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CONTENTS

FINANCIAL SITUATION ASSESSMENT TO FOSTER THE COMPANY'S DEVELOPMENT

HODNOTENIE FINANČNEJ SITUÁCIE PODNIKU ZA ÚČELOM JEHO ĎALŠIEHO ROZVOJA

Katarína ČULKOVÁ – Marcela TAUŠOVÁ

Abstract
Currently, many companies are facing difficult challenges affecting their financial health. In order to ensure financial stability for its future possible development, it is necessary to examine the given area in detail and regularly. The paper focuses on assessing the financial situation of SMZ, a.s. Jelšava and identifying strengths and weaknesses using ex-ante analysis, applying creditworthiness and bankruptcy models. The main result is the identification of critical areas where improvement is needed and proposing new opportunities for the future development of the company.

Key words: financial health of the company, ex-ante analysis, prognostic models, bankruptcy

Abstrakt
V súčasnosti čelí mnoho firiem náročným výzvam, ktoré ovplyvňujú ich finančné zdravie. Aby sa zabezpečila finančná stabilita pre jej budúci možný rozvoj, je potrebné danú oblasť podrobne a pravidelne skúmať. Práca sa zameriava na posúdenie finančnej situácie spoločnosti SMZ, a.s. Jelšava a identifikáciu silných a slabých stránok pomocou ex-ante analýzy, s využitím modelov bonity a bankrotu. Hlavným výsledkom je identifikácia kritických oblastí, kde je potrebné zlepšenie, a navrhnutie nových možností pre budúci rozvo

Kľúčové slová: finančné zdravie podniku, ex-ante finančná analýza, prognostické (predikčné) modely, bankrot / úpadok podniku

Introduction

In this dynamic - rapidly changing environment, it is very important to have an overview of the financial health of the company, for successful management and long-term development. There is number of different factors that affect the health of the company, whether they are external or internal factors, therefore financial analysis is key to preventing adverse events or risks associated with these influencing factors, whether they are pandemics, economic crises, changes in legislation and regulations, rapid technological progress or increasing market competition. If companies manage to capture adverse impacts, the company can develop more easily and faster.

The regularity of conducting financial analysis depends on the size of the company. For example, smaller companies may conduct the analysis once a year, while larger companies conduct it regularly, quarterly or monthly. However, it is important that the regularity of this analysis is sufficient to provide up-to-date information. Regular and thorough performance of financial analysis is important to obtain reliable results for the company.

Credit and bankruptcy models, which provide information on the financial health of the company, play an important role in assessing the creditworthiness of companies. Although they do not point to specific sources of problems, they can warn of potential problems or bankruptcy of the company in time. According to Šteker and Otrusinová (2021), creditworthiness models represent diagnostic models answering the question of whether the company is good or bad. They can evaluate the company with one synthetic indicator or coefficient through the purposeful selection of indicators that best contribute to its classification. Compared to bankruptcy models, these models are mainly based on theoretical knowledge. They depend on a large amount of data about the results in a certain industry, market segment, or database of comparable companies. In literary sources, we come across a number of credit and bankruptcy models that are based on a mathematical-statistical basis. In practice, creditworthiness and bankruptcy models are applied in combination with financial indicators in order to achieve a comprehensive view of the company's management and to predict the development of the company's economic health. According to Karas and Reznakova (2015), there is extremely limited literature about how such application of prediction indexes affects the stability of the model's accuracy. The accuracy can be increased by consideration of the conditions for the use of the prediction indexes in concrete situations and concrete countries (Csikosova et al., 2019). Tanaka et al. (2019) introduced a novel framework for models and a methodology for assessing the vulnerability of industrial economic activities, finding that bankruptcy criteria differ across industries. They also proposed a method of analyzing the vulnerability of industrial economic activities in various countries and industries, using the predicted likelihood of bankruptcy and company information.

The mining industry is important for the economy as the primary sector. It is necessary to predict its economic development (Camska, 2016). The bankruptcy of mining companies has been studied by Folwarczny (2020), showing that the bankruptcy prediction scores of the Ohlson and Altman modifications were found to be the dominant prediction models that affected the mining companies. Bankruptcy in Polish mining companies is studied by Jonek-Kowalska (2019), who found that the reasons for bankruptcy risk increase in the mining industry are mostly mistakes in management, changing mining-geological conditions as well as very high prices and demand fluctuations concerning energetic resources, as well as government's support for social-political reasons. Mining companies in the Czech Republic were also studied by Cerny et al. (2019) by the solvency and bankruptcy models. The research proves that selected benchmarks, such as Altman's model and Taffler's model, may be used on their own. The importance of benchmarking is strengthened by the fact that many authors consider benchmarking to be an integral part of strategic management. The research of Kozel et al. (2022) showed that the useful bankruptcy models for Czech mining companies are the IN05 Index, Altman's analysis and the Taffler index. Camska

(2016) found through the research that already existing models predicting financial distress still have enough power and accuracy for decision-making, and there is no need for the creation of a new one. Therefore, we used the well-known indexes in our research (see part methodology). Since Slovakia has a similar historical and economic development as post-communist countries, the same indexes can also be applied in Slovakian mining companies.

The method of ex-ante financial analysis is often used to evaluate the creditworthiness of companies, and through selected financial indicators, their development in time or space is compared in the company (e.g. companies operating within the same industry that are comparable to each other). The goal of this analysis is to predict the development of the financial side of companies and to prevent problems and financial decline with its help (Čulková et al., 2024).

1 Methodology

To predict future development of the company, bonity and bankrupty model had been used, mainly Quick test, Index Bonity and Tafler bankruptcy model.

1.1 Quick test

The method called the Quick Test, which is characterized by its speed of execution and the ability to work with only four financial indicators and a simple point scale (see Table 1), is often used in Western Europe. According to Králičeк quick test, three categories are evaluated: financial stability, income situation and overall situation - with 1 point representing very good results, 2 points representing good results and 3 points representing average results (Camska, 2016).

Table 1 Quick test – scale of the indexes assessment

Index	Very good (1)	Good (2)	Medium (3)	Bad (4)	Insolvency (5)
1.	>30 %	>20 %	>10 %	>0 %	Negative
2.	<3 r.	<5 r.	<12 r.	>12 r.	>30 r.
3.	>10 %	>8 %	>5 %	>0 %	Negative
4.	>15 %	>12 %	>8 %	>0 %	negative

Source: own processing according to financial statements

According to the scale, the lower the total number of points, the better the financial situation and future prospects of the company. The overall rating ranges from 4 to 20 points, with 4 points indicating the best situation and 20 points indicating the worst. The method is advantageous for its simplicity and speed in obtaining an idea of the financial situation of the company and its future. However, it is important to realize that this simplicity may be limited when it is necessary to obtain a comprehensive and detailed view of the company and its future (Ručková, 2019).

1.2 Index bonity

The financial health of a company can be evaluated also from the view of financial management quality. This task can be fulfilled by index B, evaluating the bonity of the company, provided by qualified financial management.

$$B = 1.5X1 + 0.08X2 + 10X3 + 5X4 + 0.3X5 + 0.1X6 \quad (1)$$

- X1 = cash flow/debts,
- X2 = total capital/debts,
- X3 = earnings before taxes (EBT)/total capital,
- X4 = EBT/total revenues,
- X5 = stocks/total assets,
- X6 = total revenues/total capital.

Evaluation scale: positive value means positive and healthy situation of the company. Negative values mean a negative and unhealthy situation, the lower the value, the worse the situation of the company (Csikosova et al., 2019).

1.3 Tafler index

The Tafler index of prediction is a financial metric used to predict the probability of a company going bankrupt within a year. It presents a multivariate model, developed by Tafler in 1982, computed using four key financial rations (T) and it is used to assess a company´s bankruptcy risk (Vrbka and Rowland, 2019).

$$T = 0,53T1 + 0,13T2 + 0,18T3 + 0,16T4 \quad (2)$$

T > 0,3 … low risk of bankruptcy
T = 0,3 … moderate risk
T < 0,3 … high risk of bankruptcy

The future development prediction is followed up in the company SMZ, a.s. Jelšava. Data from financial statements are considered to be significant sources of data for the analysis of a company's creditworthiness. T>he data from the financial reports of mining organizations had been obtained directly from the analyzed organizations, as well as via the database Finstat (https://finstat.sk/). The evaluation is done in time development to better understand improvement or worsening of the financial health of the company.

2 Results of Future Development Prediction

The company specializes in the production of various magnesite products, such as loose magnesite clinkers, monolithic materials, slag-forming mixtures and raw magnesite, which are intended for the refractory ceramics, metallurgy, chemical industry, agriculture, construction and environmental sectors (www.smzjelsava.sk). The main products of the company are as follows:

- Dead-burnt magnesite clinkers, which are used for the production of refractory fittings and monolithic masses directly in steelmaking units.
- Slag-forming additives, which serve to increase the basicity of slag and protect linings in steelmaking units.
- Basic monolithic refractories, which are used for various purposes, such as preparation of new floors, cold and hot repairs and protection of linings in electric arc furnaces, converters, ladles, vacuum equipment and steelmaking ladles.
- Caustic magnesite, which is used as a mineral additive in livestock feed, in the chemical industry for the production of industrial fertilizers and in the environmental field to neutralize the effects of acid rain on the natural environment.

Raw magnesite, which is used in the chemical industry for the production of magnesium-based chemicals and in construction (Wozniaková and Mikuš, 2023).

2.1 Quick Test

The development of Quick test in analyzed period is given together with the calculation in Table 2, showing the high influencing indicators to the overall financial situation.

The independence rate in all three years is stable at one, which indicates a stable situation. The debt repayment period is positive for 2022 and 2024, which may mean that the debt repayment period was acceptable in each year. In the last year, the rating is 89, which is an extremely high value. The share of cash flow in revenues is critical; the worst results were achieved in 2024, where the value dropped to negative. The year 2022 shows the best rating for the return on total capital, the following year was the worst, the year 2023 has already increased a little, but still maintained the same rating as the previous year.

