

“The importance of social networks for the SME’s innovation potential in Industry 4.0”

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THE IMPORTANCE OF SOCIAL NETWORKS FOR THE SME'S INNOVATION POTENTIAL IN INDUSTRY 4.0

Abstract

Social network usage is a prerequisite for the functioning of companies and their competitiveness. The level, focus of their usage, and link with the company process are important. This research focuses on SMEs, how they use social networks, and how this affects their innovation potential. The study aims to determine the importance of social networks for SME's competitiveness and long-term stability. To achieve this goal, 359 European SMEs were studied (2017–2019), two research questions and seven hypotheses were developed. Pearson's correlation and stepwise regression were used, and the obtained results were verified by experimental testing. The research results showed that companies using social media as a main component of their business, are active at using modern technologies and are declaring the importance of social networks to develop innovation potential. Fastness and reliability of communication are crucial for business operations in the company. Social networks offer many opportunities and connections between strategic planning, controlling management, and performance level. All SMEs mostly use Facebook, and this does not depend on size, age or industry. The research results lead to the understanding that social networks and controlling-oriented management support SME business activities and their innovation potential and long-term stability in a hyper-competitive environment.

Keywords

EU, controlling, competitiveness, communication, innovation plan, long-term stability, performance, ROE, strategic plan

JEL Classification

M10, M15, L11, L15, M31

INTRODUCTION

In the current hyper-competitive environment, the emerging technology of Industry 4.0, innovation, strong competition of large and multinational enterprises, and the interconnectedness of these entities and areas significantly impact the SMEs sector. The controlling-oriented management system and usage of social networks offer SMEs a way to strengthen their position and competitiveness in the hyper-competitive environment.

This study's originality lies in the search for solutions to the desired usage of social networks to increase SMEs' competitiveness, based on interconnection and, in a certain way, the interdependence of the external and internal environment, using social networks.

The results of this study suggest a solution that can seem complex and resource-intensive to apply, but social networks have greatly simplified and streamlined this research. Furthermore, the key areas and factors in SMEs' competitiveness and stability for the innovation potential of Industry 4.0 in terms of the use of social networks are defined.



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1. LITERATURE REVIEW

1.1. Small and medium enterprises (SMEs)

SMEs are an important part of the economy. SME's financial stability and management of business value growth are essential in increasing SMEs' competitiveness, the cohesion of the European Union, and its economy. According to Belás, Dvorský, Kubálek, and Smrčka (2018), SMEs are the cornerstones of any economy. Koisoova, Habanik, Virglerova, and Rozsa (2017) have discussed SMEs' importance for national economics as key factors in the business quality environment. Chong et al. (2019, p. 2) have discussed SMEs' importance for economics as policymakers. The importance of SMEs for the economy is further defined by Prasetyo (2016, p. 133) and Kubičková, Krošlákova, Michálková, and Benešová (2018, p. 933). SMEs are seen as holders of knowledge. Other authors also describe and agree on SMEs as an essential factor for economic. Klučníkov and Belás (2016) state that SMEs act as the main aspect of the economy. Gama and Geraldles (2012) comment that around 99 percent of the SME's economic activities are in the European Union. SMEs play a crucial role for the national and European economies; they are a significant employer, a bearer of innovation, and an important stabilizing economic element (Tomášková & Havlíček, 2018, p. 38).

The importance of SMEs for the development of national and multinational economies is undeniable. On the other hand, the question is, what will be the development of SME stability concerning large and multinational enterprises. SMEs have several advantages over large companies. Lavia and Hiebl (2014) see their flexibility as one of the key advantages of SMEs, and state that SMEs have a simpler internal organization and can be more flexible and implement more quickly new changes and challenges.

In the context of the current globalized, highly competitive, and changing environment of SMEs, Hrašková and Bartošová (2014) state that developing the competitiveness and financial stability of SMEs are key areas of interest for governments, national authorities, and researchers,

the situation, when SMEs create opportunities and challenges, is similarly perceived by Mareš and Dlasková (2016, p. 79). Developing an approach to the use of modern tools, their use for the steady growth of SMEs' value, the use of on-line tools, and controlling tools leads to maintaining SMEs' stability and competitiveness in the following periods. Písař and Havlíček (2018) also look at this issue similarly.

For effective management with the help of modern tools and the growth of SMEs' value, it is necessary to define a business management system based on social networks, which will connect the external and internal environment. A system will be effective not only for the analysis based on historical data but also in comparison with present results, but these results will also help plan and achieve the company's future value. The active and maximum use of social networks can fulfill this important role and function.

1.2. Social networks

The internet, social networks, and technologies now dominate the world, and one can hardly imagine the present without these tools. These are an integral part of working and personal time (Veber, 2018, p. 52).

Social networks are becoming an increasingly important and necessary means for SMEs to operate, present themselves, cooperate, and connect. What are social networks? What is their relationship and connection concerning SMEs?

Social networks are web applications that allow shareholders and businesses to communicate with each other. Business and society's nature should reflect on the current trend and changes in organizational environments (Song, 2015, p. 1). Regardless of whether they are a person, community, or company, all subjects and entities use modern technology tools. Social media and networks have made a huge impact on the industry. Social networking media are the community's background with approved followers (Kornpitack & Sornsaruht, 2019, p. 247).

Communication on social networks should be conversational, i.e., encourage "like" comments,

sharing. A widespread phenomenon is a profile that has thousands of fans but minimal engagement. It is important to note that this is not just an internal channel but also understandable and interesting to a wider audience. Kupec (2018a, p. 129) adds that communication on social networks links the demographic group and digital technologies. They accept the shared information in full (Kupec, 2018a, p. 133).

