Corporate competitiveness and communication practice in communication technologies – international comparison

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The technological changes of the Industry 4.0 period and the spread of communication and information technologies allow for a more efficient diversification of products and services in response to changing consumer needs. Modern ICT tools are used by all companies to varying degrees. The main aim of the primary research on which this study is based was to assess the challenges of small and medium-sized enterprises operating in Slovakia and Hungary, the factors influencing their competitiveness, and from this to learn which are the most effective communication technologies in Industry 4.0. The primary research was carried out in the form of a questionnaire survey, and the number of items of the examined international sample was 275 (145 SMEs in Hungary and 130 in Slovakia). In addition to the descriptive statistical analyses, the research questions and the related hypotheses were tested by ANOVA table and cluster analysis. The respondents from the two countries also have a unified view of the factors that help increase competitiveness. In connection with the cluster analysis, it can be stated that the business activity does not fundamentally affect whether the individual companies belong to the group of environmentally conscious people who rely on human resources and digitalisation, or to the group with negative attitudes who do not trust it. Companies still consider the constantly updated corporate website to be the most effective means of corporate communication, and although communication on social media is becoming more and more valuable, the respondents believe that the shift in communication through the website which would have been replaced by communication via the social network has not yet taken place.

Keywords: competitiveness, communication technologies, company, IT tools

1. Introduction

Remaining in the open market requires both the basic necessity of maintaining a corporate competitive advantage, and continuous targeted investment in corporate competitiveness. The efficiency of a company's operations to satisfy consumer needs can only be maintained if it has the ability to differentiate itself from its competitors. Due to the complexity of competitiveness, a fully uniform definition of this key factor has not yet been developed, but several components have been identified in relation to corporate competitiveness including company size, scope of activity, place in the corporate life cycle, etc., and each has a different effect on competitiveness. From the point of view of the long-term development of companies and the maintenance of their competitiveness, an objective assessment of the company's current situation is crucial (Vida, Kádár, Kádárová, 2009). Based on his research, Varga (2017) pointed out that corporate competitiveness means the extent to which a company can utilise its knowledge capital. These approaches highlight the fact that a competitive company cannot develop without an enterprise-friendly business environment. The turbulent digital development of the Industry 4.0 period in the field of ICT inevitably interweaves into the everyday life of the company and the related communication and technological innovations offer a potential competitive advantage. In fact, technical innovations make people's everyday lives a lot easier, and it's no different in a corporate relationship. According to Chikán et al. (2022), the continuous rapid change of digital and technological processes primarily stimulates the spillover into production areas, yet this is not the only area that can be developed within a company. In addition to the more effective diversification of products and services through the use of communication technologies, one must not forget that the application of technological achievements can also contribute to corporate competitiveness by reducing labour costs.

2. Literature review

2.1. Strategies used for literature review, selection process

To identify relevant literary sources, the study used several scientific databases in the first half of 2022, the goal being primarily to collect sources published between 2007 and 2022. In some cases, the authors used earlier literature (the source document of the literature included in the primary screening) as the basis of the literature

references. The aim was to use relevant literary sources by searching for significant research results and publications related to the examined topic, applying the method of critical selection. Among the databases there were WoS, Scopus, and the local national publication lists of the study area, and the literature search consisted of several stages. Corporate competitiveness and communication technologies used in the corporate sphere were the main concepts on which the search was built. The first step involved searching for the key concept in the abstracts (corporate competitiveness), then in the second step, this was narrowed down to the list of results based on concepts related to the corporate application of communication technology (communication technology, digital economy, digital competitive advantage). In the third step of the selection process, those publications containing approaches to competitive advantage and communication technologies from other disciplines were excluded. As the last step in the selection of the studied publications, duplications and publications that were not relevant to this study were excluded. This did not involve the exclusion of non-English language literature, as the authors considered it necessary to also search for literary sources in the researched countries. In summary, the selection criteria used for the literature review were as follows: between 2007 and 2022 (the earlier rationale can be read above), articles and books written primarily in English, Hungarian or Slovak, published in peer-reviewed journals and conference volumes, the central theme of which is corporate competitiveness and communication technology had a place in corporate competitiveness. Based on the selected literary sources, the authors prepared the theoretical overview forming the basis of the study.

2.2. Competitiveness of companies

The concept of competition is closely linked to the definition of competitiveness. Competitiveness in a general sense is a set of economic and competitive characteristics in which different actors of the economy are able to perform better than their competitors in changing economic environments, market signals and expected developments by using their resources in the most efficient way (Sápiné Duduk, 2014; 2015; 2016).

The competitiveness of companies means adapting to the competitive situation, i.e. the ability of an organization to successfully compete in the market. Competition can be interpreted in this sense within domestic markets (when comparing companies from the same country) or internationally (when comparing companies from different countries). Several levels of competitiveness analysis can be distinguished from each other. Factors affecting countries' competitiveness include tax burdens, the level of public debt, operating costs, regulatory harmonisation, transport infrastructure, market competition, and the innovativeness of companies (Marjanović-Domazet, 2021). There are also opinions that do not allow for the separation of national, corporate or individual competition, as these findings show that individuals and nations/countries do not compete; only companies do. In the authors' interpretation, competitiveness can be seen as a complex system in which the competitiveness of people, companies and nations can be separated.
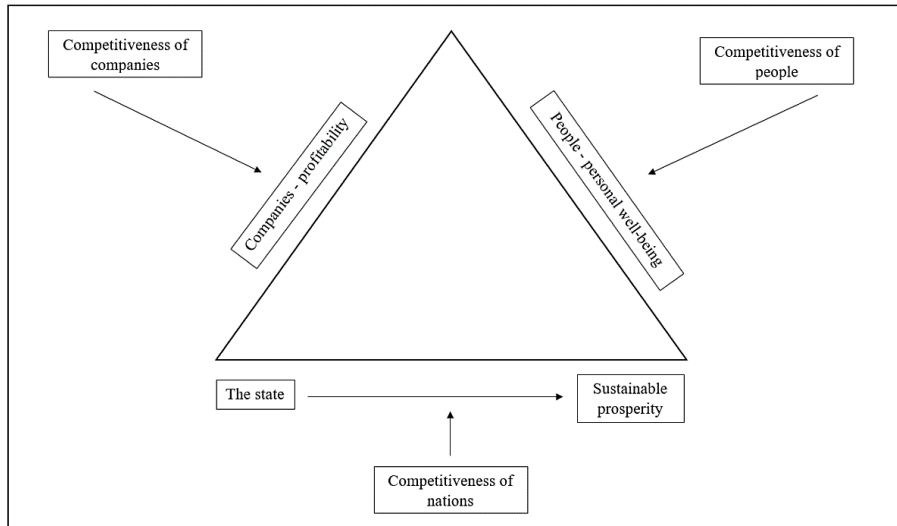
Fig. 1. Levels of interpretation of competitiveness

Source: Csath, 2019, p.18; Garelli, 2006.

