020 due to the COVID-19 pandemic.

Fig. 4 compares the evolution of the chain index (i.e. the annual growth rate) of the R&D intensity (GERD as % of GDP). In addition, here, the comparison of the analyzed countries with the EU-27 countries has been made.



Source: Authors' own processing of data from Eurostat [26], [31]

Fig. 4: *Chain index – R&D intensity in Czechia, Germany, and Poland (2012–2021)*

The comparison made in Fig. 4 confirms the aforementioned findings. Regarding the development of R&D intensity, the most significant year-on-year decrease can be seen in the case of Czechia (-0.13) and Poland (-0.04) in 2016, while the greatest year-on-year increase

was reported in Poland in 2018 (0.17). Regarding the pandemic year of 2020, Germany is the only country where the year-on-year development of GERD was negative (-0.01).

Since the aim of this article is to examine the effect of COVID-19 on R&D funding, the authors have not provided detailed information about the chain index deviations during the pre-covid period (2011–2019). To analyze the year-on-year changes more precisely, it would be necessary to closely examine the individual years' development of both GDP and GERD.

4 Discussion

The OECD [34] points to the pro-cyclicality of investment in research and development and, thus, logically, their susceptibility to a sharp decline in crisis periods and, conversely, an increase in recovery periods. The functioning of innovation systems deviates from the normal course in these situations. The impact of the pandemic is certainly a new element; it is not an ordinary crisis. Therefore, its effects may differ from already known standards, e.g. by sector - during COVID-19, some companies expanded their research and development activities (digital and pharmaceutical sectors), while others, on the contrary, reduced their investments in research and development (automotive industry, aerospace industry, defense) [1], [5], [35], [36].

What is clear, however, is that the pandemic has revealed and confirmed the importance of digital technologies. Massive investments in areas such as e-commerce, remote work and online education were quickly targeted and intensively implemented [37]. COVID-19 also confirmed the importance of the cooperation of the business sphere with universities towards joint research activities in EU countries, the development of new knowledge and technologies to support the growth of industry and the education of highly qualified workers [38]. Intensive cooperation between universities, businesses and essentially the whole society is essential for the further growth and development of the EU economy, whether in normal economic conditions or special deviations from the standard, as was the case with COVID-19 [39].

Conclusion

The presented article focused on the issue of R&D funding in EU countries. To analyze the topic, the authors studied the evolution of GDP, GERD, and R&D intensity indicators and examined the impact of the COVID-19 pandemic on them. The issue was examined in the environment of three selected neighboring Central European countries – Czechia, Germany, and Poland.

As the COVID-19 pandemic spread across Europe in the early part of 2020 and various countries started implementing various restrictive measures throughout that year, the authors considered 2020 as the pivotal pandemic year for their analysis. The findings obtained in this research confirm that the COVID-19 pandemic affected both GDP and GERD of the selected countries. Both GDP and GERD grew slowly throughout the period under review (2011–2021). As the growth rate was a bit higher in the case of GERD, R&D intensity (the share of GERD on GDP) also increased.

In the pandemic year of 2020, there was a notable decrease in GDP when compared to the levels recorded in 2019 (by 4.4% in Czechia, 2.0% in Germany, and 1.2% in Poland). The same year, GERD decreased (by 1.4% in Czechia and 3.1% in Germany). However, there was a sharp year-on-year increase of 3.5% in Poland. Moreover, in 2021, both GDP and GERD recovered again in all three countries.

Based on the research findings, it can be concluded that the COVID-19 pandemic did not have a significant and lasting impact on the economic growth of the analyzed countries

(measured by GDP) and R&D funding (measured by GERD). This is confirmed by the analysis of the development of both indicators. Despite the declines in the pandemic year of 2020, there was a significant and immediate increase of both GDP and GERD in 2021.

This article should be seen as an initial step towards analyzing the relationship between the COVID-19 pandemic and economic development of the analyzed economies along with its impact on R&D funding.

The trends in both analyzed variables, GDP and GERD, indicate that R&D spending is closely tied to the economic development of a country. However, it may take some time before the impact of the restrictive measures on R&D funding becomes apparent. To get a more comprehensive understanding, further analytical analysis is required, and it is necessary to extend the time series used in the current period.

It is also important to note that COVID-19 is not the only challenge companies have had to face. There are other factors (such as the ongoing war in Ukraine and rising inflation) that need to be taken into account.

This research was performed using EU-wide data across economic sectors and analyzed three EU member countries – Czechia, Germany, and Poland. However, as Eurostat [33] tracks the data used in this research separately for each sector, it will be possible to conduct further research examining the impact of the pandemic on R&D funding not only in other countries but also in different sectors of the national economy – sectoral perspective (business, government, higher education, private non-profit entities).

The R&D activities of businesses and institutions in EU countries have been notably impacted by the COVID-19 pandemic. While certain entities have persisted in their commitment to R&D investments, others have encountered financial challenges, leading them to scale back or defer their expenditures on R&D.

The pandemic has had a significant economic impact on R&D intensity in the EU. The economic decline triggered by the pandemic led to budget cuts and reduced R&D spending for certain businesses and institutions. Moreover, the pandemic caused disruptions in the supply chain and alterations in consumer behavior, potentially influencing the orientation and emphasis of R&D activities. However, it is also necessary to note that other destabilizing factors such as the war in Ukraine, global inflationary waves, and natural catastrophes can also negatively affect the flow of R&D funding.

Overall, the COVID-19 pandemic affected R&D in different ways across selected EU countries. Some areas saw more intense R&D activity, while others faced challenges due to money issues and disruptions in the economy. The long-term impact on R&D will depend on factors such as how long the pandemic lasts, how quickly the economy recovers, and the priorities of businesses, governments, and other entities.

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Efekt pandemie COVID-19 na hospodářský růst a výdaje na výzkum a vývoj v Česku, Německu a Polsku

Článek se zabývá problematikou hospodářského růstu a výdajů na výzkum a vývoj (VaV) ve třech sousedících středoevropských zemích – Česku, Německu a Polsku – před pandemií COVID-19, během pandemie a po ní. Článek využívá analýzu časových řad ke zjištění, zda pandemie a s ní spojená přijatá restriktivní opatření a poskytnuté záchranné balíčky ovlivnily hospodářský růst a financování výzkumu a vývoje ve vybraných zemích. Pro zodpovězení této výzkumné otázky byla využita data Eurostatu týkající se vývoje HDP a GERD a analyzováno období 2011-2021. Kromě vývoje sledovaných ukazatelů (HDP, GERD, intenzita VaV – GERD jako procento HDP) byl zkonstruován řetězový index, který slouží nejen k porovnání vývoje těchto ukazatelů mezi jednotlivými zeměmi, ale také k porovnání meziročních změn a k další analýze tempa růstu ukazatele GERD. Z výzkumu vyplývá, že COVID-19 ovlivnil HDP i oblast výzkumu a vývoje, což ilustruje vývoj analýz časových řad daných ukazatelů. Hovoříme-li v absolutních číslech, dopad pandemie lze spatřovat v poklesu HDP ve všech třech zemích v roce 2020, zatímco GERD se snížil pouze ve dvou z nich – v Česku a Německu, zatímco Polsko vykázalo výrazný nárůst financování VaV. Oba ukazatele (HDP i GERD) se však ve všech analyzovaných zemích okamžitě vrátily k růstu v roce 2021. Na základě provedené analýzy lze konstatovat, že dopad pandemie COVID-19 na HDP a GERD Česka, Německa a Polska nebyl významný ani neměl dlouhodobý charakter.

Die Auswirkungen der COVID-19-Pandemie auf Wirtschaftswachstum und Forschung und Entwicklung Ausgaben in Tschechien, Deutschland und Polen

Der Artikel befasst sich mit der Frage des Wirtschaftswachstums und der Forschung und Entwicklung (F&E) Ausgaben in den drei benachbarten mitteleuropäischen Ländern – Tschechien, Deutschland und Polen – vor, während und nach der COVID-19-Pandemie. Anhand einer Zeitreihenanalyse wird untersucht, ob sich die Pandemie und die damit verbundenen restriktiven Maßnahmen und Rettungspakete auf das Wirtschaftswachstum und die F&E-Finanzierung in den ausgewählten Ländern ausgewirkt haben. Zur Beantwortung dieser Forschungsfrage wurde die Entwicklung des BIP und der BAFE auf der Grundlage von Eurostat-Daten für den Zeitraum 2011-2021 analysiert. Neben der Entwicklung der überwachten Indikatoren (BIP, BAFE, FuE-Intensität - BAFE als Prozentsatz des BIP) wurde der Kettenindex erstellt, um nicht nur die Entwicklung dieser Indikatoren zwischen den Ländern gegenüberzustellen, sondern auch um die jährlichen Veränderungen zu vergleichen und die Wachstumsrate des BAFE-Indikators weiter zu analysieren. Die Untersuchung zeigt, dass sich COVID-19 sowohl auf das BIP als auch auf den Bereich F&E ausgewirkt hat, wie die Entwicklung der Zeitreihenanalysen der genannten Indikatoren zeigt. In absoluten Zahlen ausgedrückt zeigt sich die Auswirkung der Pandemie im Rückgang des BIP in allen drei Ländern im Jahr 2020, während die BAFE nur in zwei von ihnen – Tschechien und Deutschland – zurückgingen, wohingegen Polen einen deutlichen Anstieg seiner F&E-Mittel meldete. Beide Indikatoren (BIP und BAFE) stiegen jedoch in allen untersuchten Ländern im Jahr 2021 sofort wieder an. Auf der Grundlage der durchgeführten Analyse kann der Schluss gezogen werden, dass die Auswirkungen der COVID-19-Pandemie auf das BIP und die BAFE der Tschechischen Republik, Deutschlands und Polens weder signifikant noch von langfristiger Natur waren.

WPŁYW PANDEMII COVID-19 NA WZROST GOSPODARCZY I WYDATKI NA BADANIA I ROZWÓJ W CZECHACH, NIEMCZECH I POLSCE

Artykuł dotyczy kwestii wzrostu gospodarczego i wydatków na badania i rozwój w trzech sąsiadujących ze sobą krajach Europy Środkowej - Czechach, Niemczech i Polsce – przed, w trakcie i po pandemii COVID-19. W artykule wykorzystano analizę szeregów czasowych w celu zbadania, czy pandemia i związane z nią podjęte środki ograniczające oraz przyznane pakiety ratunkowe wpłynęły na wzrost gospodarczy i finansowanie badań i rozwoju w wybranych krajach. Aby odpowiedzieć na to pytanie badawcze, wykorzystano dane Eurostatu dotyczące PKB i GERD oraz przeanalizowano okres 2011-2021. Oprócz rozwoju monitorowanych wskaźników (PKB, GERD, intensywność nakładów na B+R - GERD jako procent PKB), skonstruowano indeks łańcuchowy, aby porównać nie tylko rozwój tych wskaźników między poszczególnymi krajami, ale także porównać zmiany rok do roku i dalej analizować tempo wzrostu wskaźnika GERD. Z badań wynika, że COVID-19 wpłynął na PKB, a także na obszar badań i rozwoju, co ilustruje ewolucja analiz szeregów czasowych danych wskaźników. Mówiąc w liczbach bezwzględnych, wpływ pandemii można dostrzec w spadku PKB we wszystkich trzech krajach w 2020 r., podczas gdy GERD zmniejszył się tylko w dwóch z nich – w Czechach i Niemczech, natomiast Polska odnotowała znaczny wzrost finansowania badań i rozwoju. Jednak oba wskaźniki (PKB i GERD) natychmiast powróciły do wzrostu w 2021 r. we wszystkich analizowanych krajach. Na podstawie przeprowadzonej analizy można stwierdzić, że wpływ pandemii COVID-19 na PKB i GERD Czech, Niemiec i Polski nie był znaczący ani nie miał charakteru długoterminowego.

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TEAM ROLES IN FAMILY BUSINESSES AND QUALITY OF FAMILY BUSINESS – CASE STUDY

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Abstract

Team roles, personal character, and temperament play a key role in team management. The unique approach brought by Dr. M. Belbin´s unique approach, known as the Belbin Team Roles, is widely used in education, research, and professional consultancy. However, there is a significant gap in research on team roles in family businesses, which hinders the understanding of a specific form of human economic activity: family business.

The aim of this article is to show the methodology used in the research of team roles in family businesses, with a focus on family business quality in one specific Czech company. The company was evaluated using Belbin Team Roles 360-degrees analysis and a Family Business Quality self-evaluating questionnaire. This case study provides a foundation for future research in this area.

Keywords

Belbin Team Roles; Family Business; Business quality; Team; Social entrepreneurship.

Introduction

The family is not only important from a social point of view, but also historically linked to the economic activity of people and is considered to be the basic building block of any human society [1]. Family business is the oldest form of business and still functions as a model in the 21st century [2]. In the economies of East Asia, the Middle East and Southern Europe, families control up to 95% of businesses [2], and estimated up to 80% of businesses worldwide [3]. Therefore, it is crucial to understand family businesses and to try to understand them more deeply.

Family businesses have received significant scientific attention, particularly in relation to sustainability, succession planning, and financial management [4–7]. However, the unique approach of viewing family business as a team has been largely overlooked. Both manual research and artificial intelligence tools have shown that there is a gap when it comes to examining the impact of team roles on family businesses. When asked to show any data concerning family business and team roles, the software answered,

> *"There is a gap in research when it comes to examining the impact of team roles on family businesses. While much research has been condu4cted on the factors that contribute to the success or failure of family businesses, little attention has been paid to the specific roles that family members play within the business, and*

how these roles affect the business's overall performance." Tested on March 6 2023, https://openai.com/.

On the other hand, there are articles that examine Belbin Team Roles in entrepreneurship. For example, one study attempted to identify leader team roles within startups [8].

The topic of team roles is addressed in the context of increasing team performance [9–11]. It is worth noting that Belbin's theory of team roles is not just applicable to managers in family businesses (where not all family members are in managerial positions), but also to non-managers. This theory has been applied in various fields such as business and education, and has been proven successful in a sibling business team [12].

One family business, which wishes to stay anonymous, was evaluated using a combination of two methods – Belbin Team Roles and self-evaluating questionnaire called National Award of Czech Republic for Quality of Family Business (developed through academic research focused on vitality of family businesses). The first method gave insights into the work style of each team member, and when combined, identified possible gaps that could occur in their cooperation and predicted potential problems of the team as a whole. On the other hand, the second method evaluated the management and governance quality of the family business based on numeric data in three modules – Governance, Management and Finances [14].

1 Aim of the Article

The purpose of this article is to demonstrate the research methodology used for investigating team roles in family businesses, with a focus on one specific Czech family business. In order to assess the company's performance, the Belbin Team Roles 360-degree analysis and a self-evaluating Family Business Quality questionnaire were utilized. This case study serves as a foundation for further research in this area.

Based on these methods, the research question was posed: "*Is it possible to predict family business quality based on Belbin Team Roles within the team?*" In this case study, the detailed results will be presented and discussed.

After receiving positive feedback and identifying potential deficiencies in management processes and governance through earnest consultation with the tested team, it was decided to continue the research on other family businesses.

2 Methodology

This article only focuses on one family business that volunteered for the case study, and no statistical method was employed for representative selection. However, a comprehensive research methodology was carried out to analyze the family business, and therefore it will be discussed in detail.

Planned milestones of constructing this case study were:

a) Analysis of family team members using Belbin individual report

b) Analysis of family team using Belbin team report

c) Evaluation of family business quality using National Award of the Czech Republic for Quality of Family Business questionnaire (Quality of Family Business)

d) Identification of deficiencies in the results from the second method using the first method

e) Direct interview with the family team members

2.1 Belbin Individual Report and Belbin Team Report

Meredith Belbin identified 9 team roles that occur in teams during the cooperation of their team members. Each role is associated with specific strengths and acceptable weaknesses that are a necessary trade-off to ensure that the team works well together. In practice, every individual has a tendency towards one or more team roles and usually performs multiple roles at once. Usually, 2-3 team roles are preferable, 2-5 team roles are possible to undertake and 2-3 roles are unfeasible for the individual to perform. The typology is shown in Table 1.

Tab. 1: *Belbin Team Roles*

Team role	Strengths	Acceptable weaknesses
Shaper	Challenging, dynamic, thrives on pressure. Has the drive and courage to overcome obstacles.	Can be prone to provocation, and may sometimes offend people's feelings.
Coordinator	Mature, confident, identifies talent. Clarifies goals.	Can be seen as manipulative and might offload their own share of the work.
Plant	Creative, imaginative, free-thinking, generates ideas and solves difficult problems.	Might ignore incidentals, and may be too preoccupied to communicate effectively.
Resource Investigator	Outgoing, enthusiastic. Explores opportunities and develops contacts.	Might be over-optimistic, and can lose interest once the initial enthusiasm has passed.
Monitor Evaluator	Sober, strategic and discerning. Sees all options and judges accurately.	Sometimes lacks the drive and ability to inspire others and can be overly critical.
Implementer	Practical, reliable, efficient. Turns ideas into actions and organizes work that needs to be done.	Can be a bit inflexible and slow to respond to new possibilities.
Team Worker	Co-operative, perceptive and diplomatic. Listens and averts friction.	Can be indecisive in crunch situations and tends to avoid confrontation.
Completer Finisher	Painstaking, conscientious, anxious. Searches out errors. Polishes and perfects.	Can be inclined to worry unduly, and reluctant to delegate.
Specialist	Single-minded, self-starting and dedicated. They provide specialist knowledge and skills.	Tends to contribute on a narrow front and can dwell on the technicalities.

Source: [13]

Further, the team roles are divided into three groups. Resource Investigator, Coordinator and Team Worker fall into the category **social**; Plant, Monitor Evaluator, and Specialist into the category **thinking**, and Shaper, Implementer, and Completer Finisher into the category **action**. [13]

Ideally, at least one member of a team should occupy each category with their dominant team role.

In order to identify an individual´s team role of, they must evaluate their typical work style using a certified questionnaire. Then, 4-6 observers are needed to match the evaluated person with written typical strengths and weaknesses. This approach is known as 360 degrees analysis. The result of this method is a report that indicates preferred and therefore dominant

team roles and working style. All of this information is displayed in a chart from the most preferred to the least preferred team role.

By combining all the individual reports, a team report emerges.

2.2 Quality of Family Business

A self-evaluating method has been developed mainly by members of the Faculty of Economics at the Technical University of Liberec for family businesses. In this method, the family business as a whole, including its representatives, evaluates three areas of doing business. These areas are also referred to as "modules", and each module consists of 10 questions. Respondents answer on a 6-step scale, indicating how much they agree with each statement. Based on the responses and statistical weights of each question, an overall mark is calculated ranging from A (the best) to F (the worst). By taking a simple arithmetical average of all three modules, an overall quality rating for the family business is obtained [14].

An example question from the first module (Governance) could be:

> *The company has a close connection to the municipality of the place/headquarters of its business (it has a closed cooperation agreement with the municipality, is made visible within the municipality, e.g. on the website municipality portal, has some support from the municipality).*

The second example from the second module, management, is:

> *Conflicts in the family are strictly separated from conflicts in the company; communication in conflict resolution is open and effective.*

Lastly, an example from the third, financial module:

> *The property of the family business and the private property of the owner and family members are strictly separated.* [14]

3 Specific Family Business and Testing Results

In this section, the tested company is described, the results are shown and the case study is presented. The company went through all the steps of evaluation and in a direct interview, they stated that their participation in the case study revealed previously hidden information.

3.1 Company Introduction

First, the tested company meets the criteria of a local definition of a family business:

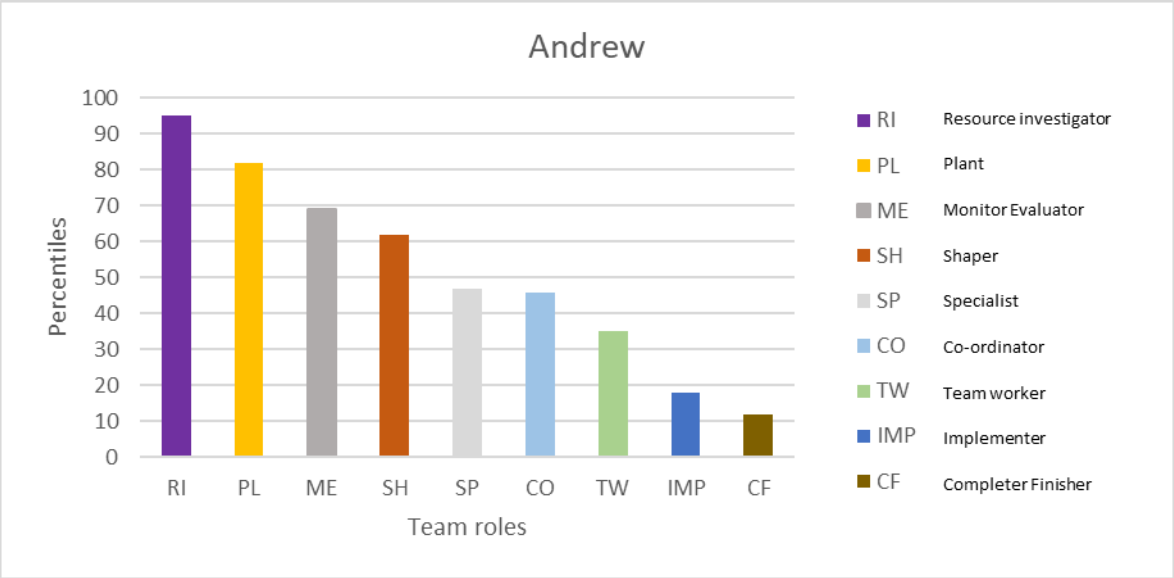
> *"A family business corporation is a business corporation in which members of one family directly or indirectly holds the majority of voting rights and at least one member of this family is a member of the statutory body of this business corporation."* [15]

Therefore, the company is suitable for the research purposes. The members of the family business have been involved in entrepreneurship even before officially establishing the family business and being registered in 2018. There are three main members in the business, two sons, Andrew and Vojtěch, and their mother Alena. The main activity of the company is event management.