Gahfoor and Niazi (2019, p. 1) draw attention to the mutual relationship of entities. Online social networks can be seen as a background for personal or professional usage. The same opinion is in line with previous authors' studies that social networks like bridges serve individuals and communities. Song and Vining (2012, p. 2) verified mutual communication between subjects, emerging online networking contributed to interconnect between companies and individualities.

Social networks include two parts: firstly, vertices as representing users, and secondly, edges as social relations and friendship (Song, 2015, p. 4). Examples of the most frequently type social networks are Facebook, Skype, LinkedIn, Twitter, Messenger. Newman (2011, p. 28) and Sellami (2012, p. 503) claim that social network users' density can indicate the network's cohesion and stability. Users of social networks and their connections make up the network (Ghafoor & Niazi, 2019, p. 2). Actors in a social network are connected with a set of relationships and links (Ravasan, Rouhani, & Asgary, 2014, p. 23). In social networks, one can keep in touch with customers, authorities, employees, fans, acquire new ones, build relationships with them, and motivate them to use services. Not every entrepreneur realizes that social networks offer them a unique opportunity to communicate. Network support and communication have an impact on the success of newly founded businesses. A social network is a prerequisite for starting a business (Petrů, Pavlák, & Polák, 2019; Petrů, Kramoliš, & Stuchlík, 2020).

The primary task of presenting the company on social networks is to build a relationship with supporters, i.e., fans, or followers, providing care, support, and relevant information. However, this relationship works in both direc-

tions: the right approach gives live feedback on the products or services conveniently and interactively. Based on feedback and communication, activities between all participants can build strategic plans, plan innovation, grow value in the present use of modern communication tools, and then monitor and evaluate all by controlling activities.

Pisar and Bilkova (2019) discussed the assertion of Safar, Sopko, Bednar, and Poklemba (2018) and Jo, Alfnes, Strandhagen, and Logan (2017) that modern controlling should reflect Industry 4.0 based on flexible organizational structure. To this end, Safar et al. (2018) state that the new trend with globalization's ongoing process serves to look for a new topic for research. According to Jo et al. (2017), Industry 4.0 can be divided into two basic areas: firstly, the combination of quickly evolving technology environments, secondly, the area in high-cost areas. Both should lead to the competitiveness of the company. Process management and its innovative activities using modern tools, social networks, and communication are the key drivers of SMEs. Goller and Bessant (2017, p. 3) state a clear need to apply innovative approaches and maximize the potential to be used. Social networks, especially in the area of business processes, contribute to higher efficiency, flexibility and connection with external environment which is also confirmed by Zaušková, Bobovnický, and Madleňák (2013, p. 256). Innovation was identified by managerial practice as a key success factor for business (Zacharias, 2011, p. 1). Nevertheless, the innovative activities of the company are not enough in themselves and must, therefore, be part of a further process that will only subsequently fulfill the theory of value creation and sharing of results with the support of social networks (Goller & Bessant, 2017, p. 3).

Concrete and specific use of social networks reflects the timeliness of trends. Kupec (2018b, p. 36) states that modern marketing communication trends are reflected in the tools used. These tools are important for managing a business (Petrů, Tomášková, & Krošlák, 2019, p. 316; Orgonáš et al., 2020). Social networks, social media, and social areas, in general, became a crucial business opportunity (Song, 2015, p. 1).

Social networks are important and can be said to be a natural part of modern times.

The research aims to determine the importance of social networks for SME's competitiveness and long-term stability.

2. HYPOTHESES, METHODOLOGY AND DATA

Research question Q1: How do social media impact SME's competitiveness and stability, what are the most important factors?

To answer the research question Q1, the following hypotheses were defined:

- H1: Industry 4.0 is an important factor, stimulating SMEs for the utilization and development of social networks as an important tool for business.*
- H2: SME's innovation potential is positively influenced by social networks.*
- H3: Social networks improve SME's communications skills, supporting communications reliability, and the fastness of information accessibility.*
- H4: SME's strategic planning and controlling management performance are supported by social networks.*
- H5: Social networks in business will have minimum moderate Pearson's linear correlation dependency with ROE, and social networks will positively influence SME's competitiveness and stability.*

Research question Q2: How do social networks influence current SME's business practices and what one can expect shortly?

To answer the research question Q2, the following hypotheses were defined:

- H6: Social networks and their importance for SMEs are increasing in the current hyper-competitive business environment.*

H7: Facebook is the most important social network channel for SMEs.

2.1. Data sources

For the research, it will be essential to determine the research sample, whereby they were selected randomly so that the research sample has a predictive ability and an even representation of SMEs to research the given issue. 741 European SMEs were selected and asked for research cooperation. For research, only those companies with complete research data were taken. The final research sample had $n = 359$. The research questionnaire collected empirical and sociological data. Empirical data were collected using official SME data valid for the researched period and official financial statements and others. The research was undertaken from 2017 to 2019, and it is continuing.

The Likert scale was used for collecting and evaluating sociological data. It was published in 1932 by R. Likert. The Likert scale should usually (not necessarily) use five degrees. An example of Likert scale may be 'I agree', 'I rather agree', 'Half-way', 'I rather disagree', 'I disagree', but may be expressed otherwise. The advantage of this scale is that it evaluates respondents' attitudes and weight (Hayes, 1998, p. 112). Research preparation, research sample identification, procedure methodology will be determined based on Gavora (2010, p. 261).

For this research, Paper Aided Personal Interview was chosen (PAPI). The interviewer visits the respondent and assists in answering the questions. According to Barbu and Alexandru (2011), PAPI questionnaire research can be successfully carried out for management research purposes nationally and globally.

A prerequisite for the research is that the data will be obtained from interviews with the owners, managers, top management, employees, and other persons so that the obtained data are cross-sectional.