In the system of relations illustrated in Figure 1, national competitiveness is determined by the effects of economic policy and the business environment, corporate competitiveness by the quality of products and services, knowledge content and innovation, and the quality of jobs created, and individual levels by people's knowledge, health and skills. The different levels are closely interlinked and have a constant impact on the value of their competitiveness. (Csath, 2019).

Competitiveness can therefore be interpreted in several ways. On the one hand, it can mean the ability of a company to successfully compete in the market, thus creating value through products and services that meet the requirements of market demand (price-quality-quantity) and contribute to its long-term development (Genge, 2017). On the other, it can be an overarching concept that includes the propensity and ability to compete, the ability to gain a position, and the endurance that can be interpreted in the ability to succeed (Lengyel, 2012; 2017). Various approaches to the analysis of competitiveness at the company level have emerged in the literature; the most common of which are industry-based analysis (Porter, 1980) and the resource allocation-based view (Barney, 1991).

Competitive advantage can also be defined as a strategic action taken by the companies concerned to help reduce costs, exploit market opportunities and/or neutralise the risks of competition. In implementing this strategy, it is appropriate to consider the company's achievements, efficiency, ability to innovate and the technologies used, profitability, cost reduction procedures and product differentiation. When analysing the complex system of competitiveness of companies, it is important to separate the external and internal factors affecting it. When characterising the internal factors, the com-

pany's processes, subsystems, the specifics of its human resources, organizational structure, performance, and the tools related to the practical implementation, should be taken into account. The internal elements interact with each other with the aim of max-imising the company's competitiveness and gaining a sustainable competitive advantage by achieving superior performance. In the anal-ysis of the internal factors of competitiveness, significant research has been donein recent years without claiming to be exhaustive, by Ageron, Gunasakaren and Spalanzani (2012), Harrison, Bose and Philips (2010), Salem, Abdien (2017), Ahuja (2012), Setia, Patel (2013), Vatamanescu, Leovaridis (2016), Maury (2018), Durungo, Tiwari and Alcock (2013) etc. As compa-nies compete with each other in different industries and environments, a number of external factors also affect their success. By identifying and analysing the external re-sources and capabilities that can be developed, external variables (economic policy, government, industry environ-ment, etc.) can influence a company's competitive posi-tion, giving them a competitive advantage that increases their organizational competi-tiveness. (Zuñiga-Collazos, Castillo Palacio, Padilla-Delgado, 2019; Falck,Heblich-Kipar, 2010; Rodríguez, Pose, Hardy 2016; Kveton, Horak 2018).

Due to the complexity of the competitiveness issue, it is also a complex task to pinpoint and measure it, as the competitive advantages that have been a success for one company may not yet ensure the competitiveness for another. Various international studies have identified a number of key factors that, individually or in combination, can help build a competitive organization. The significance of the factors illustrated in the following figure may vary depending on the size, scope, and location of the company (Cem, Suat, Strele, 2013).

Markets, competitors and customers / consumers

These include market share, export share, and consumer distribution (many small or mostly large). The degree of risk-taking of the company as well as the aggressive attitude towards competitors during the cooperation must be interpreted here.

Business / corporate strategies

They include the diversification of products and services, the uniqueness of the company's value proposition, and its ability to innovate. The process of transporting products / services is also an important factor. The competitiveness of the strategy is also affected by the trade-off between price and quality, as well as the quality and promotion strategies used.

External environment

Quality of the infrastructure required for the company's activities (e.g. taxes, legislation, shadow economy, etc.), quality of the management institutions influencing the company

Communication channels

Includes obtaining information and resources from suppliers, customers, financial institutions, business development organizations, and universities

Effective use of human and physical capital

It includes turnover and employee efficiency, efficient human resource management, and the climate within the organization. This includes various indicators measuring the efficiency of the use of material capital.

COMPETITIVENESS FACTORS

Use of financial stability

It includes access to internal and external capital and the composition of revenues and expenditures. Also included are the ratio of fixed and variable costs, cash flow characteristics (access to current assets, etc.).

Available human and physical capital

Knowledge of owners / managers, previous business experience. Access to the knowledge of employees and the quality and readiness of the available HR.

Economic and business indicators

Comparative operations with competitors' results, which include profit, turnover and increase in the number of employees

Optimistic and realistic growth plans

Fig. 2. Competitiveness factors

Source: Sauka, 2014, p.141.

The key factors of competitiveness have been developed through the experiences of business. Companies operate independently or interdependently with each other, and characteristics cannot be treated as a definite response to the needs that affect competitiveness. After all, the competitiveness of a company is affected not only by specific factors, but also by a combination of those, e.g. the external environment, time and success. Such combinations of factors, like business processes in general, are not only complex but cannot always be explained logically (Cem, Suat, Strele, 2013). For this reason, it is important to consider not only current performance but also the ability of CEOs and owners of companies to assess and anticipate potential bottlenecks in business operations when analysing a company's competitiveness (Man et al., 2002).

In order to maximise their competitive advantage, companies seek to acquire and develop a set of knowledge and skills that enable them to use their internal resources efficiently (Lafuente, Szerb, Rideg, 2016). Businesses with excellent systems and structures achieve higher performance by not easily duplicating or outperforming their resources and capabilities. In fact, this is the key to their competitive advantage (Barney, Mackey, 2005).

2.3. The importance of communication technologies in corporate competitiveness

Information systems and information and communication technologies can be seen as important tools for management, competitiveness and economic growth. They provide an opportunity for companies to take advantage of potential not only in the domestic but also in the international market (Kokles, Kirchmayer, 2017). Systematically high-quality and qualified human resources, as well as excellent technology and information tools, play an important role in the interpretation of competitiveness at any level – country, organization, and enterprise (Mazák, 2018). In addition to the lack of use of communication technologies, international research suggests that competitiveness, lack of trust, and other factors influencing knowledge sharing also have a significant impact on emotional intelligence and corporate ethics (Mura, Zsigmond, Machová, 2021).