3.2 Results

Using Belbin individual report, each of the three family business members was evaluated. These three members are the only people involved in the governance and management of the

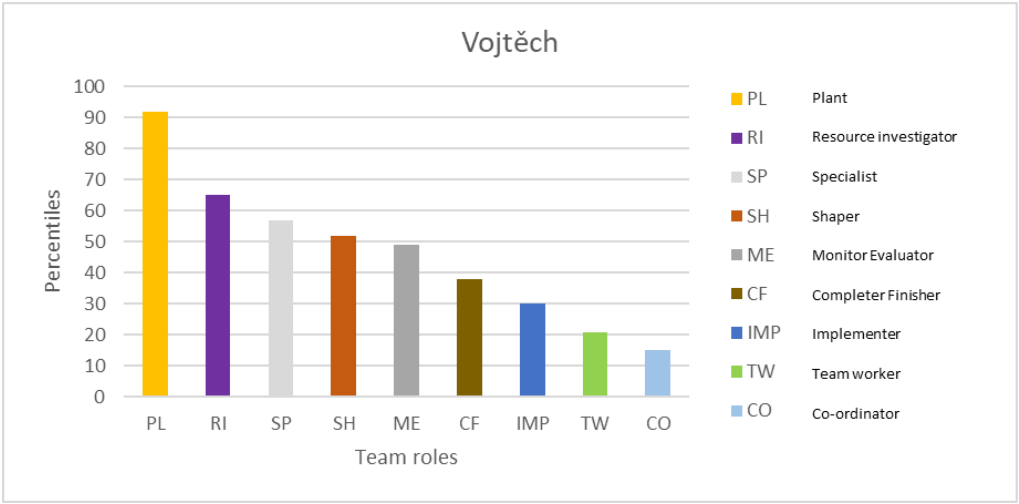
family business. The discussion will start with **Andrew** as an elder son. His profile based on Belbin individual report is as follows, see Figure 1:



Source: Own, based on results from Belbin Team Roles individual report [16]

Fig. 1: *Distribution of team roles for Andrew*

It is evident that Andrew favors the working styles of Resource Investigator and Plant, which are two major roles responsible for introducing new ideas (according to Belbin). On the other hand, Resource Investigator role is weak in putting these ideas into practice and hence requires support. Monitor Evaluator came as his third role, mainly based on the evaluation from his observers, therefore he seems to be critical in a constructive way. In the middle roles of Shaper is visible to be still quite strong, further Specialist and Coordinator, which are roles suitable for leadership. On the other hand, Andrew shows insignificant proportions for the two least preferred roles of Implementer and Completer Finisher. These roles are known for their systematic approach towards work, with Implementer being a very practical person and Completer Finisher focusing on details and perfect work delivery.



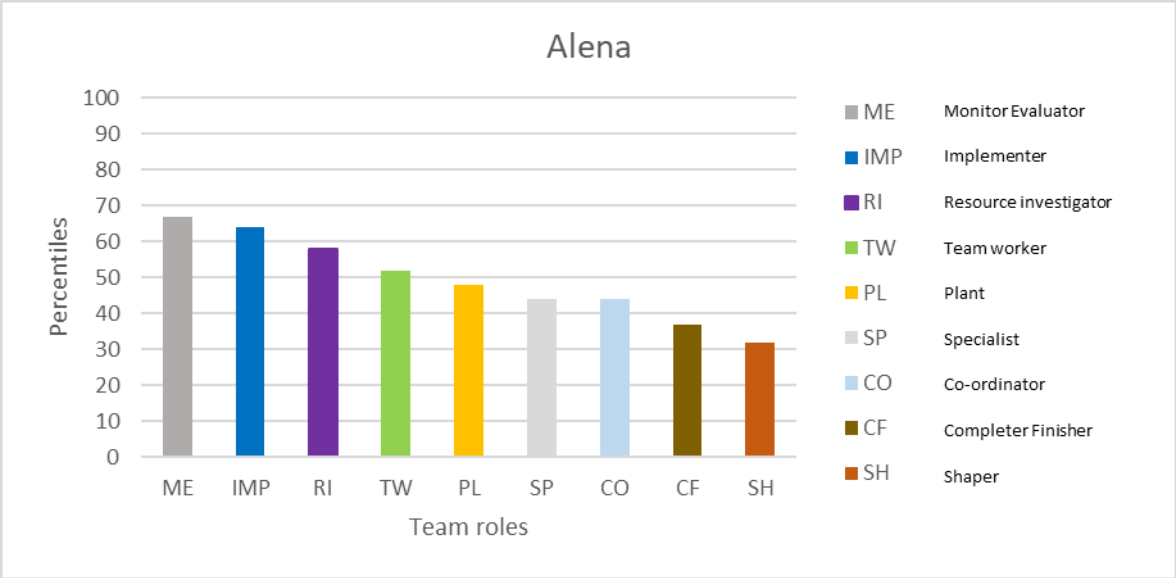
Source: Own based on results from Belbin Team Roles individual report [16]

Fig. 2: *Distribution of team roles for Vojtěch*

With enough space and the right practical support, Andrew's ideas and his drive could be excellently brought into life, but he closely cooperates with his younger brother, **Vojtěch**,

whose profile has more similarities than differences with Andrew's, making him a great complement to Andrew's deficiencies in certain team roles, as clearly shown in Figure 2.

As we can see, Vojtěch has a working style that is very close to his brother Andrew's. He is capable of inventing new ideas and tends to become attached to them, which is normal for the Plant team role. Compared to Andrew, Vojtěch is more introverted and is better at coming up with new ideas. Completer Finisher and Implementer, representing practical approach towards work, are rather weak in Vojtěch's example, but not as weak as Andrew´s. On the other hand, two team roles that very much concentrate on close cooperation with others, that means Team Worker and Coordinator, are the least preferred. Therefore, Vojtěch's talent lies in inventing something new and unconventional, he is more practical than Andrew but unable to work effectively in close cooperation with the others. If it would be up to him, he would rather work individually.

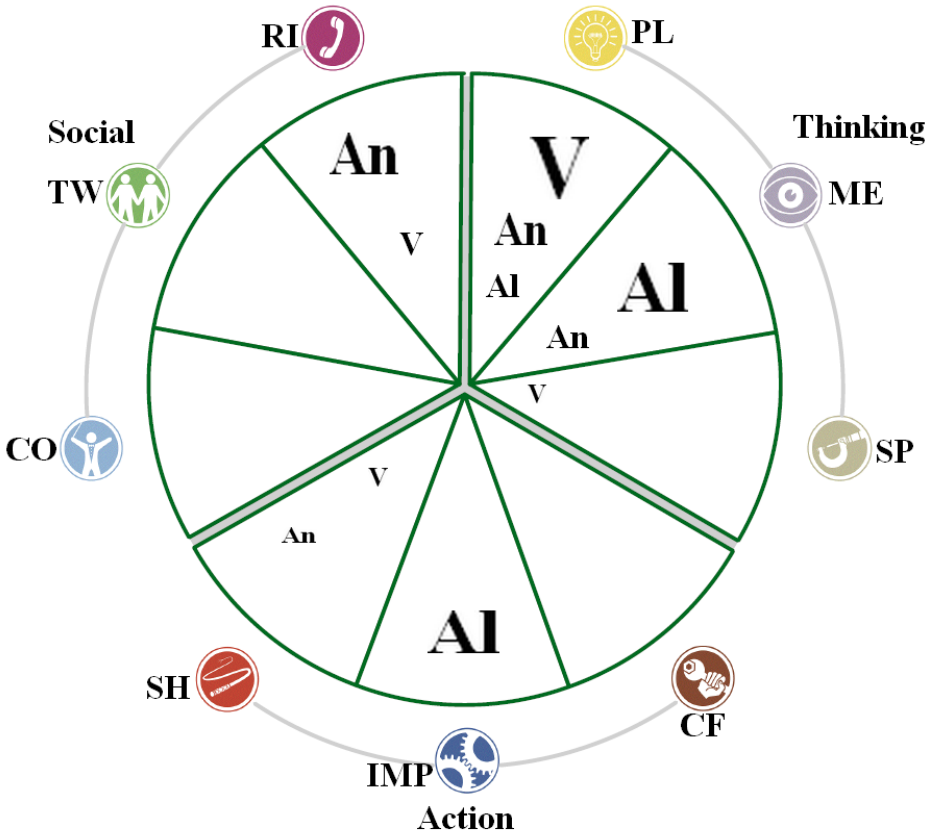


Source: Own based on results from Belbin Team Roles individual report [16]

Fig. 3: *Distribution of team roles for Alena*

Figure 3 shows a profile of Alena, the mother of the two brothers, which is notably different from theirs. In comparison to her sons, Alena's preferred team roles decline at a much slower rate. Although not visible in the graph, she evaluates herself differently than how others perceive her. Alena is more flexible and can take on tasks that may not be ideal for her, but she is protective and finds it difficult to trust others to deliver satisfactory outcomes. She is not very effective when it comes to delegating workload, which is the main strength of the Coordinator role, in which she scores quite low. Alena's preferred team role is the Monitor Evaluator, and she is able to critically evaluate situations and pay attention to detail. She is also more practical, as in the Implementer role. Her third role is Resource Investigator, and the least preferred role is the Shaper. In reality, she often plays the Resource Investigator and Shaper roles more often because she has been the key contact person and manager of the family business.

Based on Belbin team report and modified after a direct interview with the team, the team role circle was established (represented in Figure 4). The circle shows the distribution of the team's preferred roles after the interview (indicated by smaller letters). In the circle, letters **An** represents **Andrew**, **V** represents **Vojtěch**, and **Al** represents **Alena.**



Source: Own based on results from Belbin Team Roles team report [16]

Fig. 4: *Distribution of team roles in the team*

The team seems to have a strong inclination towards innovative approach and creating new ideas, with the Plant role being heavily occupied. The team also possesses the ability to assess reality with precision through the Monitor Evaluator role and exhibits strength in external communication through the Resource Investigator role. However, there is a significant risk in the Action section as Alena is the only one capable of handling practical work. The team's delegation of workload is an area of concern as the Coordinator role is missing. Additionally, the peaceful cohesion of the team is at risk due to the absence of a Team Worker role.

As stated in the official team report (and confirmed in the interview),

> *This team is likely to seek to explore untried possibilities, which could lead to very lively meetings. However, there is some risk that ideas will be presented in a competing fashion, and this can make it difficult to sort ideas into those that need to be eliminated and those that the team will pursue further. Solutions will be a key role for someone who is quick-thinking, level-headed and willing to discipline team members to achieve the meeting's purpose.*
>
> *At its best, the team has creative and innovative potential. However, there may be situations where team members need to respect each other's ideas.*
>
> *The worst-case scenario is that the team is unable to finish what they started and may disappoint their customers or clients with their mistakes or omissions.*

As shown later, there is a strong connection between the culture of a family business team and the overall business quality. Insufficient delegation may result from a lack of coordination, which has been proven true.

3.3 Quality of Family Business

The third phase of this qualitative research involved evaluating the company using the Quality of the Family Business method. Alena and Andrew, the current and next-generation managers, took responsibility for rating the business performance in three modules, with each module consisting of ten questions. During a direct interview, the team stated that they expected above-average quality but found some gaps. In the following paragraphs, only answers to statements that deviate significantly from the marks received in the modules will be discussed.

Table 2 indicates the score in each of the three modules:

Tab. 2: *Score in three modules of Quality of Family Business*

Module 1 – Governance		**Module 2 – Management**		**Module 3 – Finance**		**Overall**	
72	B	55.6	C	87.8	A	72	B

Source: Own based on results from Quality of Family Business questionnaire [14]

3.3.1 Governance Module

In the governance module, the family business performance scored 72%, marked with B. Questions that demand attention are mainly 1.1 and 1.2:

1.1 In the company/enterprise/farm (hereinafter the company) a written document (of the family constitution type) is drawn up, which sets the relations between family members, expresses family values and rules of conduct.

1.2 The company has established "organs" linked to its legal form of business (e.g. family assembly, family council, executive board, supervisory board, board of directors), which solve potential conflicts, set communication rules, etc.

Both statements were evaluated by number 2 (0 is strong disagreement and 5 is full agreement). The entire family business operates on an informal basis and therefore organs and documents that could bring structure to the working environment are present only partially. This also explains the lack of team roles such as Implementer or Completer Finisher, which are known for their practical and conscientious working style. The somewhat chaotic working style of Resource Investigator and Plant, both strong team roles within the team, further reinforces this informality.

Question 1.7 received a score of 0, indicating a clear denial.

1.7 When handing over a family business, the fact that it can be managed by a hired professional can be taken into account.

Neither Andrew nor Alena would even consider that a hired executive manager might be an option. All three family members have a significant weakness in delegation and tend to either do the work themselves or neglect it instead of passing it on to a non-family member. This could be attributed to the missing team role of a Coordinator in their team, who is an expert in effective delegation.

3.3.2 Management Module

In the management module, the family business performance scored 55.6%, marked with C. The lack of a strong managerial role of a Shaper or Coordinator (and possibly a Specialist) clearly influenced relatively weak performance in this module. During the interview, the team stated that they struggle with long-term strategic planning, as evidenced by their answers to questions 2.1 and 2.3. Additionally, the team lacks sufficient delineation of competences, which further exacerbates the problem.

2.1 Long-term family and business goals are specified in the family and in the company

2.2 Not only the business owner, but also family members are involved in deciding on the strategic plan of the family business.

Question 2.5 scored also low, marked with number 2.

2.5 Conflicts in the family are strictly separated from conflicts in the company, communication in conflict resolution is open and effective.

Andrew is suitable for the role of Shaper, while Alena is suitable for the role of Coordinator. Thus, it is essential for the team to clarify management responsibilities between these two since there are some shortcomings in the module and no willingness to delegate managerial tasks to an external member.

3.3.3 Financial Module

In the financial module, the family business performance scored 87.8%. The questions related to responsible operation with financial resources received high ratings of 4 or 5. The income is distributed according to previously agreed rules and is mostly invested into further development. The initial capital came from internal sources or from municipality donations. The financial management is transparent and well-managed. The only downturn was identified in questions 3.1 and 3.2

3.1 The property of the family business and the private property of the owner and family members is strictly separated

3.2 When starting a family business, a strategic financial plan was drawn up. It is further evaluated and updated in relation to the stages of the company's development

Andrew did not agree with these statements, and marked the first question with a 2 and the second question with a 1. Alena, on the other hand, insisted on a higher score because she is the main responsible person for this area.

Neither Andrew nor Vojtěch have a deep insight into family business finances, as they claimed. Only Alena and her Implementer and Monitor Evaluator team roles excel in this field. The clear competencies given from the rest of the team and suitable team roles to undertake tasks of financial decision-making proved to create better results than in management module where competencies and team roles mostly clash instead of harmonizing with each other.

3.3.4 Overall Quality

The calculated average of the three modules' score is the overall mark of B and a score of 72%. This family business is viable but needs to formalize its competencies and implement strategic planning. Most importantly, the business needs to clearly identify who will be the main responsible manager.

Conclusion

After analyzing a specific family business team using Belbin Team Roles and Quality of Family Business methods, it was observed that there is a direct correlation between typical strengths and weaknesses of each team role and phenomena in Quality of Family Business. While Belbin methodology is not numerical and this case study provides insight into only one family business, it can still be linked to the Quality of Family Business.

The management module of Quality of Family Business had the lowest score, indicating a lack of managerial team roles. Only one team member was identified with a practical approach towards work, but since this person was responsible for all financial issues, the financial module scored high.

The outcomes for the team are numerous. To achieve better performance, the management style must be reworked, and a clear leader with undeniable competencies should be appointed. This will help with better delegation and strategic planning. The team should also consider enhancing the competencies and responsibilities for non-family employees to involve them more closely in team cooperation, especially those employees, who show attributes of Completer Finisher, Team Worker, or Co-ordinator.

The research outcomes are also valuable. The purpose of this case study was to test the methodology, which proved seminal and useful. Belbin Team Roles, as the first step, can identify gaps in team cooperation, which can lead to specific deficiencies in areas of entrepreneurship identified by the method of Quality of Family Business. Therefore, this case study provides a positive answer to the research question: "*Is it possible to predict family business quality based on Belbin Team Roles in the team?*"

Future research on numerous family businesses is underway to further affirm this question. With enough tested teams, it might be also possible to determine which areas of doing business (which modules) might be affected by which gaps in team roles. Finally yet importantly, future research can lead to normative recommendations for family businesses to use in order to support and enhance their performance.

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TÝMOVÉ ROLE V RODINNÉM PODNIKU A KVALITA RODINNÉHO PODNIKÁNÍ – PŘÍPADOVÁ STUDIE

Při řízení týmu hrají klíčovou roli týmové role, osobní charakter nebo temperament. Jedinečný přístup přinesl dr. M. Belbin – Belbinovy Týmové Role, které se využívají jak ve vzdělávání a výzkumu, tak i v profesionálním poradenství. Nikdy však nebyl proveden úplný výzkum týmových rolí v rodinných podnicích, což vytváří mezeru v chápání této specifické formy lidské ekonomické činnosti – rodinného podnikání.
Cílem tohoto článku je ukázat metodiku, která je využívána při výzkumu týmových rolí v rodinných firmách s vazbou na kvalitu rodinných firem na jedné konkrétní české firmě, která byla hodnocena pomocí 360ti stupňové analýzy Belbinových Týmových Rolí a sebe-evaluačního dotazníku Kvalita Rodinného Podnikání. Tato případová studie pokládá základ pro budoucí výzkum.

TEAMROLLEN IN EINEM FAMILIENUNTERNEHMEN UND FAMILIENUNTERNEHMENSQUALITÄT – EINE FALLSTUDIE

Teamrollen, persönlicher Charakter oder Temperament spielen bei der Teamführung eine Schlüsselrolle. Ein einzigartiger Ansatz wurde von Dr. M. Belbin – Belbins bym bole, die sowohl in der Bildung und Forschung als auch in der professionellen Beratung eingesetzt werden. Allerdings gibt es noch nie eine vollständige Forschung zu Teamrollen in Familienunternehmen, was zu einer Lücke im Verständnis dieser spezifischen Form menschlicher Wirtschaftstätigkeit – des Familienunternehmens – führt.
Ziel dieses Artikels ist es, die Methodik aufzuzeigen, die bei der Untersuchung von Teamrollen in Familienunternehmen verwendet wird, mit Bezug zur Qualität von Familienunternehmen in einem bestimmten tschechischen Unternehmen, die anhand einer 360-Grad-Analyse von Belbins Bym Pains bewertet wurde und ein Selbstbewertungsfragebogen zur Qualität von Familienunternehmen. Diese Fallstudie legt den Grundstein für zukünftige Herausforderungen

ROLE ZESPOŁOWE W FIRMIE RODZINNEJ A JAKOŚĆ FIRMY RODZINNEJ – STUDIUM PRZYPADKU

Role zespołowe, charakter osobisty i temperament odgrywają kluczową rolę w zarządzaniu zespołem. Unikalne podejście zaproponował dr M. Belbin – Role Zespołowe Belbina, które znajdują zastosowanie zarówno w edukacji i badaniach, jak iw doradztwie zawodowym. Nigdy jednak nie przeprowadzono pełnych badań dotyczących ról zespołowych w firmach rodzinnych, co stwarza lukę w rozumieniu tej specyficznej formy działalności gospodarczej człowieka – firmy rodzinnej.
Celem niniejszego artykułu jest pokazanie metodyki stosowanej w badaniach ról zespołowych w firmach rodzinnych w powiązaniu z jakością firm rodzinnych na przykładzie jednej konkretnej czeskiej firmy, która została oceniona za pomocą 360-stopniowej analizy Ról Zespołowych Belbina oraz kwestionariusza samooceny Jakość Rodzinnego Biznesu. To studium przypadku stanowi fundament dla przyszłych badań.

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DEVELOPMENT OF THE CAPITAL VALUE INDEX OF COMMERCIAL REAL ESTATE ON THE CZECH MARKET

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Abstract

The global financial crisis has shown that property prices can significantly affect the financial sector and the real economy. More multinational investors are active in the commercial real estate market compared to the residential sector, which, according to the European Central Bank, increases the risk of spill-over of financial instability from abroad. Although the evolution of commercial property prices may increase the probability of default of firms operating in this sector, more attention is not given to a detailed analysis, which focuses mainly on residential property. This article analyses the development of the commercial real estate capital value index in the Czech Republic. The analysis revealed that, unlike the global economic crisis, the COVID-19 pandemic had a different impact on individual commercial real estate markets.

Keywords

Commercial real estate; CRECVI index; Office space; Storage facilities; Retail space.

Introduction

Compared to analyses of residential real estate, the number of studies dealing with the effects on commercial real estate prices is significantly lower. [8]

An exception is a comprehensive publication by Eurostat [5], which also confirms that there is a lack of regular analysis or data collection on price developments in the commercial property market compared to residential property price indices. The reason given is the limited information on price changes in commercial buildings, the relatively small number of transactions and the greater variety of building types.

The situation and possible overvaluation of the commercial property market are also regularly assessed by the ECB in its Financial Stability Review [4]. The methodology for determining the overvaluation of commercial property prices is based on a relatively simple comparison of commercial property market indicators, mainly capital values, with their long-term averages.

Gyourko [6] examines the relationship between residential and commercial property prices for which common demand determinants can be assumed. Using data from 32 U.S. metropolitan areas, the article finds that cycles in both markets do indeed exhibit common elements.

