

“Appraisal of the factors contributing to European small and medium enterprises innovation performance”

AUTHORS

Michael Amponsah Odei  <https://orcid.org/0000-0001-9449-5750>

Petr Novak  <https://orcid.org/0000-0003-4701-5755>

 <https://www.webofscience.com/wos/author/rid/H-6527-2012>

ARTICLE INFO

Michael Amponsah Odei and Petr Novak (2020). Appraisal of the factors contributing to European small and medium enterprises innovation performance. *Problems and Perspectives in Management*, 18(2), 102-113.
doi:[10.21511/ppm.18\(2\).2020.10](https://doi.org/10.21511/ppm.18(2).2020.10)

DOI

[http://dx.doi.org/10.21511/ppm.18\(2\).2020.10](http://dx.doi.org/10.21511/ppm.18(2).2020.10)

RELEASED ON

Tuesday, 05 May 2020

RECEIVED ON

Tuesday, 18 February 2020

ACCEPTED ON

Thursday, 16 April 2020

LICENSE



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

JOURNAL

"Problems and Perspectives in Management"

ISSN PRINT

1727-7051

ISSN ONLINE

1810-5467

PUBLISHER

LLC "Consulting Publishing Company "Business Perspectives"

FOUNDER

LLC "Consulting Publishing Company "Business Perspectives"



NUMBER OF REFERENCES

49



NUMBER OF FIGURES

0



NUMBER OF TABLES

3

© The author(s) 2025. This publication is an open access article.



BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Received on: 18th of February, 2020

Accepted on: 16th of April, 2020

Published on: 5th of May, 2020

© Michael Amponsah Odei, Petr Novak, 2020

Michael Amponsah Odei, Ph.D.
Student, Faculty of Management and
Economics, Tomas Bata University in
Zlín, Czech Republic.

Petr Novak, Ph.D., Head of
Department, Faculty of Management
and Economics, Tomas Bata
University in Zlín, Czech Republic.
(Corresponding author)



This is an Open Access article,
distributed under the terms of the
[Creative Commons Attribution 4.0
International license](https://creativecommons.org/licenses/by/4.0/), which permits
unrestricted re-use, distribution, and
reproduction in any medium, provided
the original work is properly cited.

Conflict of interest statement:

Author(s) reported no conflict of interest

Michael Amponsah Odei (Czech Republic), Petr Novak (Czech Republic)

APPRAISAL OF THE FACTORS CONTRIBUTING TO EUROPEAN SMALL AND MEDIUM ENTERPRISES INNOVATION PERFORMANCE

Abstract

Small and Medium Enterprises (SMEs) play a vital role in driving job creation and Gross Domestic Product (GDP) growth in all economies worldwide. Their increasing importance also means that they must be innovative enough to survive and be sustainable, improve their productivity and competitiveness. It is pertinent for European SMEs to know the contributing factors driving their innovations, which will enable them to channel their limited resources to ensure they achieve their innovation goals. This paper examined the various factors that stimulate innovations within SMEs. Using the ordinary least squares regression analysis and data from the European Innovation Survey, the authors analyzed 296 European SMEs between 2011 and 2018. The results show that intellectual assets, financial support, firm investment, and human resources all significantly contribute to firm's sales output across Europe. Conversely, it was found that financial support and innovation linkages were not significant predictors of firms' innovations. The results are important for SMEs managers who are aiming to be innovative and improve their productivity. The study can serve as a practical guide on how SMEs can ameliorate their innovation potentials and activities.

Keywords

innovation, competitiveness, productivity, turnover,
SMEs, ordinary least squares, Europe

JEL Classification

O30, O31, O32, O34, O36

INTRODUCTION

Globally, SMEs are considered as the engines for economic growth and development for both developed and developing economies. Many authors in their research found that SMEs contributed about 60% to economic development and created about 95% of jobs worldwide (Muriithi, 2017). According to Harvie, Narjoko, and Oum (2013), formal registered SMEs contribute about 33% to the GDP of developing economies. The business sector receives a massive boost owing to SMEs (IFC, 2010). Data in 2012 from 27 European countries indicated that SMEs in Europe constitute 99.8% of the business sector; thus, have reduced the unemployment rate to about 67% and contributed about 58% of gross value added in the European countries (Muller, Caliandro, Peycheva, Gagliardi, Marzocchi, Ramlogan, & Cox, 2015). SMEs contribution to the development of economies varies across countries, although developed economies benefit a lot more than developing economies in terms of job creation and contributions to GDP as a result of technological advancement and innovations.