The change in technology and the efficient use of communication and information tools in the company reduces general labour costs, and at the same time costs per unit of output. A further competitive effect of technological development may be in the reduction in capital costs. The use of communication technologies allows for the more efficient diversification of products and services in response to changing consumer needs (Corekcioglu, 2019). The key elements of successful information security management are meeting the requirements of information management, supporting top management, having security controls, and the organizational awareness of companies operating in the digital world. The research results showed that the existence of organizational awareness, supportive senior management and

security controls are the most important factors for small and medium-sized enterprises in the short term (Ključnikov, Mura, Sklenár, 2019).

The digital economy is a way forward for innovation, competitiveness and the economic development of corporate structures. The main factor of economic development is related to the digital economy. The rapid development of digital technology covers all areas of socio-economic activity. Based on digital technologies, new digital business models are emerging, existing operating models are being transformed, and fundamentally new types of businesses are being created. Digital capital is becoming a factor in the competitiveness of businesses (Sunigovets, 2019). The factors influencing the competitiveness of companies operating in the digital economy are illustrated in the following figure.
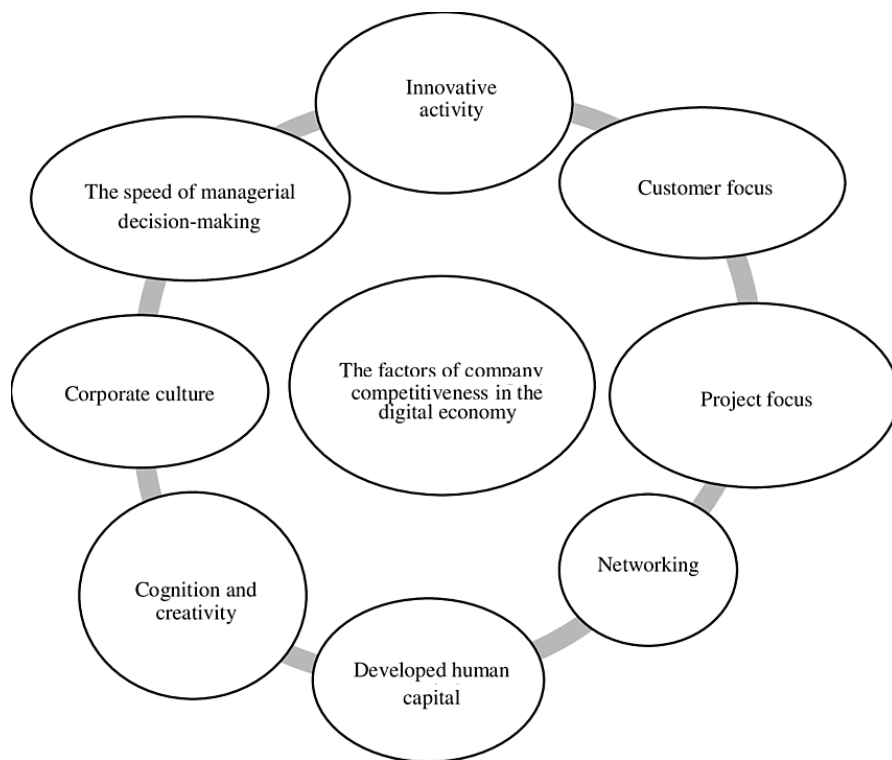
Fig. 3. Key factors of company competitiveness in the digital economy

Source: Tolstykh, Mitina, Isaeva, 2017, p. 471.

It is necessary to gain space in the global economy and to be globally competitive in order to ensure success, and thus to establish new networks of competition between competitors. The effective implementation of successful management work in a globalised and digitalised world lists a number of critical elements that affect

competitiveness: employees, strategy, managers, structure, processes, information and communication technologies (Vodáček, Vodáčková, 2004). In the age of information and knowledge, the creative use of communication and information technologies is at the heart of corporate innovation (Škorecová, 2005).

The development of information and communication technologies in today's growing digital global economy plays an important role in increasing the competitiveness of companies. ICT for development is based on the concepts of development, growth, progress and globalization and is often interpreted as the use of technology to achieve a greater good (Ratheeswari, 2018). There is a strong belief among scientists that the introduction and application of ICT in many areas of human life and the economy can be a direct and / or indirect benefit through access to information, knowledge, job opportunities, health, internationalisation, etc. (Aksentijević, Ježić, Zaninović, 2021).

Information and communication technology (ICT) continues to gain ground in the global economy. Recently, ICT has played a significant role in promoting globalisation and economic growth, as well as in making communication and trade more transnational (Maneejuk,Yamaka, 2020). ICT plays a key role through the capitalisation of investment and the contribution of all productivity factors. Investing in ICT will help companies reduce their communication and coordination costs and in addition, ICT investments can accelerate efficiency and productivity in a company (Erumban -Das, 2016; Kurniawati, 2022).

In the literature, the term information and communication technology (ICT) reflects the seamless convergence of digital processing and telecommunications. ICT is defined as the combination of information technology with other related technologies; in particular communication technology (Velmurugan, 2010).

ICT includes any type of software and software-related activities and solutions, such as ICT services, ICT applications, software products, and embedded software. Examples of ICT solutions are custom software development, mobile application development, website design and development, and graphic and animation design. As such, ICT is an integral part of business management in any country in the world (Islam, 2016). The practical application of communication technologies provides a number of benefits for large, small, and medium-sized enterprises (Cela, 2005), namely:
- promotes acceptance of original leadership, tactical and decision-making models,
- improves the efficiency and effectiveness of operations,
- facilitates entry into new market environments, including the creation of fresh operations and business models.

Overall, therefore, communication technologies, including broadband networks, the World Wide Web, mobile and smartphones, social networking sites, news feeds, sales websites, etc., provide the technological background for accessing, collecting, organizing, publishing and making available data and information. With the use of ICT, companies' communication channels become more accessible, and their

external and internal communication with stakeholders faster and more efficient (Vassné Egri, Kovács, 2009).

The use of information systems and information and communication technologies enables managers to effectively manage and administer information that is critical to business management (Griffin, 2017).