In the Czech Republic, Hlaváček is researching commercial property prices, focusing mainly on office prices. Also Jones Lang LaSalle and SAVILLS periodically publish descriptive

analyses for the Czech market. [7], [8], [9], [12], [13], [14], [15]

Describing and modelling the evolution on the commercial is real estate market is key to understanding the dynamics of this market for companies, investors, as well as for the government sectors themselves. [2], [10]

1 Commercial Real Estate Market

1.1 Research Methods

The commercial real estate market is very specific because the use of each type of property is very diverse. Therefore, it is necessary to examine each type of commercial property separately, as different factors may influence them. For the purpose of this article, a market survey of each type of commercial property will first be conducted. Subsequently, the time series evolution of capital value indices for each market is analyzed. The last part of the article compares price developments using year-on-year growth rates.

1.2 Research Subject

According to Mařík [11] commercial real estate refers to real estate that is used exclusively for business purposes. Once completed, these properties are usually rented out and thus generate income for the owner.

The main segments of the commercial real estate market include office buildings, industrial and logistics halls, hotels and retail space.

In the valuation and analysis of commercial property prices, we encounter the terms prime yield or prime property.

Yield can be defined as a percentage of gross annual rental income, which is calculated as the ratio of NOI (net annual rental income) to the gross value of the property before deducting taxes, transaction costs and other deductions. [1]

1.2.1 Yield from Prime Office Space

This designation represents the gross yield for which a modern class “A” office building can be sold under normal market conditions in Prague. The class “A” office building represents a new or recently completed building, with a high level of BREEAM/LEED certification, located in a sought-after city center location, which is fully let for 5 years or more to reputable tenants. [1]

1.2.2 Yield from Premium Shopping Centers

The yield on prime shopping centers is the gross yield for which a prime shopping center can be sold in Prague. This can be defined as a modern center with a wide catchment area, consistently high turnover and footfall, together with a range of internationally recognized retail brands. [1]

1.2.3 Yield from Prime Industrial Real Estate

This yield is the gross yield at which a grade “A” industrial property would sell. These properties are defined as high-quality, newly or recently constructed sheds with variable layouts, located in a highly accessible location on a major highway route. Properties so designated are also fully leased and contracted for more than 5 years, while meeting at least the minimum ESG requirements. [1]

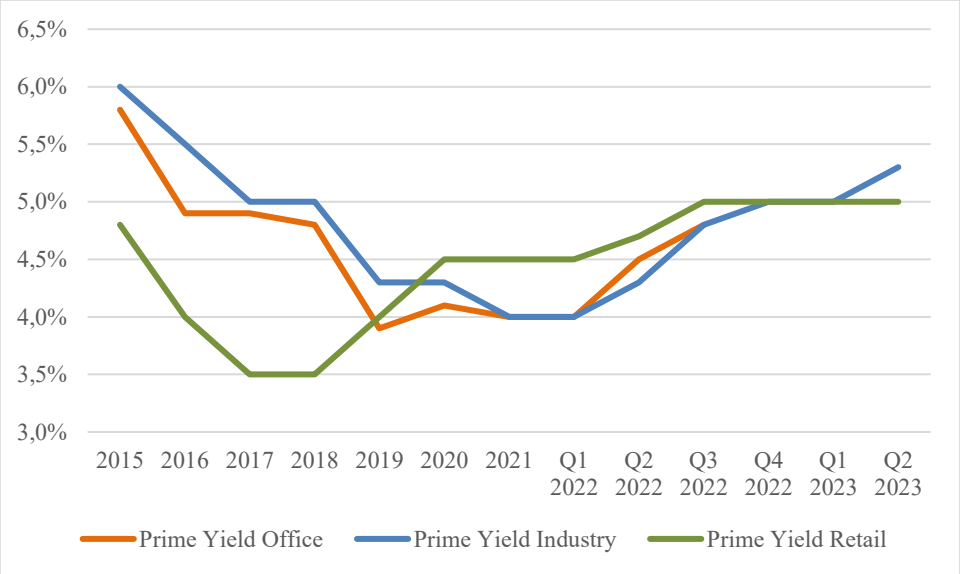
2 Development on the Commercial Real Estate Market

The following chapter is devoted to the analysis of the commercial real estate market. The analysis and data collected focuses only on prime properties with prime yields. For the Czech Republic, this standard is met mainly by commercial properties in Prague. Data on the development of yields for commercial properties in other parts of the country are not as well available. The advantage, however, is comparability with foreign markets.

2.1 Retail Space

The retail sector has been significantly affected by the global COVID-19 pandemic. After the pandemic ended, the market recovered and retail footfall and sales gradually increased, with consumer spending proving more resilient than analyses had predicted. However, according to Savills research [16], retail sales will decline slightly in the second half of 2023 due to the economic slowdown. However, limited new construction and positive demand are supporting retail occupancy and rents in good quality space are maintaining stable levels. Retailers' demand for quality space in premium locations within Prague's tourist districts and shopping centres is thus strengthening. Yields in Class A shopping centers remained at 6.5% in Q2 2023, up from the same period last year.

The development of prime yields of commercial real estate in Prague is shown in Figure 1.



Source: Own processing of data [16] in Excel

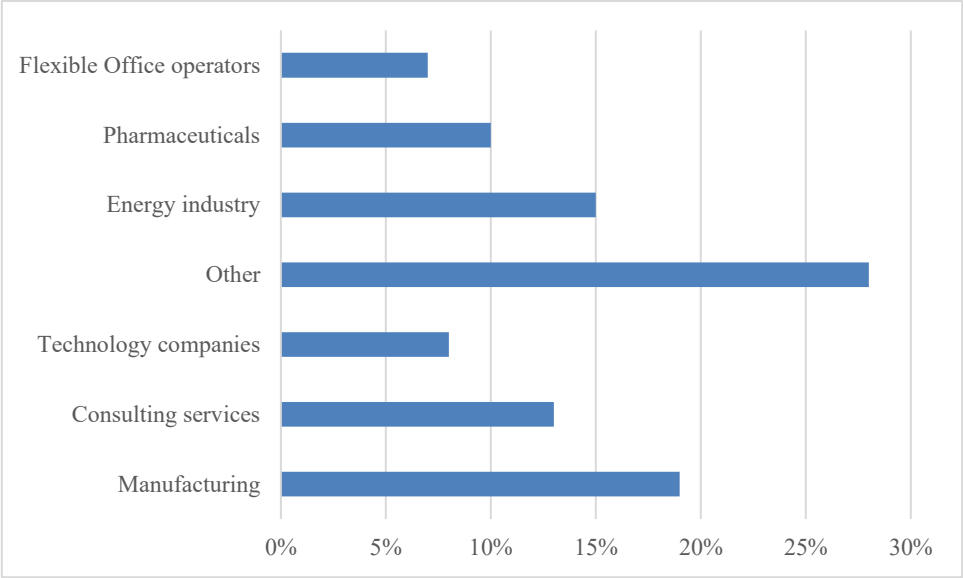
Fig. 1: *Prime yields of commercial real estate in Prague*

2.2 Office Space

The COVID-19 pandemic had a significant impact on the office market. However, the stabilization of the market came unexpectedly fast and soon the vacancy rate of office space started to decrease. At the end of 2022, the vacancy rate in Prague was reached 7.7%, which corresponds to 293,600 sqm. In the first quarter of 2023 reached the Prague's office vacancy rate a record low of 7.5%, which is the lowest vacancy rate since the end of 2020. [10], [13]

According to JLL's market analyses [9], base monthly rents as of Q1/2023 for class A offices in Prague city center are around 640 CZK/sqm. In the wider center of Prague, A-class offices are offered for around 440 CZK/sqm. Base rents in the outskirts of Prague or for class B office space in the center of Prague are approximately 373 CZK/sqm.

Demand for office space in Prague by sector is shown in Figure 2.



Source: Own processing of data [9] in Excel

Fig. 2: *Demand by sector in Q1/2023*

2.3 Industry

According to Savills analysis [14], the European logistics market faced significant macroeconomic challenges in the first half of 2023. Demand fell by 37% from the record level in Q1 2022, but this was due to a return to normal levels of demand, according to the analysis. The market research also shows that the logistics space in Q1 2023 still outperforms the data recorded in the same period in 2018 and 2019, i.e. before the COVID pandemic. The economic turbulence has had a greater impact on the investment market than the occupier market. In the first half of 2023, investment volumes in Europe reached only 10 billion EUR, significantly lower than the averages for the first half of the year, which were 25.3 billion EUR during the pandemic (2020-2022) and 16.7 billion EUR before the pandemic (2017-2019).

Despite this decline in volumes, investor interest is still higher than before the pandemic, with investment in logistics properties accounting for 17% of total real estate investment volumes, compared to an average of 13% in 2017-2019.

According to Savills' analysis [14], the total estimated volume of completed industrial rental space in the Czech Republic in 2022 was 1.33 million sqm, the highest ever. This is a year-on-year increase of 96%.

The vacancy rate for all Czech modern industrial space increased slightly to 1.93%, both on a quarterly (+25p) and annual basis (+9p). However, this is still very low given that never has so much new industrial space been built as in the past year.

At the end of Q1 2023, vacancy rates were below 1% or even zero in the Hradec Králové, Liberec, Pardubice, South Bohemia, Zlín, South Moravia and Prague regions. The vacancy rate in Prague is currently 0.8%, although if we exclude office space (located inside industrial halls), the rate would be close to 0%.

Base rents for modern industrial space in Prague have remained unchanged at 7.25-8.30 EUR/sqm for 5,000 sqm leased for 5 years (given the low vacancy rates, these opportunities reflect mostly brand new space). Outside Prague, the range has widened to 5.50-7.80 EUR/sqm.

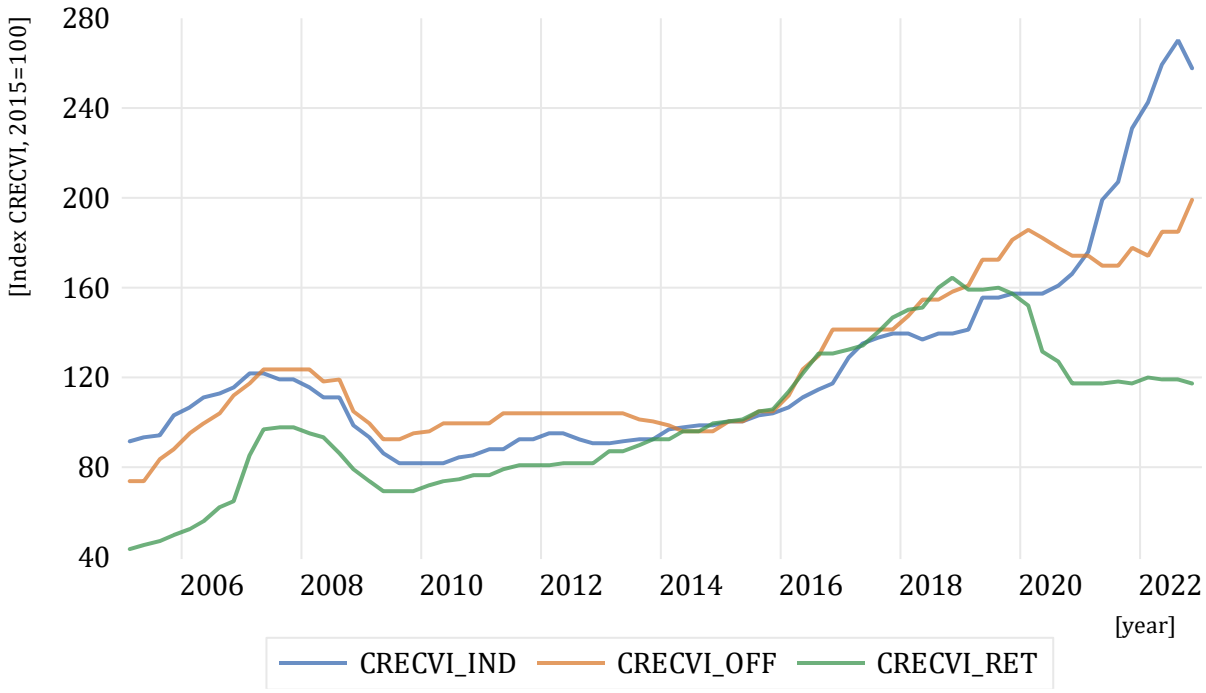
Rents for small commercial units (up to 1,000 sqm) in Prague ranged from 8.50-9.50 EUR/sqm per month.

Office and sanitary space within industrial halls continued to be offered at 9.50-12.50 EUR/sqm per month. Monthly service charges remained in the range of 0.75-1.00 EUR/sqm. [12]

2.4 Commercial Real Estate Capital Value Index

The C&W CRECVI (Commercial Real Estate Capital Value Index) is compiled by the consultancy Cushman & Wakefield, which provided it for the purposes of this research. The CRECVI represents development of the capital value of commercial real estate portfolio in the Czech Republic. The index includes prime rents and prime yields for Prague warehouses and production halls, offices and shopping centers. [3], [10]

The graph in Figure 3 shows the development of the CRECVI index from 1Q/2005 to 4Q/2022. The blue line "CRECVI_IND" shows the development on logistics parks. The time series "CRECVI_OFF" represents the index for office space. The green line "CRECVI_RET" describes index changes for retail space.



Source: Own processing of data [3] in EViews 13

Fig. 3: *Development of the CRECVI index*

According to the development in the time series, we see that the series follow the same trend time, up to 2020. The global economic crisis has had an impact on commercial real estate with falling prices, but with the same trend for all three types of commercial real estate. This was followed by a sharp increase in prices until the end of 2019. At the beginning of 2020, the effects of the COVID-19 pandemic became apparent. After that, however, there was a significant change in the development of each time series.

Prices for warehouses and production halls have seen a steep increase, and conversely, commercial retail space has seen a significant drop. The reason for this is certainly the government regulations during the lockdown, when stores were closed. On the other hand, e-commerce stores have experienced a boom, which we see in the increase in warehouse prices. Office space has also seen a decline, however, there has been a relatively quick recovery in

this market and prices have started to rise again since 2022. This is also confirmed by the growth factors for the 2022 and 2020 quarters in Table 1.

Tab. 1: *Growth Rate of Commercial Real Estate Capital Value Index*

Period	k_i – Industry	k_i – Retail	k_i – Office
1Q 2022 / 1Q 2020	1.54	0.79	0.94
2Q 2022 / 2Q 2020	1.65	0.90	1.02
3Q 2022 / 3Q 2020	1.68	0.94	1.04
4Q 2022 / 4Q 2020	1.55	1.00	1.14

Source: Own processing of data [3] in Excel

Based on the annual growth rate for Q1 2022 compared to Q1 2020, the 54% price increase for the industry. This trend will continue until the end of 2022.

On the other hand, the index for retail sees a 21% decline over this period. However, at the end of the period under review, this market recovered and prices stopped falling.

Conclusion

The time series of the commercial real estate capital value index and detailed market analysis show that this market has experienced significant fluctuations in recent years. Transactions in the commercial real estate market are currently rather stagnant and investors are waiting for interest rates and commercial real estate prices to fall.

The central bank has kept interest rates for mortgage loans at a high level, hovering around 6%. According to economists' forecasts, interest rates should fall slowly over the next year and by the end of 2025 they should halve to around 2.6%. It is very difficult to make predictions in the current situation. However, dynamic developments can certainly be expected.

Given the significant impact of the COVID-19 pandemic and inflation on the commercial real estate market, the use of time-lagged econometric models, including consideration of structural breaks in the time series, is appropriate for more detailed analysis and forecasting.

Acknowledgements

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VÝVOJ INDEXU KAPITÁLOVÉ HODNOTY KOMERČNÍCH NEMOVITOSTÍ NA ČESKÉM TRHU

Světová finanční krize ukázala, že ceny nemovitostí mohou významně ovlivnit finanční sektor i reálnou ekonomiku. Na trhu komerčních nemovitostí působí více nadnárodních investorů než v sektoru rezidenčních nemovitostí, což podle Evropské centrální banky zvyšuje riziko přelévání finanční nestability ze zahraničí. Přestože vývoj cen komerčních nemovitostí může zvyšovat pravděpodobnost platební neschopnosti firem působících v tomto sektoru, podrobnější analýze, která se zaměřuje především na rezidenční nemovitosti, není věnována větší pozornost. Tento článek analyzuje vývoj indexu kapitálové hodnoty komerčních nemovitostí v České republice. Analýza odhalila, že na rozdíl od globální ekonomické krize, pandemie COVID-19 měla na jednotlivé trhy komerčních nemovitostí odlišný dopad.

ENTWICKLUNG DES KAPITALWERTINDEXES FÜR GEWERBLICHE IMMOBILIEN AUF DEM TSCHECHISCHEN MARKT

Die weltweite Finanzkrise hat gezeigt, dass die Immobilienpreise den Finanzsektor und die Realwirtschaft erheblich beeinflussen können. Auf dem Markt für Gewerbeimmobilien sind mehr multinationale Investoren tätig als auf dem Wohnungsmarkt, was nach Ansicht der Europäischen Zentralbank das Risiko eines Übergreifens finanzieller Instabilität aus dem Ausland erhöht. Obwohl die Entwicklung der Preise für Gewerbeimmobilien die Wahrscheinlichkeit eines Zahlungsausfalls von in diesem Sektor tätigen Unternehmen erhöhen kann, wird einer detaillierten Analyse nicht mehr Aufmerksamkeit geschenkt, die sich hauptsächlich auf Wohnimmobilien konzentriert. In diesem Artikel wird die Entwicklung des Kapitalwertindexes für Gewerbeimmobilien in der Tschechischen Republik analysiert. Die Analyse ergab, dass im Gegensatz zur globalen Wirtschaftskrise, die COVID-19-Pandemie unterschiedliche Auswirkungen auf die einzelnen Gewerbeimmobilienmärkte hatte.

ROZWÓJ INDEKSU WARTOŚCI KAPITAŁOWEJ NIERUCHOMOŚCI KOMERCYJNYCH NA RYNKU CZESKIM

Globalny kryzys finansowy pokazał, że ceny nieruchomości mogą znacząco wpływać na sektor finansowy i realną gospodarkę. Więcej międzynarodowych inwestorów jest aktywnych na rynku nieruchomości komercyjnych w porównaniu z sektorem mieszkaniowym, co według Europejskiego Banku Centralnego zwiększa ryzyko rozprzestrzeniania się niestabilności finansowej z zagranicy. Chociaż ewolucja cen nieruchomości komercyjnych może zwiększać prawdopodobieństwo niewypłacalności firm działających w tym sektorze, szczegółowej analizie nie poświęca się większej uwagi, która koncentruje się głównie na nieruchomościach mieszkalnych. Niniejszy artykuł analizuje rozwój wskaźnika wartości kapitałowej nieruchomości komercyjnych w Czechach. Analiza wykazała, że w przeciwieństwie do globalnego kryzysu gospodarczego, pandemia COVID-19 miała inny wpływ na poszczególne rynki nieruchomości komercyjnych.

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A Framework for a Valuation of Digital Start-ups Using Artificial Intelligence and Fuzzy Sets

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Abstract

The purpose of this article is to present an innovative framework for assessing digital start-ups and smaller companies using a fuzzy set approach, considering the founder's expertise, product marketability, financial health, and social media presence. Four Czech digital startups were analyzed by both human experts and an artificial intelligence model. The methodology is based on using a fuzzy additive ratio assessment. Each start-up was evaluated on a five-point scale, with the results compared to Deloitte's FAST 50 rank. The AI and human evaluations differed, with humans placing more emphasis on the founder's experience and product appeal. As a practical contribution, the article suggests a valuation framework involving both human and AI expertise for interactive comparison and update. The article highlights the value of AI in start-up assessment, stressing the necessity of merging human and artificial intelligence in decision-making. To date of the publication, no study combining human expertise and artificial intelligence using fuzzy sets was found. Therefore, both methodology and results can be considered innovative and original.

Keywords

Digital start-ups; Artificial intelligence; Fuzzy sets; Company evaluation.

Introduction

The global economy has witnessed a significant transformation in the last several years, primarily driven by technological advancements and digitization. One of the key movers of this transformation is the advent of digital start-ups, which have profoundly affected the various dimensions of our economies, societies, and daily lives. Digital start-ups, inherently characterized by innovation, agility, and a high propensity for scalability, represent a potent force in driving economic growth. Digital start-ups serve as a key element in advancing digital transformation, affecting sectors as varied as healthcare, education, finance, and retail.

Financial investment is a crucial element of the success of digital startups. Start-ups with financial investment are more likely to survive and grow than startups without financial support. [1] However, the decision of a potential investor about an investment in a start-up is challenging. As most start-ups a newly created companies, traditional financial criteria do not provide a sufficient benchmark of a startup value and its future perspective [2], [3]. As can be seen in a literature review, investors use various criteria to decide whether they are going to invest in a digital start-up. Gathering information, evaluating it, and making decisions is a complicated and time-consuming process that requires know-how and knowledge in various

fields. This article aims to formulate a framework that increases the efficiency of this process by using artificial intelligence (AI). The framework shall provide a good ability to explain the result to the decision-makers and allow the results to be compared with results provided by human experts (HE).

The framework uses a set of predefined criteria based on a literature review and it is primarily focused on publicly available data sources. The criteria are evaluated by AI and the results of a model are compared with valuation by HE. The evaluation framework uses fuzzy sets, which are aggregated. An individual evaluation of the importance of given criteria is included in the evaluation of the results. The article interprets the results of both approaches.

Several studies have been conducted on the investment criteria of investment firms (venture capital). Studies and analyses for various markets, conducted using different methodologies, arrive at different conclusions regarding decision-making criteria. The number of criteria and the strictness of their assessment vary across different markets. For instance, investors in the USA tend to consider more criteria than investors in Europe do.