Table 2 Results of Quick Test

Index / calculation	2022	2023	2024
Measure of financial independence	77%	68%	74%
(equity / total capital)	1	1	1
Payment period in years	-2	89	-1
(debt – financial means) / cash flow	1	5	1
rate of cash flow on revenues	1%	0%	-3%
(cash flow / revenues)	4	4	5
Return on total capital	9%	2%	7%
(EAT + interest / total capital)	3	4	4
Total points	**9**	**14**	**11**

Source: own processing according to financial statements of the company

The overall assessment of the quick test is as follows. In 2022, we achieved an overall rating of 9 points, indicating a relatively stable situation. The year 2023 brought us a significantly worse rating, indicating a more critical situation. The last year, 2024, dropped, indicating a better situation, but was still worse than the first year. The mentioned results are illustrated by Figure 1.

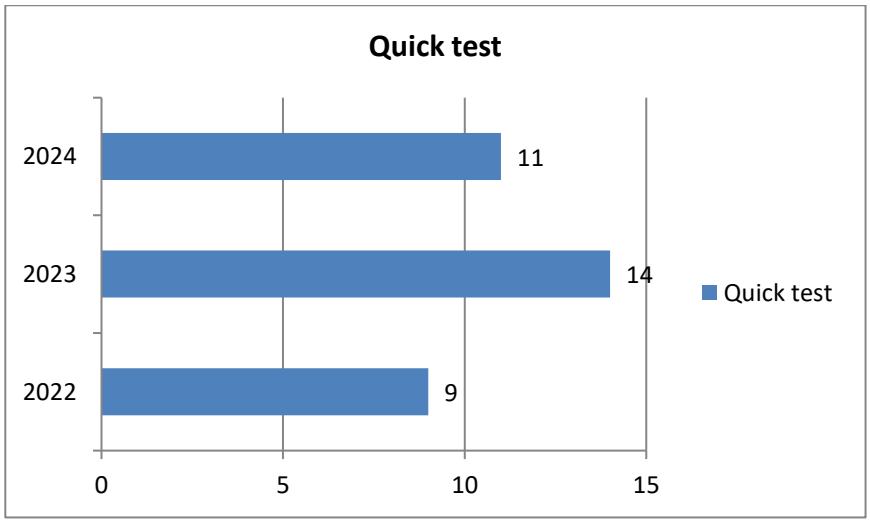

Figure 1 Quick test development

Source: own processing according to financial statements

2.2 Index Bonity

For 2021, we obtained a creditworthiness index value of 2.23, which indicates a very good situation. The next year it dropped to 0.75, which signaled some problems in the company. The last year, 2022, the value increased, which indicated a good situation (see Table 3).

Table 3 Index Bonity Development

Index / calculation		2022	2023	2024
Cash flow/ debts	**x1**	0,03	0,00	-0,20
Total capital / debts	**x2**	4,31	3,16	3,81
EBT / total capital	**x3**	0,12	0,02	0,09
EBT / Revenues	**x4**	0,10	0,02	0,06
Stocks / Total Assets	**x5**	0,10	0,10	0,20
Total Revenues / Total Capital l	**x6**	1,23	1,23	1,56
B = 1,5x1 + 0,08x2 + 10x3 + 5x4 + 0,3x5 + 0,1x6	**B =**	**2,23**	**0,75**	**1,46**

Source: own processing according to financial statements

Overall, the situation can be considered stable with a significant improvement in 2024 compared to 2023, which was a period of some problems. This is due to the economic crisis that the company faced in 2023 (see Figure 2).

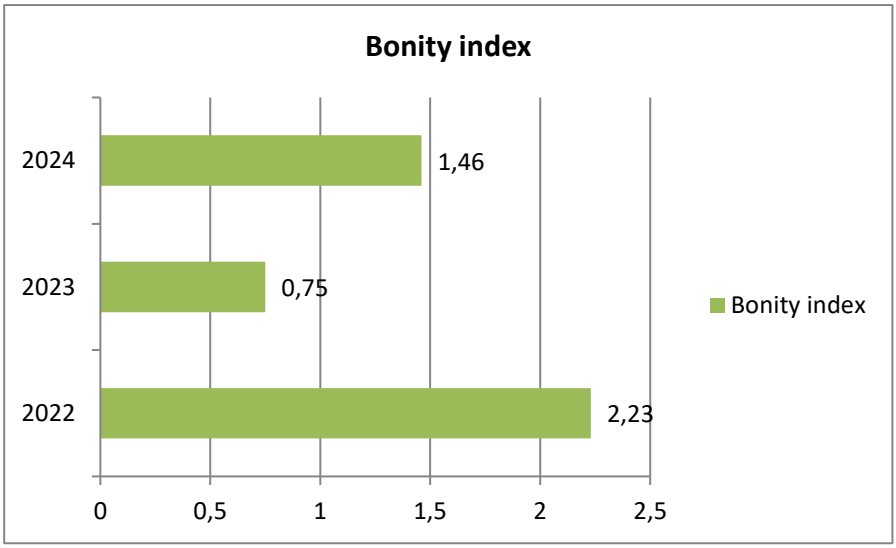

Figure 2 Bonity index development

Source: own processing according to financial statements

2.3 Tafler bankrutcy model

Analysis of Tafler bankruptcy model showed changes during the analyzed years, as illustrated by Table 4. The results show that even though the company has faced uncertainty and challenges, it is still on solid financial footing with promising prospects for the future.

Table 4 Results of Tafler bankruptcy model

Index / calculation		2022	2023	2024
EBT / short term debts	**x1**	0,70	0,09	0,24
Current Assets / debts	**x2**	2,24	1,84	2,31
Short term debts / total assets	**x3**	0,17	0,26	0,22
Sales / total assets	**x4**	1,19	1,21	1,40
T = 0,53 * x1 + 0,13 * x2 + 0,18 * x3 + 0,16 * x4	**T =**	**0,88**	**0,53**	**0,79**

Source: own processing according to financial statements of the company

After analyzing the results of the Taffler bankruptcy model, it is clear that the company's financial stability has changed over the years. In 2022, it reached a very high value, indicating a low probability of bankruptcy. This figure indicates confidence in the company's financial strength during this period. In 2023, the value fell to 0.53, which is a significant decrease compared to 2022. This decrease may be due to the deterioration of some financial indicators. However, it is still in the range with a low probability of bankruptcy. The situation seems to be more stable in 2024, where it reached a value of 0.79, indicating a slight return to higher financial stability compared to 2023. Figure 3 provides development of Tafler index values.

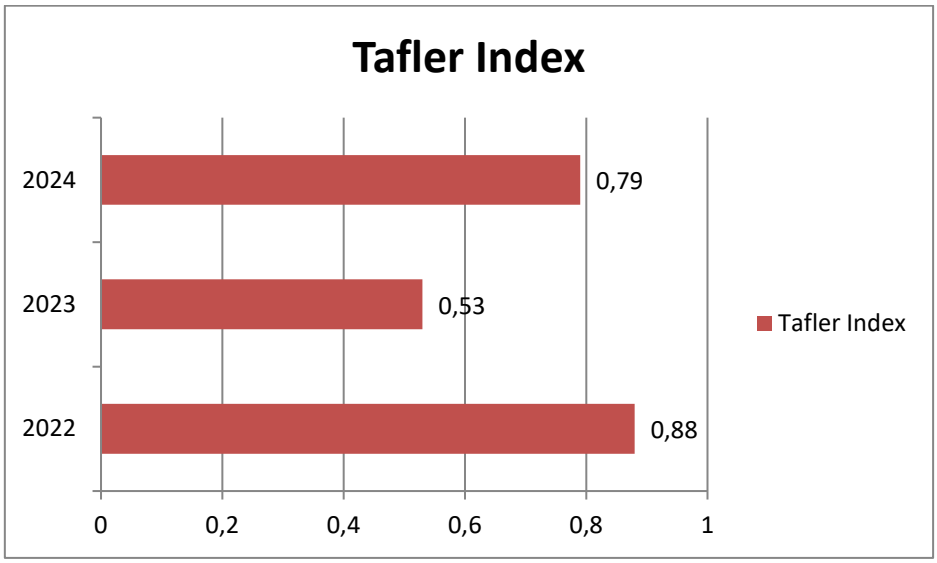

Figure 3 Tafler index development

Source: own processing according to financial statements

3 Assessment of results obtained

The ex-ante analysis, focusing on creditworthiness and bankruptcy models, provided further important information on the future development of the company. We also saw the impact of the economic crisis in these models, but the development over time brought an improvement in the financial situation. Increased emissions in 2021 related to the crisis affected the financial stability of the company. Fortunately, in 2022 we saw some recovery, which indicates the adaptation of the company and its ability to quickly respond to changes in the environment. Currently, the results still do not reach the level of 2022, which indicates that the company is still trying to reach the pre-crisis level. Overall, we can note that the company faced difficulties during the economic crisis, but its ability to adapt and respond to changes in the environment indicates that it has the potential to recover and grow in the future. It is important for the company to continue its efforts to improve financial stability and achieve sustainable growth (see Table 5).

Table 5 Optimal values achievement of evaluated indexes in 2024

	2024	Optimal value	Assessment
Quick Test	11	≤ 4	negative
Index Bonity	1,46	> 0	positive
Tafler Index	0,79	≥ 0,3	positive

Source: own processing according to financial statements

4 Suggestions for future development improvement

Although the financial situation of SMZ, a.s. Jelšava is generally good, there are certain areas that require attention and improvement. One of these areas is high emissions, as already mentioned in the previous chapter. These can have a negative impact on the financial situation and performance of the company. We suggest that the company pay special attention to reducing emissions and implementing measures to control and limit them.

Therefore, following measurements and steps had been suggested to improve the situation and to strengthen long-term sustainability:

1. Investing in new machinery and equipment – technology modernization. We propose to invest in new machinery and equipment that will be more environmentally friendly and can help reduce the company's overall emissions. This step could include switching to renewable energy sources.
2. Investing in research and development of new technologies that will enable more effective emission reduction. For example, creating cooperation with students of the General Viesta Secondary Vocational School in Revúca, with which the company already has an existing cooperation through dual education, for example on startups.
3. Investing in employee education – By increasing employee education in environmental sustainability and innovation, we can ensure that employees are actively involved in the process of reducing emissions. This may include training or other forms of education that raise awareness of environmental challenges and solutions.

Share and collaborate with other companies to solve the problem – sharing experiences with other companies can be a valuable tool in solving environmental problems, including emissions. We suggest participating in innovative projects that ensure effective cooperation with other companies and the creation of a joint effort in finding solutions.