In summary, the study examines the relations between communication techno-logies and other competitiveness factors. After studying the test results and literary sources, it can be concluded that the primary factors of competitiveness in the changed market environment are the responsiveness of organizations, export/import orientation, company performance and digitalisation readiness – this means the practical use of communication technologies. It is no longer a question that the digitalisation of a company is necessary, and as technology develops unceasingly, it has also been clearly proven that it contains a number of advantages. Sooner or later, it is inevitable for every company to redefine its operations, since digitalisation plays a prominent role in terms of company survival. However, if this is neglected, it can cause value and sustainability problems, which can easily lead to its decline. Companies/clusters are making significant efforts to boost the factors that make them more competitive, not least the adoption of information and communication technologies (ICT), which is a determining factor in global industrial trends (Arredondo-Trapero, Vázquez--Parra, Guerra-Leal, 2020). Today, the main goal of preserving and improving competitiveness in corporate practice is the development and increasing use of information and communication technology (ICT), which influences companies' strategic planning processes, their ICT investment decision-making processes, and their organizational structure (Tricoci, Corral and Rosenthal, 2016).

2.4. Hypotheses/research questions development

During the formulation of the research questions and hypotheses, the authors primarily focused on the competitive characteristics summarised in the research model describing the corporate practice of communication technologies in corporate competitiveness. The research questions were formulated based on what was described in the literature review.

The research model was developed based on the knowledge from the literature research, and focused on Slovak and Hungarian companies. The model analysed the examined topic in two approaches. In the first round, this applied to the elements of competitiveness factors listed at the corporate level of competitiveness and their corporate practices, while in the second, to the general company characteristics related to communication technologies. The model centred on communication technologies at the intersection of the two key topics, researched as part of corporate competitiveness.

The aim of the research was to assess the challenges of small and medium-sized enterprises operating in Slovakia and Hungary, as well as the factors influencing

their competitiveness, and to learn about the most efficient communication techno-logies in the Industry 4.0 period. In order to achieve this goal, the authors defined the main research questions and the related hypotheses:

RQ1: What are the factors most influencing the enhancement of competitiveness? This was based on the general approach to competitiveness, namely the approach to the level of interpretation of competitiveness by companies and profitability. Within this, the study placed the communication channels and communication technologies included in the presented competitiveness factors at the centre of the investigation. The possibilities and importance of digitalisation were discussed separately in Section 2.3. Both the hypothesis and the research question were based on the views of several authors, such as Sunigovets, 2019; Ratheeswari, 2018 and Maneejuk-Yamaka, 2020.

H1: In the Industry 4.0 period, corporate digitalisation was singled out among the factors affecting the competitiveness of companies in the markets of both countries.

RQ2: Which communication technology is considered most effective by companies in terms of competitiveness? In the theoretical overview of the study, the authors examined the role of communication technologies in corporate compe-titiveness in a separate section. The necessity of communication networks and channels forming the basis of the 4.0 economy as a key element of corporate competitiveness was proved by several secondary literary sources. For this reason, this study examined the presence of possible communication technologies and the connection system of the most effective technologies. Social networks are very popular among companies, but the correct use of many of their functions is still controversial. Their effectiveness in improving existing business processes and their added value in terms of competitiveness require the use of different functions (Kettles-Smith, 2008). For this reason, it was analysed whether the social network is considered the most effective communication method in each industry, and whether there are differences per sector.

H2: Companies consider social networking to be the most effective communication technology in the markets of both countries. There are differences between companies in different industries.

3. Data and methodology

3.1. Data collection

Among the primary research methods relevant to the research problem, the authors used an online questionnaire survey and thus were able to obtain a large amount of data in a relatively short period of time, but this method of observation did not allow to collect sensitive qualitative information of a personal nature. With regard to the structure of the questionnaire, it contained questions regarding the

demographic data of the respondents, questions regarding the characteristics of the company itself, and an examination of the factors affecting competitiveness relevant to the research.

The Slovak business environment has long been characterised by a high representation of micro-enterprises, as 97.3% of the total number of active economic companies in 2021 were micro-enterprises, i.e. in absolute terms 618,115 entities. The structure of economic organizations is also supplemented by small enterprises with a share of 2.1% (13,469 in absolute value) and medium-sized enterprises with the smallest representation of 0.4% (2,725 entities in total). The proportion of large enterprises remained at the level of 0.1% compared to previous years, i.e. 655 entities (SBA, 2022). In Hungary in 2021, 94.47% were micro-enterprises (842,755), small enterprises were 4.05% (36,119) and medium-sized enterprises accounted for 0.63% (5,602). The proportion of non-SME organizations was 0.86% (7,630) (KSH, 2021). It can be seen that in the case of both countries, micro-enterprises dominate, followed by small enterprises. However, the ratio of medium and large enterprises was different in the two countries. In Slovakia the number of medium-sized enterprises was higher than the number of large enterprises, but in Hungary the situation was reversed in this respect.

The number of the respondents in Hungary was higher in the sample, 145 (53%) of the 275 surveyed companies were based in Hungary. In addition, 35% of the samples were micro-enterprises, 41% small enterprises and 24% medium-sized enterprises. The sample did not include SMEs in the same proportion as the statistical data collected during the secondary research show, but overall, micro and small enterprises dominated the sample at 76%.

3.2. Research sample

The target group of the international research were Slovak and Hungarian small and medium-sized enterprises.

Of the 281 questionnaires received, those that did not meet the parameters of the target group were filtered out. Following the survey, the authors performed data cleaning and filtered out the irrelevant data. Subsequently, the data from 275 questionnaires were analysed.

To collect the data, a database of companies operating in Slovakia and Hungary was created. Through the various collection pages, it was possible to organize the contact information of 2,648 companies into one source. Among the sampling procedures, stratified sampling was used within the random sampling procedures, where the stratification variable was the location of the enterprise. Based on the questionnaires received, the response rate was 10.7%.