Brooks et al. [4] evaluate the result of three start-up competitions and two experiments in the USA and discovered there was a statistically significant preference for attractive males among the winners. Widyanto et el. [5] identified 8 significant criteria using a survey sent to professional investors: long-term effort, risk valuation, market knowledge, leadership, previous success, market growth, acceptance of a product by a market, and availability of a prototype of a start-up's product. Crick & Crick [6] performed 20 interviews with business angels and evaluated the following criteria: foreign market orientation, team performance, approaches and data used for planning etc. Portmann & Mlambo [7] performed a survey among 56 investor subjects and identified the following criteria: the personality of a founder and a team (e.g., moral integrity, experience, ambition, and knowledge), acceptance of a product by market, and expected internal interest rate. Another survey focused on founders of start-ups was performed by Fichter et al. [8] who identified the personal characteristics of founders as a key criterion. Garkavenko et al. [9] have identified the following groups of criteria using a machine learning approach (2366 companies were included in the dataset): financial capital, human capital, product and technology, industry and market, social capital, and online environment. Keppler et al. [10] performed semi-structured interviews to conclude investors use industry-specific criteria, e.g., availability of clinical data for the medical industry. Miller et al. [11] performed a survey to find out investors are often more motivated by philanthropical reasons than by profit. Finally, Festel et al. [2] identified 5 groups of criteria (technological, product, organizational, implementational, and financial) using a literature review.

1 Research Objectives

The research presented in the article aims to focus on the following research objectives:

1. To evaluate and compare the performance of four Czech digital start-ups (FTMO, Knihobot, Apify Technologies, and DODO Czech) using human expertise and artificial intelligence, specifically ChatGPT-4.
2. To assess the utility and applicability of the fuzzy sets as a decision-making tool for ranking start-ups based on multiple criteria. The exact criteria are defined in the next section.
3. To explore the disparities between the FAST 50 ranking by Deloitte [25], human expert evaluation, and the AI-based evaluation and to identify the added value of both HE and AI.

4. To formulate a framework that can be used in the future research. The framework aims to enhance future valuation performance using research experience.

2 Research Methods

As can be seen in the literature review in the Introduction, various factors affect both success factors and investment decisions. However, it may be extremely challenging to evaluate some of the factors (e.g., personal characteristics of founders) using publicly available resources, such as financial databases, websites of companies, articles in highly relevant resources, or social media profiles of companies and their founders. As the presented framework aims to decrease the time required to evaluate a start-up, these criteria are not included in the framework. As a result, the following criteria were selected to be used: experience and human capital of the founder(s) of the start-up (C1), attraction of the product from the market view (C2), the financial situation of the company (C3) and presence and activity on social networks (C4).

A fuzzy set was used as a tool to evaluate each start-up based on the listed criteria. A fuzzy set is a concept in mathematics and computer science introduced by Zadeh [12] that provides a way of quantifying uncertainty and imprecision. Fuzzy sets are commonly used to evaluate and perform in uncertain conditions. [13]. It has already been used to evaluate technological start-ups by Arsenyan. [14] However, it is commonly used to evaluate several alternatives using predefined criteria in uncertain conditions. The example use cases of fuzzy sets are the selection of an energy source, [15], material in the automotive industry [16], the selection of a supplier [17], treatment of a patient with breast cancer [18], nuclear medicine imaging device [19], the most suitable product based on reviews of internet user [20], best locality of a logistical center [21], etc.

The key feature of the fuzzy set is it can provide a “common language” between the artificial intelligence and the human decision-maker. Both humans and artificial intelligence can evaluate the criteria using fuzzy sets, and the results can be compared and critically discussed. However, the evaluation of the criteria needs to be aggregated to get a final order of the alternatives.

Several methods can be used to create a final ranking order of the options. The authors focused on methods implemented in the pyFDM library created by Więckowski et al. [22] The Fuzzy Additive Ration was selected as the final assessment method. The application of the method with real-world examples can be found in articles [23], [24].

3 Results of the Research

As a first step of the practical part of the research, start-up companies for the evaluation were selected. After a preselection, 4 Czech digital start-ups from the FAST 50 rank were selected. [25] The companies included in the research are FTMO (A_1), Knihobot (A_2), Apify Technologies (A_3), and DODO Czech (A_4). The companies are listed in the FAST 50 rank by Deloitte, so the ranking of the companies is used as a benchmark [25].

The second step was evaluation of the start-ups by a board of four human professionals. The following evaluation criteria were used: experience and human capital of the founders, the attractiveness of the product from the market perspective, financial capital, social network presence and activity. The professionals were given a list of information about each company. The primary information taken into consideration is:

a) links to key documents about product descriptions
b) profiles of the founders on LinkedIn,

c) financial statements of the companies,
d) profiles of companies on social networks (Facebook, Twitter, and Instagram were primary sources as most of the companies are present there).

The professionals were free to use additional resources. The researchers used a 5-point scale to evaluate each start-up from the perspective of all criteria. The scale contained the following points: very low, low, average, high and very high. Additionally, each of the researchers using the same scale provided the weight of all criteria.

As a next step, the evaluation matrix was formed. Each entry in the matrix represents the rating of an alternative under a specific criterion. The ratings are represented as fuzzy triangular numbers. Tab. 1 displays the matrix.

Tab. 1: *The fuzzy decision matrix and fuzzy weights of four alternatives (HE)*

	C_1	C_2	C_3	C_4
A_1	(3.5, 5.5, 7.5)	(4.5, 6.5, 8.5)	(2.5, 4.5, 6.5)	(4, 6.0, 8.0)
A_2	(3.5, 5.5, 7.5)	(3.5, 5.5, 7.5)	(2.5, 4.5, 6.5)	(5, 7.0, 8.8)
A_3	(5, 7.0, 8.8)	(4.5, 6.5, 8.2)	(5, 7.0, 8.8)	(3, 5.0, 7.0)
A_4	(5.5, 7.5, 9.2)	(4.5, 6.5, 8.5)	(3.5, 5.5, 7.2)	(6.5, 8.5, 9.8)
Weights	(5.5, 7.5, 9.2)	(7.0, 9.0, 10.0)	(3.0, 5.0, 7.0)	(3.0, 5.0, 7.0)

Source: Own

As a further step, the normalized fuzzy matrix was calculated. As a next step, the data were normalized using formula (1)

$$\tilde{x}_{i,j} = \frac{x_{i,j}}{\sum_{i=0}^{m} x_{i,j}}, \tag{1}$$

where $x_{i,j}$ is the value of the ith value and the jth criterion, and m is the count of the alternatives [23], [24].

The normalized fuzzy matrix is shown in Tab. 2.

Tab. 2: *The normalized fuzzy decision matrix*

	C_1	C_2	C_3	C_4
A_1	(0.081, 0.152, 0.265)	(0.119, 0.215, 0.382)	(0.061, 0.134, 0.255)	(0.095, 0.173, 0.299)
A_2	(0.081, 0.152, 0.265)	(0.093, 0.182, 0.337)	(0.061, 0.134, 0.255)	(0.118, 0.201, 0.327)
A_3	(0.116, 0.193, 0.31)	(0.119, 0.215, 0.371)	(0.121, 0.209, 0.343)	(0.071, 0.144, 0.262)
A_4	(0.127, 0.207, 0.327)	(0.119, 0.215, 0.382)	(0.085, 0.164, 0.284)	(0.154, 0.245, 0.364)

Source: Own

Normalized fuzzy values were weighted by the given fuzzy weights of the criteria using formula (2)

$$\tilde{x}_{w(i,j)} = \tilde{x}_{i,j} * w_j , \tag{2}$$

where $\tilde{x}_{i,j}$ is the normalized value of the ith value and the jth criterion (calculated using formula (1)), and the w_j is the weight of the jth criterion [23], [24].

The weighted normalized fuzzy decision matrix can be seen in Tab. 3.

Tab. 3: *The weighted normalized fuzzy decision matrix*

	C_1	C_2	C_3	C_4
A_1	(0.445, 1.138, 2.456)	(0.834, 1.934, 3.82)	(0.182, 0.672, 1.784)	(0.284, 0.863, 2.093)
A_2	(0.445, 1.138, 2.456)	(0.649, 1.636, 3.371)	(0.182, 0.672, 1.784)	(0.355, 1.007, 2.29)
A_3	(0.636, 1.448, 2.865)	(0.834, 1.934, 3.708)	(0.364, 1.045, 2.402)	(0.213, 0.719, 1.832)
A_4	(0.699, 1.552, 3.029)	(0.834, 1.934, 3.82)	(0.255, 0.821, 1.99)	(0.462, 1.223, 2.551)

Source: Own

Then, the overall performance index for the ith alternative was calculated using formula (3)

$$S_i = \sum_{i=1}^{n} \tilde{x}_{w(i,j)} \tag{3}$$

where the $\tilde{x}_{w(i,j)}$ is the weighted normalized fuzzy value of the ith value and the jth criterion (calculated using formula (2)).

The values are centralized using the center-of-area method (4).

$$\tilde{S}_i = \frac{1}{3}\left(S_{i,1} + S_{i,2} + S_{i,3}\right) \tag{4}$$

As a last step, the utility degree of the ith alternative was calculated using formula (5)

$$Q_i = \frac{\tilde{S}_i}{S_0} \tag{5}$$

where the $\tilde{S}_i$ is the centralized overall performance index of the ith alternative calculated using formula (4) and S_0 is the optimal utility function calculated as the best performance of the given alternatives.

The higher is the value of the utility degree, the better is the performance of the alternative. The calculations were performed using the Python library pyFDM [22] and following the description of the Fuzzy ARAS method in [23], [24]. The results can be found in Tab. 4. The ranking order of the start-ups is DODO Czech (A_4), Apify Technologies (A_3), FTMO (A_1), Knihobot (A_2).

Tab. 4: *The utility degree of the alternatives (HE)*

A_1	0.7166
A_2	0.6939
A_3	0.7814
A_4	0.8322

Source: Own

The order of alternatives is different from the rank of the companies in the FAST 50 [25], which is as follows: FTMO (A_1), Knihobot (A_2), Apify Technologies (A_3), and DODO Czech (A_4). The results are further discussed in the next section.

As the last step of the research, all companies were evaluated by ChatGPT (version 4, May 24) [26]. As ChatGPT does not have a live connection to the internet, a set of information was provided for each criterion. For the C_1, the experience and education were gathered from the LinkedIn profiles of the founders of the start-ups. For C_2, the company product description from the official website was the key source. Additional data sources were articles published on the website of the company and paragraphs from the interview with the founders of the start-up. For the C_3, the last available 3 years were added to the prompt.

The financial statements were downloaded from the Orbis All Companies database [27]. To be more specific, the prompt contained key items from the profit and loss statements and key financial indicators, such as Return on Equity. The C_4 was evaluated using the ChatGPT instance available as a part of the Bing search engine. This instance has a more recent dataset available. It was able to evaluate the activity on social networks, including the number of reactions aggregated by months. The paid version of the tool was used, so the length of the prompt was limited to 4 thousand characters. The fuzzy decision matrix of ChatGPT is illustrated in Tab. 5.

Tab. 5: *The fuzzy decision matrix and fuzzy weights of four alternatives (AI)*

	C_1	C_2	C_3	C_4
A_1	(5, 7.0, 9.0)	(7, 9.0, 10.0)	(7, 9.0, 10.0)	(5, 7.0, 9.0)
A_2	(5, 7.0, 9.0)	(5, 7.0, 9.0)	(1, 3.0, 5.0)	(1, 3.0, 5.0)
A_3	(7, 9.0, 10.0)	(7, 9.0, 10.0)	(5, 7.0, 9.0)	(3, 5.0, 7.0)
A_4	(7, 9.0, 10.0)	(7, 9.0, 10.0)	(1, 3.0, 5.0)	(5, 7.0, 9.0)
Weights	(7.0, 9.0, 10.0)	(7.0, 9.0, 10.0)	(5.0, 7.0, 9.0)	(5.0, 7.0, 9.0)

Source: Own processing of data generated by ChatGPT [26] as a result of author's prompts

Data in Tab. 6 were normalized using formula (1).

Tab. 6: *The normalized fuzzy decision matrix*

	C_1	C_2	C_3	C_4
A_1	(0.128, 0.226, 0.391)	(0.179, 0.281, 0.417)	(0.143, 0.205, 0.278])	(0.104, 0.167, 0.265)
A_2	(0.128, 0.226, 0.391)	(0.128, 0.219, 0.375)	(0.020, 0.068, 0.139)	(0.021, 0.071, 0.147)
A_3	(0.179, 0.290, 0.435)	(0.179, 0.281, 0.417)	(0.102, 0.159, 0.250)	(0.062, 0.119, 0.206)
A_4	(0.179, 0.290, 0.435)	(0.179, 0.281, 0.417)	(0.02 , 0.068, 0.139)	(0.104, 0.167, 0.265)

Source: Own

The weighted normalized fuzzy decision matrix in Tab. 7 was calculated using formula (2).

Tab. 7: *The weighted normalized fuzzy decision matrix*

	C_1	C_2	C_3	C_4
A_1	(0.897, 2.032, 3.913)	(1.256, 2.531, 4.167)	(0.714, 1.432, 2.500)	(0.521, 1.167, 2.382)
A_2	(0.897, 2.032, 3.913)	(0.897, 1.969, 3.750)	(0.102, 0.477, 1.250)	(0.104, 0.5, 1.324)
A_3	(1.256, 2.613, 4.348)	(1.256, 2.531, 4.167)	(0.510, 1.114, 2.250)	(0.312, 0.833, 1.853)
A_4	(1.256, 2.613, 4.348)	(1.256, 2.531, 4.167)	0.102, 0.477, 1.250)	(0.521, 1.167, 2.382)

Source: Own

The values of the performance utility index of each alternative can be seen in Tab. 8. The rank of alternatives is FTMO (A_1), Apify Technologies (A_3), DODO Czech (A_4), and Knihobot (A_2).

Tab. 8: *The utility degree of the alternatives (AI)*

A_1	0.8472
A_2	0.6204
A_3	0.8304
A_4	0.7953

Source: Authors' calculations in pyFDM [22]

The final comparison of all three rankings is provided in Tab. 9.

Tab. 9: *The comparison of ranking of the Companies*

Alternative	FAST 50	HE	AI	AI (C_1 - C_3)
FTMO (A_1)	1	3	1	2
Knihobot (A_2)	2	4	4	4
Apify Technologies (A_3)	3	2	2	1
DODO Czech (A_4)	4	1	3	3

Source: Authors' calculations in pyFDM [22]

4 Discussion of the Results

As clearly seen in Tab. 9, the rank of Deloitte is the rank created by AI. Both AI and HE placed Knihobot in 4th place. Knihobot was ranked by AI, especially in C_3 and C_4. Nonetheless, the activity of Knihobot on social media has recently increased, which explains the significance of the valuation of this criterion by HE and AI. The effect of the time-limited dataset of the AI model is present here. Withal, as can be seen in the last column of Tab. 4, Knihobot is evaluated as the last one even if C_4 is excluded. The rank of TMO and Apify Technologies is swapped if C_4 is excluded, yet there is no significant recent change in the activity of these start-ups, as the valuation of their activity by AI and HE is equal or very close. The second big difference is in the valuation of the financial capital of FTMO, which was significantly better valued by AI.

In the case of C_1 and C_2, AI was generally more positive in the case of all companies. As it does not directly affect rank, it might be useful to define the rank for these criteria in detail, so there is a better common understanding between both sides. Additionally, the results of FTMO were affected by very brief information on the LinkedIn profiles of both founders. The AI used its own database, which was clear from mentioning the former name of FTMO that was not provided in the prompt.

Regarding the weights, the HE gave relatively lower weights to C_3 and C_4. The valuation of AI has been recalculated using the weights provided by HE which results in swapping Apify Technologies and FTMO, i.e., the rank is equal to the rank without C4. It can be easily explained by the small margin between the first two companies and the significantly better performance of FTMO on social networks.

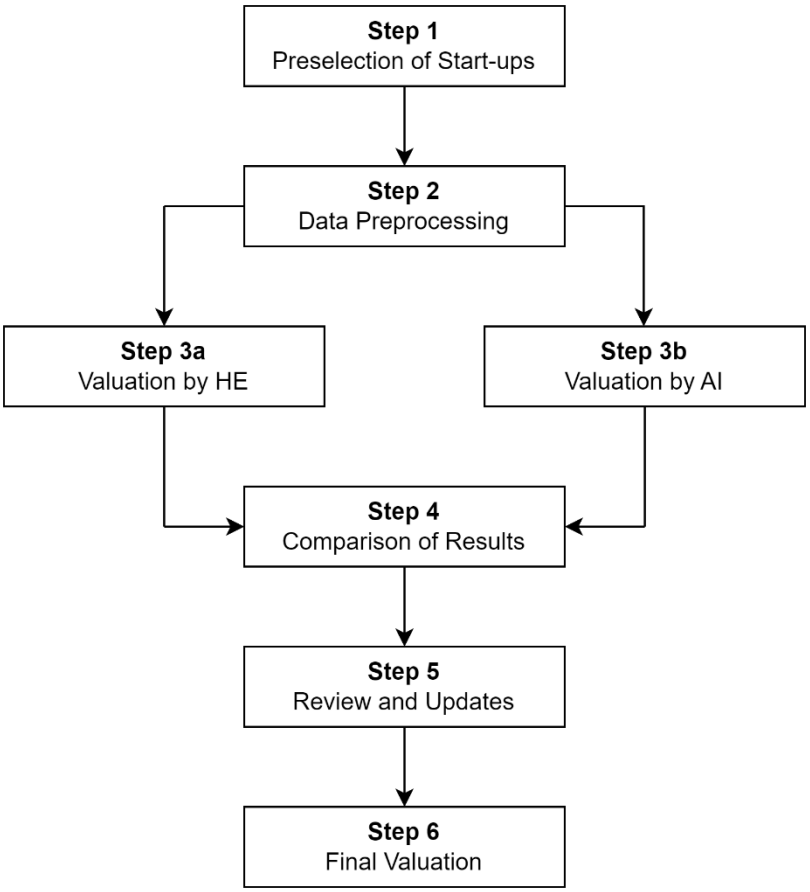
After the discussion of the results, the experience from the research process is used to define a valuation framework that can be used to solve similar tasks. The main conclusion is the research process was too linear, as the ranks were calculated separately and the reasoning of both HE and AI was not compared and critically reviewed. The ChatGPT provided a good and structured review of all valuations and it might bring additional facts and ideas useful for HE. As a result, a Comparison of Results and Review and Update steps were added to the framework. The complete description of the framework is given in the rest of this section. A graphical scheme is provided in Fig. 1.

The first step is the preselection of start-ups. As the valuation requires human work, it is recommended to preselect start-ups that should be evaluated. The start-ups can be preselected using a defined set of criteria, such as the location of start-ups, type of product, state of product, etc. After the preselection, key data and data sources are gathered, and data are processed. For example, the content of social network profiles can be downloaded using the APIs of social networks so the most recent content can be provided to the AI models. It is an open question whether AI should be involved in data preprocessing. It can provide valuable input for EA (e.g., clear explanation of highly technical concepts for HE without deep domain knowledge, extracting key points from long texts). On the other hand, the AI preprocessing

might influence the valuation by HE towards AI. Nevertheless, both HE and AI should not be limited to the provided data and data sources.

The third step is divided into two parts: the valuation of companies by HE and AI. The valuation should be done independently, so the HE is not aware of valuation by AI and vice versa. The results are compared in the next step. The rating should be reviewed, especially when there is a significant difference between HE and AI. As AI provides reasoning for the results, it should be reviewed, and the argument of AI should be taken into consideration. AI model can also be asked for more detailed reasoning, and additional data gathering and research may be included if necessary. However, HE should be given the option to stand by their original decision. When all significant differences are settled, the valuation of HE should be updated. As a final step, the final rank of the start-up is provided.

It should be noted that the used valuation criteria are not a mandatory part of the valuation framework and they can be fully used with different sets of criteria. Potential users may leave out the fuzzy sets and use a different quantitative technique. However, the fuzzy sets have been shown as a good common tool for humans and AI.



Source: Own

Fig. 1: *Schema of the valuation framework*

New research should fully implement the framework, as it was not followed during the previous study based on the authors' experience.

Conclusion

In conclusion, the study presents a novel approach to start-up evaluation using both human expertise and artificial intelligence.

As the first research objective, the article aimed to evaluate and compare the performance of four Czech digital start-ups using human expertise and artificial intelligence. The start-ups were evaluated, and the results are described in Section 3. For evaluation, various criteria such as the founder's experience, product appeal, financial health, and social media presence were used. The evaluations were marked on a five-point scale, forming a fuzzy decision matrix, and the results were compared with Deloitte's FAST 50 rank [25].

As the second research objective, the utility and applicability of the fuzzy sets were to be evaluated and the result is shown in Section 3 and Section 4. It has been shown that fuzzy sets are an efficient tool for start-up evaluation, as they were proved to be easy to use by both human experts and generative AI models, and the results were easy to compare and evaluate.

The third research objective aimed to evaluate disparities between evaluation by human experts and artificial intelligence. These disparities were discussed in Section 4. The results demonstrated differences in evaluations by human experts and AI, pointing out the uniqueness of perspectives each side brings to the table. While human experts showed a tendency to value the founder's experience and product appeal, the AI model was observed to take a different evaluation approach, resulting in a divergence in rankings. This divergence prompted the study to suggest a dual evaluation framework that incorporates both human and AI inputs, enabling an iterative comparison, review, and update process. Such a process facilitates a more balanced and comprehensive assessment, harnessing the strengths of both AI and human evaluators. Moreover, the evaluation results indicated that AI was generally more optimistic about all companies in terms of founder experience and product attractiveness. This highlights the potential need for a detailed definition of these criteria to improve understanding between human experts and AI.

The last research objective was a formulation of a framework that can be used in future research. The framework was designed in the second part of Section 4. The framework was designed using the experiences from the research process. The process involves the preselection of start-ups, independent valuation by humans and AI, comparison and review of results, update of valuation, and finally, the provision of the start-up's rank. The framework allows for flexibility, as the used valuation criteria can be adapted based on specific needs.

In retrospect, although the research has provided insightful findings and proposed a useful framework, further research is recommended to fully implement and test this new framework. As this framework combines the strengths of human cognition and AI capabilities, it holds significant potential for robust start-up evaluation in the future. The implication is clear: in start-up evaluation, the harmonious blending of human expertise and AI can offer nuanced, insightful, and balanced perspectives.