2.2. Reliability analysis – Cronbach's alpha

For the research similar to this article, the method of calculating Cronbach's alpha is often used. According to Cronbach (1951), Cronbach's alpha

takes values in the interval of 0-1. Generally, a Cronbach's alpha value of 0.7 or higher is interpreted as high reliability of the data sample examined. Cronbach's alpha is given as follows:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{j=1}^k \text{var}(Y_j)}{\text{var}(Y)} \right),$$

where k is the number of test items, $\text{var}(Y_j)$ is the j scatter of the score, and $\text{var}(Y)$ is the total score of the test. Cronbach's α and its value evaluate the plausibility of the data and determine to what extent the conclusions based on these data can be reliable.

2.3. Variables

Variables are defined according to Písař and Bílková (2019), in the initial stage of research.

Social networks – rating scale: 0 = not used, 1 = random use without feedback, 2 = medium level, use at least once every three months, efficiency control mechanisms is missing, 3 = high level - the enterprise is working intensively on the use of social networks, 4 = optimized level - the company uses high-level techniques for social networks usage, and there is a process that continuously stimulates the company in social networks usage development.

Return on Equity (ROE) – return on equity capital
 $ROE = EAT/\text{equity capital}$.

Controlling – evaluation of the execution and implementation of controlling management activities in the short term. The level is evaluated based on the Capability Maturity Model Integration (CMM) methodology. Rating scale: 0 = absent or insufficient, 1 = low level, 2 = medium level, 3 = excellent level with continuous improvement.

Innovation plan – level of usage and implementation of the innovative plan in the examined business, with an emphasis on assessing the innovations' success and the feedback for the innovative plan development. Rating scale: 0 = none or insufficient, 1 = low level, incentive state, ran-

dom innovations without feedback, 2 = medium level, innovations are driven essentially, lacking the control process of innovation malfunctions, 3 = high level – enterprise is working hard on the innovative plan and has some results, 4 = optimized level - the enterprise has an innovative plan at a high level, and there is a process that constantly stimulates the enterprise to innovative behavior.

Strategic plan – rating scale: 0 = absent or insufficient, 1 = low level, 2 = medium level, 3 = excellent level involves automated ideas for innovative attitude and long-term objectives achievement.

Industry 4.0 – rating scale: 0 = missing or inaccurate, 1 = low level, 2 = medium level, use of information systems, partial automation, partly Industry 4.0 tools usage, 3 = advanced level, cloud solutions, remote control, including automatic data sharing, Industry 4.0 tools usage, 4 = excellent level, advanced communication technologies, production, data sharing, and full Industry 4.0 tools usage.

Communication – rating scale: 1 – initial, communication is random, mostly oral, 2 – basically managed, communication is oriented to operational tasks, basic electronic communication is used, 3 – managed, regular communication, electronic communication, chat, basic cloud solutions, 4 – quantitatively managed – communication is solved within the organizational structure of the company, information is subject to security, information transmission is focused on quality and speed of its transmission, basics of automated information and data transmission, 5 – optimizing – strives for continuous improvement and development.

2.4. Pearson's correlation analysis

The research collected the data from various management areas, enterprise financial performance, and stability of the company, and many others. To determine important factors – variables, it is necessary to use a tool to evaluate the interdependence between these variables. The solution offers Pearson's correlation coefficient, which evaluates the linear dependence of var-

ables and its strength. Pearson's correlation by Tran (2011) is as follows:

$$\rho_{x,y} = \text{COV}(x,y) / \sigma_x \sigma_y$$

with the corresponding correlation sample $r_{x,y}$ given by:

$$r_{x,y} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{(n-1)S_x S_y}$$

Pearson's correlation coefficient defines how strong the relationship between variables is. According to Tran (2011), Pearson's coefficient is a parametric statistical test for determining the tightening relationship of variables. With Pearson's correlation coefficient values above 0.4 (minimum with one of the other variables), the linkage of the variables will be significant for this research, and at values above 0.7, it will be interpreted as very important.

2.5. Statistical analysis model

Research data were analyzed using regression and correlation analysis methods to prove the dependence of variables and model definition. The following procedure is by Písař and Bílková (2019) additive model. A more detailed way of analyzing the data is following Darlington and Hayes (2017). The analysis results will serve the goal of the achievement and acceptance or rejection of the hypotheses.

2.6. Experimental testing

If at least the moderately important relationship between the variables researched will be proven, a research sample will be randomly generated for previous analysis experimental research. These SMEs will be tested using the research finding and its implementation and testing again, focusing on reaching the research objectives.

3. EMPIRICAL RESULTS

The data of this research were analyzed using an IBM statistical program SPSS ver. 25. A detailed

description of procedures was performed according to the software manual.

3.1. Verifying the consistency and reliability of the examined sample

The analyzed sample $n = 359$ was tested for the tested variables' complexity with the statistical program SPSS ver. 25. The calculation of this indicator achieved a value of 0.898 for $n = 7$ variables. Cronbach's alpha value of 0.7 or more means high reliability and consistency of the analyzed sample. Based on this result, the examined data can be presented as highly reliable and consistent.

3.2. Pearson's correlation analysis

Table 1 shows the Pearson's correlation analysis results. For research, it is defined that the correlation value must be at least 0.4 under at least one other variable researched. All variables pass by these criteria. The correlation matrix follows the research by Písař and Bilkova (2019) and Písař and Havlicek (2018).

3.3. Stepwise regression and forward selection model

Dependent on variable – social networks, the procedure by stepwise regression and forward selection is used, computing with all variables immediately. The procedure is following Darlington and Hayes (2017).