3.3. Measurement

Table 1 summarises all the variables for which data were collected and analysed within the framework of the study. Before compiling the questionnaire, the authors reviewed and analysed the subject literature. At the same time, the variables included in the compiled questionnaire were not previously validated. All the variables in the table were measured using a 5-point Likert scale. The variables found in the first five rows of the table contain variables deemed important in terms of increasing competitiveness. In relation to these variables, the respondent could express his/her

Table 1

Measurement scales

Measurement scales	Number of variables	Sample item used in the study
Digitalisation and business development	4	• Close cooperation with partners • Corporate digitalisation • Digitalisation in plant organization • Renewal of the company's operating model
Implementation of production and logistics	4	• Increase efficiency • Capacity enhancement • Capacity reduction • Purchase of the most modern machines/equipment
Labour market developments	4	• Continuous training of employees • Continuous development of the human resources strategy • Finding and employing suitably qualified personnel • A well-developed, transparent career opportunity within the company
Research-development-innovation	3	• Continuous development even with small steps • Encouraging and supporting innovative ideas and proposals • Increasing efficiency in a cost-effective way
Ecosystem	2	• Environmentally conscious operation • A call for the protection of the ecosystem and its active propagation
Communication techniques	12	• Organization of events • Promotions • Product trial/free use of services • Communication on social networks (e.g. Facebook, Instagram) • Leaflets • Printed advertisement in professional newspapers • Regional print media • Regional TV channel • Regional radio channel • Constantly updated company website • Application of billboards and posters • Application of direct mail • Use of car advertising

Source: authors' work.

opinion as to the extent to which he/she considered each variable important on the scale 1 (I do not consider it important at all) to 5 (I consider it extremely important).

In relation to the variables of communication techniques, the respondents had to determine how effective they consider each market communication solution from the point of view of their business, where 1 = I do not consider it effective at all, and 5 = I consider the given market communication technology to be extremely effective. The individual variables were subsequently analysed as ordinal level variables.

3.4. Variables

The following tables summarise the average values and dispersion indicators of the variables examined. Out of the 17 variables influencing the enhancement of competitiveness, one can observe a value above the average value of 4 in the case of four variables considered very important by the respondents, namely: increasing efficiency, close cooperation with partners, continuous development even with small steps and capacity expansion. In the case of the other variables (with one exception – capacity reduction), the mean value was also higher than the median. Examining the dispersion indicators, one can see that there was a high level of agreement among the respondents in three of the four variables highlighted above. These variables have a lower deviation value (continuous development with small steps, increasing efficiency, close cooperation with partners).

Table 2

Descriptive statistics of factors influencing the enhancement of competitiveness, N=275

	Mean	SD
Close cooperation with partners	4.28	.983
Corporate digitalisation	3.72	1.054
Digitalisation in plant organization	3.44	1.094
Renewal of the company's operating model	3.27	1.082
Increase efficiency	4.36	.851
Capacity enhancement	4.01	1.057
Capacity reduction	1.94	1.151
Purchase of the most modern machinery and equipment	3.80	1.027
Continuous training of employees	3.89	1.087
Continuous development of the human resources strategy	3.54	1.095
Finding and employing suitably qualified personnel	3.91	1.080
A well-developed, transparent career opportunity within the company	3.32	1.166
Continuous development even with small steps	4.23	.873
Encouraging and supporting innovative ideas and proposals	3.95	.973
Increasing efficiency in a cost-effective way	3.97	.939
Environmentally conscious operation	3.59	1.063
A call for the protection of the ecosystem and its active propagation	3.27	1.192

Source: authors' work.

Table 3

Descriptive statistics of the effectiveness of market communication solutions, N=275

	Mean	SD
Organization of events	2.48	1.320
Promotions	2.85	1.285
Product trial / free use of services	2.58	1.376
Communication on social networks (e.g. Facebook, Instagram)	3.56	1.401
Flyers	2.58	1.355
Printed advertisement in professional newspapers	2.84	1.347
Regional print media	2.37	1.242
Regional TV channel	2.04	1.215
Regional radio channel	2.00	1.212
Constantly updated company website	4.00	1.213
Application of billboards and posters	2.44	1.370
Application of direct mail	2.78	1.457
Use of car advertising/ads	2.44	1.413

Source: authors' work.

In terms of market communication solutions, the result is no longer so clear. Here one can see that out of the 13 listed variables, only two had an average value higher than the median (continuously updated company website, communication on social networks), the other variables ranged between two to three values. Regarding dispersion, it can be said that the dispersion indicators were relatively high, and the lowest dispersion value were observed for the continuously updated company website variable.

3.5. Methods

A total of 145 organizations in Hungary and 130 in Slovakia participated in the research. Before starting the analysis, the data were coded using the SPSS statistical program.

The study mainly used descriptive statistics on the data of the evaluated questionnaires collected during the primary research, and then subjected to bivariate and multivariate data analysis to test the hypotheses.

Before testing the posed hypotheses, it was important to examine the variables in relation to the common method bias problem. After data collection, common method bias (CMB) was filtered out during data analysis. Harman's single-factor test was performed on the examined variables (factors influencing the enhancement of competitiveness; the effectiveness of market communication solutions) using the

Table 4

Principal axis factoring – total variance explained

Factor	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	6.364	21.212	21.212	5.591	18.636	18.636
2	3.161	10.536	31.748			
3	1.849	6.163	37.911			
4	1.509	5.030	42.941			
5	1.432	4.775	47.716			
6	1.301	4.336	52.052			
7	1.175	3.917	55.969			
8	1.159	3.865	59.834			
9	.986	3.287	63.121			
10	.941	3.138	66.259			
11	.896	2.986	69.245			
12	.837	2.790	72.035			
13	.772	2.574	74.609			

Source: authors' work.

SPSS program. After the analysis, it was possible to ensure that the first unrotated factor explained only 18.63% of the variance of the data, and this value was less than 50%, so as a result CMB was omitted in the study.

4. Empirical and research results

The database contained the contact information of 2,648 companies. Due to incorrect email addresses, the authors received 37 letters requesting the completion of the questionnaire. The respondents willing to respond to the three-month survey amounted to 10.7%. Thus, a total of 281 completed questionnaires were received, of which another 6 were excluded due to incorrect completion, leaving a total of 275 questionnaires. The number of the respondents in Hungary was higher in the sample, as 145 (53%) of the 275 surveyed companies were based in Hungary. In addition, 35% of the samples were micro-enterprises, 41% small enterprises and 24% medium-sized enterprises.

The first hypothesis, formulated in connection with the answer to the research question (What are the factors most influencing the enhancement of competitiveness?), was as follows:

H1: In the industry 4.0 period, corporate digitalisation was singled out among the factors affecting the competitiveness of companies in the markets of both countries.