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FRAMEWORK PRO OCEŇOVÁNÍ DIGITÁLNÍCH STARTUPŮ POMOCÍ UMĚLÉ INTELIGENCE A FUZZY MNOŽIN

Tento článek představuje inovativní framework pro hodnocení investic do digitálních startupů pomocí fuzzy množin. Framework zohledňuje odborné znalosti zakladatele, prodejnost produktu, finanční zdraví a přítomnost v sociálních médiích jako hodnotící kritéria. V rámci výzkumu byly analyzovány čtyři české digitální startupy, a to jak lidskými experty, tak s využitím umělé inteligence. Každý startup byl ohodnocen na pětibodové stupnici, přičemž výsledky byly porovnány s žebříčkem FAST 50 společnosti Deloitte. Hodnocení AI a lidských expertů se lišilo, přičemž lidé kladli větší důraz na zkušenosti zakladatele a atraktivitu produktu. Článek navrhuje framework, který interaktivně kombinuje hodnocení lidskými experty a umělou inteligencí.

EIN FRAMEWORK FÜR DIE BEWERTUNG DIGITALER START-UPS UNTER VERWENDUNG KÜNSTLICHER INTELLIGENZ UND FUZZY-SETS

In diesem Beitrag wird ein innovativer Rahmen für die Bewertung digitaler Start-ups und kleinerer Unternehmen unter Verwendung eines Fuzzy-Set-Ansatzes vorgestellt, der die Expertise des Gründers, die Marktfähigkeit des Produkts, die finanzielle Gesundheit und die Präsenz in den sozialen Medien berücksichtigt. Vier tschechische digitale Start-ups wurden sowohl von menschlichen Experten als auch von einem Modell der künstlichen Intelligenz analysiert. Unter Verwendung einer unscharfen additiven Verhältnisbewertung wurde jedes Start-up auf einer Fünf-Punkte-Skala bewertet und die Ergebnisse mit dem FAST 50-Ranking von Deloitte verglichen. Die Ergebnisse wurden mit dem FAST 50-Ranking von Deloitte verglichen. Die Bewertungen der künstlichen Intelligenz und der Menschen unterschieden sich, wobei die Menschen mehr Wert auf die Erfahrung des Gründers und die Attraktivität des Produkts legten. Die Studie schlägt einen Bewertungsrahmen vor, der sowohl menschliche als auch KI-Expertise für den interaktiven Vergleich und die Aktualisierung umfasst. Der Artikel unterstreicht den Wert der KI bei der Bewertung von Start-ups und betont die Notwendigkeit, menschliche und künstliche Intelligenz bei der Entscheidungsfindung zu vereinen.

FRAMEWORK DO WYCENY START-UPÓW CYFROWYCH Z WYKORZYSTANIEM SZTUCZNEJ INTELIGENCJI I ZBIORÓW ROZMYTYCH

Niniejszy artykuł przedstawia innowacyjny framerok do wyceny inwestycji w cyfrowe start-upy przy użyciu zbiorów rozmytych. Framework uwzględnia jako kryteria oceny merytoryczną wiedzę założyciela, zbywalność produktu, kondycję finansową i obecność w mediach społecznościowych. W ramach badań przeanalizowano cztery czeskie start-upy cyfrowe, wykorzystując w tym celu zarówno ludzkich ekspertów, jak i sztuczną inteligencję. Każdy start-up oceniono w pięciopunktowej skali, a wyniki porównano z rankingiem FAST 50 firmy Deloitte. Oceny AI i ludzi różniły się, przy czym ludzie kładli większy nacisk na doświadczenie założyciela i atrakcyjność produktu. W artykule zaproponowano framework, który interaktywnie łączy ocenę przeprowadzaną przez ludzkich ekspertów i sztuczną inteligencję.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE ACCOUNTING SUBJECT CURRICULUM

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Abstract

This article looks at how artificial intelligence affects the teaching of accounting in secondary schools. The article is divided into three parts. The first part of the article is devoted to literature research on the topic of the implementation of artificial intelligence in the curriculum within the subject of accounting. In the second part of the article, the methodology for the implementation of the author's own research is described. The third part of this article deals with the research itself, whether artificial intelligence is implemented in the curriculum of secondary schools, within the subject of accounting. The pupils are already preparing for their future profession in schools, which has already moved forward thanks to the implementation of artificial intelligence. 43 respondents participated in the research that was conducted in two secondary schools where the subject of Accounting is taught.

Keywords

Artificial intelligence; Curriculum; Accounting subject; Students; High school.

Introduction

Artificial intelligence is one of the most important technologies of the future, in which machines imitate human actions [1]. Artificial intelligence is experiencing greater utilisation in many professions, and it is, therefore, necessary to change the curriculum for education in these professions due to this fact.

After entering the 21st century, economic globalization is unstoppable. The traditional accounting teaching system is in conflict with the current market demand [2]. It is, therefore, necessary to re-evaluate the way in which we prepare students for the accounting profession as part of teaching.

It is clear that artificial intelligence is becoming an essential part of the accounting profession, so it is crucial that students are introduced to it early in their education.

The development and use of artificial intelligence technologies continues to expand in accounting practice, industry, and government, however, the introduction of artificial intelligence to students within the subject of accounting lags behind [3]. Curriculum updates and the incorporation of artificial intelligence into teaching are essential to equip future accountants with the necessary skills and knowledge in the profession.

In the accounting profession, artificial intelligence can significantly improve the efficiency and accuracy of accounting tasks. This allows accountants to complete tasks faster and more

accurately, leading to increased productivity and cost savings for companies. Thus, it is necessary for students to become familiar with the tool of artificial intelligence already in school classes and to be prepared for the use of this tool in the profession [4].

It is clear that artificial intelligence is a key element of the future, and educational institutions should be prepared to provide students with the skills and knowledge needed to work effectively with this technology. Thanks to this, graduates will be better prepared for work in the accounting profession.

1 Literary Research

Artificial intelligence is the ability of machines to imitate human abilities, which include reasoning, learning, planning or creativity [6]. Artificial intelligence is one of the most current topics discussed in connection with the EU Digital Single Market. Artificial intelligence is a part of people's everyday life. It offers many opportunities that affect, for example, the labor market, the education system, or the structure of industry and investment [7]. Artificial intelligence mostly takes the form of a computer program and is designed to solve tasks that previously required human intellect [8].

In accounting practice, for example, it is possible to use artificial intelligence to monitor accounting books and eliminate errors in records [9]. Artificial intelligence can also be used in auditing, financial and managerial accounting, taxation, and state administration. Therefore, it would be good to include the subject of artificial intelligence within the curriculum so that students get to know about artificial intelligence before they encounter it in practice [3].

Accounting education in schools must be updated to equip graduates with the skills and knowledge of artificial intelligence that is impacting the accounting profession. This may include implementing artificial intelligence courses in the accounting curriculum, emphasizing data analysis and critical thinking, and promoting interdisciplinary education that bridges the gap between accounting and technology [4].

It is possible to use virtual reality to build a practical platform within managerial accounting. This allows students to virtually simulate real accounting [2].

A study was conducted to present accounting professionals' perspectives on the impact of AI adoption and associated risks on the accounting profession. The survey data suggest that participants have a positive perception of artificial intelligence due to the fact that it reduces repetitive tasks and the risk of human error. Participants also believe that the development of artificial intelligence will change the teaching of Accounting in schools to include specialized computer skills. Public accountants in companies claim that it is essential that students for accounting positions come with changes in the profession [5].

2 Methodologies

A form of quantitative research was conducted to obtain the necessary data as part of the research implementation. A questionnaire survey was used as a data collection technique. The survey was conducted in the form of a questionnaire through the Survio program. The questionnaire was sent to respondents by e-mail. The data from the questionnaire survey was initially analyzed and then graphically processed and interpreted.

The questionnaire was designed to answer the following research questions (RQ):

RQ1: *Do students in the selected secondary schools learn about artificial intelligence, automation of accounting processes, digitalization, or robotization within the Accounting subject?*

RQ2: *Are students in the selected secondary schools interested in the future development of Accounting with regard to evolving automation, robotics, and artificial intelligence?*

RQ3: *Are students in the selected secondary schools concerned about the implementation of robots in the accounting profession?*

RQ4: *Do students in the selected secondary schools think that artificial intelligence can replace the human work of accountants?*

3 Own Research

As part of the research, 43 respondents, students of two secondary schools where the Accounting subject is taught, were approached. The research was carried out within the Hradec Králové and Liberec regions. Students took part in the survey.

Based on the findings presented in Figure 1, it can be concluded that none of the respondents were taught about artificial intelligence, automation of accounting processes, digitisation, or robotization as a part of their Accounting subject in school. This is a concerning outcome that highlights a significant gap in the current curriculum. It clearly suggests the need for improvements in the curriculum to keep pace with the technological advancements in the field of accounting.

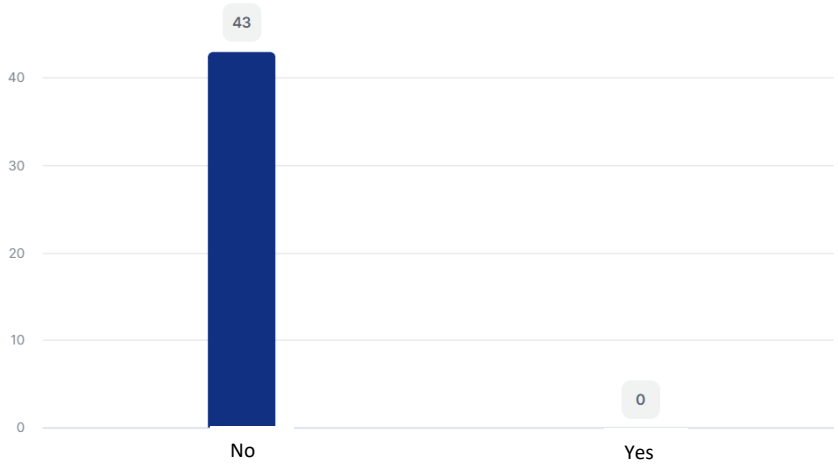

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Fig. 1: *Teaching the automation of accounting processes, digitization or robotization in the subject of Accounting*

From Figure 1, it follows that all respondents answered that they do not learn about artificial intelligence, automation of accounting processes, digitisation, or robotization at school as part of the Accounting subject.

As can be seen from Figure 2, out of 43 respondents, 33 students showed no interest in the future development of accounting with regard to developing automation, robotization and artificial intelligence. Only 10 respondents expressed their interest in future developments in accounting. The lack of interest among most students is remarkable and raises questions about the factors contributing to this disinterest. One of the factors may be ignorance. If students were introduced to the topic of artificial intelligence, automation and robotization in their classes, they would be more likely to take an interest in the future development of accounting. This would also enable them to understand the importance of these technologies in their future profession better. Another possible factor could be a lack of interest in the topic itself.

It is possible that the students who participated in the survey may want to pursue a profession other than accounting and therefore are not interested in this topic.

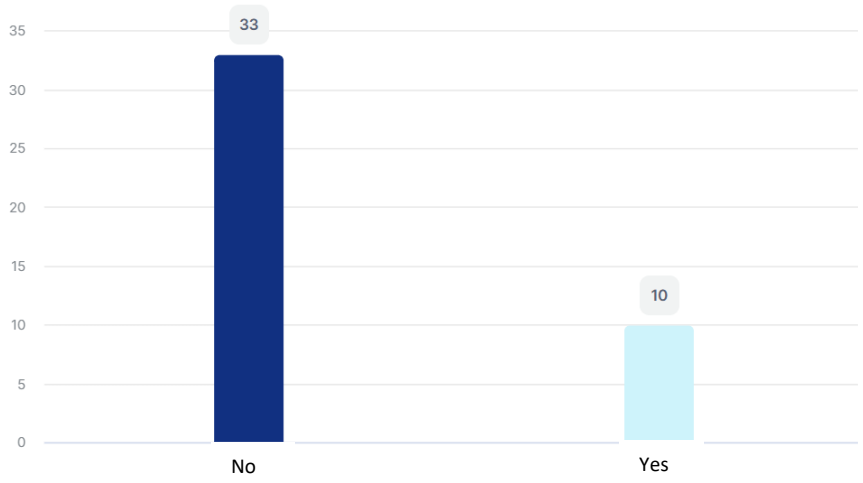

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Fig. 2: *Students' interest in the future development of Accounting*

As depicted in Figure 3, out of the 43 students surveyed, 15 respondents expressed their worries about the potential impact of robots on their future accounting profession. This finding may signify a lack of understanding of how artificial intelligence could enhance their jobs as accountants. Discussing the benefits of working with artificial intelligence could help allay such fears and create a more optimistic outlook. By doing so, accountants can learn how to optimize their work with AI to improve efficiency and improve efficiency and productivity.

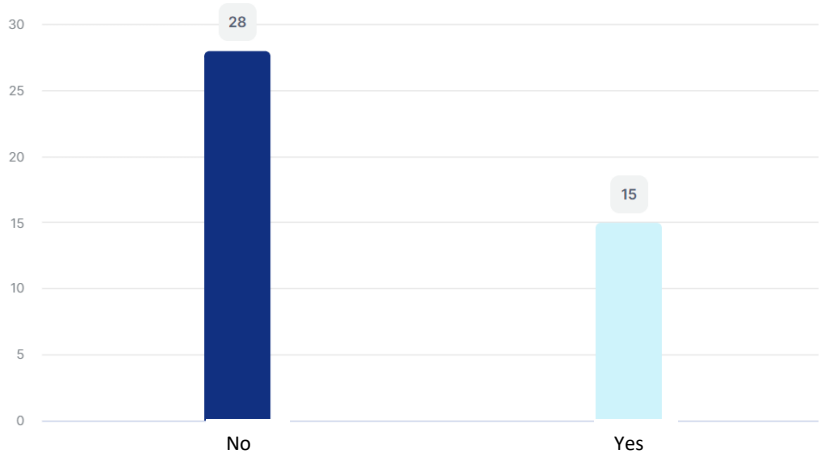

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Fig. 3: *Students' concern about the implementation of robots in the accounting profession*

The results of the survey in Figure 4 indicate that 36 of the students surveyed believed that artificial intelligence could partially replace human accountants, mainly by assisting in routine tasks. Meanwhile, six students answered that AI could fully replace human accountants, and only one respondent said that AI could not replace human accountants at all.

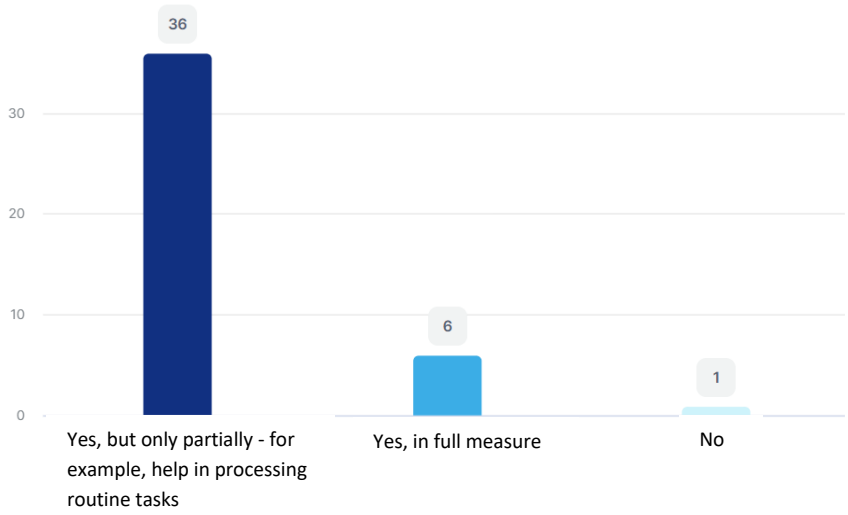

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Fig. 4: *Substitutability of the human work of accountants with artificial intelligence*

Conclusion

The research questions were answered as part of the conducted research. It was found out that students in the selected secondary schools do not learn about artificial intelligence, automation of accounting processes, digitization or robotization within the Accounting subject. Furthermore, it was found out that 33 surveyed students were not interested in future developments in accounting, with regard to developing automation, robotization, and artificial intelligence in the accounting profession. On the contrary, 10 surveyed students showed interest in the development of accounting. As part of the third research question, it was found out that 15 surveyed students were concerned about the implementation of robots in the accounting profession. The remaining 28 students are not worried about this implementation. Through the implementation of the research, it was further discovered that 36 surveyed students think that artificial intelligence can replace the work of accountants, but only partially. This means, for example, the processing of routine tasks. Accountants will thus be able to focus on more important tasks and be more productive. 6 of the surveyed students further answered that artificial intelligence can fully replace human work in accounting, and only one student answered that artificial intelligence cannot replace the work of accountants.

The study shows that neither of the chosen schools includes teaching artificial intelligence in their Accounting subject. It is possible that students' lack of interest in future accounting developments is due to this. If schools introduced topics on artificial intelligence, automation, and digitization in Accounting, students could learn how these technologies can help them in their future accounting careers. The findings suggest a significant need to revise the Accounting curriculum and integrate AI-related topics. This will help bridge the gap between current education and the evolving demands of the accounting profession. In conclusion, the current education in Accounting at secondary schools lacks integration of AI-related topics, which could result in students graduating without the key knowledge required for future accounting job challenges.

I recommend organizing professional training for teachers in secondary schools, which would familiarize them with modern technologies in the field of accounting. This would enhance their ability to incorporate these topics into their teaching activities. To make the training more practical, it would be beneficial to connect theoretical teaching with real-life examples

of AI usage in accounting. This would provide students with a better understanding of how these technologies are implemented in practice.

The research was conducted only in the Hradec Králové and Liberec regions, which limits the generality of the results. I recommend expanding the geographical scope of the research to other regions to obtain more comprehensive and representative research results. Also, the research focused only on students and did not include the perspective of teachers, who have a key role in educating future accountants. Future research should incorporate teachers' opinions and observations to enable a more comprehensive assessment of the state of teaching and more beneficial suggestions for changes in educational programs.

The research focused on students' awareness of AI in teaching rather than its practical use in accounting. Future research could be aimed at assessing the actual implementation of AI in the work environment of accountants. This analysis would provide a deeper understanding of how AI technology is being utilized in professional practice. An evaluation of the specific tools and techniques used in practice would offer valuable knowledge for designing the teaching curriculums in secondary schools for the subject of Accounting.

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Ing. Pavlína Petrová

DOPAD UMĚLÉ INTELIGENCE DO UČEBNÍCH OSNOV PŘEDMĚTU ÚČETNICTVÍ

Tento článek se zabývá tím, jak umělá inteligence ovlivňuje výuku předmětu Účetnictví na středních školách. Článek je rozdělen do tří částí. První část článku se věnuje literární rešerši k tématu implementace umělé inteligence do učebních osnov. V druhé části článku je popsána Metodologie pro realizaci vlastního výzkumu. Třetí část tohoto článku se zabývá vlastním výzkumem, zda je umělá inteligence implementována do učebních osnov na středních školách v rámci předmětu Účetnictví. Žáci se tak připravují již ve školách na svou budoucí profesi, která se již díky implementaci umělé inteligence posunula dopředu. Výzkum byl proveden na dvou středních školách, kde se vyučuje předmět Účetnictví a zúčastnilo se ho 43 respondentů.

DER EINFLUSS KÜNSTLICHER INTELLIGENZ AUF DEN LEHRPLAN DES FACHS RECHNUNGSWESEN

In diesem Artikel wird untersucht, wie sich künstliche Intelligenz auf den Buchhaltungsunterricht an weiterführenden Schulen auswirkt. Der Artikel ist in drei Teile gegliedert. Der erste Teil des Artikels widmet sich der Literaturrecherche zum Thema Implementierung künstlicher Intelligenz im Lehrplan im Fach Rechnungswesen. Im zweiten Teil des Artikels wird die Methodik zur Umsetzung eigener Forschung beschrieben. Der dritte Teil dieses Artikels befasst sich mit der Forschung selbst, ob künstliche Intelligenz im Lehrplan weiterführender Schulen im Fach Rechnungswesen implementiert ist. Die Schüler bereiten sich bereits in den Schulen auf ihren zukünftigen Beruf vor, der dank der Implementierung künstlicher Intelligenz bereits vorangekommen ist. Die Untersuchung wurde an zwei weiterführenden Schulen durchgeführt, an denen das Fach Rechnungswesen unterrichtet wird, und 43 Befragte nahmen daran teil.

WPŁYW SZTUCZNEJ INTELIGENCJI NA PROGRAM NAUCZANIA PRZEDMIOTU RACHUNKOWOŚĆ

W artykule omówiono wpływ sztucznej inteligencji na nauczanie rachunkowości w szkołach średnich. Artykuł podzielony jest na trzy części. Pierwsza część artykułu poświęcona jest na analizę stanu badań w zakresie wdrażania sztucznej inteligencji w programie nauczania przedmiotu Rachunkowość. W drugiej części artykułu opisano Metodologię realizacji badań własnych. Trzecia część artykułu dotyczy samych badań, czy sztuczna inteligencja jest uwzględniana w programach nauczania szkół średnich, w ramach przedmiotu Rachunkowość. Sami uczniowie już w trakcie edukacji szkolenj przygotowują się do przyszłego zawodu, który bardzo rozwinął się dzięki wdrożeniu sztucznej inteligencji. Badania przeprowadzono w dwóch szkołach ponadgimnazjalnych, w których nauczany jest przedmiot Rachunkowość i wzięło w nich udział 43 respondentów.