The analysis procedure continued by entered and removed variables to the model. Closer results are in Table 2.

The next step of model computing is selective regression hyperplanes (Table 3).

Final model – sample regression hyperplane of dependent variable Social networks:

$$\text{Social networks} = -0.203 + 0.131 \cdot ROE + 0.203 \cdot \text{Innovation plan} + 0.199 \cdot \text{Strategic plan} + 0.254 \cdot \text{Industry 4.0} + 0.125 \cdot \text{Communication} + 0.077 \cdot \text{Controlling}$$

This model should be used for forecasting, planning, and achieving the goals of future values variables.

Table 1. Pearson’s correlation of variables

Source: Authors’ data, own processing.

Variables		Social networks	ROE	Industry 4.0	Innovation plan	Strategic plan	Controlling	Commun.***
Social networks	Pearson’s correlation	1	.466**	.731**	.680**	.563**	.588**	.653**
	Sig. (2-tailed)	–	.000	.000	.000	.000	.000	.000
	n	359	359	359	359	359	359	359
ROE	Pearson’s correlation	.466**	1	.445**	.445**	.285**	.302**	.534**
	Sig. (2-tailed)	.000	–	.000	.000	.000	.000	.000
	n	359	359	359	359	359	359	359
Industry 4.0	Pearson’s correlation	.731**	.445**	1	.766**	.597**	.669**	.720**
	Sig. (2-tailed)	.000	.000	–	.000	.000	.000	.000
	n	359	359	359	359	359	359	359
Innovation plan	Pearson’s correlation	.680**	.445**	.766**	1	.522**	.604**	.670**
	Sig. (2-tailed)	.000	.000	.000	–	.000	.000	.000
	n	359	359	359	359	359	359	359
Strategic plan	Pearson’s correlation	.563**	.285**	.597**	.522**	1	.586**	.553**
	Sig. (2-tailed)	.000	.000	.000	.000	–	.000	.000
	n	359	359	359	359	359	359	359
Controlling	Pearson’s correlation	.588**	.302**	.669**	.604**	.586**	1	.538**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	–	.000
	n	359	359	359	359	359	359	359
Commun.***	Pearson’s correlation	.653**	.534**	.720**	.670**	.553**	.538**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	–
	n	359	359	359	359	359	359	359

Note: ** Correlation is significant at the 0.01 level (2-tailed). *** Communication.

Table 2. Variables entered/removed^a

Source: Authors’ data, own processing.

Model	Variables entered	Variables removed	Method
1	ROE	–	Stepwise*
2	Strategic plan, Innovation plan, Industry 4.0 ^b	–	Stepwise*
3	Controlling, Communication ^b	–	Stepwise*

Note: a. Dependent variable: social networks, b. All requested entered variables. *(Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

Table 3. Inclusion in the final model of dependent variable Social networks

Source: Authors’ data, own processing.

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	.576	.161	–	3.571	.000
	ROE	.529	.053	.466	9.958	.000
2	(Constant)	–.188	.125	–	–1.509	.132
	ROE	.161	.043	.142	3.743	.000
	Innovation plan	.249	.058	.229	4.292	.000
	Strategic plan	.272	.067	.170	4.052	.000
3	Industry 4.0	.319	.046	.390	6.890	.000
	(Constant)	–.203	.124	–	–1.631	.104
	ROE	.131	.045	.116	2.915	.004
	Innovation plan	.203	.059	.187	3.424	.001
	Strategic plan	.199	.071	.125	2.808	.005
	Industry 4.0	.254	.051	.311	5.022	.000
	Communication	.125	.055	.122	2.298	.022
Controlling	.077	.039	.094	1.971	.050	

Table 4. Model F-test^a

Source: Authors' data, own processing.

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	109.198	1	109.198	99.163	.000 ^b
	Residual	393.125	357	1.101	–	–
	Total	502.323	358	–	–	–
2	Regression	302.977	4	75.744	134.507	.000 ^c
	Residual	199.346	354	.563	–	–
	Total	502.323	358	–	–	–
3	Regression	308.109	6	51.352	93.071	.000 ^d
	Residual	194.214	352	.552	–	–
	Total	502.323	358	–	–	–

Note: a. Dependent variable: Social networks; b. Predictors: (Constant), ROE; c. Predictors: (Constant), ROE, Strategic plan, Innovation plan, Industry 4.0; d. Predictors: (Constant), ROE, Strategic plan, Innovation plan, Industry 4.0, Controlling, Communication.

Table 5. The development of the determination coefficient value (*R*-squared)

Source: Authors' data, own processing.

Model	R	<i>R</i> -squared	Adjusted <i>R</i> -squared	Std. error of the estimate	Change statistics				
					<i>R</i> -squared change	F change	df1	df2	Sig. F change
1	.466 ^a	.217	.215	1.049	.217	99.163	1	357	.000
2	.777 ^b	.603	.599	.750	.386	114.704	3	354	.000
3	.783 ^c	.613	.607	.743	.010	4.651	2	352	.010

Note: a. Predictors: (Constant), ROE; b. Predictors: (Constant), ROE, Strategic plan, Innovation plan, Industry 4.0; c. Predictors: (Constant), ROE, Strategic plan, Innovation plan, Industry 4.0, Controlling, Communication.

These results follow the results by Písař and Bilkova (2019). Table 4 shows that the overall F-test model with six explanatory variables is also significant at the 5% significance level.

Table 5 shows how the value of the multiple coefficients of determination gradually increased with the model's gradual integration of variables.

The compiled model of $n = 6$ explanatory variables depended on variable Social networks – multiple selection coefficient $R^2 = .783^c$ shows 61.3% variability of the dependent variable explained by the chosen regression plane. The multiple sample correlation coefficient $R = 0.783$ is close to 1, at the level of the variable's direct linear dependence on six selected explanatory variables taken together.