The factors influencing the enhancement of competitiveness were identified in relation to a 17-item questionnaire. The respondents were asked to rate competitiveness-enhancing factors on a scale of 1 to 5 (1 = not important, 5 = very important). To test the hypothesis, the study first considered the frequency distributions from the univariate analyses. In connection with each statement, the first step was to examine only the distribution of the responses received in each country (Slovakia and Hungary), using median and standard deviation. Regarding the standard deviations, after performing the analyses, it can be stated that a value close to one was taken for each statement, so the group opinions can be considered almost identical.
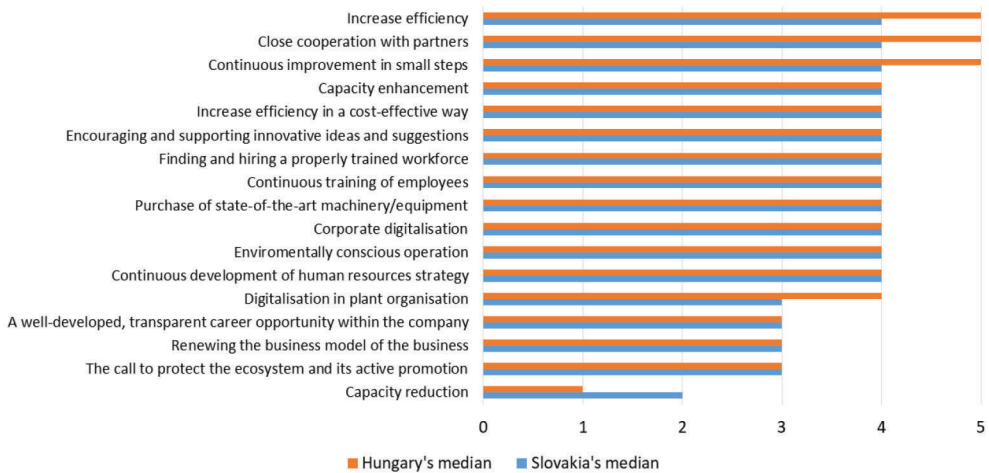
Fig. 4. The median of factors influencing the enhancement of competitiveness in Slovakia and Hungary

Source: own work based on the questionnaire research.

Based on Figure 4, one can state that increasing efficiency, working closely with partners and continuous improvement, even in small steps, are the three most important factors enhancing competitiveness, while reducing capacity does not contribute to increasing corporate competitiveness. Examining the differences between the median of the two countries more closely, the study identified five factors that differ in the perceptions of companies in the countries: efficiency gains, close cooperation with partners, continuous development even with small steps, digitalisation in plant organization and capacity reduction. In the case of four factors, the Slovak interviewees considered them to be more important for increasing competitiveness, while our Hungarian interviewees considered the reduction of capacity to be less important. In terms of the other factors, the opinions of the two groups were completely identical. Next, in order to compare the corporate practice in Slovakia and Hungary, it was decided to perform a multi-aspect analysis of

variance to examine in depth as to whether there was a difference between the assessment of factors enhancing competitiveness in Hungarian and Slovak business practice. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests were not significant for any of the variables ($p > 0.05$), therefore the variables can be considered as normally distributed. After running Levene's tests, it was found that the standard deviation homogeneity was not met in the case of the factor of close cooperation with the partners, i.e. the standard deviations within the group do not match. Hence, a multivariate ANOVA table was constructed for the other 16 factors.

Table 5

ANOVA table on factors enhancing competitiveness

	F	p
Capacity reduction	1.916	0.167
The call to protect the ecosystem and its active promotion	1.107	0.294
Renewing the business model of the business	0.207	0.65
A well-developed, transparent career opportunity within the company	0.029	0.866
Digitalisation in plant organization	3.004	0.084
Continuous development of human resources strategy	0.041	0.839
Environmentally conscious operation	0.189	0.664
Corporate digitalisation	11.599	0.001
Purchase of state-of-the-art machinery/equipment	0.515	0.474
Continuous training of employees	0.016	0.898
Finding and hiring a properly trained workforce	1.789	0.182
Encouraging and supporting innovative ideas and suggestions	2.94	0.088
Increase efficiency in a cost-effective way	0.375	0.541
Capacity enhancement	9.368	0.002
Continuous improvement, even in small steps	2.414	0.121
Increase efficiency	5.913	0.016

Source: own work based on the questionnaire research.

Based on Table 5, it can be stated that the standard deviations in the assessment of the above factors were the same within the group, so its members judged that the listed factors enhanced competitiveness. Regarding the significance levels, one can state that the Hungarian and Slovak companies attach different importance to the factors of corporate digitalisation, capacity expansion and increasing efficiency. The importance of other factors influencing the enhancement of competitiveness was assessed in the same way by both groups. Thus, based on the question, it can be stated that the respondents of the two countries have a unified point of view in the assessment of the factors helping to increase competitiveness in relation to Slovak and Hungarian corporate practice.

During the research, the authors set the goal of creating different company groups based on the assessment of the factors influencing the enhancement of competitiveness, so the method of cluster analysis in the SPSS program was applied, to arrange the observation units into relatively homogeneous groups based on the variables involved in the analysis. Before running the cluster analysis, it was necessary to examine the conditions of the analysis. There was no need to standardise the data, as the variables were measured on a five-point metric scale, two salient elements were identified and excluded from the analysis. The correlation between the variables was not too high either, so clustering became feasible. In the first step in the analysis, the authors determined the ideal number of clusters using the Ward technique. To establish the number of clusters, the authors examined the dendrogram on which an elbow was identified, thus the companies were classified into two clusters: 47% in the first cluster, the remaining 53% in the second.

Table 6

Averages of the two clusters created

	Cluster 1	Cluster 2	Average
Capacity reduction	2.24	1.71	1.96
The call to protect the ecosystem and its active promotion	3.89	2.7	3.26
Renewing the business model of the business	3.76	2.83	3.26
A well-developed, transparent career opportunity within the company	3.89	2.78	3.3
Digitalisation in plant organization	4.03	2.9	3.43
Continuous development of human resources strategy	4.17	2.93	3.51
Environmentally conscious operation	4.1	3.12	3.58
Corporate digitalisation	4.2	3.3	3.72
Purchase of state-of-the-art machinery / equipment	4.05	3.57	3.79
Continuous training of employees	4.34	3.48	3.89
Finding and hiring a properly trained workforce	4.41	3.48	3.92
Encouraging and supporting innovative ideas and suggestions	4.33	3.61	3.95
Increase efficiency in a cost-effective way	4.32	3.67	3.97
Capacity enhancement	4.32	3.78	4.03
Continuous improvement, even with small steps	4.51	3.99	4.23
Close cooperation with partners	4.34	4.25	4.29
Increase efficiency	4.72	4.04	4.36

Source: own work based on the questionnaire research.