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BUILDING THE ENVIRONMENTAL AWARENESS OF THE UNIVERSITY: AN EXAMPLE OF THE MATEJ BEL UNIVERSITY

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Abstract

The article extends existing research on the issue of environmental awareness in the tertiary education space. The aim of the article is to identify relevant activities for building the university's environmental identity and environmental awareness in the European area. The results of the research confirmed that the 17 Sustainable Development Goals (SDGs) established by the United Nations are being used in selected public universities, with activities focusing mainly on emissions, water, energy, food, waste reduction and recycling, finance, transportation, social responsibility, sustainability policies and strategies, and student/employee participation. The questionnaire survey showed that the topic of green activities at Matej Bel University in Banská Bystrica (MBU) for employees is very important or important. Experts generally consider the most important strategic documents that reflect the current and future situation and respond to the idea of sustainable development for future generations, cooperation with other institutions and organizations, including active participation in environmental awareness-raising activities.

Keywords

Public universities; Green university; Sustainable development; Questionnaire survey.

Introduction

Tertiary education institutions face constantly changing student preferences and demands, changing employer expectations, and changing societal expectations. It is, therefore, necessary to monitor not only the reactions of target groups (i.e., customers (students, alumni), employees, public) [1] and competitors but also the environment itself. The culture of an educational institution can be considered as part of a marketing approach to identity building. The main objectives of universities and colleges inherently include branding and identity building, which is an important marketing communication tool across the entire spectrum of society. According to Untermüller [2], branding differentiates a university of higher education from others, builds an image, and at the same time strengthens the quality of educational services. Quality branding helps draw attention to key areas that help identify and create unique areas for the institution. It also contributes to building identity, image, trust, and social value. Finally, it contributes to creating a strong sense of belonging to the academic community as a staff member, student, alumnus, and also as a partner or supporter.

Activities that are increasing in importance over time are socially responsible activities. They are related to the social aspect of education, as Drucker's [3] stance on the marketing of tertiary education institutions is also that they aim to make a difference to individuals and

society. They fulfill the function of an educational institution as such, providing new knowledge in the context of scientific research activities and, at the same time, fulfilling an important function as a cultural and socially creative agent. This function can also be described as a 'third mission', which it fulfills through various types of volunteering, cultural, sporting, and socially beneficial activities which, among other things, enhance its reputation, overall image, attractiveness, and brand credibility. Currently, within the framework of socially beneficial activities focused on sustainable development and increasing environmental awareness, the main material for tertiary education institutions is “The 2030 Agenda” set by the United Nations [4]. An important aspect of sustainable development is its ability to ensure the responsible use of resources, both environmentally and socially, while also supporting economic growth.In the last period, offline activities of tertiary education institutions have become more marginalized compared to online activities. In this way, public universities are also eliminating visual smog and, at the same time, saving the environment by using more sustainable materials in the production of promotional materials. Related to this is the issue of socially responsible activities, which include not only environmental activities but also other activities that have a positive impact on society.

In the following sections, the article is organized as follows. Chapter 1 contains the literature review; Chapter 2 contains the aim of the article; Chapter 3 focuses on describing and explaining the methodological aspects of the article; Chapter 4 discusses the research results obtained; the last section contains the discussion and summarizes the conclusions of the article.

1 Literature Review

Effective strategic planning and brand identity management require more today, which means that tertiary institutions that create and present a unified brand message, experience, and environment achieve a competitive advantage in attracting, retaining, and building loyalty and environmental awareness among their target audiences. Brand building and market intelligence gathering are identified by Moogan [5] as a necessary routine practice of tertiary education institutions. Zollo et al. [6] argue that the provision of real-time information through social networks and a better understanding of consumers through the information institutions glean from them are particularly beneficial for creating brand value. Based on research results, up to 93% of authors consider the institution as a brand, a statement that can be described as an appearance rather than an objective truth [7]. Over time, the initiative of tertiary institutions in branding and awareness is increasing, as is the investment of time and money in creating strong institutional brands. This is increasingly important to reach out to a diverse student/employee base and differentiate themselves from competitors. It also serves as an indicator of the underlying quality of service provision and performance and is, therefore, extremely important for the development of (commercial and institutional) partnerships.

Hanover Research [8] stresses the importance of a multichannel marketing communication strategy, i.e., both online and offline. Tertiary education institutions operate under market conditions, and it is therefore increasingly important to use tools that are more sophisticated. This involves communication not only through offline activities and channels but also through electronic, i.e., online communication. Based on in-depth interviews with representatives of public and private universities, the authors Hall and Witek [9] concluded that the main determinant influencing the identity and branding of tertiary education institutions is the development of information technology and the growth in the use of the Internet, as it is an important source of information for young consumers. Research shows that social networks are currently the dominant marketing channel.

Environmental awareness-raising activities carried out in the online space, which includes the institution's website (separate section or separate website), communication through social networks, other websites, as well as other various forms, can be considered a necessity, as they are becoming more and more important in the time of global digitalization and informatization. Despite the complexity of their creation and processing, users can access information quickly and conveniently. Social networks are of particular importance in digital communication as one of the marketing channels of institutions. In marketing activities, social media plays a vital role because of customer acquisition and individual relationship building [10, 11]. Semerádová and Weinlich, [12] state that by using broad content-sharing capabilities, social media allows to strategically expand the customer base and reach a well-defined target group with minimal costs, which is most likely to be interested in the services and information offered. Target audiences tend to seek information about products online, and their attitudes toward products and brands are increasingly shaped by social networks [13]. As part of building a university's environmental identity and awareness, marketing channels can be used to reach out and provide engaging information, including direct communication with target audiences. The institution's website is a key part of online communication and should be intuitive and clear. It provides a reliable and relevant source of information from the perspective of all target groups. It is important to link it to social networks, which create support for the dissemination of information [14].

In the third mission, adherence to the principle of sustainable development is an integral part of ensuring the life of future generations. Sass et al. [15] define relevant knowledge, willingness, and self-efficacy (confidence in individual or collective capacities to perform the action) as necessary skills for contributing to sustainable development Today, one of the major trends in sustainability is environmental marketing, and the concept of a so-called “green university” represents a new challenge and opportunity for socially responsible marketing of tertiary education institutions. Implementing socially responsible measures to reduce the carbon footprint is consistent with promoting coherence in the governance of tertiary education and in the framework of sustainable resource management [16].

The United Nations [4] described sustainable development as complex problems that combine interrelated aspects from different areas (five Ps): Planet, People, Peace, Prosperity, and Partnership. Today, in the field of Sustainable Development, one of the most significant debates is the necessary incorporation of the 17 Sustainable Development Goals from the 2030 Agenda created by the United Nations in education and, specifically, in tertiary education institutions. Most studies focused on the issue of sustainable development are published by European and Latin American universities [17]. The results of the study focused on the implementation status of The 2030 Agenda sustainable development goals in Poland by Raszkowski and Bartniczak [18] indicate that the problems of today should be solved in a manner that ensures sustainable material and social and environmental foundations for further development. Engaging in socially responsible activities that support sustainable development has been shown to bring many positive benefits and advantages. Musova [19] cites the most common examples such as allocating resources more efficiently and increasing productivity; improving image and awareness; building brand and trust; streamlining customer relationships; increasing attractiveness to donors; improving human resource management; creating innovative solutions; and gaining a specific competitive advantage. The mission of tertiary education institutions is to spread democratic values in society, upholding the ideals of freedom, prosperity, solidarity, and social cohesion. Based on the results of the study by Cebrián et al. [20], there are a number of limiting factors regarding the building of environmental identity and awareness at educational institutions, such as staff and student engagement, lack of resources, government support, and an overcrowded curriculum.

Education is proving to be an important determinant in influencing people's environmental thinking, as well as the actions of corporations and public administrations. This is precisely why there is a need for effective professional development frameworks and programs that will help develop sustainability competencies and help operationalize the leadership of sustainability education at universities.

Empirically based tools for mapping environmental awareness and identity within school organizations, according to Verhelst et al. [21], are not readily available, which is both a cause and a consequence of the scarce empirical and quantitative research on school organizations and education for sustainable development. Identity is suggested to have profound environmental implications [22]. In the context of environmental awareness in tertiary education institutions and related education for sustainable development, the opinion of students and employees is an important determinant. One of the most common approaches to identifying the level of environmental awareness and identity is a questionnaire survey [23, 24, 25]. The results of selected studies prove that the questionnaire survey is a valid and reliable instrument for research and practice in education for sustainable development. Expertise from experts in this field is also an approach used to obtain opinions and attitudes within the framework of the issue of sustainable development and environmental awareness. Those in synergy with the results of the questionnaire survey can provide a comprehensive view not only from the inside but also from the outside of the institution. In the study, the authors of [26] investigated the opinions of experts on the environment in Hungary. The results show that current environmental awareness initiatives are not satisfactory, but an engaged society can influence decision-makers to strengthen the goals through top-down regulations.

2 Aim of the Research

The aim of the article is to identify relevant activities for building the university's environmental identity and environmental awareness in the European area. The findings are supplemented by the results of a questionnaire survey focused on the employees of the selected university and the expertise of selected experts.

3 Methodology

To identify and investigate activities that help to build the environmental awareness of universities at home and abroad it is necessary to establish selection criteria that confirm their suitability for comparison with the selected public university operating in the Slovak Republic Matej Bel University in Banská Bystrica (MBU). The selection criteria are as follows:

1. university status,
2. geographic definition,
3. active participation in environmental activities/projects,
4. similarity in the institution's size, time history, or curriculum portfolio.

The first criterion for selecting universities is their status. All selected universities are classified as public due to the significant differences between public and private tertiary education institutions. The geographical definition refers, in particular, to the condition of a public university being located in the European area. Within the selected countries, the selection of areas that are not located only in metropolitan areas is also an important aspect. The criterion for such a selection applies to the conditions of MBU that does not operate in a metropolitan area. Similarly, the fact that public universities in selected countries place an emphasis on environmental activities plays an important role in the selection according to geographical delimitation, which also implies a third criterion. To ensure a fair comparison,

we have chosen public universities that have similar characteristics to MBU in terms of size, time history, and study programs. We have focused on finding universities that meet at least one of these criteria, with a particular emphasis on the similarity of their study program portfolio to that of MBU.

Table 1 lists selected public universities, including available information on geographic boundaries, year of establishment, and approximate number of students. A higher number of the selected public universities are located in Slovakia, the Czech Republic, and Poland. The total number of selected public universities, including the MBU, is 24, with the sample consisting of 12 countries located in the European area.

Tab. 1: *Selected public universities in the European area, including basic information*

Name of the public university	Country	Year of establishment	Number of students
Matej Bel University in Banská Bystrica	Slovakia	1992	6 987
Pavol Jozef Šafárik University in Košice	Slovakia	1959	7 511
University of veterinary medicine and pharmacy in Košice	Slovakia	1949	2 281
Catholic University in Ružomberok	Slovakia	2000	3 259
Charles University in Prague	Czech Rep.	1348	56 000
Masaryk University	Czech Rep.	1919	33 492
Palacký University Olomouc	Czech Rep.	1573	18 673
University of Warsaw	Poland	1816	43 000
Wroclaw University of Environmental and Life Sciences	Poland	1951	8 000
Lodz University of Technology	Poland	1945	15 000
University of Gdansk	Poland	1970	21 958
Paris Lodron University of Salzburg	Austria	1622	18 000
University of Graz	Austria	1585	29 660
University of Oldenburg	Germany	1973	16 244
University of Bayreuth	Germany	1975	12 969
University of Jaen	Spain	1993	14 200
University of Bath	Great Britain	1971	19 926
University of Hull	Great Britain	1927	16 000
University of Essex	Great Britain	1964	17 800
Örebro University	Sweden	1977	16 000
Aalborg University	Denmark	1974	19 400
Nord University	Norway	2016	11 000
University of Trás-os-Montes and Alto Douro	Portugal	1986	7 000
University of Limerick	Ireland	1972	16 000

Source: Own, 2023

The main internal documents for comparison of the selected universities in the analysis are strategic materials, long-term plans of the universities, design manuals, action plans within the framework of various campaigns, or areas of awareness building of individual public universities.

The questionnaire survey was aimed at finding out the current state of the perception of environmental awareness of MBU employees. The questions aimed at MBU staff are based on the specificities of the environment in which the institution operates. It also includes questions derived from secondary research, i.e., examples of good practice from selected public universities in the European area. Its 15 questions include demographic data (e.g., age, gender), data related to status within the institution under study (i.e., classification, tenure within the components of the institution), data within the context of environmental awareness issues, as well as space for respondents' insights and ideas for improving sustainability within the institution. It was carried out on a sample of 94 respondents. Due to the total number of responses from the respondents, this questionnaire survey cannot be described as a statistically representative sample concerning the total number of employees at MBU. The sample size was affected by a hacking attack that forced MBU to suspend electronic systems. We therefore consider it a "pilot" survey, the results of which provide an initial insight into the internal environment concerning building environmental awareness at MBU. The questionnaire was distributed to all UMB employees, i.e., teaching (61%) and non-teaching (39%). Of the total respondents, by gender, 72% of the responses came from females and 28% from males. In terms of age, two groups have a significant representation in the questionnaire survey. The first is 31-45 years old (40% of respondents), and the second age group is 46-60 years old (38% of respondents). An interesting indicator is the fact that more than half of the responses come from employees who have been at the MBU for more than 10 years. This article focuses on the analysis of selected questions in relation to the findings of the current situation. To complement the results of the questionnaire survey, the article also contains the answers of experts from selected public universities operating in the Slovak Republic.

Another approach to obtaining opinions and attitudes regarding the issue of sustainable development and environmental awareness is interviews with experts in this field. They were selected not only based on their expertise but also because of the focus of the institutions on green activities where they work (i.e. public universities, regional and state institutions, private sector). A total of 9 experts from the public universities were surveyed, as well as selected institutions (Pavol Jozef Šafárik University in Košice; Catholic University in Ružomberok; Slovak University of Agriculture in Nitra; University of Warsaw; Lodz University of Technology; Banská Bystrica Self-Governing Region; State Nature Conservancy of the Slovak Republic; Slovak Environment Agency; MIRUMACO, s.r.o. – Corporate Social Responsibility, ESG, etc.). The questions for the experts focused on the communication strategy of the institutions in which the experts work, as well as on examples of good practice, implementation of environmental activities, staff training, and raising environmental awareness within the institution, including evaluation of the success of the implemented activities. The experts were able to express their views on the vision and recommendations for a public university operating in the conditions of the Slovak Republic. The results of the expertise are included in the discussion section, as they complement the secondary research conducted as part of the comparison of universities in the European area, as well as the questionnaire survey.

4 Results

Secondary research has shown that many public universities in the European area have their own strategy for reducing the environmental impacts resulting from the operation of the institution. Based on a survey of selected public universities, Table 2 provides an overview of collaborations or projects that aim to build environmental identity. It also includes information on whether the public university has a strategy or plan for environmental activities, including selected examples of best practices.

Tab. 2: *Comparison of selected public universities in countries of the European area in the field of green activities*

Name of the public university	Cooperation / projects	Plan / strategy	Staffing	Examples of best practices
Matej Bel University in Banská Bystrica	Race to zero	✓	✗	-
Pavol Jozef Šafárik University in Košice	Race to zero	✓	✓	questionnaire survey
University of veterinary medicine and pharmacy in Košice	Race to zero	✗	✓	advice; manuals
Catholic University in Ružomberok	Race to zero	✗	✗	-
Charles University in Prague	2030 Agenda	✓	✓	podcast
Masaryk University	2030 Agenda	✗	✓	#munisaves
Palacký University Olomouc	2030 Agenda	✓	✓	Freeshop; Freefood; Ridesharing
University of Warsaw	Race to zero	✓	✓	-
Wroclaw University of Environmental and Life Sciences	Race to zero; EU GREEN	✗	✓	EU GREEN
Lodz University of Technology	Race to zero	✗	✓	questionnaire survey
University of Gdansk	2030 Agenda	✗	✓	Centre for Sustainable Development
Paris Lodron University of Salzburg	PLUS Green Campus; Salzburg 2050; EMAS	✓	✓	podcast
University of Graz	2030 Agenda; EMAS; ÖKOPROFIT	✗	✓	approach to carbon management
University of Oldenburg	HochNiNa; KSG; NKlimaG; FFF process	✓	✓	report creation
University of Bayreuth	2030 Agenda	✓	✓	Green Campus
University of Jaen	2030 Agenda	✓	✗	sustainable transport plan
University of Bath	Race to zero	✓	✓	Climate Action Team
University of Hull	Race to zero	✓	✓	approaches to environmental innovations
University of Essex	own initiative	✓	✓	more sustainability teams
Örebro University	2030 Agenda	✓	✓	development of an action plan, individual activities
Aalborg University	2030 Agenda	✓	✗	report creation
Nord University	2030 Agenda	✓	✓	-
University of Trás-os-Montes and Alto Douro	2030 Agenda	✓	✗	strategy development
University of Limerick	2030 Agenda	✓	✗	report creation

Source: Own, 2023

One of the determinants for the selection of public universities for research was active participation in environmental activities/projects. Within the institutions studied, 46% are involved in The 2030 Agenda initiative set by the United Nations [4]. Another initiative that is more strongly represented (38%) is Race to Zero, in which MBU is also involved. In addition to the above, the public universities created their own initiatives as well as

memberships in various partnerships that make it possible to more effective raise of environmental awareness and make institutions carbon neutral.

In terms of developing a specific strategy/plan to achieve carbon neutrality, 71% of the surveyed public universities operating in the European area have such a document. We consider staffing within the studied issue to be an important determinant of the success of the path to carbon neutrality and environmental awareness raising. The results of the research confirm this statement, as only a quarter of the institutions surveyed do not have explicitly designated staff to secure this agenda at the university as a whole. Within the results of the issue of raising environmental awareness in selected public universities in the European area, the secondary research also focuses on examples of best practices. Based on these examples of best practices, it is possible to expand the current portfolio of activities and tools for promoting environmental awareness at the MBU.

4.1 The Environmental Awareness at the Matej Bel University

In the article, as an example of building environmental identity, the MBU was the first tertiary education institution in Slovakia to commit to carbon neutrality by 2050 at the latest as part of the Race to Zero campaign. By joining this campaign, MBU sends a clear signal that it cares about the future of our planet and wants to positively influence the thinking of society through its actions.

The specific steps of MBU to build an environmental identity are based on the findings of the literature research and the international-scale findings based on the review of public universities outlined in the research methodology.

Over the past period, MUB has begun to build an environmental identity using the following tools and activities:

- Logo and motto of Green MBU,
- The Green University website.

The green MBU logo is captured in the MBU Design Manual, which was redesigned in 2023. At the same time, the green MBU logo is consistent with the MBU's Long Term Plan, specifically in its mission and vision.

MBU's [27] Long-term goal 2021-2026 defines the main mission of the university as

> *"to create and disseminate knowledge that protects, strengthens, and develops democratic and humanistic values and contributes to the solution of societal challenges in the 21st century. In fulfilling our mission to be an open, dynamic, and intercultural institution that provides education and advances science, research, innovation, culture, and the arts, we respect the fundamental values of freedom, democracy, the rule of law, respect for human rights, and sustainable development that underpin our work."*

MBU is in its third decade in the 21st century. The university aims to become the most important actor in the field of education, science, research, and culture in the Central Slovakia. It strives to be a unique and irreplaceable university among Slovak universities, and an internationally recognized center of education, science and research in the social sciences, humanities, and natural sciences. MBU is an open university reflecting the principles of diversity, equality, and inclusiveness, respecting the freedom of scientific research in the spirit of the principles of academic ethics. It provides superior conditions for all its employees to realize, apply, and develop their abilities while protecting the rights of socially and medically disadvantaged persons. It is a strategic partner with significant social responsibilities,

protecting the values of freedom, democracy, equality, and cultural diversity, promoting intercultural dialogue, and respecting the principles of environmental protection in all its activities.

In the case of the motto, most universities use the green color or the abbreviation “eco” as the basis for their motto, and MBU is no exception. The motto of the MBU is taken from the communication motto, which is distinguished by the green color of the heart, which is the supporting symbol of the motto (originally red). It refers to the regional location of the university and Slovakia in the European space. The motto is related to the main idea of the university identity and we consider it as one of the important elements that represent the university outwards but also inwards. The importance of mottos, word phrases, or quotes has been confirmed in research by other selected universities, especially in communicating their activities outward from the institution, as Table 2 confirms.

As reported in the literature, Hall and Witek [9] concluded that the main determinant influencing the identity and branding of a tertiary education institution is the development of information technology and the growth in the use of the Internet. The MBU, over the last period, has also increased the rate of use of the web interface for its activities, not excluding the university's environmental activities. To build its identity mainly through offline activities, MBU has been strongly influenced by the COVID-19 pandemic, the increase in the energy efficiency of buildings, which has affected the flow of funds, and also by the process of digitization.

The MBU’s website is designed in the university colors and it includes the MBU’s communication logo, which reflects the university's identity. The web interface uses predefined formatting, coloring, alignments, tables, fonts, forms, links, attachment labels, event structure, banner areas, etc., which are identical for all pages, subpages, and language versions of the website to support its identity. The use of the developed web interface is thus directly linked to the corporate identity of the university. Among other things, an interesting online tool used by selected universities to promote the university's green identity is the creation of institutional podcasts. Among the selected public universities, there are the Paris Lodron University of Salzburg and the Charles University.

Various types of volunteering, cultural, sporting, and socially responsible activities, which, among other things, enhance its reputation, overall image, environmental awareness, attractiveness, and brand credibility, complement the above-mentioned activities. The MBU has a long-standing cooperation with the Svetielko nádeje Foundation, which it supports through events such as the University Punch, the Generosity Day, the auction of the university hockey team’s jerseys, and spring runs for the Svetielko nádeje Foundation.