3.4. Analysis data interpretation

Statistical analysis results are significant at 1% and 5% levels. Cronbach's alpha computing results show that data reliability analyses are on a high level, and conclusions based on these data are relevant. Based on that, the research questions and hypotheses will be evaluated.

H1: Industry 4.0 is an important factor, stimulating SMEs for the utilization and development of social networks as an important tool for business.

Based on Pearson's correlation, the variable Industry 4.0 reached a moderate or very tight relationship with all tested variables (see Table 1 for details). These values are significant for the linear dependence of the variable tested. Based on the social networks model, Industry 4.0 has an important value of 0.254 at a model scale. The companies, which are using social media as a component of their business, are also active at using modern technologies. Hypothesis *H1* should be declared as proved.

H2: SME's innovation potential is positively influenced by social networks.

The companies that are successful in innovation activities are also declaring the importance of social networks to develop innovation potential. Based on Pearson's correlation, the variable Innovation plan reached a moderate or very tight relationship with all tested variables (see Table 1

for details). These values are significant for the linear dependence of variables tested and proving the role of social media for SME's innovation activities. The value 0.203 of Innovation plan of the social media model declares its importance. Hypothesis *H2* should be declared as proved.

H3: Social networks are improving SME communications skills, supporting communications reliability, and fastness of information accessibility.

Based on deep research of communication in SMEs, it was recognized that communication's fastness and reliability are crucial for business operations in the company. Communication and its importance were evaluated based on Pearson's correlation as a moderate or very tight relationship. The social networks model evaluates Communication on a 0.125 value. Communication is supported by using social networks. Hypothesis *H3* should be declared as proved.

H4: SME's strategic planning and controlling management performance are supported by social networks.

The existence of strategic planning and a controlling management system in a company declares that the company can think in the long term. A company, which uses social networks, can analyze the current environment and search for opportunities. Social networks that offer many opportunities and connections between strategic planning, controlling management, and social networks are no surprise. Pearson's correlation coefficient shows a moderate or very tight relationship between variables researched, and the model of the social networks evaluates strategic plan (0.199) and controlling (0.077) levels. Hypothesis *H4* should be declared as proved.

H5: Social networks in business will have minimum moderate Pearson's linear correlation dependency with ROE, and social networks will positively influence SME's competitiveness and stability.

Companies, which are using and supporting social networks as part of their business activities, have a higher ROE value. Partly because the digital envi-

ronment is a new growing market place and by social networks, companies can increase their activities there. Pearson's correlation coefficient shows the moderate linear dependency between social networks and ROE (0.466). Hypothesis *H5* should be declared as proved.

Q1: How social media are impacting SME competitiveness and stability, what are the most important factors?

Based on personal research, on statistical analysis, the results were experimentally tested on selected companies. The findings are as follows:

- SME's age – the research showed that companies younger than five years are using social networks for current business operation (promotion, communication, marketing research, ...) in 78%, companies aged between 5 and 10 years in 61% and older in 49%. The company that uses social networks is closely connected with top management and its support. Usually, if older people manage the company, 50 years plus have a lower need for social networks use and vice versa.
- Business core – SMEs operating a business closely connected to technologies like, for example, IT is usually accepting social networks like a natural part of the business. SMEs operating in the technology field are using social networks in 94% for their business operations. On the other hand, SMEs from agriculture, craftwork, animal husbandry, and some types of services are using social networks only in 21%.
- Industry 4.0 – SMEs operating a business by using Industry 4.0 or are coming to start with Industry 4.0 in 3 years are using social networks for business operation (hiring employees, promoting, marketing research, effective long-distance communication, ...) in 79 %.
- Innovation plan – based on the research, it was found that companies, which are using social networks, are also active in innovations. 86% of the companies, which are using social networks on a high level, are also active in innovation activities, have an innovation plan, and

control management by continuously evaluating innovation results, focusing on achieving innovation goals.

Based on data analysis and results, experimental testing proves the consequences of using social networks, company stability, and competitiveness.

3.5. Experimental analyses data testing

The analysis result was experimentally tested to verify statistical results. This research was compounded from applying research knowledge and focused on a deeper understanding of social networks' importance for the SME's innovation potential in Industry 4.0. Based on that, the following research question and hypotheses were evaluated.

H6: Social networks and their importance for SMEs are increasing in the current hyper-competitive business environment.

The researched companies operating in social networks also had in total higher ROE values, approximately about 3.6 %. 67% of SMEs, which focus on using social networks, are active in export, and 74% are thinking about an expansion using Industry 4.0 technologies and social networks. Also, SME's innovation activities are mainly supported by social networks in 34 % of companies, and as a tool for marketing research and inspiration, the social networks for innovation activities are used in 74 %. Based on previous findings, the hypothesis *H6* should be declared as proved.

H7: Facebook is the most important social network channel for SMEs.

Through the experimental testing, the research was also oriented on the most important social networks platform. It was recognized that the most used is Facebook with high distance, and then YouTube and Instagram were important for SME's business operations. Based on research results, hypothesis *H7* should be proved.

Hypotheses *H6* and *H7* helped answer Q2: How the social networks influence current SME's business practices and what one can expect in the not too distant future?

Before answering this question, size, SME's age, top management age, and type of industry must also be important, and it is not possible to answer in general conclusions. On the other hand, big numbers' law is declaring clearly that Facebook is predominant as a social network tool. The research results show that all SMEs are mostly using Facebook and do not depend on size, age, or industry. The companies pronounced that they are using Facebook and will use this network in the future (77%).