Implementing these proposed steps for future development can lead to significant improvements in the financial stability and sustainability of the company. Their implementation could bring long-term growth and success in a dynamic business environment.

Conclusion

Nowadays, many entrepreneurs are so obsessed with money that when they reach a certain profit limit, they often spend it for personal purposes. It would be right to invest at least 5 to 10% of their profit for future development. Investing these funds in the company would bring significant improvement and in the long term, it can return many times over in the form of increased income and competitiveness of the company. It is necessary to draw attention to external threats to the company, as signaled by lower company values. The proposed steps could be beneficial for the company and its sustainable development in the future. The results of the company development prediction have important informative capabilities for business leaders, managers, so that they can make decisions about investments, financing or planning future steps. The results could serve also for investors and creditors, so that they can assess the financial stability and ability of the company to repay its debts, and for employees, because negative results can affect their work and job security.

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THE IMPORTANCE OF ENGAGEMENT RATE AS AN INDICATOR OF EFFECTIVE COMMUNICATION BY BOOKSTORES ON SOCIAL NETWORKS

VÝZNAM ENGAGEMENT RATE AKO UKAZOVATEĽA EFEKTÍVNEJ KOMUNIKÁCIE KNÍHKUPECTIEV NA SOCIÁLNYCH SIEŤACH

Janka KOPČÁKOVÁ

Abstract
Social networks are currently an essential element of successful business. Companies that are able to properly utilize their potential gain not only a competitive advantage, but also a long-term perspective for building stable relationships with customers in a dynamic online environment. The article uses a comparative analysis created by the Facebook and Instagram social media applications. The study examined the two largest bookstores in Slovakia, which, in addition to brick-and-mortar stores, also sell online. The analysis showed that even with a lower number of posts on social platforms, it is possible to achieve high consumer interaction if the individual posts are properly targeted and provide added value for consumers, such as in the form of competitions.

Key words: Social networks, Facebook, Instagram, Engagement rate

Abstrakt
Sociálne siete predstavujú v súčasnosti nevyhnutný prvok úspešného podnikania. Podniky, ktoré dokážu vhodne využiť ich potenciál, získavajú nielen konkurenčnú výhodu, ale aj dlhodobú perspektívu budovania stabilných vzťahov so zákazníkmi v dynamickom online prostredí. V článku je využitá komparatívna analýza vytvorená aplikáciou na sociálne siete Facebook a Instagram. Skúmanými boli dve najväčšie kníhkupectvá na Slovensku, ktoré okrem kamenných predajní zabezpečujú aj online predaj. Analýza poukázala na skutočnosť, že aj nižším počtom príspevkov na sociálnych platformách je možné dosiahnuť vysokú interakciu spotrebiteľov, ak sú jednotlivé príspevky správne cielené a poskytujú pridanú hodnotu pre spotrebiteľov, ako napríklad vo forme súťaží.

Kľúčové slová: Sociálne siete, Facebook, Instagram, Engagement rate

Introduction

In today's digital age, social networks have become an integral part of everyday life for individuals and businesses alike. Originally created as platforms for personal communication, sharing experiences, and maintaining contacts, in recent years they have grown into an important tool for strategic marketing, brand building, and strengthening customer relationships. For businesses, they represent new opportunities to reach target groups, create communities, and, last but not least, effectively promote the sale of their products or services.

The importance of social networks in business practice can be viewed from several angles. On the one hand, it provides a space for immediate, two-way communication with customers, enabling businesses to respond to needs and

feedback in real time. On the other hand, they create opportunities for targeted promotion through advertising and customized content that can reach precisely defined market segments. This makes social networks a unique tool that is not only a marketing channel but also a source of data and insights into consumer behavior.

Currently, there are many platforms through which businesses can attract consumers, such as Facebook, Instagram, TikTok, Twitter, YouTube, etc. Among the most important platforms actively used by businesses in Slovakia and worldwide are Facebook and Instagram, which is why these platforms formed the basic framework for the research.

1 Literature Review - Comparison of social networks of the most preferred bookstores

Social networks are currently monitored by various target groups. Based on this fact, individual companies strive to attract the largest possible audience in order to gain potential consumers.

Nowadays, it is very important to monitor follower interactions on social networks in the digital world in order to target customers and increase your rating on social networks. This issue was also addressed by Li and Kannan (2014), who present a measurement model that allows for the analysis of customer decision-making when choosing online channels, their visits through these channels over time, and subsequent purchases on the website (Li and Kannan, 2014).

Authors Balaji, Behl et al. (2023) also addressed consumer interactions when using online channels in their study, where they created a model that tracks their visits over time and subsequent purchases on the website. The model estimates the transfer and side effects of previous contacts at each stage of the purchasing process. Based on these estimates, credit for conversion is assigned to specific channels (Balaji, Behl et al., 2023).

Research focusing on individual metrics applied to input data from social networks was also used in a study by Trunfio, M., & Rossi, S. (2021) also used research focusing on individual metrics applied to input data from social networks in their study, classifying different approaches and metrics (likes, shares, comments, CTR), identifying problems with normalization and the design of standardized engagement indices, and providing recommendations for future research. Muñoz Expósito et al. (2017) also point to practical applications, proposing a specific metric for engagement on Twitter that takes into account interactions (retweets, replies, likes) and the number of views. The article also discusses data normalization and creates a framework for the comparable evaluation of Twitter campaigns.

The Engagement Rate (ER) indicator was used to determine the level of engagement of social networks followers in interactions. This indicator is used primarily in digital marketing evaluations. Followers can interact by liking, commenting, and sharing (Malaga, 2025). Based on this fact, the following formula was applied in the article:

$$\text{Engagement rate} = \frac{\sum (likes+comments+shares)}{number\ of\ followers\ x\ number\ of\ posts} x\ 100 \quad (1)$$

If the indicator value is in the range <0 – 1>, this represents a low level of engagement. A value in the range <1 – 3> indicates an average level of engagement. A good level of engagement is represented by results in the range <3 – 6>, while values above 6 indicate an excellent level of engagement among followers.

The analysis comparing social networks is performed using quantitative indicators such as interaction frequency, post frequency, and engagement rate for the monitored period of August 2025. Two bookstores were analyzed, both of which have brick-and-mortar stores in Slovakia but also sell books online. The two most popular social networks, Facebook and Instagram, were monitored.

Authors De Vries et al. (2012) analyzed 355 posts from 11 international brands in six product categories. The results showed that placing a post at the top of a brand's fan page increases its popularity. An empirical study analyzed the factors that influence the popularity of posts on Facebook (likes, shares, comments). The authors examine the content and visual aspects of posts and their impact on engagement, providing practical recommendations for optimizing social content. (De Vries et al., 2012). Based on this fact, we also monitored consumer interactions at the two most preferred bookstores on the most preferred social networks, Facebook and Instagram.

The first social network used for gathering information was Facebook. Facebook is one of the most important social networks today, which has fundamentally changed the way people communicate, share information, and build social connections online. The history of Facebook can be traced back to 2004, when it was founded by Mark Zuckerberg and his classmates at Harvard University. Originally, Facebook was intended only for Harvard students, but it later expanded to other universities and eventually became a global platform available to anyone over the age of 13. The development of Facebook is characterized by the constant expansion of features and services. Gradually, the ability to add friends, create profiles, share photos and videos, publish statuses, use comments and reactions, and chat via Messenger were added. Later, Facebook began implementing algorithms that personalize content based on user interests and enabled the creation of pages for businesses, groups, and events. Facebook's overall impact on society has a positive effect in that it provides communication and information, but it also has a negative impact in terms of privacy and addiction.

The second social network that was monitored is Instagram. Instagram is a popular social network focused on sharing photos and videos, which has fundamentally changed the way people present their lives online. It was founded six years after Facebook, in 2010, by Kevin Systrom and Mike Krieger in San Francisco. The original goal was to create a simple platform for quickly sharing visual content. Instagram quickly gained popularity, especially among young users, and in 2012 it was acquired by Facebook, which enabled its further dynamic development. Specifically, they announced the acquisition in April 2012 for approximately $1 billion. Instagram's development is characterized by the constant expansion of its features. From its original photo-sharing function, it has gradually become a platform that supports videos, stories, reels, and live broadcasts. It also added the option of private messaging, interaction through comments and reactions, and the creation of profiles for companies and influencers. Instagram has significantly influenced the marketing and media industry, as it has become a tool for promoting brands, products, and creative projects. Like Facebook, this social network has its positives and negatives, just like any other social network.

2 Results - Monitored bookstores compared

Martinus is one of the most important bookstores in Slovakia, which has established itself as a modern platform for readers of all ages. Its history began in 1990, shortly after the political changes in the former Czechoslovakia, when the first brick-and-mortar store was opened. The first brick-and-mortar store of the Martinus bookstore was opened in the city of Martin, which is also the birthplace of the brand itself. (Figure 1).

Figure 1 First brick-and-mortar operation Martinus

Source: https://onas.martinus.sk/

The founders were brothers Miroslav and Jozef Santus, who decided to establish one of the first private bookstores in Slovakia. Martinus' development is characterized by the gradual expansion of its product range and the modernization of its services. The original brick-and-mortar bookstore has grown into a network of stores throughout Slovakia, with an online store as an additional service, allowing customers to order books from the comfort of their own homes. Martinus also organizes various literary events, discussions, book signings, and festivals, thereby supporting the community and cultural dimension of reading. It is characterized by its friendly and modern environment, intuitive store layout, wide selection of books of all genres and age categories, and emphasis on customer experience. In addition to classic titles, Martinus also offers e-books, audiobooks, and gift items.

The second bookstore compared is Panta Rhei. Panta Rhei is one of the most important and extensive bookstores in Slovakia. Its history began in 1991, when founder Ladislav Bödök started selling books seasonally at the market. (instore.sk, 2020). He later continued selling books from a tent and then opened a small bookshop. His dream was to create a large-format bookstore that would offer a wide selection of books and become a cultural center for literature lovers. Ladislav Bödök opened his first bookstore in Veľký Meder in 1992 (Valček & Rehák, 2012). Over the years, Panta Rhei has grown into a network of bookstores throughout Slovakia. Today, it operates more than 58 branches and also owns 15 Café Dias cafés, which offer quality coffee and a pleasant environment for readers (pantarhei.sk, 2024). Figure 2 shows the cities in which Panta Rhei operates its individual stores in Slovakia.