Companies are developing a new set of ideas, which is very important for economic growth and development (Carree & Thurik, 2006). In recent times, knowledge production through research and development

is driving firm's growth. Innovation is crucial to European firms because, through innovations, firms develop new products and services. Firms are faced with intense competition from domestic and foreign partners, and so are looking for ways to stay competitive and productive. The adoption of innovations positions the firms and gives them a competitive edge over market rivals. Although it cannot be disputed that innovation of SMEs helps to be productive and competitive, policymakers in the European region are certain that innovation is highly beneficial. SMEs developing competitive advantage is very vital for product and service innovation, which will help generate revenue and improve productivity across the European region. SMEs will not survive if there is no continuous and sustainable innovation as this is the only way of providing a protective shield for companies to expand their new market share and to change consumers' preferences (Ruediger Kaufmann, Tsangar, & Vrontis, 2012). This paper aims to examine the various determinants that stimulate innovations within SMEs across Europe.

The rest of this paper is divided into five sections. Section 1 presents theoretical background on recent literature on factors influencing firm's innovation. Section 2 talks about the source data, the variables, and method used for the empirical analysis. Section 3 illustrates the results and provides a detailed discussion in relation to other previous studies. Final section concludes the paper with limitations and implications of the study.

1. LITERATURE REVIEW

Globalization, as a result of competitive market in recent times, can be attributed to the technological changes in terms of product development for Small and Medium Enterprises (SMEs) and helps in building national economies worldwide. Although there are different literatures on innovation, renowned economist Joseph Schumpeter played a vital role in using the concept of innovation in his academic studies. According to Schumpeter (2010), capitalism will help transform all economies and the transformation of industries will lead to job creation. Innovation is termed as employment of new improved method of product change, marketing such as branding or packaging, process, or business adaptation to both internal and external environments. In order for innovation to be implemented successfully, the specific target groups need to be reached in the targeted market to make economic impact (Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2016). Innovation needs to integrate firm's business strategy, organization of working environment, marketing ideas, factor people, and technology in order for it to be considered as successful. SMEs are faced with numerous challenges, including having limited resources which seek to reduce their level of innovation performance expected of them in the society, although they have a new set of innovative ideas. This paper aims to examine various factors that stimulate innovations within

SMEs in Europe. The study initially looks at the overall nature of innovation in Europe and some parts of the world. The later part focuses on SMEs' position and their strategy adoption in the market based on measuring and evaluating their performance within the environment. Many researchers have contributed to studies relating to factors affecting SMEs' performance, such as Afolabi (2013) who studied the effect of SMEs' financing on economic growth in Nigeria between 1980 and 2010 using the ordinary least squares regression. Empirical studies were conducted from 267 Spanish manufacturing SMEs by Bayo-Moriones, Billón, and Lera-López (2013) using the OLS with a result indicating a positive impact of ICT adoption in the manufacturing sectors of the SMEs involved in the survey.

Studying innovation seeks to explain why some SMEs innovate rapidly than others by identifying various factors that help in their innovation. However, there have been major challenges identifying the successful determinants of firm's innovation worldwide. Although there have been several issues connected with some of the factors contributing to high performance of firms, many studies fail to provide a more integrated framework in the field of innovation. This is a result of higher expectations on the part of SMEs to provide good satisfaction to customers and achieve better revenue for firms due to several actors like networking with external institutions, which in-

cludes academic universities, companies, and the general public in the area of operation coupled with organizational policies. Such a form of collaboration provides a clearer picture of SMEs innovation activities. According to Cohen and Levinthal (1990), a research model on innovation was proposed for the comprehensive framework during a constant review and analysis of various studies on innovation.