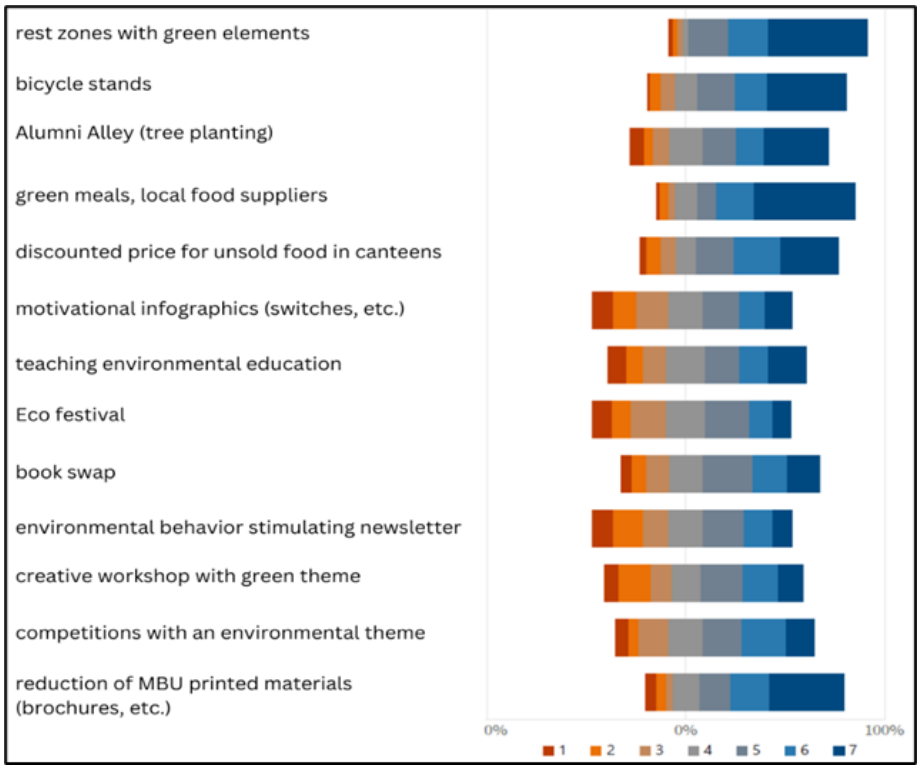
Based on research [23, 24, 25], an important determinant influencing environmental awareness within the environment of a tertiary education institution is its staff. The results of the questionnaire survey, using the MBU as an example from the perspective of employees, confirmed the importance of the problem under study. The topic of green activities at the MBU is considered very important or important by 97.87% of the respondents. The content of the questionnaire survey also included questions related to satisfaction, for which respondents could vote on a scale from 1 to 5 (1 – lowest satisfaction, 5 – highest satisfaction). Specifically, these were satisfaction with the internal and external environment in relation to environmental sustainability; with the inclusion of green issues in teaching, research, and projects at the university; and satisfaction with the university's involvement in green awareness. The mean score for all questions is 3. This means that the employees rate their satisfaction with the current activities on environmental awareness issues at MBU as neutral, i.e., they are neither satisfied nor dissatisfied.

In the next section, the questionnaire survey focused on ranking the importance (on the scale of 1-6) of selected determinants perceived by respondents as barriers in relation to the topic of environmental sustainability at MBU. The ranking of the determinants based on their importance from the respondents' perspective is as follows:

1. lack of financial resources,
2. insufficient or contradictory information,
3. people around you,
4. feeling of "*I cannot do anything alone*",
5. environment around you,
6. green washing.

The determinants included in the research take into account the environment in which MBU employees operate. The results under this question confirm the findings of the research by Priščáková and Vidiečanová [28], which point to the overall underfunding of public universities in Slovakia in terms of state funding. As in various other publicly funded sectors, financial needs in education far exceed the total amount of funds that are allocated annually from the state budget. This shortfall is also reflected in environmental activities, which is also felt by the MBU staff. Therefore, it is necessary to look for alternative sources of funding for such activities.

In terms of the next order of determinants, information, the people working at the institution, and the environmental setting itself play an important role. Based on the results, it can be concluded that, in addition to finance, environmental awareness raising and institutional affiliation play an important role in MBU.



Source: Own, 2023

Fig. 1: *The importance of the activities and tools selected to support environmental awareness building at the MBU*

Figure 1 shows, on a scale of 1 to 7 (1 - lowest importance, 7 - highest importance), thirteen activities and tools to promote environmental awareness at MBU. For activities and tools such

as rest zones with green elements and green meals, local food suppliers, at least 50% of the respondents indicated their high importance. In the context of sustainable development in educational institutions, research confirms the importance of decisions related to sustainable food and support for local suppliers [29, 30]. More than 25% of the respondents indicated the following activities and tools as highly important: bicycle stands, Alumni Alley (tree planting), discounted price for unsold food in canteens, and reduction of MBU's printed materials. Approximately 38% of the respondents ranked motivational infographics, Eco festival, and environmental behavior stimulating newsletter as the lowest importance in terms of activities and tools for raising environmental awareness at the MBU.

5 Discussion

Based on the knowledge of the current situation in the European area resulting from the examined documents of the selected public universities, we present the most important findings:

a) on the issue of sustainable development, selected public universities refer to The 2030 Agenda for Sustainable Development [31], which contains 17 Sustainable Development Goals (SDGs);

b) sustainability from a university perspective focuses mainly on the following areas: emissions, water, energy, food, waste reduction and recycling, finance, transport, social responsibility, sustainability policies and strategies, student/staff engagement;

c) staffing is more dominated by working groups or teams dealing with sustainable development issues.

The results of primary and secondary research further suggest that a fundamental step toward building environmental awareness is the creation of a distinct brand for the university (motto/logo). Under this brand, environmental awareness is raised through selected tools and activities. In terms of promotion, the use of online space [10, 11, 13], i.e., websites and social networks of institutions, is currently preferred based on research results.

In terms of primary research results, we consider it necessary to conduct a questionnaire survey on a regular basis, through which the current level of environmental awareness can be ascertained, not only among employees but also among other target groups of MBU. As indicated by selected studies by Inman et al. [23], Sass et al. [24], and Sinakou et al. [25], the questionnaire survey is a valid and reliable instrument for research and practice in education for sustainable development.

The results of the primary and secondary research further suggest a number of suggestions for actionable activities and tools to promote environmental awareness at MBU:

- to become a part of the UN initiative: *The 2030 Agenda for Sustainable Development*,
- monitoring trends in environmental sustainability and their systematic implementation within the MBU environment,
- The Green University website – information on the University's latest activities in the field of climate protection and sustainability,
- "Green MBU" podcast and popularizing activities aimed at promoting environmental awareness through social networks.
- "ECO-MANUAL" – a manual for use in the organization of events within the University,

- to publish on the website how much CO2 MBU has saved thanks to sustainable development measures (The Green MBU website),
- reduction of administrative burden = digitization and computerization,
- cooperation on sustainable development issues with other institutions and organizations (city, etc.),
- promoting sustainable mobility – cycling (shelters/racks/charging stations/service stations, own #MBUbike, Bike to work – including free inspection and servicing), encouraging employees and students to commute by bike (recording CO2 savings),
- promotion of sustainable mobility – interfaculty carsharing, fleet renewal (e.g., plug-in hybrids – use of electricity for commuting; longer distances - internal combustion engine), charging stations,
- creation of rest areas, water areas, water retention measures, minimization of paved impermeable areas, green roofs, vegetation care, planting and revitalization of green areas (e.g., alumni trees), composting,
- promoting the cleanliness of the neighborhood, e.g., ballot bins for cigarette butts,
- measures to reduce energy and water consumption (modernization of current equipment, solar collectors, solar lighting, solar benches, etc.),
- internal operations – environmentally friendly cleaning products and consistent waste separation, targeted training for a specific group of employees,
- filtered water stands,
- encouraging students and staff to behave sustainably – optimizing waste management (a convenient system that does not burden the target groups – waste bins in accessible and frequented places),
- supporting students and staff in their sustainable behavior – university-wide sustainability courses/lectures,
- supporting students and staff in their sustainable behavior – free shop (clothes collection), free food (food collection) = reducing wastage of clothes and food,
- encouraging students and staff to behave sustainably – collection of medicines/batteries and electronic waste/oil,
- the creation of a systematic incentive and reward scheme to encourage students and staff to behave sustainably,
- garbage collection (in connection with Earth Day),
- infographics for educating students on sustainable development,
- “Sustainability Week” / ”Green Week” – lectures, workshops, experiential activities, etc.,
- Canteens – seasonal menus, disposable plastics (cutlery, packaging, cups, straws, etc.) in biodegradable quality,
- “ECO-MAP” – a map of Banská Bystrica with packaging-free shops, second-hand shops, antique shops, market stalls, local food shops, etc.,

- offer of marketing items with the MBU green logo; reusable coffee cups, drink bottles, and reusable bags with the MBU green logo; clothing with the MBU green logo made from sustainable materials (e-shop),
- the possibility for target groups to send suggestions and measures to raise environmental awareness and improve the environmental environment of the MBU to the designated email address,
- participation in university rankings according to universities' environmental commitments and initiatives, green campus, and environmental sustainability.

In terms of the ambition to raise environmental awareness at the MBU, an action plan was drawn up that incorporates the vision, mission, and, based on the results of the research, the goals of the Green MBU. Based on the activities and tools mentioned above, the objectives were set as short, medium, and long-term in terms of their time, financial or personnel requirements. The short-term objectives of the MBU are as follows:

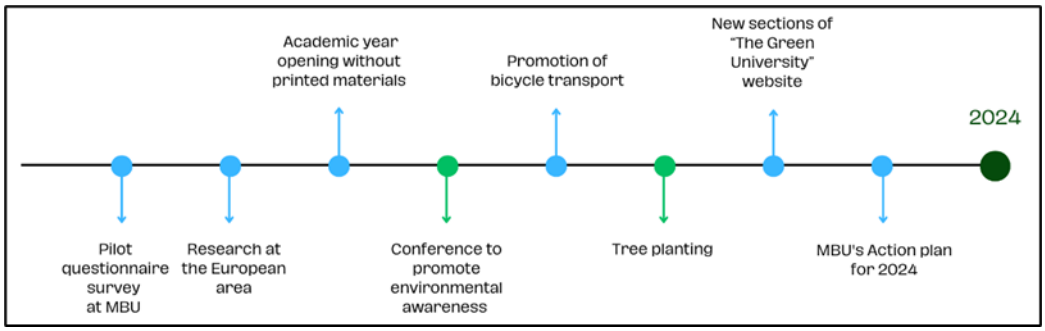
1. promotion of the environmental agenda in sustainable behavior based on the inclusion of the university in initiatives and collaborations;
2. promotion of popularization in sustainable behavior through the web and social networks;
3. promotion of sustainable behavior through strategic and internal documents;
4. promotion of sustainable behavior through digitization and computerization;
5. promotion of sustainable behavior through the popularization of local and organic suppliers;
6. promotion of sustainable behavior through educational and project activities.

The short-term objectives set out include a concrete description of the activities and tools that the MUB intends to use to achieve them. They also contain specific measurable indicators that will make it possible to evaluate the success of the objective. These include, for example, the number of online editions of the university magazine, the updating of strategic documents, the number of new internal documents and project plans developed, as well as posts on the Green University website and social networks according to a set timetable.

An inspiration for supplementing research results is the study by Hafenscher and Jankó [26], in which the opinions of experts on the environment were investigated. The perception of external actors or experts helps to gain a comprehensive perspective and complement the already acquired results of secondary research on the external environment within the European area.

The results of the expertise focused on a number of areas of sustainable development. Experts from selected public universities confirmed the results of the secondary research, which showed that although some institutions do not have specified staffing, the coverage of the agenda is ensured from the position of the management or the individual components of the institutions. In such cases, based on the responses of the experts from the tertiary education institutions, it is planned in the long term to set up (both in terms of staff and material) new departments replicating the objectives set. The strategic documents of the institutions (e.g., long-term plans, etc.) that contain the objectives in question on the issue of environmental awareness are decisive. Based on these, they carry out various forms of awareness-raising activities and participate in projects through which they communicate this environmental awareness to the internal and external environment. Experts from other institutions interviewed also confirm the importance of strategic documents.

Experts consider cooperation with national and supranational institutions and organizations to be particularly important in terms of communication with the external environment within the sustainable development agenda. Related to this is the assertion that the tertiary education institution should be a leader and show direction and vision in other, seemingly unrelated areas such as climate change, interpersonal relations, the working environment, etc. At the same time, to be an inspiring and educational element not only for the students directly, but also for its wider surroundings and region. This is why experts also consider it important to participate in international rankings such as e.g., the GreenMetric World University Ranking[1]. In the context of sustainable development, exchanging visits, mobility activities, and sharing knowledge between institutions are an important part.



Source: Own, 2023

Fig. 2: *Selected activities to support environmental awareness at MBU in 2023*

Measurable indicators are established in the evaluation of individual support activities that do not necessarily result in savings for the institutions. Based on these, it is possible to draw impacts, including an analysis of the financial impact of the measures implemented. Experts consider it appropriate to regularly evaluate the success and returns of such activities, e.g., in a document such as the annual management report, in the section on reducing the carbon footprint.

High energy prices can also be seen as an important determinant in terms of building sustainability and reducing energy intensity (university energy audit). On the issue of sustainability and environmental burdens, the analysis recommends the development of a strategy or action plan that reflects the current and future situation and responds to the idea of sustainable development for future generations. MBU is planning several steps to promote environmental awareness by 2024. An example of these steps is shown in Figure 2.

The examples of best practices from the public universities surveyed for the development of such a strategy are e.g., University of Bayreuth, University of Graz, University of Oldenburg, University of Essex, University of Trás-os-Montes and Alto Douro, etc.

Conclusion

The aim of the article was to identify relevant activities for building the university's environmental identity and environmental awareness in the European area. In general, socially responsible activities are currently gaining in importance, as confirmed by the survey results. Most of the selected public universities are influencing society through activities such as equal opportunities and gender equality concepts, volunteering, collections, and activities that contribute to the development of society and help sustainable development for future generations.

[1] The rankings are ordered by universities' environmental commitment and initiatives, green campus and environmental sustainability.

Based on the research results, we see environmental marketing and the development of the "green university" concept as a growing trend, which public universities are implementing in various forms in their strategic documents. The application of the United Nations Sustainable Development Goals through relevant, interdisciplinary, and inclusive research, education, and innovation plays an important role in this. The research findings confirmed that the following 17 SDGs are being used in selected tertiary education institutions, with activities mainly focusing on emissions, water, energy, food, waste reduction and recycling, finance, transportation, social responsibility, sustainability policies and strategies, and student/employee participation. Other public universities surveyed are involved in the #RaceToZero campaign, have their own initiatives, or are committed in their development strategies to reducing the environmental burden resulting from the operation of the institution.

The pilot questionnaire survey showed that 97.87% of respondents consider the topic of green activities at MBU to be very important or important. Respondents rate their satisfaction with current activities in the field of environmental education at MBU as neutral, i.e., they are neither satisfied nor dissatisfied. In the context of sustainable development in educational institutions, the results are confirmed by other studies in which decisions regarding sustainable food and support for local suppliers are important. Respondents considered rest areas with green elements, bicycle racks, alumni alley (tree planting), a discounted price for unsold food in the dining halls, and also a reduction in MBU printed materials important. The results show that it is necessary to continue active participation in activities that promote environmental awareness in the MBU within the framework of sustainable development issues.

Experts generally consider the most important strategic documents that reflect the current and future situation and respond to the idea of sustainable development for future generations, cooperation with other institutions and organizations, including active participation in environmental awareness-raising activities focused on target groups.

Acknowledgments

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BUDOVANIE ENVIRONMENTÁLNEHO POVEDOMIA UNIVERZITY: PRÍKLAD UNIVERZITY MATEJA BELA

Článok rozširuje doterajší výskum problematiky environmentálneho povedomia v terciárnom vzdelávaní. Cieľom článku je identifikovať relevantné aktivity pre budovanie environmentálnej identity a environmentálneho povedomia univerzity v európskom priestore. Výsledky výskumu potvrdili, že na vybraných univerzitách sa využíva 17 cieľov udržateľného rozvoja (SDGs) stanovených OSN, pričom sa aktivity zameriavajú najmä na emisie, vodu, energiu, potraviny, znižovanie množstva odpadu a recykláciu, financie, dopravu, sociálnu zodpovednosť, politiky a stratégie udržateľného rozvoja a participáciu študentov/zamestnancov. Z dotazníkového prieskumu vyplynulo, že téma environmentálnych aktivít na Univerzite Mateja Bela v Banskej Bystrici (UMB) je pre zamestnancov veľmi dôležitá alebo dôležitá. Experti vo všeobecnosti považujú za najdôležitejšie strategické dokumenty, ktoré odrážajú súčasnú a budúcu situáciu a reagujú na myšlienku udržateľného rozvoja pre budúce generácie; spoluprácu s inými inštitúciami a organizáciami vrátane aktívnej účasti na aktivitách zvyšujúcich environmentálne povedomie.

ERRICHTUNG EINES UMWELTBEWUSSTSEINS DER UNIVERSITÄT AM BEISPIEL DER MATEJ BEL UNIVERSITÄT

Dieser Artikel erweitert die bisherige Untersuchung der Problematik des Umweltbewusstseins in der Ausbildung des dritten Alters. Das Ziel des Beitrags besteht in der Identifikation einer relevanten Aktivität für die Errichtung einer Umweltidentität und des Umweltbewusstseins der Universitäten im europäischen Raum. Die Untersuchungsergebnisse haben bestätigt, dass an den ausgewählten Universitäten die 17 von der OSN festgesetzten Ziele der nachhaltigen Entwicklung Verwendung finden (SDGs), wobei die Aktivitäten besonders auf folgende Faktoren ausgerichtet sind: Emissionen, Wasser, Energie, Lebensmittel, Verringerung der Abfallmenge, Rezyklierung, Finanzen, Verkehr, soziale Verantwortung, Politik, Strategie der nachhaltigen Entwicklung, Einbeziehung von Studenten und Angestellten. Aus der Fragebogenuntersuchung ging hervor, dass das Thema der Umweltaktivitäten an der Matej Bel Universität in Bánska Bystrica (UMB) für die Angestellten sehr wichtig ist. Die Experten halten im Allgemeinen die strategischen Dokumente für am wichtigsten, da sie die gegenwärtige und zukünftige Situation widerspiegeln, und reagieren auf den Gedanken der nachhaltigen Entwicklung für die künftigen Generationen; die Zusammenarbeit mit anderen Institutionen und Organisationen der einbezogenen aktiven Teilnahme an den das Umweltbewusstsein steigernden Aktivitäten.

BUDOWANIE ŚWIADOMOŚCI EKOLOGICZNEJ UCZELNI: PRZYKŁAD UNIWERSYTETU IM. MATEJA BELA

Artykuł rozszerza dotychczasowe badania nad kwestią świadomości ekologicznej w szkolnictwie wyższym. Celem artykułu jest zidentyfikowanie odpowiednich działań na rzecz budowania tożsamości środowiskowej i świadomości ekologicznej uniwersytetu w środowisku europejskim. Wyniki badań potwierdzają, że na wybranych uniwersytetach stosowanych jest 17 Celów Zrównoważonego Rozwoju (SDGs) określonych przez ONZ, przy czym działania koncentrują się głównie na emisjach, wodzie, energii, żywności, redukcji odpadów i recyklingu, finansach, transporcie, odpowiedzialności społecznej, polityce i strategiach zrównoważonego rozwoju oraz partycypacji studentów / pracowników. Z przeprowadzonych badań ankietowych wynika, że zagadnienie działań środowiskowych na Uniwersytecie im. Mateja Bela w Bańskiej Bystrzycy (UMB) jest dla pracowników bardzo

ważne albo ważne. Eksperci ogólnie uważają, że najważniejsze są dokumenty strategiczne, odzwierciedlające obecną i przyszłą sytuację oraz uwzględniające ideę zrównoważonego rozwoju dla przyszłych pokoleń; współpraca z innymi instytucjami i organizacjami, w tym aktywny udział w działaniach na rzecz podnoszenia świadomości ekologicznej.

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AN IN-DEPTH ANALYSIS OF GENERATION Z SELECTED MOTIVES FOR ACTIVE TIKTOK USAGE

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Abstract

A significant amount of the existing literature on the motives of Generation Z is rooted in the era of the COVID-19 pandemic, during which social restrictions played a crucial role in communication and interaction with friends and the world. However, since the pandemic is over now, there is a curiosity about the current motivations driving young people to use the TikTok platform. This study involved surveying over 200 participants in Germany and Kazakhstan within the specified age group to explore their motives for using the TikTok platform. The collected data underwent correlation and regression analysis to identify the primary motivators. For active usage, where participants engage in producing and uploading content, the primary motivations include expressing personal *creativity*, *perceiving oneself as an influencer*, and the need to *try out new things*. This research aims to provide contemporary insights into the evolving motivations of young individuals within the post-pandemic landscape.

Keywords

TikTok; Social media; User motives; Active usage; Creativity, Trying out new things; Influencer role.

Introduction

TikTok is a concise story of a skyrocketing social media platform. It is a social media app that allows users to create, share, and discover short-form videos. It was launched in 2016 by the Chinese tech company *ByteDance* and has since become one of the world's most popular social media platforms. TikTok is known as *Douyin* in China. Recently, apps designed for short videos have played an increasingly important role in the entertainment industry as the increase in users has grown exponentially. According to Statista, TikTok has now, after seven years in existence a number of 1.7 billion active users per month worldwide [1]. Short videos are the next fast-growing content medium after text, images, and traditional video. Its characteristics include, in particular, low production costs, rapid dissemination possibilities, and the phenomenon of thinning boundaries between producers (video authors) and viewers.

Unlike other popular social media platforms in specific regions or countries, TikTok has a broad global user base. This attracted an eclectic range of content creators and users, contributing to its popularity. Inexhaustible and endless content leads to addictive consumption [2] [3]. As the algorithm presents you with content according to your

preferences, people feel that the more they watch, the more relevant and entertaining videos they get.

Social media users are predominantly young people known as Generation Z [4]. TikTok is primarily used by adolescents and young adults under 30 years old [5]. This aligns with the finding that TikTok has gained prominence among individuals aged 16 to 25, who can be classified as Generation Z, constituting the majority of its user base [6]. Thus, the in-depth analysis of selected motives for TikTok usage will be dedicated to Generation Z users.