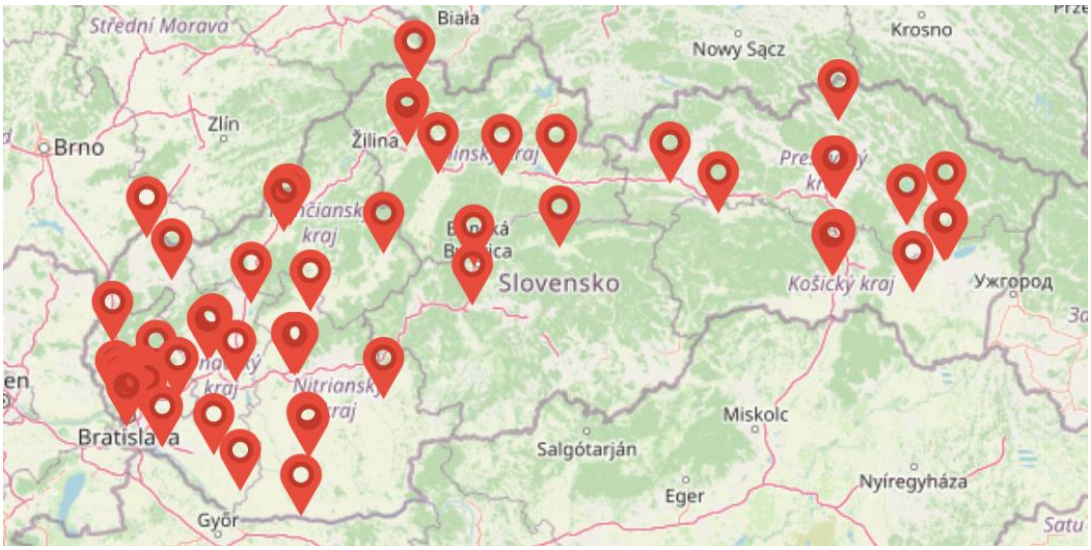

Figure 2 Location of Panta Rhein brick-and-mortar stores in Slovakia

Source: https://www.pantarhei.sk/predajne/

In addition to brick-and-mortar stores, Panta Rhei also has an online store with an extensive range of books and other products. The basic idea behind Panta Rhei is to offer high-quality books of various genres and for all age groups, to support Slovak authors, and to organize cultural events such as book signings, literary discussions, and debates. Panta Rhei is also involved in recognizing Slovak authors through the Knižná múza – Panta Rhei awards, which are given based on votes from the public and a jury. In this way, it supports the development of Slovak literature and raises awareness of domestic authors.

Social networks is currently becoming a key tool for marketing and brand building in the retail sector, and bookstores are no exception. Given the dynamic development of digital marketing and increased interest in online communication, it is relevant to compare the presence of individual bookstores on social networks and analyse their reach, audience engagement, and frequency of posting. In this context, data on two major Slovak bookstores - Martinus and Panta Rhei - are interesting, as they differ not only in the scope of their offerings but also in their activity on social platforms such as Instagram and Facebook.

The Martinus bookstore has 149,000 followers on Facebook, which indicates its strong presence and audience engagement on this social network (Figure 3).

Figure 3 Facebook page Martinus

Source: Facebook, 2025

In comparison, Panta Rhei stands out on Instagram, where it has 512,000 followers, reflecting the brand's focus on visual content and a younger audience (Figure 4).

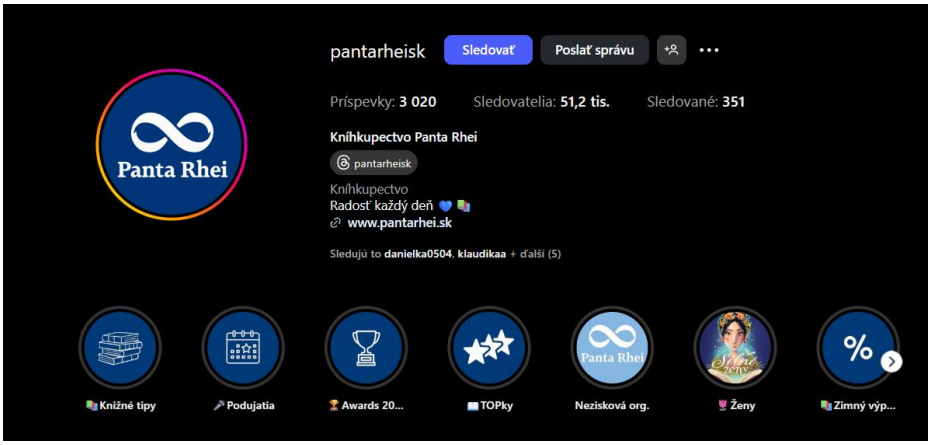

Figure 4 Panta Rhei's Instagram page

Source: Instagram 2025

This difference highlights the different digital marketing strategies of the two bookstores. Martinus uses Facebook for information and community interaction, while Panta Rhei maximizes the visual appeal and shareability of content on Instagram. This diversification of social platforms allows for the optimization of reaching different target groups.

An analysis of published posts shows that Martinus bookstore is significantly more active than Panta Rhei. On Instagram, Martinus has 36 posts for the monitored period (August 1, 2025 – August 31, 2025), while Panta Rhei has only 23 posts. The difference is even more pronounced on Facebook. Martinus has 58 posts, compared to 22 posts by Panta Rhei. This difference in posting frequency suggests that Martinus systematically focuses on maintaining a presence on social networks and actively engaging with its audience, which can promote engagement and build customer loyalty.

An analysis of interactions with posts provides further insight into the success of the social networks strategy. The post that received the most likes on Instagram was Martinus's post entitled "Bookworms, did you know that August 9 is also known as Book Lovers Day?" This post received 1,364 likes, 9 comments, and 32 shares. It is a post thematically focused on addressing readers and literature (Figure 5).

Figure 5 Most liked bookstore post for the month of August 2025 on Instagram

Source: Instagram 2025b

Martinus' most successful Facebook post is "Opening on August 22 – new Martinus in Michalovce," which received 1,027 likes, 37 comments, and 77 shares (Figure 6). This post shows that followers respond not only to thematic content but also to practical information about services and new branches. The audience's response in the form of comments and shares indicates that news and current events are an important factor in engagement and can support the local community around the bookstore.

Figure 6 The most liked bookstore post for the month of August 2025 on Facebook

Source: Facebook 2025b

Although Panta Rhei publishes fewer posts, it has the most engaging post on Instagram, which is a competition for a €300 gift voucher, organized in collaboration with Saturn. This post received 1,916 likes, 2,569 comments, and 37 shares, indicating that competitive forms of content can significantly increase interaction. The same post was also preferred on Facebook, where it received 649 likes, 847 comments, and 157 shares. This fact highlights Panta Rhei's ability to generate high engagement through strategic competitions, even though the total number of posts is lower than that of Martinus (Figure 7).

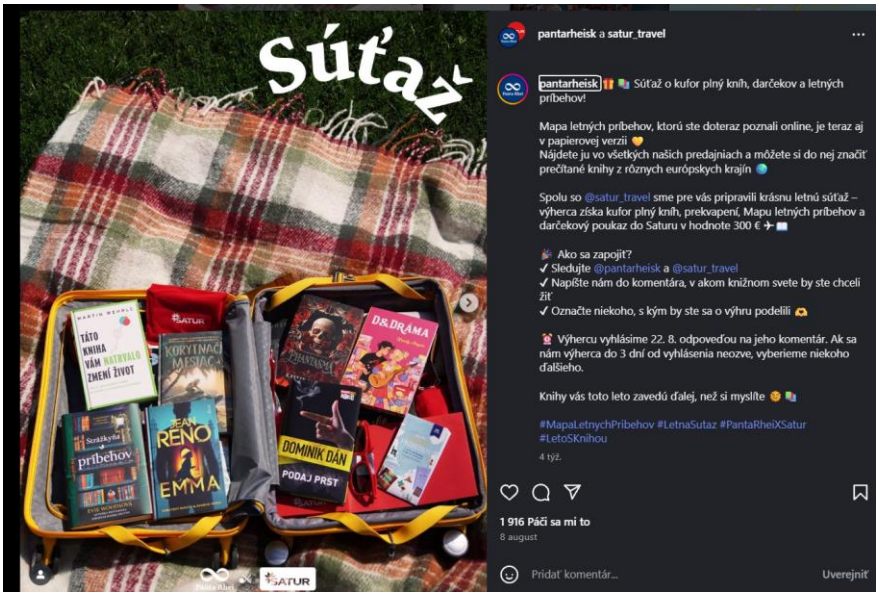

Figure 7 The most liked bookstore post for the month of August 2025 on Facebook and Instagram

Source: Instagram 2025c

A comparison of the two bookstores reveals several key trends. With a higher number of posts and regular activity on social networks, Martinus is able to maintain consistent communication with its audience. Regular publishing and diverse content, from thematic posts to celebrations of special days to announcements of new branches, increase the likelihood that posts will reach a wider audience and promote customer loyalty. In the case of Panta Rhei, it appears that even with a smaller number of posts, it is possible to achieve a high level of interaction if the posts are strategically targeted and contain elements of competition or valuable rewards for users.

From a social networks marketing strategy perspective, the difference in the number of posts is key. Higher posting frequency contributes to greater brand visibility, increases the reach of posts, and promotes online community building. Martinus thus profiles itself as a brand that regularly communicates with its audience and maintains its attention. Panta Rhei, on the other hand, shows that the quality and strategic focus of content can compensate for a lower frequency of posts, especially when it comes to contests or other forms of interactive content.

Analyzing specific metrics such as the number of likes, comments, and shares allows you to quantify the success of individual posts and evaluate their reach. For example, Martinus' Instagram post with 1,364 likes, 9 comments, and 32 shares shows that thematic content can generate high visual engagement and information sharing. Conversely, Panta Rhei's competition post on Instagram with 1,916 likes and 2,569 comments proves that competition formats can generate significantly more intense interactions, especially in the form of comments and shares, which increases the visibility of the content.

The analysis was performed using the Engagement rate indicator, which shows the level of engagement on Facebook. The calculation itself was applied to both bookstores. We implemented the calculation from the input data in Table 1.