After the proposed model by Cohen and Levinthal (1990), there have been some setbacks according to several studies reviewed. Despite the significant role of the innovative firms' absorptive capacity, it does not consider the role of firms' innovation. According to Limaj and Bernroider (2019), absorptive capacity of firms adopting innovation refers to their ability to learn and use new ideas from their research through investment. In other words, it means firms use both tangible and intangible assets of SMEs to acquire loans and adopt new technologies to implement new ideas for developing new products for higher revenue. Individual companies cannot carry out innovations independently unless there is collaboration with some academic or research institutions as a result of high cost of technology involved and acquiring experts. This means that knowledge is fundamental for building companies and developing or improving new products. Furthermore, innovation is the ability of the company to generate new ideas for existing or new products.

Innovation performance can be taken into consideration from the quantitative point of view, turn over results, how efficient the firm can be, level of production of the SMEs sector, and the number of customers targeted. According to Zimon (2018), revenue generated, profit margins, cost involved, market share, and value are all considered quantitative. Also, goals and mission achievements, leadership style and employee behavior satisfaction of customers, product and process innovation are some qualitative approaches that can be employed to describe SMEs' innovation performance.

Although it is not only studying the performance features of SMEs that matter the most, it is also important to focus on the factors that influence SMEs' performance. In order for these firms to survive in each environment within the society,

companies need to manage employees with the combination of physical and organizational assets effectively. This means that competitive advantage will be developed on a long-term basis and, in turn, achieve high turnover. However, due to inadequate resources, firms need to find other means of achieving competitiveness and performance.

In general, the various factors can be classified as internal and external factors influencing SMEs' innovation performance. Among the internal factors are size and age of the enterprise, human resources and human resources practices, business networks, occupational health and safety precautions, product, process, organizational, marketing innovation, leadership and planning, family ownership, and intellectual property. Although most of the reviewed articles analyze the different aspects of organization's internal and external factors to contribute to the performance of SMEs, other authors also consider macroeconomic factors to be critical to the general success of SMEs.

Also, key factors contributing to SMEs' innovation performance in the external environment to the extent that they have a great impact on developing the business sector for the government in Malaysia (Li & Imm, 2007). Research conducted in the UK focused on innovation policy, which has a great influence on service performance of SMEs in the manufacturing sector (Vanino & Becker, 2019). According to Cicea, Popa, Marinescu, and Cătălina Ștefan (2019) who reviewed a cluster development policy on SMEs performance, while others reviewed the level of organizational performance of 77 SMEs in Taiwan depending on the types of network relationship. Other authors also assessed direct investment impact on the performance of SMEs in Taiwan (Lo, Chiao, & Yu, 2016). There are also studies, which blended both internal and external factors contributing to firm's innovation performance. According to Cicea et al. (2019), three factors influence SMEs' degree of development and performance: economic climatic conditions on GDP and Gross National Product, as well as ability to invest; structural characteristics of economy with an influx of technology and innovation; microeconomic conditions such as the survival rate of SMEs. Gupta and Batra (2016) analyzed 198 manufacturing firms in India and discovered a positive relationship between business

orientation and firm performance, while environmental contingencies were discovered to influence business orientation performance relationship. Many of these studies have developed different models to assess firms' level of innovation performance with the structural equation model, multiple equations, and decision-based model (Mohnen & Hall, 2013). Similar studies were conducted on societal and environmental responsibilities, which increase business performance through "green practices" (Rekik & Bergeron, 2017).

All the literature reviewed factored SMEs' performance at the microeconomic level, but a detailed understanding could be explained by studying firm's performance at the macroeconomic level. Studying at the macroeconomic level has more advantages since it takes all the determinants of SMEs innovation into account. SMEs' innovation performance can be taken in three dimensions: the number of SMEs involved, the number of employees working for the firms, and the added value for firms. Osakwe, Verter, Bečvářová, and Chovancová (2015) analyze the influence of macroeconomic indicators on SMEs' growth in the Czech Republic and, based on their results, developed a concave relationship between growth and unemployment, which was a positive relationship between economic growth and development of firms, while finance used to support the SMEs sector had no significant influence.

A firm's internal and external conditions affect the innovation due to the rapid changes in the operating environment, short product cycle, competition, and technological advancement (Ukko, Saunila, & Rantala, 2020). Innovation enables firms to meet consumer needs and capitalize on new marketing opportunities, which makes firms more competitive to retain the market or obtain new clients (Bockstedt, Druehl, & Mishra, 2015). Funding is a major contributing factor to successful innovation within firms. According to Kamasak (2015), financial resources are main drivers for innovation, which can happen if SMEs implement new innovative ideas through modern technologies, and there is capacity to grow. Innovation capacity is defined as availability of resources, structures needed to collaborate, and various methods to provide new solutions to existing problems within the firm and the external environment (Hagen, Denicolai, & Zucchella, 2014).