Generation Z individuals born between the mid-1990s and mid-2000s and have grown up in a world where social media is ubiquitous. One of the defining characteristics of Gen Z social media use is their preference for visually driven platforms such as Instagram, Snapchat, and TikTok [7]. The Gen Z user is likelier to follow influential figures who share their values and champion causes they believe in [8]. Social media are shaping how Generation Z communicates, expresses, and engages with the world.

Against this background, the study centers on the following key research question (RQ):

RQ *Why do members of Generation Z create and upload video content?*

This research question is based on a literature review elaborated into hypotheses and then statistically tested and evaluated. This research aims to provide contemporary insights into the current motivations driving Generation Z to use this platform within the post-pandemic landscape.

1 Literature Review

The Literature Review is based on a search of academic and scientific publications on Gen Z social media usage and the social media platform – TikTok.

1.1 Social Media and Generation Z

Gen Z, also known as the iGeneration or post-millennials, is a cohort of individuals born between the mid-1990s and early 2000s. The period in which Generation Z began has been a topic of debate among researchers. Some authors have suggested that Generation Z starts in the year 1995, with individuals born after this date being classified as part of this generation [9]. Similarly, other researchers have proposed that Generation Z encompasses individuals born between 1995 and 2010 [9]. Furthermore, there are references indicating that Generation Z includes those born between 1996 and 2012 [10] and from the early 1990s until the early 2000s [11]. The term “Generation Z” refers to the demographic cohort succeeding Millennials and preceding Generation Alpha, also known as Zoomers. According to Tapscott, Generation Z started in 1998 [12]. This diversity in proposed starting years for Generation Z suggests a lack of consensus among researchers regarding the exact beginning of this generation. This generation has grown up immersed in technology, in particular, social media platforms. Various sources have suggested that Gen Z is the first generation of *digital natives* who have had exposure to the internet and social media from a young age [13]. Gen Z’s behavior and attitudes towards social media have been greatly influenced by this exposure to technology. The social media behavior of Gen Z is notable for its high levels of engagement and activity across a range of platforms, including Instagram, Snapchat, and Twitter. These platforms serve as spaces for self-expression, connection, and entertainment and have become an integral part of their daily lives [14].

One of the defining characteristics of Generation Z’s social media usage is their preference for visually-driven platforms like Instagram, Snapchat, and TikTok [7]. These platforms rely

heavily on short-form video content, images, and filters, which appeal to Gen Z's desire for instant gratification and self-expression [15].

Another trend in Gen Z's social media usage is the emphasis on authenticity and social activism. Gen Z users are likelier to follow influencers who share their values and advocate for the causes they believe in [8]. They are also more likely to use social media as a platform for activism, with hashtags like #MeToo and #BlackLivesMatter gaining widespread traction on social media platforms [15].

Overall, social media has become integral to Gen Z's lives, shaping how they communicate, express themselves, and engage with the world around them.

1.2 TikTok, a Concise Story of a Skyrocketing Social Media Platform

TikTok is a global social media platform that allows users to create, share, and discover short form videos on the platform. It has become one of the world's most popular social media platforms since it was launched in 2016 by Chinese tech company ByteDance. TikTok's brand name in China is Douyin. Although the two apps look the same, they are actually completely separate. Thus, it is impossible to search for a Douyin account on TikTok or vice versa, as there is no link between Chinese and international content. For that reason, the article is dedicated to the social media platform under the brand name TikTok. As the number of TikTok users has grown exponentially in recent years, the app, which is designed for short videos, has played an increasingly important role in the entertainment industry. According to Statista, TikTok now has 1.7 billion monthly active users worldwide after having existed for seven years [1].

Xu et al. [16] believe that short videos can be considered a new type of video. Typically, these videos range in length from a few seconds to five minutes. This research presents a theoretical framework that explores important antecedents of user loyalty. The research shows that satisfaction is the most critical factor responsible for why people use TikTok.

Factors influencing user satisfaction include perceived usefulness, entertainment, and social value. Several other research papers discuss why short videos may have become so popular in the current era. Jianguo & Qi [17] believe that their popularity is due to their "short" form, as audience attention tends to be limited and fragmented during the information explosion. Thus, the video must be short enough to capture and hold the viewer's attention. TikTok's success can be attributed to several other factors as well.

Firstly, its algorithm delivers personalized content to users based on their interests [18], making the user experience engaging and addictive [3]. The app also has a user-friendly interface and allows for easy creation and sharing of content, leading to a proliferation of viral challenges and trends [19]. Another reason for TikTok's success is its global appeal. Unlike other social media platforms primarily popular in specific regions or countries, TikTok has a broad user base worldwide. The vast user base has allowed the app to attract a diverse range of content creators and users, which has, in turn, contributed to its popularity [20].

Omar and Dequan [21] have identified five motivators for using this platform. These include social interaction (messages), archiving (sending pictures of important/impressive events to others to keep in mind), self-expression (to display one's creativity), escapism (to escape everyday sorrows and problems), and peeking (users show their lives or talents to other users, who are expected to derive personal, social, and fantasy satisfaction from it).

According to Smith [22], TikTok's success can be attributed to the fact that it has become a cultural phenomenon. Many popular trends and challenges on TikTok have been adopted by

mainstream media, and celebrities, politicians, and brands have also embraced the app. This has helped to solidify its position as a significant player in the social media world.

Most of the literature referred to in this article dates from the COVID-19 pandemic when TikTok was used to escape lockdowns and socialize virtually with friends. Especially the uncertainty of what might be next caused fears, and TikTok seemed to be the solution to forgetting one's sorrows and loneliness [23] [24] [25], offering a way out.

The sadness caused by social isolation during the COVID-19 pandemic called for entertainment media that made people laugh again [26] [27]. The funny content in TikTok is meant to entertain people and thus increase their happiness [28].

Sheer inexhaustible and endless content leads to addictive consumption [2] [3]. Since the algorithm presents content according to the user's liking, people get more matching and entertaining videos the more they watch. Interrupting this would lead to a fear of missing out that users try to avoid [29].

Since TikTok started as a lip-synchro platform, others have created and watched many music videos [21]. Background songs for short videos and reels gained popularity within this context [30] [31]. TikTok thus provides new unreleased music content.

2 Hypotheses

This chapter deals with the research question outlining the hypotheses under consideration in this survey. It provides a context by delving into the background and situating them within the current scientific research landscape, demonstrating the derivation of these hypotheses.

The hypotheses of the research question deal with motives for active TikTok usage: Why do members of Generation Z create and upload video content?

The following hypothesis can be derived:

People who feel like influencers in that they believe their content will be liked, shared, and creatively processed by many people will upload more content than others who are merely entertained without this sense of mission [32] [33]. To keep the role and function of an influencer, a constant creation of videos is necessary [34] and we thus conclude:

H1: *Heightened feelings of being an influencer lead to increased levels of activity in content creation.*

Uploading videos is not only a social act of participating in a non-verbal conversation. It can be seen as a way of self-expression that enables users to live out their creativity [35] [36] [37]. We then assume:

H2: *The more users feel creative, the more they post on TikTok.*

Uploading videos makes users happy and satisfied [38] [33] [39]. So, it can be expected that:

H3: *Increased video uploads result in a higher level of users' happiness.*

Studies have revealed that Likes work as rewards and reinforcers for the content creator [34] [40] and as a form of social support [41], leading to enjoyment. Now, the question can be raised as to whether negative feelings arise for the users if they do not receive a positive response to the content they have created. We thus conclude:

H4: *The absence of positive feedback leads to a lower emotional state among users, resulting in a heightened sense of sadness.*

The fast pace of today's media, the short attention span, and the hunger for ever-new content lead to strong attrition effects in video consumption. Users are always looking for something new in reception and production, whether it is new formats or content [42]. Therefore, those who want to try out new things are also the ones who upload new content more frequently [39].

H5: *The higher the willingness to try out new things, the higher the content upload.*

3 Methodology

The survey was conducted online and the students were asked to distribute it on social networks. The course was made up of participants from Germany and Kazakhstan. These results are an international sample. Table 1 gives sociodemographic key data of the sample showing the data of the country-specific samples and the overall data set.

Tab. 1: *Overview of socio-demographic survey key data*

Country	**N**	**Age**	**Women [%]**
Germany	121	23.,6	54
Kazakhstan	105	22.,3	72
Total	**226**	**23.,0**	**62**

Source: Authors' calculations based on the conducted survey

A total of 226 participants completed the survey in both countries. The overall share of women is 62%, which is more than half, and the average age is 23 years, representing TikTok's most substantial user group: Generation Z.

For all items of the battery in the questionnaire to measure the motives of active TikTok usage, a scale ranging from 0 to 10 was used. This scale was chosen due to its inclusion of an absolute zero point, ensuring a clear minimum in both Germany and Kazakhstan. A 1-5 scale was avoided, as it serves as a school grading system in both countries, where 5 is the highest grade in Kazakhstan and the lowest in Germany, creating potential confusion. The decimal scale ranging from 0-10 was used for the following reasons: Scherpenzeel [43] discusses the practical use of 11-point scales, which are often used in surveys and are well handled by respondents. These studies collectively underscore the need for a nuanced understanding of the use and analysis of 0-10 scales in social sciences.

The 11-point scale is used in many other ongoing surveys, for example, the *Gsoep* and *World Value Study*, and seems to be well handled by respondents. Respondents are asked to indicate the strength of their attitude or opinion in a number between 0 and 10, with the endpoints 0 and 10 being defined by verbal labels. Also, for many questions of the *Swiss Household Panel questionnaire*, the 11-point scale has been chosen instead of a category scale.

Given that the scales in this study verbally define the minimum and maximum points but do not assign specific expressions to the intermediate levels, which are challenging to delineate verbally, the authors categorize these scales as metric ones. The authors presume that the scale points are equidistant due to the online survey's layout, which utilizes an optical scale displaying distances between 0 and 10 in equal intervals.

The item battery consists of a question on the intensity of use and five items of motivation for the usage. The following tables show the measured construct, the corresponding item, its mean, and its standard deviation, see Table 2.

Tab. 2: *Selected motives to upload TikTok videos*

Item measured	Question / Statement in Survey (0-10)	M	SD
Active TikTok Use	*How often do you upload video content yourself?*	2.10	2.79
Influencer Role	*I see myself as an influencer.*	0.98	1.87
Creativity	*TikTok allows me to live out my creativity.*	2.37	3.14
Wellbeing	*I feel better when I get positive feedback on TikTok.*	3.38	3.63
Feared Sadness	*It makes me sad when no one "likes" my posts.*	2.29	3.07
Try Out New Things	*I want to try out new things.*	3.75	3.45

Source: Authors' calculations based on the conducted surveys

First, it is noticeable that none of the mean values are above 4. This means that all of the values for these statements are in the lower third of the scale.

It can be seen that *trying out new things* and *wellbeing* receive the highest level of approval, although their values in absolute terms are not high. Creativity is relatively in the middle range, and the perceived role as an influencer even brings up the rear. However, the extent to which these items are related to active TikTok use, or have an impact on it, will be examined in the next chapter.

4 Results

In hypotheses testing as we regard the 0-10 scale as a metric, we employ a Pearson correlation to assess coherence between the items and active TikTok usage. Furthermore, a non-parametric correlation (Kendall Tau) is computed to investigate the relationship when the scale is not treated as metric. The findings are consistent in both scenarios, revealing moderate to high correlations at a significantly robust level (refer to Table 3).

The hypotheses deal with active TikTok usage (Video creation). Again, 5 items and their coherence with the *active usage* were checked, yielding the following results: All items show highly significant correlations, with highly intermediate to even strong values, see Table 3.

Tab. 3: *Correlation table of active TikTok usage*

Hypothesis	Items	r	Tau	Sig.
H1	Influencer Role	.577	.538	< .001
H2	Creativity	.661	.623	< .001
H3	Wellbeing	.558	.512	< .001
H4	Feared Sadness	.488	.451	< .001
H5	Try Out New Things	.588	.548	< .001

Source: Authors' calculations based on the conducted surveys

Here, *creativity* and *trying out new things* show the highest correlation, whereas *feared sadness* and *wellbeing* show the lowest value. However, **all hypotheses can be accepted.**

A linear regression (R^2 = .497) was also conducted here to check for the "impact" of the correlating items on active TikTok usage, delivering the following results, see Table 4.

Tab. 3: *Regression model of active TikTok usage*

Item	Standard Beta	Significance	VIF
Creativity	.313	.002	3.347
Perceived Influencer Role	.233	.002	1.887
Trying Out New Things	.213	.013	2.366
Wellbeing	-.010	.918	2.893
Feared Sadness	.086	.254	1.835

Source: Authors' calculations based on the conducted surveys

We see that *Creativity*, the *Perceived Influencer Role*, and *Trying Out New Things* are significant motivators to upload content. *Wellbeing* and *Feared Sadness* well correlate with ~~the~~ active TikTok usage, but impact is not significant here.

Overall: All Hypotheses can be accepted.

Conclusion

All findings concerning the motivational drivers for the active usage of this platform are a backup and validation of the results of the surveys yet in existence. What this article can provide, however, is an examination of how strongly these individual items contribute to the outcome – variable.

In terms of active use, it is evident that Generation Z is primarily driven and motivated to upload and share content by the perceived aspect of creativity. TikTok opens up a channel they have used well during the pandemic and whose possibilities they have been able to try out and exploit often as the only way to interact with others and communicate with the world. This can be done by developing new video formats, trying out classic lip-syncs, taking on challenges and reacting to them, and creating memes, hoping they will go viral.

Trying out new things reflects a certain need for stimulation. The brevity of the videos and their ephemerality in the feed are not intended to create evergreens" that will be remembered years from now but are entirely ephemeral, paying homage to the moment. A mere copying and clumsy repetition of what is already known is what stands in the way of creativity and trying out the new. The rise of social media has contributed to an increase in the desire for novel experiences among young people. Furthermore, the cultural context in which Gen Z has grown up plays a significant role in their inclination toward trying new things. The increasing emphasis on individualism and self-expression in Western societies has led to a culture of experimentation and personal exploration. Thus, contemporary emerging adults, including Gen Z, are more likely to engage in diverse experiences and lifestyles than previous generations. In addition, the impact of globalization cannot be overlooked. Gen Z has been exposed to a more interconnected world, allowing them to access a wide array of cultural products and ideas. This exposure to diverse influences has contributed to their openness to trying out new things, whether it be in fashion, food, or entertainment. It is also essential to consider the potential risks and benefits associated with trying out new things. While exploration can lead to personal growth and self-discovery, it can also expose individuals to potential harm, especially in the context of social media challenges and trends. Therefore, it is crucial for educators, parents, and policymakers to provide guidance and support to ensure that Gen Z's experimentation is safe and informed.

The role of feeling like an influencer, communicating with the world, contributing, and showcasing personal abilities also plays a significant role. While interpreting this as a form of "fishing for compliments" might be tempting, indicating a desire for attention and recognition

possibly linked to lower self-esteem, such a conclusion could not be definitively established. The urge to feel like an online influencer is a complex phenomenon that various factors might shape. Gen Z consumers exhibit discerning behavior towards influencers and endorsed brands, often avoiding them due to perceptions of commercialization and opportunism. This skepticism towards traditional marketing has led Gen Z to focus on growing their social networks, establishing relationships, and exerting personal influence, indicating a preference for authentic interactions. The constant need for authenticity often results in active social media to vocalize their concerns and preferences. Additionally, Gen Z individuals appreciate the efficiency of personal branding through social media, leveraging their digital and tech-savvy nature to build authentic personal brands.

It is worth noting that well-being does not have a significant effect as a driver on the active use intensity of the platform in the case of positive feedback. However, the mean value of the item is the second highest. By looking only at the mean values of the items that can be seen as motivators, it can be concluded that receiving positive feedback creates a sense of well-being that users strive for. It seems that well-being does not arise when the user simply uploads content, but only when it is accepted by the community and receives positive reactions. This suggests that users define themselves through third parties, which would indicate insecurity and a lack of self-confidence on the part of the individual. The self-created is only valuable if others perceive it as such. However, the regression shows that this is different in the context of direct use. Respondents generally agree that their well-being increases, but it is not the reason why they become active on TikTok. This means that the obvious assertion that Generation Z defines itself through others and third parties is not tenable.

The same applies to the fifth item examined in the study—the feared sadness resulting from a lack of feedback and the intensity of active use. The situation is very similar here too. The statement receives low approval but not the lowest value. This means that the respondents agree that they feel sad when their actions receive no likes, but they do not act proactively due to the fear of not getting enough likes. This suggests that active and creative work motivates users to upload something rather than prophylaxis against the fear of not getting enough feedback. This behavior might also be because other metrics might help GenZets distinguish whether the content user posts is exciting, e.g., the number of views. Undoubtedly, the reinforcement of TikTok usage is likely influenced by design elements such as Likes or Number of Views. Likes provide an easy way to give feedback and help with authentic self-expression. This indicates that likes play a significant role in shaping user behavior on the platform. Again, the role of hedonic consumption experiences, including enjoyment and escapism should be emphasized as they influence users' intention to use the TikTok app. The enjoyment of receiving likes from others could be linked to the impact of likes on Gen Z's active usage. On the other hand, when the likes are missing, other factors might give GenZets feedback from their followers on the quality of their content.

The study sheds light on the reasons why Generation Z actively uses TikTok. According to the study, creativity and the desire for recognition are the major motivators for active usage of the platform. Overall, this research helps us better understand the usage patterns and appeal of TikTok among Generation Z.

The relatively low values in the lower third of the scale can be questioned critically, as none of the values exceeds 4. This may be explained by the fact that the platform TikTok is not yet as popular as it is believed to be in the studied sample. It would be helpful to conduct a comparative study with the same cohort, but with Instagram as the platform instead of TikTok.

It would also be desirable to collect the items in the subsequent questionnaire with a single question and 3-5 items, using item batteries previously used in studies. Additionally, having a larger participant pool in both countries would have allowed for mean value comparisons to explore intercultural differences in use. Furthermore, conducting a follow-up study in 4 or 6 years could provide insights into whether the motivational drivers remain consistent or if prolonged platform use exhibits signs of wear and tear, potentially diminishing its initial appeal.

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HLOUBKOVÁ ANALÝZA VYBRANÝCH MOTIVŮ GENERACE Z PRO AKTIVNÍ VYUŽÍVÁNÍ TIKTOKU

Značné množství existující literatury o motivech Generace Z má kořeny v éře pandemie COVID-19, během níž hrála sociální omezení zásadní roli v komunikaci a interakci s přáteli a světem. Pandemie skončila, a je zajímavé zjistit, jaká motivace vede mladé lidi k používání platformy TikTok v dnešní době. Tato studie zahrnovala průzkum u více než 200 účastníků v Německu a Kazachstánu ve specifikované věkové skupině s cílem prozkoumat jejich motivy pro používání platformy TikTok. Shromážděná data prošla korelační a regresní analýzou, a byly identifikovány primární motivátory. Mezi primární motivace účastníků, kteří se aktivně zabývají tvorbou a nahráváním obsahu této platformy, patří vyjádření osobní kreativity, vnímání sebe sama jako influencera a potřeba zkoušet nové věci. Tento výzkum si klade za cíl poskytnout současný pohled na vyvíjející se motivaci mladých jedinců v post pandemické době.

EINE EINGEHENDE ANALYSE DER GENERATION Z AUSGEWÄHLTER MOTIVE FÜR DIE AKTIVE TIKTOK NUTZUNG

Innerhalb weniger Jahre hat sich TikTok zu einer der meistbesuchten Social-Media-Plattformen weltweit entwickelt. Ziel dieser Studie ist es, die Frage zu beantworten, was die Hauptnutzergruppe dazu motiviert, die Plattform zu nutzen – sowohl als Konsumenten als auch als Produzenten von Kurzvideos. Im November 2022 wurde in Deutschland und Kasachstan gleichzeitig eine empirische quantitative Online-Umfrage mit 226 Teilnehmern durchgeführt, um den „Impact“ der in früheren Umfragen und Quellen genannten Motivatoren zu ermitteln. Für die aktive Nutzung (Videoerstellung) werden in der Literatur die Rolle des wahrgenommenen Influencers, das Ausleben der eigenen Kreativität, Wohlfühlen bei positivem Feedback, die Traurigkeit wenn es keine Likes gibt, und das Ausprobieren neuer Dinge genannt. Natürlich lassen sich noch weitere Motive aufzählen, aber die in dieser Arbeit verwendeten Motive sind diejenigen, die in der Literatur am häufigsten anzutreffen sind. Alle Zusammenhänge dieser Einflussgrößen konnten in dieser Befragung untermauert und validiert werden.

DOGŁĘBNA ANALIZA WYBRANYCH MOTYWÓW AKTYWNEGO KORZYSTANIA Z TIKTOKA PRZEZ POKOLENIE Z

W ciągu kilku lat TikTok stał się jedną z najczęściej odwiedzanych platform mediów społecznościowych na świecie. Celem niniejszego badania jest odpowiedź na pytanie, co motywuje główną grupę użytkowników do korzystania z platformy – zarówno jako konsumentów, jak i producentów krótkich filmów. Empiryczna ilościowa ankieta internetowa z udziałem 226 uczestników została przeprowadzona w Niemczech i Kazachstanie w listopadzie 2022 r. w celu określenia „wpływu” motywatorów wspomnianych w poprzednich ankietach i źródłach.. W przypadku aktywnego wykorzystania (tworzenie wideo) literatura identyfikuje rolę postrzeganego influencera, przeżywanie własnej kreatywności, pozytywne opinie, smutek, gdy nie ma polubień i wypróbowywanie nowych rzeczy. Oczywiście motywów można by wymienić więcej, ale te, które zostały użyte w tym artykule, to te, które najczęściej spotyka się w literaturze. Wszystkie te korelacje elementów wpływających mogą zostać zarchiwizowane i zweryfikowane w tej ankiecie.

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