Table 1 Bookstore engagement rate on Facebook

ER on Facebook profiles		
	Martinus Bookstore	Panta Rhei Bookstore
Total likes, comments and shares	6 101	4 074
Number of posts for the monitored period	58	22
Number of followers	149 000	90 000
ER in %	0,0706	0,2058

Source: own processing

By analyzing the engagement rate (ER) of the Martinus bookstore and the Panta Rhei bookstore, we concluded that despite the lower number of posts, the Panta Rhei bookstore achieved a higher level of interaction with followers on its Facebook page in August 2025.

We also monitored the engagement rate of both bookstores on Instagram. We implemented the calculation from the input data in Table 2.

Table 2 Bookstore engagement rates on Instagram

ER on Instagram profiles		
	Martinus Bookstore	Panta Rhei Bookstore
Total likes, comments and shares	17 890	11 398
Number of posts for the monitored period	36	23
Number of followers	69 300	512 000
ER in %	0,7171	0,0968

Source: own processing

When comparing Table 1 and Table 2, it is clear that both bookstores achieve higher interaction in terms of the total number of likes, comments, and shares on Instagram. By analyzing the engagement rate (ER) of Martinus and Panta Rhei bookstores, we concluded that in August 2025, Martinus achieved a higher level of interaction with followers on its Instagram page. This may be due to the higher number of posts published in this case. These facts show that Martinus leads in terms of follower interaction on Instagram, while Panta Rhei generates a higher

level of interaction among its followers on Facebook. However, the results show that in both cases, the values range between <0 and 1>, which represents a low level of follower engagement.

Overall, it can be said that the differences in the number of posts between Martinus and Panta Rhei influence the way the audience perceives the brand and engages with its content. The higher number of Martinus posts indicates a systematic and continuous approach to social networks, which supports the stable presence of the brand and maintains audience interest. The lower number of posts by Panta Rhei shows that even with less frequency, it is possible to achieve high interaction if the posts are strategically targeted and provide value to users, for example in the form of competitions and gifts. From a professional marketing evaluation perspective, it can therefore be concluded that the Martinus bookstore has higher activity and regularity of posts, which can result in higher long-term reach and customer loyalty, while Panta Rhei achieves high engagement in short-term campaigns.

Conclusion

Social networks are becoming increasingly popular. Currently, social networks such as Facebook, Instagram, TikTok, YouTube, etc. are the most popular. It is no longer just individuals who are active on social networks, but also companies that are trying to attract their consumers in the best possible way through various posts. The post monitored the two largest bookstores in Slovakia, Martinus and Panta Rhei. The research was applied by calculating the level of engagement of followers on Facebook and Instagram. The results showed that in all cases, the level of follower engagement was low, even though the number of followers of the Martinus bookstore was higher on Facebook, while the number of followers of the Panta Rhei bookstore was higher on Instagram.

In conclusion, it can be said that analyzing social networks posts provides valuable information about bookstores' marketing strategies and their ability to interact with their audience. Martinus' higher frequency of posting, combined with content focused on readers and the community, gives the brand an advantage in maintaining audience engagement. Panta Rhei, on the other hand, demonstrates the effectiveness of competition and promotional formats, which can generate high immediate interaction even with fewer posts.

An overall view of this data confirms that the number of posts is an important factor in social networks strategy and that Martinus dominates Panta Rhei in this regard, which may have long-term implications for marketing effectiveness and brand building on digital platforms.

Further research should be extended to other retail businesses in different sectors to compare the use and effectiveness of social networks across different types of retail.

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SKILLS IN DEMAND: AN NLP ANALYSIS OF BUSINESS JOB ADVERTISEMENTS IN SLOVAKIA

DOPYT PO ZRUČNOSTIACH: NLP ANALÝZA PRACOVNÝCH INZERÁTOV NA BUSINESS POZÍCIE NA SLOVENSKU

Jakub SIEBER – Michal TKÁČ ml.

Abstract
This paper uses online job advertisements from Slovakia's main job portal, Profesia.sk, to map skills requested in business-related positions. We web-scrape 800 vacancies from a 31-day period analysed using a dictionary-based NLP approach. Skill mentions are grouped into socio-emotional, analytical, digital and language bundles. Employers overwhelmingly demand hybrid profiles: almost all adverts stress responsibility, two thirds mention communication skills, and over half require English. Digital tools such as Excel, generic office software and ERP/CRM systems are frequent, while explicit references to AI and data-science tools remain rare and are concentrated in Bratislava. In this sample, higher advertised wages are more clearly associated with language and, to a lesser extent, analytical requirements than with the sheer number of skills listed.

Keywords: skills, job market, lifelong learning, business operations, NLP analysis

Abstrakt
Príspevok využíva údaje z online pracovných inzerátov na portáli Profesia.sk na zmapovanie zručností požadovaných v business a administratívnych pozíciách na Slovensku. Webovým zberom sme získali 800 inzerátov za obdobie 31 dní analyzovaných NLP metódou. Výskyty zručností sú združené do štyroch zväzkov – socio-emocionálne, analytické, digitálne a jazykové zručnosti. Zamestnávatelia jednoznačne požadujú „hybridné" profily: takmer všetky inzeráty zdôrazňujú zodpovednosť, približne dve tretiny spomínajú komunikačné schopnosti a viac ako polovica vyžaduje angličtinu. Digitálne nástroje ako Excel, balík MS Office a ERP/CRM systémy sú časté, kým explicitné odkazy na AI a dátovo-vedecké nástroje zostávajú zriedkavé a sústredené najmä v Bratislave. V tejto vzorke sú vyššie ponúkané mzdy viac spojené s jazykovými a čiastočne analytickými požiadavkami než s celkovým počtom uvedených zručností.

Kľúčové slová: zručnosti, trh práce, celoživotné vzdelávanie, podnikové operácie, NLP analýza

Introduction

Firms competing in open, digitalised markets depend critically on the skills and competences of their workforce to maintain productivity and adapt to changing technologies (Fabo et al., 2017; Musinszki et al., 2025). In business-related occupations such as administration, finance, project coordination and operations management, employees orchestrate information flows, coordinate teams and translate strategic goals into everyday processes, making their skill profiles central to organisational performance (Muller & Safir, 2019; Giambona et al., 2024). Recent work suggests that employers in these roles no longer look

only at formal qualifications, but increasingly emphasise combinations of cognitive, technical and socio-emotional skills when recruiting (Muller & Safir, 2019; Djumalieva & Sleeman, 2018).

In parallel, researchers and policy organisations have begun to treat online job advertisements as a rich, near real-time source of information on labour demand and required competences. Large-scale initiatives such as Cedefop's Skills OVATE and the UK's data-driven skills taxonomy show that vacancy data can be used to map skill requirements across countries, regions and occupations, and to track how they evolve over time (Cedefop, 2019; Djumalieva & Sleeman, 2018; Vassilev et al., 2021). Using text-mining or dictionary-based methods, these studies consistently find that transversal competences such as communication, problem-solving and teamwork are requested across a wide range of occupations, alongside more specific digital and technical abilities (Muller & Safir, 2019; Musinszki et al., 2025). Applications in different national contexts confirm that online vacancies can reveal what employers "actually want" from new hires, beyond what is visible in formal occupational classifications (Muller & Safir, 2019; Giambona et al., 2024; Musinszki et al., 2025).

The wider context is a labour market shaped by rapid digitalisation and accelerating advances in artificial intelligence (AI). Evidence on automation suggests that robot and AI technologies have altered the task content of work, contributing to job polarisation and shifting the composition of skills demanded across occupations (Autor et al., 2006; Lábaj & Vitáloš, 2024; Lábaj et al., 2025). Cross-country analyses of occupational AI exposure similarly indicate that AI adoption is associated with changes in employment patterns, particularly in occupations intensive in computer use, even if net employment effects remain ambiguous (Georgieff & Hyee, 2021). Online vacancy studies focusing specifically on AI-related jobs show that postings increasingly require bundles of advanced digital and data skills, combined with higher-order cognitive and socio-emotional abilities (Squicciarini & Nachtigall, 2021; Musinszki et al., 2025). In other words, the "burst" of AI appears to reshape entire skill bundles rather than adding a single new technical requirement.

Yet much of this evidence either focuses on aggregate occupational groups or on highly technical AI-intensive roles, and often on Western European or North American labour markets. Central and Eastern European countries remain comparatively less studied, despite their integration into global value chains and their own digitalisation agendas (Fabo et al., 2017; Cedefop, 2019). For Slovakia in particular, existing work with online vacancies has mainly examined vacancy volumes, regional distributions and broad task content, rather than detailed skill profiles in specific occupational domains (Štefánik et al., 2023). This leaves a gap in understanding how skill demand is configured in the broad set of business-related positions that underpin everyday organisational functioning, and how prominently different "hard" skills such as specific software tools or analytical techniques feature in advertised requirements.

Against this backdrop, the present study asks a simple but timely question: Which skills are most frequently requested in online job advertisements for business-related positions in Slovakia, and how are these skills bundled across digital, analytical and socio-emotional domains in the context of rapid AI-driven change? Building on the methodological tradition of using online job adverts to infer skill demand (Djumalieva & Sleeman, 2018; Vassilev et al., 2021; Musinszki et al., 2025), the study uses web-scraped vacancies from Slovakia's dominant job portal to construct a dataset of business-area postings and to identify the prevalence of different skills mentioned in job descriptions. A dictionary-based coding approach, informed by existing taxonomies such as ESCO and prior empirical work on skills in online advertisements, is used to classify skill mentions into broader categories (Djumalieva & Sleeman, 2018; Giambona et al., 2024). The paper thus provides up-to-date descriptive evidence on the skill content of business-related vacancies in Slovakia, contributes to debates on how AI and digitalisation reshape the composition of skill demand, and offers a labour-market based perspective that can inform curriculum discussions in business and management education (Muller & Safir, 2019; Musinszki et al., 2025).

1 Background and conceptual foundation

1.1 Skills in business and operations-related occupations

Business and operations-related occupations – such as administration, finance, project coordination or operations management – typically sit at the interface between strategic decision-making and day-to-day organisational processes. Empirical studies consistently show that employers hiring into such roles look for hybrid skill profiles that combine cognitive abilities, technical know-how and socio-emotional competences, rather than formal qualifications alone (Muller & Safir, 2019; Musinszki et al., 2025).