The resources are made readily available when there are funds and skilled workforce for SMEs to carry out their activities successfully. Financial resources are required by all SMEs to begin their operation and expand in the area of operation. According to Kastrati (2015), firms need some amount of capital to adapt to new technologies irrespective of the firm's size. However, the amount of funds to improve the SMEs sector remained low.

Good innovation-friendly environment or conditions encourage employees to be innovative by calculating and accepting the risk to help them adapt to personal and professional growth within their surroundings. Innovation-friendly environment involves innovation culture, which involves risk-taking, involvement of employees through creativity, and sharing of roles assigned to them. According to Kanu (2015), one of the elements that constitute innovation-friendly environment is safe surroundings that permit innovation process. The impact of governmental policies such as reduction of corruption in the locations of SMEs contributes to high performance as they can operate without interferences (Kanu, 2015).

Human resources are known as one of the relevant factors that predict innovation among firms. Human resource managers tend to play both direct and indirect roles, which allow R&D through firm's collaboration. Middle managers can help in the reinforcement of the company's objective through communication, knowledge, and human capital skills, which will enhance innovation in the long run (Prokop, Odei, & Stejskal, 2018). Training of employees through knowledge sharing and creativity inspires new ideas, which will be applied when it is well understood. The learning process from the human resource department involves the key elements that enhance productivity, which includes searching for skilled personnel, which in the long run contributes to both product and process development (Odei & Stejskal, 2019).

Well-established research systems available at the firm level can contribute to knowledge creation and its spillover effect of innovations. It is very expensive to develop new products and adapt to modern technology; hence, there is keen competition among firms to utilize resources and develop unique products. Most of these products are trade-

mark in the company's name to keep competition high due to high risk and cost involved (Ritala, 2012). The in-house technological capability involves intensive training of employees and must be a continuous routine. Joint research systems have given firms a greater competitive advantage against the procurement of new technology employed, which does not involve working together.

Formal and informal linkages are vital for firms' innovations; they help to augment shortfalls in internal innovation. When firms cannot innovate from within, they need to form synergies with vital partners that can contribute and complement their internal efforts (Odei & Stejskal, 2019). In order for innovation to take place, firms need collaboration with firms R&D experts and scientists from universities and other research organizations. The research and development come up with new product models and design based on consumer preferences and economic factors. The values and norms in an organization account for the need to collaborate with other firms for new ideas. The need for collaboration comes with new product ideas, new business strategic decision, and new process innovation. Collaborative research as a circumstance where "expert scientists and firms jointly commit financial, human, and physical resources to a particular project". As a result of high cost of conducting research, companies are working with research institutions to provide new ideas and designs for process and product innovation. Profits in the companies are channeled for this kind of development of the SMEs sector.

Firms also need investment in intellectual assets, the design and technology, together with some laws that protect companies' properties (Alikhan & Mashelkar, 2009). Intellectual assets played a key role in SMEs' progress as they seek to acknowledge product, process and marketing strategies used by SMEs. The creative expressions of new ideas have been keen on the knowledge acquisition for firms and expert scientists. This has created an enabling environment for competitive firms and a challenge for firms to innovate as well. There has been dynamism in economic, social, cultural, and political determinants to dialogue in case firms should have property rights issues, which has shaped the future of intellectual property systems. Some authors claim that patenting

has reduced collaboration between firms (Bruneel, d'Este, & Salter, 2010). This made more firms co-operated with research institutions to avoid problems in the ownership of new ideas as a result of research (Etzkowitz & Ranga, 2015).