An independent sample t-test was used for the statistical testing of the visual differences. The largest significant differences between the two cluster opinions generated were found for a total of six factors, such as: the continuous development

of the human resources strategy; a well-developed, transparent career opportunity within the company; finding and employing a suitably qualified workforce; the call for the active protection of the ecosystem and its active promotion; environmentally conscious operation; and digitalisation in plant organization. With regard to all other factors influencing competitiveness, no such significant difference of opinion could be detected between the opinions of the cluster members. Based on Table 6, it can also be stated that all the factors were considered more important by the companies in the first cluster. Therefore, it can also be said that they are a group of companies that pay attention to human resources, digitalisation and to the importance of environmental protection. This identifies the above three main factors as the means of increasing competitiveness. Thus, this cluster of companies was described as *environmentally conscious*, *relying on human resources and digitalisation,* while the other cluster was classified as *negative that does not trust human resources, digitalisation and environmental awareness*. Overall, companies can be divided into two groups based on their assessment of factors that enhance competitiveness. Significant differences can be observed between the two groups for several factors. Based on the above studies, hypothesis H1 can be accepted.

Later, further analyses were performed to characterise the above clusters along company demographic variables not included in the clustering. With the help of the chi-square test, the authors examined whether there was a correlation between the areas of operation of the companies, their location, the number of employees and their cluster membership. For the area of operation, the value of the chi-square was 4.315 at the significance level of 0.889. If one accepts the margin of error used in practice as 0.05, it can be stated that there was no significant correlation between cluster membership and the operating sectors of companies. Both clusters were dominated by companies in the services, construction and manufacturing industries. The above is also true in the relation between the operating site and the cluster membership, where the value of the chi-square was 0.921 at the 0.337 significance level, so whether the surveyed company did business in Hungary or in Slovakia did not affect its entry into the cluster; 45% of the first cluster was made up of companies in Slovakia and 55% in Hungary, while in the case of the second cluster the proportion of Hungarian and Slovak companies in the two clusters was 50-50. There was already a significant relation between company size and cluster membership (chi-square value was 26.609 at the significance level of 0.000). Further examining the strength of the relation, Cramer V was 0.312, indicating a moderately weaker significant relation between the two variables, i.e. company size and cluster membership. The companies in the first cluster were rather in the category of small and medium-sized enterprises, while those in the second cluster were rather in the category of micro-enterprises. In light of the above, the study also examined the relation between cluster membership and the turnover of the companies. Based on the performed F-test, there was a significant correlation between cluster membership and corporate revenue. As expected from previous studies, the average turnover of each cluster

falls more into the third price category (between EUR 100,000 and EUR 1 million), while the turnover of companies in the second cluster (between EUR 50,000 and EUR 100,000) falls into the lower price response category.

The second research hypothesis was formulated in connection with the application of communication techniques in corporate practice:

H2: Companies consider social networking to be the most effective communication technology in the markets of both countries. There are differences between companies in different industries.

In the next question, the respondents had to evaluate 13 types of communication solutions in terms of their effectiveness (1 = extremely effective, 5 = not effective at all). To test hypothesis H2, the authors first considered the frequency distributions from the univariate analyses. For each statement, the first step was to examine how the responses were distributed, using the mean, mode, and standard deviation. Based on the averages, the respondents considered two communication tools to be the most effective: the constantly updated corporate website (4.00) and the communication on the social network (3.55). The respondents considered regional communication tools to be the least effective, probably due to their narrow range. Thus, at first sight, it seems that the first half of the hypothesis may already be proven. On the other hand, the value of the standard deviations was greater than one in each case, suggesting that the respondents did not share the same view on each statement. In the next stage of the study, the authors wanted to map out the difference between the opinions of Hungarian and Slovak companies regarding the efficiency in the use of communication technologies.
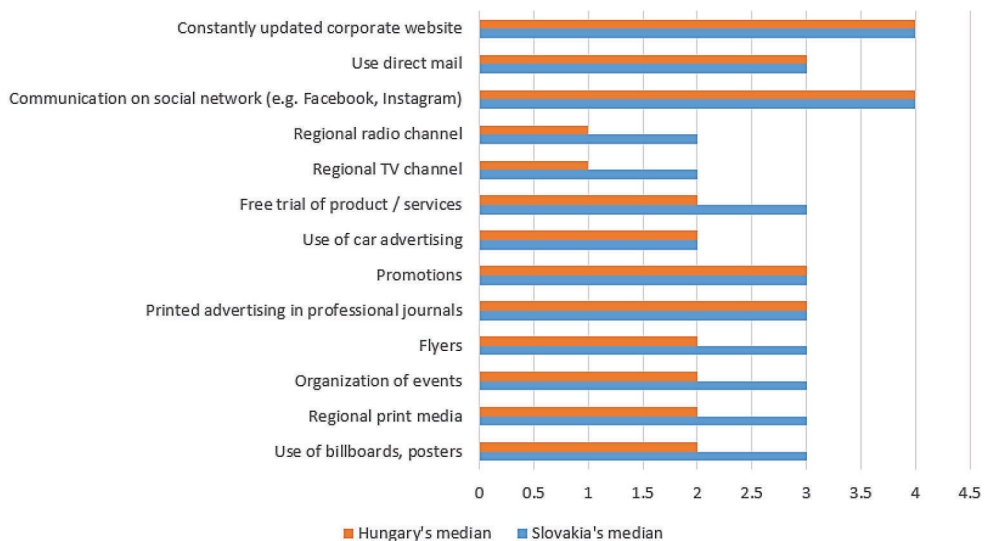

Fig. 5. Judging the effectiveness of communication technologies in Slovakia and Hungary

Source: own work based on the questionnaire research.