Using online vacancy data from Ukraine, Muller and Safir (2019) document that business and office-related positions systematically require combinations of general cognitive skills, ICT skills and "soft" skills such as communication, teamwork and responsibility, and that these competences are often more prominent in adverts than detailed degree requirements. A growing European literature reaches similar conclusions: employers expect business professionals to be able to manage information flows, coordinate stakeholders and handle data-rich digital tools, while also exhibiting customer orientation, problem-solving and collaboration skills (Cedefop, 2019; Giambona et al., 2024; Musinszki et al., 2025).

From a policy perspective, these hybrid requirements are often framed in terms of "advanced" or "higher-order" skills that combine technical and transversal components. Evidence for Slovakia, for example, shows that moving up global value chains and adopting more complex technologies increases demand for workers with stronger analytical, problem-solving and

communication competences, not just higher levels of formal education (Machlica et al., 2017; OECD, 2017). This aligns with broader OECD work arguing that modern labour markets reward bundles of cognitive, digital and socio-emotional capabilities, particularly in business services and professional occupations (OECD, 2019; OECD, 2023). The paper focuses on business-related occupations precisely because they concentrate this mix of coordination, information processing and technology-mediated tasks. These jobs are expected to be especially sensitive to changes in skill demand associated with digitalisation and AI, as they combine routine elements that can be automated with non-routine cognitive and interpersonal work that remains difficult to codify (Lábaj & Vitáloš, 2024; Lábaj et al., 2025).

1.2 Online job advertisements as a source of skill intelligence

Online job advertisements (OJAs) have become an established data source for monitoring labour demand and skill requirements. Cedefop's pan-European programme on online vacancies shows that large-scale web-scraped adverts can be processed to produce near real-time indicators on occupations, required skills and working conditions, complementing traditional survey and administrative statistics (Cedefop, 2019).

Methodologically, most OJA-based studies follow a similar logic. First, vacancy texts are collected from major portals or aggregators. Second, occupations and skills are identified using taxonomies such as ESCO – the European multilingual classification of occupations and skills (European Commission, 2017; ESCO, 2024). Third, text-mining or dictionary approaches are used to extract competences and assign them to broader groups. Djumalieva and Sleeman (2018), for instance, develop an open and data-driven skills taxonomy from UK job adverts and show that such taxonomies can capture fine-grained changes in skill demand at the level of individual tasks and tools. Vassilev et al. (2021) apply similar methods to Bulgarian adverts and demonstrate that OJAs can be used to track both general and specialised skills across occupations and regions.

Recent work extends these approaches to different national settings and occupational domains. Giambona et al. (2024) use Italian regional OJAs to identify clusters of digital and managerial skills requested in business and administrative occupations, highlighting strong co-occurrence between general ICT proficiency, data handling and teamwork. Musinszki et al. (2025) show, using Hungarian adverts, that employers systematically emphasise transversal competences such as communication and responsibility alongside job-specific technical requirements, and that these patterns can be quantified using ESCO-based skill categories. At the same time, the literature points to several limitations of OJA data. Coverage is restricted to jobs that are advertised online, which may under-represent smaller firms, low-wage segments or informal recruitment channels (Cedefop, 2019; Vassilev et al., 2021). Skill extraction is imperfect and

depends on the quality of dictionaries or machine-learning models, while the language used in adverts can be noisy and marketing-driven (Djumalieva & Sleeman, 2018; Giambona et al., 2024). Despite these caveats, OJAs are now widely recognised as a valuable complement to traditional labour-market intelligence, especially for studying emerging technologies and fast-changing skill needs (Cedefop, 2019; OECD, 2023).

1.3 Digitalisation, AI and the changing composition of skills

A large body of research documents how digital technologies and automation reshape the task content of work and, in turn, the demand for skills. Early task-based studies for Europe and the United States show that computerisation and robot adoption disproportionately affect routine tasks, contributing to employment polarisation and increasing the relative importance of non-routine cognitive and interpersonal skills (Autor et al., 2006; Lábaj & Vitáloš, 2024). Building on this work, Lábaj and Vitáloš (2024) find for European countries that automation and other forms of technological change increase the demand for higher-skilled labour, with particularly strong effects in business services and professional occupations.

More recent analyses focus specifically on AI. Georgieff and Hyee (2021) construct cross-country measures of occupational exposure to AI and show that, while the net employment impact is ambiguous, occupations intensive in computer use and abstract tasks tend to be more exposed to AI-related change. OECD's Employment Outlook (Lassébie, 2023) similarly concludes that AI adoption in firms is associated with increased demand for digital, analytical and socio-emotional skills, even when the technology automates some cognitive tasks.

Online vacancy studies provide more direct evidence on how AI affects advertised skill requirements. Squicciarini and Nachtigall (2021), using large OJA datasets from Canada, Singapore, the United Kingdom and the United States, show that postings requiring AI skills have grown rapidly and typically bundle several advanced digital competences (e.g. machine learning, data engineering) with general programming and data-analysis skills. OECD case studies based on vacancy data report that AI-intensive jobs tend to combine these technical competences with higher-order problem-solving and teamwork skills, reflecting the need to integrate AI systems into organisational processes (Squicciarini & Nachtigall, 2021; OECD, 2023).

Taken together, this literature suggests that the "burst" of AI does not simply increase demand for a narrow set of programming skills. Instead, it alters the composition of skill bundles across occupations, reinforcing the importance of advanced digital and analytical skills while also raising the bar for complementary socio-emotional competences (Georgieff & Hyee, 2021; Lassébie, 2023). This is particularly relevant for business occupations, which often involve coordinating AI-enabled tools, interpreting data-driven outputs and communicating insights to diverse stakeholders.

1.4 Central and Eastern Europe and the Slovak context

Central and Eastern European (CEE) countries are deeply integrated into European value chains, yet their labour-market and skills structures differ in important respects from those of Western Europe. Studies using survey and administrative data highlight relatively low shares of adults with high proficiency levels, significant qualification and field-of-study mismatches, and strong pressures on tertiary-educated workers to upskill in response to technological change (Machlica et al., 2017; OECD, 2017).

OJAs have already been used to study specific aspects of skill demand in the region. Fabo et al. (2017) analyse vacancy data from major job portals in the Visegrad Four countries and show that English is by far the most frequently requested foreign language, followed by German, with clear wage premia associated with language skills. Fabo et al. (2017) use the same data to argue that online vacancies can reveal detailed patterns of employer demand that are not visible in aggregate statistics, particularly in internationally oriented business services.

For Slovakia, online vacancy data have primarily been exploited to track labour-market developments rather than detailed skill profiles. Using a time series of aggregate online postings, Štefánik et al. (2023) demonstrate that counts of vacancies from a major Slovak portal can predict official vacancy statistics and key labour-market indicators such as employment and unemployment several quarters ahead. Their work confirms that OJAs provide timely signals about the Slovak labour market, but it does not focus on the content of skill requirements within specific occupational groups.

At the same time, policy analyses emphasise persistent challenges in aligning education outputs with labour-market needs in Slovakia, especially for advanced and digital skills. The OECD's economic survey and related working papers point to shortages of highly skilled workers, relatively low participation in adult learning and the need to improve information systems on skills supply and demand (Machlica et al., 2017; OECD, 2017). Cedefop's country work on online vacancies notes that the Slovak OJA market is dominated by a single large private portal, Profesia.sk, which is described by experts as the "number one and best-known job portal" in the country and a key source of vacancy data (Cedefop, 2019). Independent assessments similarly describe Profesia.sk as the leading Slovak job board and the most popular platform for posting vacancies and searching for jobs. Despite this infrastructure, there is limited empirical evidence on the skill content of Slovak online vacancies for specific occupational domains. Existing studies on Slovakia either examine aggregate vacancy volumes and predictive properties (Štefánik et al., 2023) or discuss skills more broadly in the context of education and migration (Machlica et al., 2017; Kureková, 2015).

1.5 Conceptual focus of the study

Building on this literature, the present study uses online job advertisements from Profesia.sk to examine the skill requirements attached to business-related positions in Slovakia. Conceptually, we treat advertised requirements as a signal of employers' preferences over combinations of:

- Digital skills – including general ICT competences, office software, data handling and, where present, more advanced tools;
- Analytical skills – such as quantitative reasoning, problem-solving and the ability to work with data and performance indicators;
- Socio-emotional skills – including communication, teamwork, customer orientation and responsibility.

This tripartite distinction reflects both ESCO's skill taxonomy – which differentiates between knowledge, skills and transversal skills (ESCO, 2024) – and empirical findings from OJA-based studies that identify recurrent clusters of digital, analytical and socio-emotional competences in business and administrative occupations (Djumalieva & Sleeman, 2018; Giambona et al., 2024; Musinszki et al., 2025).

Within this framework, the contribution of this paper is deliberately descriptive. Rather than estimating causal effects of AI or digitalisation on employment, we use web-scraped vacancy texts to: (i) identify which specific skills are most frequently mentioned in Slovak adverts for business-related positions; and (ii) map how these skills are bundled across digital, analytical and socio-emotional domains. By focusing on a single country and a specific group of occupations, the study complements cross-country work on AI and skills (Georgieff & Hyee, 2021; Squicciarini & Nachtigall, 2021) and adds a labour-market-based perspective to ongoing discussions about aligning Slovak business and management curricula with employer needs (Machlica et al., 2017; Fabo et al., 2017).

2 Methodology

This study combines web-scraped online job advertisements from Slovakia's dominant job portal, Profesia.sk, with a dictionary-based text analysis to describe the skill requirements attached to business-related positions. The methodological choices follow established approaches in the online job advert (OJA) literature (e.g. Djumalieva and Sleeman, 2018; Cedefop, 2019; Giambona et al., 2024; Musinszki et al., 2025).

2.1 Data collection and sample construction

Vacancy data were collected from Profesia.sk using a custom Python script that requested search results via the portal's public web interface. The search was restricted to profesia.sk business-oriented categories, which include administrative, finance, business support and related roles, and was limited to

adverts posted over the preceding 31 days. The data were downloaded on 9 December 2025, yielding a cross-sectional snapshot of the current Slovak labour market for business and operations-related occupations.

For each advert, the script extracted the job title, employer name (where available), location, salary field, URL and the free-text job description. Duplicates were identified using the advert URL and removed. After basic cleaning (e.g. trimming white space, removing clearly corrupted rows), the resulting dataset comprised 800 unique adverts.