4. DISCUSSION

In the same period as the authors of this paper, the Association of Small and Medium-sized Enterprises and Sole Traders of the Czech Republic (AMSP) carried out social network research in the Czech Republic. Each research independently reflected the importance of using modern technologies, Industry 4.0, and innovations. AMSP's research period was 2018–2019. The research objectives were: (1) to use online technologies and tools for business; (2) to map the approach of Czech SMEs to digitization and Industry 4.0; (3) to map the use of modern technologies and access of entrepreneurs to Services 4.0; (4) to find out how business subjects view the use of modern technologies in the industry; (5) to map the use of modern technologies in smaller agriculture and farmers' access to digitization (AMSP, 2019a, b, c, d, e; AMSP, 2018).

Both studies in the following areas showed the same results and differences. Social networks as an important tool for business, and social networking knowledge are important to business growth. AMSP's result is the same: 9 out of 10 companies agree that digital knowledge/competence is important for business growth (AMSP, 2018). The most widely used tools are websites, mail, and social media (AMSP, 2018). This research-proven social network is the most important instrument, accepting social networks like a natural part of the business. In contrast, AMSP's research has shown that the prevailing form and instrument of support are websites, e-mail, and social media, following a significant loss (over 20%) (AMSP, 2018; AMSP, 2019a, b, c, d, e). The main difference is an issue about accepting social networks. The

reason can be (1) research sample (farm, exporting companies, start-up, difference between number of company employees), (2) years of company (start-up, ongoing company), (3) age of owners, managers (generally a younger generation is more accepting for using modern technology), (4) kind of managers (generation cooperation and family manager in case of family company, external manager), (5) type of company (self-employed, limited liability company, joint-stock company), (6) others (management style, headquarters). The agreement of both surveys is also in the area of exporting companies that use social networks to a large extent. Companies see in this instrument a more accessible degree of openness to the world.

In the area of social media, Facebook is dominant. AMSP claims that Facebook is used by 75% of business entities (AMSP, 2018). Nastišin, L., Fedorko, R., Vavřečka, V., Bačik, R., & Rigelsky, M. (2019, p. 16) showed the same results on the dominance of Facebook as a social network. The impact of social media, mainly Facebook, is growing. The same result was obtained by Song (2015, p. 128, 129), his survey was based on 286 respondents – entrepreneurs and the most important social network is Facebook, fol-

low by LinkedIn and Twitter. The same result as by Song confirmed that by AMSP (2018) that 3 out of 4 businesses support their business via Facebook, followed by Instagram and LinkedIn.

The companies, which are using social media as a component of their business, are also active at using modern technologies. AMSP (2019b) agrees that 2/3 use modern technologies (Internet of Things, online marketing, and cloud services). Companies use online reservations, orders, social media, or cloud services in the case of services. Nearly 1/2 of the entities have a social networking profile for promotion, acquisition, and communication” (AMSP, 2019c). Social network importance is confirmed by Kupec (2018), Petru, Tomášková & Krošláková (2019). AMSP's result is that 8 out of 10 companies consider innovation important; 3 out of 10 even considered it very important. Process innovation and product innovation are the most common types of implemented innovations (AMSP, 2018). The authors of this research agree that the companies, which are successful in innovation activities, also declare the importance of social networks for the development of innovation potential. The consequence of this is the growth of ROE values.

CONCLUSION

The research aimed to determine the importance of social networks for SME's competitiveness and long-term stability. Based on previous findings and experimental testing, the authors can declare that social networks are crucial factors for SME's innovation potential in Industry 4.0. The companies, which are using social media as a component of their business, are active at using modern technologies, are successful in innovation activities, and are also declaring the importance of social networks for the development of innovation potential. Fastness and reliability of communication are crucial for business operations in the company. The existence of strategic planning and controlling management system in a company declares that the company can think in the long term. The companies, which use social networks, can analyze the current environment and search for opportunities based on the relationship between strategic planning and controlling management, are also active in innovations, and have an innovation plan. By controlling management, they are continuously evaluating innovation results with the emphasis on achieving innovation goals. These companies have a higher value of ROE and are closely connected with top management and their support. Usually, if older people manage the company, it has a lower need for social networks use and vice versa. The SMEs operating a business closely connected to technologies, usually accept social networks like a natural part of the business.

The knowledge and findings obtained can be used for deeper research and application in business practice. Also, the research opened topics for deeper research. If companies want to know how to talk about them, it is clear that it is better to be in social networks than not to be. It is a good idea to learn more about potential and existing customers, their opinions, habits, or tastes. If a business says yes, social networks should not miss it. Their potential is far from being exploited.