Firms need to invest in profitable assets required to increase growth and productivity. Investment in new machinery, knowledge production, human resources, and collaboration are companies' main goal for expansion, to exploit economies of scale and bring down long-run average total cost. Firms can secure loans from the banks easily by using their fixed assets as collateral. These secured loans can be invested in hiring and training skilled personnel to contribute to firm's growth and innovations. These investments can also be channeled to fund R&D partnerships with research institutions, which can result in new knowledge production. Firm investment is very relevant to improving efficiency through innovation and technological progress, which will lead to improvements in productive capacity in the long run. Furthermore, consumers will always have a variety of new products on the market and so there is a need for firms to invest heavily if firms are looking to control the larger market (Lamprinopoulou & Tregear, 2011). According to Deschryvere (2014), firms' investment in both process and product innovation resulted in huge profit margins for SMEs in Finland.

2. DATA AND METHODOLOGICAL APPROACH

For this study, the authors sourced data from the European Innovation Scoreboard (EIS). This is a survey conducted by the European Union to gather data on innovation activities of firms in all member states. The data constitute a comprehensive yearly analysis of SMEs' innovation performance across the European Union member states, revealing the various factors that affect innovation creation at the firm level. The EIS divides the countries based on relative scores into four categories, namely innovation leaders, strong, moderate, and weak innovators. The EIS is designed to disseminate innovation information according to sectors, aspects of innovation development, innova-

tion funding, collaborations for innovations, and the types of innovation. Numerous studies have used the EIS dataset to analyze firms' innovations empirically, for instance, Marseguerra, Bragoli, and Cortelezzi (2019) used the EIS to assess the innovation performance of Italian SMEs. Jozsef, Balogh, and Torok (2018) also used the same datasets to analyze the innovation performance of firms across European Union member states.

The authors analyzed 296 SMEs that took part in the EIS survey between 2011 and 2018, using the ordinary least squares method (OLS). The OLS is a linear model used to estimate or model the regression parameters by minimizing the sum of the squared residuals and a linear function represents the outcomes. The OLS was used because of the continuous nature of the dependent variable and continuous independent variables, which may be represented when there is a line of best fit. In case this relationship is linear, the result would be interpreted using the equation of a straight line. It is also assumed that the relationship between firms' innovations and the various factors that influence it is linear. The general formula of the OLS is provided by Craven and Islam (2011) as follows:

$$y = \alpha + \beta \cdot x_i + \varepsilon_i, \quad (1)$$

where y – sales impact, α – intercept, β – constant, x_i – independent variables, ε – .

The OLS has been widely used for similar empirical modeling, H.-C. Huang, Lai, and W.-W. Huang (2015) used the OLS to analyze open inbound innovation through simplified technology, which was a success for SMEs. Classen, Carree, Van Gils, and Peters (2014) also used the OLS to eval-

uate family and non-family SMEs and discovered that family SMEs perform better than non-family SMEs.

3. RESULTS

The authors begin the study with a description of the correlation matrix used to measure the strength of the relationship between the dependent variable and the covariates. The results of the correlation matrix are shown in Table 1. The results show that all the constructs used in the empirical model have low coefficients, which means that they are not contaminated with potential multicollinearity issues. Also, the results of the descriptive statistics of the variables used in the empirical analysis are shown in Table 2. This table provides imperative information about the frequencies of the variables.

The results show that about 43% of these firms have the human resources needed for their work. Furthermore, approximately 40% of these firms have well-established research systems in place that help in new knowledge production that is trivial for firms' survival. Again, about 43% of these firms operate in an innovation-friendly environment needed for successful improved innovation performance. It could also be seen that with regard to finance and support system, about 42% of these firms reported having financial support from different sources for their operations. Furthermore, about 47% of these SMEs invested in new process and product innovations. Concerning intellectual assets, about 35% of these SMEs invested in intellectual assets related activities such as branding, design, knowledge, and technology acquisitions,

Table 1. Correlation matrix

Source: Own calculation.

Variables	Human resources	Research systems	Innovation-friendly environment	Finance and support	Firm investments	Linkages	Intellectual assets	Sales impacts
Human resources	–	–	–	–	–	–	–	–
Research systems	0.846	–	–	–	–	–	–	–
Innovation-friendly environment	0.710	0.736	–	–	–	–	–	–
Finance and support	0.731	0.780	0.702	–	–	–	–	–
Firm investments	0.584	0.518	0.418	0.472	–	–	–	–
Linkages	0.774	0.755	0.666	0.721	0.686	–	–	–
Intellectual assets	0.633	0.705	0.586	0.588	0.510	0.572	–	–
Sales impacts	0.360	0.483	0.158	0.368	0.387	0.364	0.450	–

etc. Concerning linkages, the mean results show that approximately 42% of these firms have established innovation collaborations with other partners. Lastly, turnover reports for these firms show that it hovers around 49%.