Location information is available in a structured field for 468 adverts (58.5 %). To facilitate regional comparisons, these locations were further classified into three categories: "Bratislava" (if the location string contained "Bratislava"), "Other region" (other Slovak locations) and "Unspecified" (missing or unusable entries). Skill extraction, however, relies on the textual job description. Because missing descriptions would mechanically imply zero skill mentions, the analysis of skill prevalence is restricted to the 372 adverts (46.5 %) with a non-empty description. Adverts without a description are retained only for descriptive statistics on locations and salaries.

The salary field on Profesia.sk is semi-structured and may contain ranges, minimum values or textual qualifiers (e.g. "from", "depending on experience"). To construct an approximate monthly wage, all whitespace within numbers was first removed (e.g. "2 500" → "2500"), and all numeric values between 500 and 10,000 were extracted and interpreted as euro per month. For adverts listing a range (e.g. "2 500 – 3 000 EUR/mesiac"), the midpoint of the range was used; for adverts listing a single figure, that value was taken directly. Applying this procedure yields a numeric monthly salary indicator for 591 adverts overall and for 352 adverts in the subsample with a non-empty description.

2.2 Skill dictionary and coding

Skill requirements were identified using a dictionary-based approach applied to the free-text job descriptions. The construction of the dictionary followed three steps. First, an initial list of skills and keywords was drawn from existing taxonomies and empirical studies on OJAs, in particular ESCO's skills and competences lists and prior work on skill extraction from vacancy texts (Djumalieva and Sleeman, 2018; Cedefop, 2019; Giambona et al., 2024; Musinszki et al., 2025). Second, this list was adapted to the Slovak context by translating key terms and adding common Slovak stems and phrases observed in the adverts (e.g. komunik- for communication, analyt- for analytical skills, zodpoved- for responsibility, zákazn- for customer orientation). Third, the dictionary was iteratively refined through manual inspection of a subset of descriptions to ensure that frequent formulations of relevant skills were captured.

The final dictionary contains keywords for several broad groups of skills. Socio-emotional skills include communication skills, teamwork, customer

orientation and responsibility. Analytical skills cover analytical thinking, data analysis, problem solving and organisation/time management. Digital tools encompass office software (MS Office/Office 365), Excel, ERP/CRM systems (e.g. SAP, Oracle, Navision, Dynamics) and a set of advanced digital and data-science tools (artificial intelligence, machine learning, Python, SQL, Power BI, Tableau, business intelligence tools). Language skills are captured through references to English and German, in both Slovak and English wording (e.g. anglický jazyk, angličtina, "English").

All job descriptions were converted to lower case and searched for the occurrence of each keyword. For each advert and each skill category, a binary indicator was created, taking the value 1 if any of the associated keywords appeared at least once in the description and 0 otherwise. This yields a set of individual skill indicators (e.g. Excel, ERP/CRM, English) as well as broader categories such as AI/data-science tools (any mention of AI, machine learning or listed analytics tools).

2.3 Construction of skill bundles and statistical analysis

To characterise the combinations of skills requested in each vacancy, the individual indicators were aggregated into four skill bundles: socio-emotional, analytical, digital and language skills. For each advert, the number of different skills within each bundle was counted (e.g. an advert that mentions communication, teamwork and responsibility has a socio-emotional skill count of three). In addition, binary indicators were created to capture whether at least one skill from a given bundle is present in the description.

The empirical analysis is deliberately descriptive. First, simple frequency tables are used to report the prevalence of individual skills and bundles in the analytic subsample of 372 adverts. Second, differences in skill prevalence between Bratislava and other Slovak regions are examined using standard tests for differences in proportions (two-proportion z-tests), both for bundles (e.g. at least one digital skill mentioned) and for selected individual skills such as Excel, analytical skills, English and German. Given the relatively small number of adverts mentioning AI- or data-science-related tools, inferential results for these skills should be interpreted with caution. Third, the relationship between advertised wages and skill requirements is explored in the subsample of 352 adverts with both a description and a numeric salary. Pearson correlation coefficients are computed between the monthly wage and (i) the total number of distinct skills mentioned and (ii) the counts of socio-emotional, analytical, digital and language skills. In addition, Welch two-sample t-tests compare mean skill counts between a low-salary group (adverts at or below the median wage) and a high-salary group (above the median). These tests are used in an exploratory way and p-values are reported without adjustment for multiple comparisons, so emphasis is placed on the direction and magnitude of associations rather than on formal hypothesis testing.

2.4 Limitations

As with other OJA-based studies, the methodology is subject to several limitations. The data cover only vacancies posted on a single large portal and may under-represent jobs filled through informal channels or alternative platforms. Skill extraction relies on keyword searches and thus cannot capture all nuances of the language used in adverts; both false negatives (missed skills) and false positives (ambiguous phrases) are possible. Salary parsing is approximate and assumes that reported figures refer to monthly pay in euro. Finally, the analysis is cross-sectional and describes one 31-day snapshot rather than long-term trends. These caveats should be borne in mind when interpreting the findings, but they do not detract from the value of the data as a timely, detailed source of information on employer skill demand in Slovak business occupations.

3 Results

In total, the dataset contains 800 online job advertisements scraped from Profesia.sk over a 31-day period ending on 9 December 2025, using profesia.sk business-oriented categories. For each advert, the dataset includes the job title, employer (where available), location, salary field, URL and the free-text job description, as well as binary indicators for selected skills derived from the text. Location is specified for 468 adverts (58.5 %), while 332 adverts (41.5 %) have no usable location information in the structured field. Among adverts with a specified location, approximately 38.7 % refer to Bratislava and 61.3 % to other Slovak regions. Textual job descriptions are available for 372 adverts (46.5 %) as shown in Table 1. Because the skill indicators are based on dictionary searches within the description text, the analysis of skill prevalence is restricted to this subsample of 372 adverts with a non-empty description. The remaining adverts are used only for basic structural information (location, salary), as their missing text would mechanically imply zeros for all skill indicators. Overall, the adverts cover a mixture of business-related roles, including accounting and finance positions, back-office and administrative roles, business and financial consultancy, and various coordination or managerial jobs.

Table 1 Sample description

Total number of adverts scraped	Number of adverts with non-empty description	Adverts with non-empty location field (all 800)	– of which: Bratislava	– of which: Other Slovak regions	Adverts with parsable numeric salary	Adverts with description and parsable numeric salary	Adverts with description and location = Bratislava	Adverts with description and location = other regions
800	372 (46.5%)	468 (58.5%)	181	287	591 (73.9%)	352 (44.0%)	102	270

Source: Authors' processing.

3.1 Prevalence of individual skills

Table 2 summarises the prevalence of individual skills identified through the dictionary-based coding in the 372 adverts with descriptions. Several patterns emerge clearly. First, socio-emotional competences are ubiquitous. Almost all adverts in the analytic subsample (367 out of 372; 98.7 %) contain at least one phrase relating to responsibility (e.g. zodpovednosť, zodpovedný prístup or responsibility in English). Nearly two thirds explicitly mention some form of communication skills (251 adverts; 67.5 %), using formulations such as komunikačné zručnosti, komunikačné schopnosti or "communication skills". Teamwork appears less frequently in exact wording but is still present in 18.3 % of descriptions (68 adverts), mainly through phrases such as tímová práca and tímový hráč. Customer orientation (e.g. orientácia na zákazníka, zákaznícky orientovaný) is referenced in 20.4 % of cases (76 adverts).

Table 2 Individual skill prevalence in the analysed sample

Skill category	N adverts	% of adverts	Skill category	N adverts	% of adverts
Responsibility / reliability	367	98.70%	MS Office / Office 365	73	19.60%
Communication skills	251	67.50%	Teamwork	68	18.30%
English	212	57.00%	Organisation / time management	56	15.10%
Excel	109	29.30%	German	42	11.30%
Analytical / data-related skills	104	28.00%	Leadership / people management	21	5.60%
ERP / CRM systems	79	21.20%	AI / data-science tools (AI, ML, Python, SQL, BI, etc.)	15	4.00%
Customer orientation	76	20.40%	Problem-solving (explicit wording)	14	3.80%

Source: Authors' processing.

Second, language skills are highly salient. Requirements related to English (e.g. anglický jazyk, angličtina, "English") appear in 212 adverts, corresponding to 57.0 % of all descriptions. References to German (e.g. nemecký jazyk, nemčina, "German") are less frequent but still substantial, present in 42 adverts (11.3 %). Many adverts simply require "active communication" in English or German, without specifying proficiency levels, which is consistent with their use as de facto baseline requirements in internationally exposed business functions.

Third, digital and data-related skills are very prominent. Around 29.3 % of descriptions (109 adverts) mention Excel, often in formulations such as "pokročilá znalosť Excelu" or "advanced Excel skills". A further 19.6 % (73 adverts) refer to generic office software, captured through mentions of MS Office, Microsoft Office, Office 365 or balík Office. Requirements related to ERP or CRM systems (including references to SAP, Oracle, Navision, Dynamics or CRM generally) appear in 21.2 % of adverts (79 cases).

More advanced digital or data-science-related skills—such as artificial intelligence, machine learning, Python, SQL, Power BI, Tableau or business intelligence tools—are much rarer. The combined "AI/data science" category is detected in 15 adverts, corresponding to 4.0 % of descriptions. This indicates that while classic digital tools (Excel, ERP/CRM, Office) are widespread in business jobs, explicit references to AI, machine learning or specialised analytics tools still constitute a niche within this segment.

Finally, more generic analytical skills (e.g. analytické myslenie, analytické schopnosti, analýza dát, "analytical skills", "data analysis") are mentioned in 104 adverts (28.0 %). Explicit references to problem-solving (e.g. "problem solving", riešenie problémov) are less frequent, appearing in 3.8 % of descriptions (14 adverts), but analytical and problem-solving skills are often intertwined in the wording.

3.2 Skill bundles across domains

For each advert with a description, we counted how many distinct skills from each bundle were mentioned. On average, adverts contain:

- 2.05 socio-emotional skills,
- 0.47 analytical skills,
- 0.74 digital tools, and
- 0.68 language requirements.

Looking at the extensive margin (at least one skill from a bundle), almost all adverts (98.7 %) mention at least one socio-emotional skill. Just over 40.9 % mention at least one analytical skill, 54.3 % mention at least one digital tool, and 58.3 % require at least one foreign language (English or German).