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REFERENCES

1. Association of SME and Sole Traders CZ. (2018). *66th AMSP CR Survey: Using Online Technologies for Business*. Retrieved from <http://amsp.cz/66-pruzkum-amp-cr-vyuzivani-online-technologie-pro-podnikani/>
2. Association of SME and Sole Traders CZ. (2019a). *69th AMSP CR Survey: Digital Craft*. Retrieved from <http://amsp.cz/69-pruzkum-amp-cr-digitalni-remeslo/>
3. Association of SME and Sole Traders CZ. (2019b). *70th AMSP CR Survey: Trade 4.0*. Retrieved from <http://amsp.cz/70-pruzkum-amp-cr-obchod-4-0/>
4. Association of SME and Sole Traders CZ. (2019c). *72nd AMSP CR Survey: Services 4.0*. Retrieved from <http://amsp.cz/72-pruzkum-amp-cr-sluzby-4-0/>
5. Association of SME and Sole Traders CZ. (2019d). *73rd AMSP CR Survey: Industry 4.0 from the view of SMEs*. Retrieved from <http://amsp.cz/73-pruzkum-amp-cr-prumysl-4-0-z-pohledu-msp/>
6. Association of SME and Sole Traders CZ. (2019e). *75th AMSP CR Survey: Digital Farm*. Retrieved from <http://amsp.cz/75-pruzkum-amp-cr-digitalni-farma/>
7. Barbu, A., & Alexandru, I. M. (2011). Data collection in Romanian market research: a comparison between prices of PAPI, CATI and CAWI. *Management & Marketing*, 6(3), 349-364. Retrieved from https://www.researchgate.net/publication/227430482_DATA_COLLECTION_IN_ROMANIAN_MARKET_RESEARCH_A_COMPARISON_BETWEEN_PRICES_OF_PAPI_CATI_AND_CAWI
8. Belás, J., Dvorský, J., Kubálek, J., & Smrčka, L. (2018). Important factors of financial risk in the SME segment. *Journal of International Studies*, 11(1), 80-92. <https://doi.org/10.14254/2071-8330.2018/11-1/6>
9. Chong, S., Hoekstra, R., Llemmers, O., Van Bereben, I., Van Den Berg, M., Van Der Wal, R., & Verbirst, P. (2019). The role of small- and medium-sized enterprises in the Dutch economy: an analysis using an extended supply and use table. *Journal of Economic Structures*, 8(1). <https://doi.org/10.1186/s40008-019-0139-1>
10. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334. Retrieved from http://cda.psych.uiuc.edu/psychometrika_highly_cited_articles/cronbach_1951.pdf
11. Darlington, R. B., & Hayes, A. F. (2017). *Regression Analysis and Linear Models: Concepts, Applications, and Implementation*. New York: The Guilford Press. Retrieved from <https://www.amazon.com/Regression-Analysis-Linear-Models-Implementation/dp/1462521134>
12. Fischer, E., & Reuber, A. R. (2011). Social interaction via new social media: (How) can interactions on Twitter affect effectual thinking and behaviour? *Journal of Business Venturing*, 26(1), 1-18. <https://doi.org/10.1016/j.jbusvent.2010.09.002>

13. Gama, A. P. M., & Geraldles, H. S. A. (2012). Credit risk assessment and the impact of the New Basel Capital Accord on small and medium-sized enterprises: an empirical analysis. *Management Research Review*, 35(8), 727-749. <https://doi.org/10.1108/01409171211247712>
14. Gavora, P. (2010). *Introduction to educational research*. Brno: Paido.
15. Ghafoor, F., & Niazi, M. A. (2016). Using social network analysis of human aspects for online social network software: A design methodology. *Complex Adaptive Systems Modeling*, 4(1), 1-19. <http://dx.doi.org/10.1186/s40294-016-0024-9>
16. Goller, I., & Bessant, J. (2017). *Creativity for Innovation Management*. New York: Routledge.
17. Hayes, N. (1998). *Basics of social psychology*. Prague: Portál.
18. Hrášková, D., & Bartošová, V. (2014). Quality of the business environment and its impact on business competitiveness. *EMI*, 6(2), 43-51.
19. Jo, W. S., Alfnes, E. Strandhagen, J. O., & Logan, R. V. (2017). The fit of industry 4.0 applications in manufacturing logistics: A multiple case study. *Advances in Manufacturing*, 5(4), 344-358. <http://dx.doi.org/10.1007/s40436-017-0200-y>
20. Klučnikov, A., & Belás, J. (2016). Approaches of Czech entrepreneurs to debt financing and management of credit risk. Equilibrium. *Journal of Economics and Economic Policy*, 11(2), 343-365. <http://dx.doi.org/10.12775/EQUIL.2016.016>
21. Koisova, E., Habanik, J., Virglerova, Z., & Rozsa, Z. (2017). SMEs Financing as an Important Factor of Business Environment in Slovak Republic Regions. *Montenegrin Journal of Economics*, 13(2), 129-140. <https://doi.org/10.14254/1800-5845/2017.13-2.8>
22. Kornpitack, P. P., & Sornsaruth, P. (2019). Intention to Purchase Travel Online: A SEM Analysis. *European Research Studies. Journal*, XXII(3), 246-260. Retrieved from <https://ideas.repec.org/a/ers/journal/vxxiiy2019i3p246-260.html>
23. Kramer, R. S., Mileva, M., & Ritchie, K. L. (2018). Inter-rater agreement in trait judgements from faces. *PLoS One*, 13(8). <https://doi.org/10.1371/journal.pone.0202655>
24. Kubičková, V., Krošlákova, M., Michálková, A., & Benešová, D. (2018). Gazelles in Services: What are the Specifics of Existence Slovakia? *Management & Marketing: The Official Journal of the Society for Business Excellence*, 13(2), 929-945. <https://doi.org/10.2478/mmcks-2018-0014>
25. Kupec, V. (2018a). Risk Audit of Marketing Communication. *International Strategic Management Association*, XXI(1), 125-133. Retrieved from <https://ideas.repec.org/a/ers/journal/vxxy-2017i3bp125-132.html>
26. Kupec, V. (2018b). Digital Possibilities of Internal Audit. *Acta VŠFS*, 11(1), 28-44. Retrieved from <https://ideas.repec.org/a/prf/journal/v11y2017i1p28-44.html>
27. Lavia, L. O., & Hiebl, M. R. W. (2015). Management accounting in small and medium-sized enterprises: current knowledge and avenues for further research. *Journal of Management Accounting Research*, 27(1), 81-119. Retrieved from https://www.researchgate.net/publication/264985396_Management_Accounting_in_Small_and_Medium-Sized_Enterprises_Current_Knowledge_and_Avenues_for_Further_Research
28. Mareš, D., & Dlasková, G. (2016). Small and Medium-Sized Enterprises – Opportunities and Challenges. *European Research Studies Journal*, 4(19), 78-87.
29. Mareš, D., & Petrů, N. (2018). Stabilization factors of family enterprises in the context of macroeconomic performance. *European Research Studies Journal*, 21(1), 206-220. Retrieved from <https://ideas.repec.org/a/ers/journal/vxxy2017i3bp206-220.html>
30. Nastišin, L., Fedorko, R., Vavřečka, V., Bačik, R., & Rigelsky, M. (2019). Quantitative study of selected Facebook marketing communication engagement factors in the optics of different post types. *Innovative Marketing*, 15(3), 16-25. [https://doi.org/10.21511/im.15\(3\).2019.02](https://doi.org/10.21511/im.15(3).2019.02)
31. Newman, M. E. J. (2011). Communities, modules and large-scale structure in networks. *Nature Physics*, 8(1), 25-31. Retrieved from <https://www.nature.com/articles/nphys2162>
32. Orgonáš, J., Bais, J., Churý, R., Krošlákova, M., Paták, M., Rak, P., Šetaffy, J., Gonda, J., Karabec, D., Krajča, J., Turnerová, L., Mandel, K., Ziółkowska, M., Jung, M., Martius, W., & Hayes, J. P. (2020b). Franchising in V 4 countries. *Uherské Hradiště: Akademie krizového řízení a management*, 249.
33. Petrů, N., Kramoliš, J., & Stuchlík, P. (2020). Marketing tools in the era of digitization and their use in practice by family and other businesses. *E+M Ekonomie a Management, Economics and Management, Česká republika: Technická univerzita v Liberci*, XXIII(1), 199-214. <https://doi.org/10.15240/tul/001/2020-1-014>
34. Petrů, N., Pavlák, M., & Polák, J. (2019). Factors impacting startup sustainability in the Czech Republic. *Innovative Marketing*, 15(3), 1-15. [https://doi.org/10.21511/im.15\(3\).2019.01](https://doi.org/10.21511/im.15(3).2019.01)
35. Petrů, N., Tomášková, A., & Krošlákova, M. (2019). Diversification of export territories of family businesses as a tool of their further development. *Problems and Perspectives in Management*, 17(3), 306-322. [https://doi.org/10.21511/ppm.17\(3\).2019.25](https://doi.org/10.21511/ppm.17(3).2019.25)
36. Písař, P., & Bílková, D. (2019). Controlling as a tool for SME management with an emphasis on innovations in the context of Industry 4.0. *Quarterly Journal of Economics and Economic Policy*, 14(4), 763-785. <https://doi.org/10.24136/eq.2019.035>
37. Písař, P., & Havlíček, K. (2018). *Advanced Controlling and Information Systems Methods*