Table 2. Descriptive statistics of the variables

Source: Own calculations.

Variables	N	Mean	Min	Max
Human resources	296	0.431	0.064	0.908
Research systems	296	0.403	0.026	0.983
Innovation-friendly environment	296	0.431	0.021	1
Finance and support	296	0.420	0.004	0.904
Firm investments	296	0.465	0.050	1
Linkages	296	0.415	0.010	0.795
Intellectual assets	296	0.353	0.022	0.810
Sales impacts	296	0.490	0.149	0.879

Table 3 presents the results of the exploratory regression. First, Table 3 shows that the predictive power of the model is 0.387, implying that the combined effect of the covariates can predict sales outcomes (dependent variable), which was used to measure innovations by approximately 39%. This can be assumed for the model to have substantial predictive accuracy (see Cohen, 1988). The results show a negative but statistically significant relationship between human resource and sales output, with a coefficient of -0.142 . There is a positive and significant relationship between research systems and sales outcomes, with a coefficient of 0.405 . There is a negative but statistically significant relationship between the innovation-friendly environment and sales, with a coefficient of -0.327 . In addition to the above, the results point to a positive and significant relationship between firm investment and sales outcome, with a coefficient of 0.175 . Furthermore, there is a positive and significant relationship between intellectual assets, with a coefficient of 0.178 . There is a positive and insignificant relationship between finance and sales, with a coefficient of 0.088 . There is also a negative correlation between linkages or innovation collaborations and sales output.

4. DISCUSSION

The results point to a strong relationship between human resources and sales output. Employing skilled personnel is known to be a vital catalyst for

successful innovations. However, the results rather contradicted this assertion. This means that when these SMEs employ skilled human and competent resources, it rather decreases their sales output. This result is shocking because educated or skilled personnel are known to be knowledgeable and can apply this knowledge in their work process and activities, and this can affect the overall sales outcomes and innovations. This means that a skilled workforce is a key rudiment for successful innovation. The result contradicts other related studies conducted by González, Miles-Touya, and Pazó (2016) and Ramadani, Hisrich, Abazi-Alili, Dana, Panthi, and Abazi-Bexheti (2019) who found that SMEs investments in workers' skills and their subsequent training programs enhance innovation far better than engaging in R&D.

The results point out that the research systems are a significant factor that can positively impact firms' innovation potential. Firms that have efficient research systems in place are very likely to be innovators because it can contribute to new knowledge production and dissemination (Gloet & Samson, 2020). The research system defines how firms can conduct their research. A well-defined research system serves as a framework to carry out research and use the results for further appropriation. This implies that collaboration with research institutions for new ideas and market research contributes to new product development, which in the long run, helps SMEs to increase their sales output. The results confirm the findings of similar research carried out by Mullins and Panagopoulos (2019) who found that the provision of market research helps firms in the development of products that turn to satisfy customers' needs.

The results indicate that innovation-friendly environment decreases the likelihood of improving sales outcomes. The result is contrary to the literature. The numerous innovation literature has proven that innovation requires the presence of rule of law, issues related to gender equality, political and economic stability, and general access to information. However, the result has proven that when SMEs have a conducive innovation-friendly environment, it is not likely to spur their sales outcomes. Similar research by Kanu (2015) contradicts the finding that good governmental policies influence SMEs' innovation performance.

It was established that when firms invest in their innovation activities, they are very likely to pay-off significantly. This means that firms with larger investment portfolios will have good strategies and policies. They will be able to channel these investments into their innovation activities and will be more likely to carry out advertisements, media production, and attractive packaging for their products. Lastly, they will invest in R&D and can use their asset for collateral in banks. They can equally channel these investments into human resource development and have a competitive advantage over other SMEs. The result is similar to a research conducted by Gherghina, Botezatu, Hosszu, and Simionescu (2020) and R. Lee, J. Lee, and Garrett (2019) whose findings indicated that investment in both process and product innovation resulted in huge profit margins.