Taken together, these patterns underscore that business-related positions in Slovakia demand hybrid skill bundles: nearly every advert signals expectations around responsibility and interpersonal communication; more than half combine this with explicit language requirements and digital tool use.

3.3 Regional patterns: Bratislava versus other regions

Given the importance of Bratislava as Slovakia's main business and service hub, it is informative to compare skill requirements by location. Among adverts with a description, 102 are classified as located in Bratislava and 270 in other regions. Socio-emotional and language skills are prominent in both groups. Responsibility is mentioned in virtually all adverts in both Bratislava (100.0 %) and the rest of the country (98.1 %). Communication skills are referenced in 79.4 % of Bratislava adverts and 63.0 % of adverts from other regions. English language requirements are likewise prevalent in both areas, appearing in 59.8 % of Bratislava descriptions and 55.9 % of those from other regions. More pronounced differences emerge for digital and analytical skills. In Bratislava, 42.2 % of adverts mention Excel and 26.5 % refer to ERP/CRM systems, compared

with 24.4 % and 19.3 %, respectively, in other regions. Analytical skills are likewise more frequently emphasised in Bratislava (around 38 % of adverts) than in the rest of the country (24.1 %). The AI/data-science category remains relatively rare everywhere, but the share is somewhat higher in Bratislava (6.9 % of adverts) than in the rest of Slovakia (3.0 %).

Standard tests for differences in proportions indicate that adverts in Bratislava are significantly more likely to mention at least one digital tool (63.7 % vs. 50.4 %, $p < 0.05$), especially Excel (42.2 % vs. 24.4 %, $p < 0.01$) and analytical skills (about 38 % vs. 24.1 %, $p < 0.05$). By contrast, German language requirements are significantly more frequent in other regions (13.7 % vs. 4.9 %, $p < 0.05$), while socio-emotional skills and English language requirements show no statistically significant regional differences. Given the small number of adverts mentioning AI- or data-science-related tools, the higher share in Bratislava (6.9 % vs. 3.0 %, $p \approx 0.09$) should be viewed as suggestive rather than statistically conclusive. Overall, the regional comparison suggests that skill bundles requested in Bratislava are somewhat more digitally and analytically intensive, while other regions put relatively greater emphasis on the core socio-emotional requirements.

3.4 AI-related skills within business positions

Although AI and data-science-related skills are mentioned in only 4.0 % of all descriptions, their distribution provides some early signals about how advanced digital competences enter business roles. Among adverts that explicitly require English, 5.7 % also mention at least one AI/data-science keyword, compared with 1.9 % among adverts without an explicit English requirement. Similarly, the share of AI/data-science mentions is higher in Bratislava than in other regions (6.9 % vs. 3.0 %).

These small but non-negligible shares suggest that, within the broader population of business-related vacancies in Slovakia, a minority segment of roles is beginning to combine standard business tasks with AI or advanced analytics tools. In line with the aggregate results, these adverts are somewhat more likely to be located in Bratislava and to require English. Given the low absolute numbers, however, these patterns should be interpreted as indicative of emerging AI-related business roles rather than as precise estimates of their prevalence.

3.5 Salary and skill requirements

For the analysed 352 adverts, the approximate monthly wages range from €500 to €7,000, with a median of €1,800 and an interquartile range from €1,500 to €2,300. Many business positions thus cluster around the €1,500–€2,500 range, with a smaller number of substantially higher-paid roles. We relate this salary indicator to (i) the total number of distinct skills mentioned in each description and (ii) the counts of skills in the four bundles defined earlier (socio-emotional, analytical, digital tools, languages). Pearson correlations show that the total number of skills is only weakly and not significantly associated with salary (r =

0.06, p ≈ 0.24). In other words, higher-paying adverts in this sample do not simply list many more skills.

Table 3 Relationship between advertised monthly salary and skill requirements

Skill measure	r with salary	p(r)	Mean skills, low salary (≤ €1,800)	Mean skills, high salary (> €1,800)	t-statistic	p(t)
Total number of skills	0.06	0.24	3.87	4.11	1.29	0.198
Socio-emotional skills (count)	−0.11	0.034	2.08	2.02	−0.72	0.472
Analytical skills (count)	0.14	0.008	0.42	0.53	1.66	0.097
Digital tools (count)	0	0.912	0.77	0.66	−1.22	0.225
Language requirements (count)	0.14	0.011	0.57	0.8	3.51	0.001

Source: Authors' processing.

Table 3 indicates that the composition of skills matters more than the overall count. Counts of analytical and, in particular, language requirements are positively associated with salary (r ≈ 0.14 for both), and adverts in the above-median wage group list, on average, more language requirements than those in the lower-wage group (p ≈ 0.001 in a Welch two-sample t-test). These associations are statistically significant at conventional levels but remain modest in size and are based on exploratory tests without adjustment for multiple comparisons. By contrast, the numbers of socio-emotional and digital tool requirements do not systematically increase with salary; socio-emotional skills appear across the wage distribution, while digital tools are mentioned with similar frequency in lower- and higher-paid positions.

4 Discussion

The findings from this exploratory analysis confirm, first and foremost, that Slovak employers recruiting for business-related positions articulate hybrid skill profiles rather than narrow technical requirements. Almost all adverts with a description emphasise responsibility and other socio-emotional competences, and around two thirds explicitly mention communication skills. This pattern is highly consistent with evidence from other countries that transversal skills such as communication, teamwork and reliability are central to business and office roles (Muller & Safir, 2019; Musinszki et al., 2025). In the Slovak context, these results underline that "soft" skills are not marginal add-ons but form the backbone of what employers expect from business professionals.

At the same time, the analysis shows that digital and language skills are firmly embedded in the skill bundles requested of business workers. English is explicitly mentioned in more than half of all descriptions, while Excel, generic office tools and ERP/CRM systems are referenced in a sizeable share of adverts. This aligns with Cedefop's OVATE work and related OJA studies, which document widespread demand for digital and language competences across high- and medium-skilled occupations (Cedefop, 2019; Djumalieva & Sleeman, 2018; Giambona et al., 2024). For Slovakia, often characterised as lagging in advanced digital skills, these results suggest that, at least in business and operations roles, employers already treat digital tools and English as normal components of the job rather than specialist requirements.

The "burst" of AI, by contrast, is only weakly visible in the current snapshot. Explicit references to AI, machine learning, Python, SQL-based analytics or BI tools appear in a small minority of adverts, and even then mainly in Bratislava and in adverts that already require English. This is consistent with international evidence that AI-related competences diffuse first into specific segments of the labour market, often in larger, internationally oriented firms and in digitally intensive functions (Georgieff & Hyee, 2021; Squicciarini & Nachtigall, 2021). In Slovak business vacancies, AI and advanced analytics currently appear as a niche "top layer" on top of a much broader base of general digital and business skills.

The regional comparison points to a modest but meaningful differentiation within the Slovak labour market. Adverts in Bratislava are more likely to request Excel, analytical skills and at least one digital tool, while adverts in other regions are more likely to require German. This mirrors structural differences in economic specialisation, with the capital hosting a concentration of corporate services and HQ-type functions with stronger analytical and digital demands, and regional centres hosting more export-oriented or manufacturing-related operations where German remains important. From a skills-policy perspective, this suggests that regional strategies may need to account for these distinct profiles rather than assuming a single national pattern of "business skills".

The relationship between salary and skills is more nuanced. Higher-wage adverts in this sample do not simply list more skills in general, but they are more likely to explicitly require foreign languages and, to a lesser extent, analytical competences. This pattern is consistent with broader evidence that returns to skills are particularly pronounced for cognitive and language-related abilities in internationally connected segments of the labour market (Machlica et al., 2017; OECD, 2017). At the same time, socio-emotional skills are present across the wage distribution, and the weak negative correlation between their explicit enumeration and salary may indicate that employers treat these competences as baseline expectations in higher-level roles, mentioning them less exhaustively even though they remain important.

For business and management education, the results offer a concrete, data-driven perspective on what "labour market relevance" means in practice. Curricula that combine core business knowledge with strong emphasis on English, applied digital tools (Excel, ERP/CRM), and practical analytical work are closely aligned with the skill bundles observed in adverts. At the same time, the near-universal emphasis on responsibility and communication suggests that systematically embedding socio-emotional skill development through project work, presentations and client-facing assignments remains essential. Finally, the study shares the usual limitations of OJA-based research: it covers only one portal, relies on keyword-based skill extraction and captures a single 31-day snapshot rather than long-term trends. Nevertheless, the analysis demonstrates that even a relatively simple dictionary-based approach can yield granular, timely insights into employer skill demand in Slovak business occupations. Future work could extend this design by incorporating longer time series, refining the skill dictionary using machine-learning methods, or linking vacancy-based skill indicators to graduate outcomes and programme-level curriculum data.

Conclusion

This paper has used web-scraped online job advertisements from Slovakia's main job portal to provide a descriptive snapshot of the skills requested in business and operations-related positions. The analysis shows that employers overwhelmingly demand hybrid profiles, combining socio-emotional competences—especially responsibility and communication—with digital tools and foreign languages, most notably English. Advanced digital and AI- or data-science-related skills are visible but remain confined to a small niche of adverts, concentrated in Bratislava and in roles that already require English. Regional comparisons indicate that business positions in Bratislava are more digitally and analytically intensive, whereas vacancies in other regions more often require German, reflecting differences in economic specialisation. Finally, advertised wages are more strongly associated with language and analytical requirements than with the sheer number of skills listed, suggesting that these competences are key differentiators for higher-paid business roles. Taken together, the findings offer concrete input for curriculum discussions in business and management education and illustrate the value of online vacancy data as a low-cost, timely source of skill intelligence for the Slovak labour market.

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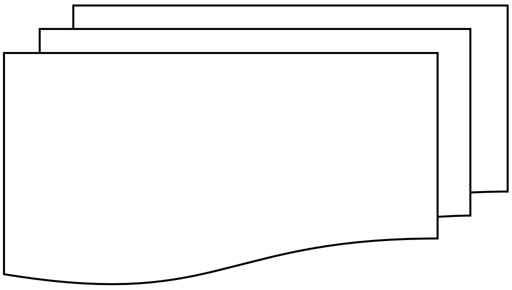

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