In the first step, the opinions of the two groups interviewed were compared using the median. When comparing the median, the greatest differences of opinion were obtained with regard to the efficiency of billboards, the regional print media, regional radio channel, regional TV channel, product testing, the organization of events and leaflets. For all seven factors, the respondents in Slovakia attributed greater efficiency to the use of tools than their Hungarian counterparts. Thus, the first half of the hypothesis seems to be overturned after the analysis of the medians, as there was no significant difference of opinion between the companies in the markets of the two countries in that they considered the constantly updated corporate website to be more effective than communicating on the social network. In order to determine whether the difference between the two groups was really based on whether they have a place of business and a place of operation in Hungary or Slovakia, the analysis of variance was applied, which essentially measures whether there is a difference between two groups. Examining the conditions of the analysis of variance, it was true that the dependent variables were measured on an interval scale. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests were not significant for any of the variables ($p > 0.05$), therefore the variables could be considered as normally distributed. Scattering homogeneity was performed using Levene's test. After running the test in the program, it resulted that the condition of homogeneity of variance was met for all the factors. The ANOVA table was thus constructed taking all 13 factors into account.

The significance levels of the answers can be read from Table 7, hence it can be stated that Hungarian and Slovak companies attach different importance to the

Table 7

ANOVA table on the evaluation of the effectiveness of communication tools

	F	p
Regional radio channel	0.021	0.886
Regional TV channel	1.026	0.312
Regional print media	9.073	0.003
Use of billboards, posters	27.619	0.000
Use of car advertising	1.868	0.173
Organization of events	4.531	0.034
Flyers	3.970	0.047
Free trial of product / services	1.445	0.230
Use direct mail	0.037	0.848
Promotions	3.456	0.064
Printed advertising in professional journals	3.617	0.058
Communication on a social network (e.g. Facebook, Instagram)	0.017	0.896
Constantly updated corporate website	0.088	0.767

Source: own work based on the questionnaire research.

regional print media, the use of billboards, the organization of events and the efficiency of the use of leaflets. The effectiveness of the application of the remaining nine factors was judged in the same way by both studied groups. In light of the above analysis, the authors rejected the first half of hypothesis H2, with respondents in both countries agreeing that the most effective means of communication today remains a constantly updated corporate website, with most still visiting the company with a request for quotation. Communication on the social network is gaining ground, as the respondents consider it to be the second most effective tool, regardless of the company's location. However, the change according to which, communication via websites would have been replaced by communication via the social network, has not yet taken place in the markets of the two countries.

Next, when exploring the differences of opinion of the individual sectors which helps to confirm or reject the second half of the hypothesis, the authors decided to perform the analysis of variance again. The dependent variables were the same as in the study performed above, so it was decided to omit performing the normality test again, and consider the variables to be normally distributed. Scattering homogeneity was performed using Levene's test. After running the test in the program, it resulted that the condition of homogeneity of scattering was not met for five factors (communication on a social network, flyers, regional TV channel, regional radio channel, car advertising, advertising). The ANOVA table was thus prepared to take into account the remaining five factors.

Table 8

ANOVA table on the assessment of the effectiveness of communication tools in each sector of operation

	F	p
Regional print media	0.838	0.581
Use of billboards, posters	1.958	0.044
Organization of events	4.313	0.000
Free trial of product / services	0.803	0.614
Use direct mail	1.531	0.137
Promotions	1.608	0.113
Printed advertising in professional journals	0.836	0.584
Constantly updated corporate website	0.316	0.229

Source: own study based on the questionnaire research.

The significance levels of the responses can be seen in Table 8 and it can be stated that the companies in each sector attribute different levels of efficiency through the use of billboards, posters, and organization of events. The effectiveness of the other communication solutions was assessed in the same way by scrutinising groups of

companies, regardless of their sector. To assess the effectiveness of the tools mentioned earlier, the respondents could use a scale from 1 to 5. Thus, using a weighted average method in the case of the two factors above (use of billboards and organization of events), the authors further examined in which sector the respondents considered these factors to be most effective. Based on the results, one can state that the hospitality industry attaches the greatest importance to the organization of events, while tourism gives the greatest importance to the use of billboards. In light of the analyses performed above, it can be state that the second half of hypothesis H2 can be accepted with modifications. Companies in each operating sector have different views on the use of billboards and the organization of events, and judge the effectiveness of the other communication factors in the same way.

Discussion and conclusions

After clarifying the data obtained during the primary data collection, based on the research questions and the results of the analyses carried out in terms of the hypotheses associated with them, it can be stated that the Slovak and Hungarian SME sector participants share the same opinion, which can be traced back to the two neighbouring countries sharing an economic, social and cultural background. At the same time, minor differences in international comparison could be identified in some places. Increasing corporate efficiency, working closely with partners, and continuous improvement, even in small steps, will clearly help increase competitiveness, so the future pursuit of such activities can promise positive results in terms of maintaining corporate competitiveness. From the companies in the study sample, the study created a group of environmentally conscious companies relying on human resources and digitalisation in the markets of both countries, as well as the ones with a negative outlook that do not trust it. The companies of the two groups have fundamentally different views on the continuous development of their human resource strategy: a well-developed, transparent career opportunity within the company, finding and employing a suitably qualified workforce, the call for the active protection of the ecosystem and its active promotion, environmentally conscious operation, and digitalisation in plant organization issues. Based on other international research related to the topic, the authors consider it important for companies belonging to the negative group to announce programmes and tenders that would promote corporate efficiency, while at the same time integrating digitalisation into everyday business, specifically the economic sector in which the company operates. There was no difference of opinion between companies in the two countries on how to judge the effectiveness of communication technologies, and the most effective means of communication today is the constantly updated corporate website, all the while acknowledging the growing potential of social media. Naturally, at this point one should point out the not insignificant fact that companies representing different economic sectors were present in the examined sample, and as such they target

different consumer groups with their products and services. In order to show more accurate results, and this can even be identified as a future research direction, a sector-specific study is needed. In the course of the detailed analysis, the authors also considered it important to take into account that companies strive to meet the needs of different generations of consumers outside the different spheres of activity, and different generations can be addressed through different communication channels and different communication technologies.

The research results are a reminder that it would be worthwhile to supplement this survey with personal company interviews, which would also offer the opportunity to explore cause-and-effect relationships. Furthermore, large companies were missing from the sample, and the authors suggest that comparing SMEs with them would reveal additional interesting results regarding the examined problem. Another limitation of this research was the respondents' low willingness to answer. By increasing the number of sample items, one would have the opportunity to explore more useful, more general correlations.

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