- as a Tool for Cohesion and Competitiveness of the European Union (Proceedings of the 4th International Conference on European Integration 2018, Ostrava, 1172 p.).
38. Prasetyo, H. A. (2016). What driver international competitiveness? An empirical test in emerging Indonesian market. *Journal of Competitiveness*, 8(4), 124-139. <http://dx.doi.org/10.7441/joc.2016.04.08>
 39. Ravasan, A., Rouhani, S., & Asgary, S. (2014). A Review for the Online Social Networks Literature (2005–2011). *European Journal of Business and Management*, 6(4), 22-37. Retrieved from <http://cite-seerx.ist.psu.edu/viewdoc/download?doi=10.1.1.735.4593&rep=rep1&type=pdf>
 40. Safar, L., Sopko, J., Bednar, S., & Poklemba, R. (2018). Concept of SME business model for industry 4.0 environment. *TEM Journal*, 7(3), 626-637. <http://dx.doi.org/10.18421/TEM73-20>
 41. Sellami, K., Ahmed-Nacer, M., Tiako, P., Chelouah, R., & Kadima, H. (2012). From social network to semantic social network in recommender system. *International Journal of Computer Science Issues (IJCSI)*, 9(4), 501-507. Retrieved from <https://search.proquest.com/docview/1055227264?accountid=37662>
 42. Song, Y., & Vinig, T. (2012). Entrepreneur online social networks – structure, diversity and impact on start-up survival. *Int. J. Organisational Design and Engineering*, 2(2). Retrieved from https://www.alphagalileo.org/Uploads/imported/66177_IJODE-linkedln-25876.pdf
 43. Song, Y. (2015). From offline social networks to online social networks: Changes in entrepreneurship. *Informatica Economica*, 19(2), 120-133. <https://doi.org/10.12948/issn14531305/19.2.2015.12>
 44. Tomášková, A., & Havlíček, K. (2018). Family Enterprises and their Support through Subsidies. *European Research Studies Journal*, 21(2), 23-37. Retrieved from <https://www.ersj.eu/journal/982>
 45. Tran, M. (2011). *Robustness of two formulas to correct pearson correlation for restriction of range* (Georgia State University Digital Archive, pp. 1-2). Retrieved from <http://proxy.cityu.edu/login?url=https://search-proquest-com.proxy.cityu.edu/docview/899270775?accountid=1230>
 46. Veber, J., et al. (2018). *Digitization of economy and society: benefits, risks, opportunities*. Prague: Management Press.
 47. Zacharias, N. (2011). *An Integrative Approach to Innovation Management: Patterns of Companies*. Wiesbaden: Gabler.
 48. Zaušková, A., Bobovnický, A., & Madleňák, A. (2013). How can the state support the innovations to build sustainable competitive advantage of the country. *Serbian Journal of Management*, 8(2), 255-267. Retrieved from https://atif.sobiad.com/index.jsp?modul=makale-de-tay&Alan=fen&Id=AWoBL8c1V_NiHlSgz3mB