Based on the results, SMEs aiming to be innovative can put in place to measure to invest in intellectual assets and properties. This implies that intellectual assets play a major role in SMEs' development as they seek to influence incentives to innovators because it will help SMEs to be owners of their invention or research. Also, intellectual assets are keen on the progress of SMEs as they seek to acknowledge product, process, and marketing strategies, which instill trust and confidence in customers. Similar research was conducted by Alikhan and Mashelkar (2009). The result indicated that intellectual assets have a positive influence on innovation performance.

The results on funding for innovation activities is rather shocking because it proved not to be a significant factor capable of contributing to SMEs innovation potentials. This implies that when these SMEs even have access to funding for their innovations, it does not necessarily translate into successful innovation. This can be as a result that this funding is not enough, or these firms are not efficient in allocating these amounts. When research funds or budget of SMEs cannot undertake research-based innovations that are needed to boost their innovation growth, the lack of adequate financial support for R&D within SMEs will impede innovations and negatively impact firms' growth and productivity (Henry Junior, & Odei, 2018). Inadequate funding will,

in the long run, affect the firm's ability to train employees to apply modern technology, and affect expansion and infrastructure development. The findings contradict similar research by Kastrati (2015) who affirms that funds are needed for technological innovation. However, similar research conducted by Nylund, Arimany-Serrat, Ferras-Hernandez, Viardot, Boateng, and Brem (2019) confirmed the findings that finance contributes negatively to SMEs innovation performance in Europe.

Lastly, the findings also showed the absence of a relationship between linkages and sales output. The result is surprising because innovation collaborations or linkages with other firms and other relevant partners were not significant. This means that firms do not benefit from these collaborations, which is known to create new ideas for both process and product development. Also, linkages are supposed to create expert scientists who will, in the long run, cooperate with the human resource department to train employees. However, the results show that this form of cooperation was ineffective. The results point to the fact that prevailing collaborations are not effective and efficient; hence, they do not exert any significant effect on the process, product, and sales outputs. The result contradicts Martínez-Costa, Jiménez-Jiménez, and Dine Rabeh (2019) findings that R&D linkages have a positive influence on innovation.

Table 3. Fixed effects parameter estimates

Name	Estimate	SE	t	p
Intercept	0.4903	0.00765	64.082	0.001***
Human resources	-0.1417	0.07876	-1.800	0.073*
Research systems	0.4047	0.06736	6.007	0.001***
Innovation-friendly environment	-0.3266	0.05101	-6.404	0.001***
Finance and support	0.0882	0.06294	1.401	0.162
Firm investments	0.1750	0.05935	2.949	0.003***
Linkages	-0.0117	0.06917	-0.169	0.866
Intellectual assets	0.1784	0.05266	3.389	0.001***
Model fit summary				
Root MSE	0.132			
R ²	0.387			
Cronbach α	0.902	–	–	–
N	296			

Note: Significance levels: ***P < 0.01, **P < 0.05, *P < 0.1.

CONCLUSION

In this study, it was analyzed whether research systems, intellectual assets, firm's investment and human resources drive innovation within European SMEs. Using the ordinary least squares regression model, this article analyzed 296 European SMEs. The findings of this study have an interesting conclusion with previous related researches contradicting that finance and support are not relevant for SMEs expansion and technological innovation. Also, the result contradicts conclusions in previous studies that R&D linkages have a positive influence on innovation. Furthermore, the result supports previous findings that human resources are a key rudiment for successful innovation. Surprisingly, it was discovered that conducting research in an innovation-friendly environment rather had a negative influence on firms' innovation performance.

The research result has also confirmed that firm investment had the highest effect on innovation performance among SMEs. It is, therefore, recommended that these SMEs invest massively for high turnover. The result of the analysis has again indicated that research systems were also a significant determinant with a probable positive effect on SMEs' innovation performance. Therefore, firms are recommended to intensify the partnership with research institutions for new knowledge production and dissemination either for new process or product development.

This paper also provides valuable insights for SMEs managers. Managers supervising their firms to achieving sustainable innovations may consider investing in research systems at the firm level to carry out the needed research that can boost their innovations. They may also consider making their workplace an innovation-friendly environment by fostering internal interactions and extending these interactions to other partners outside the firm, such as universities and other research institutions. From the policy perspective, the results of this paper can be adopted by firm managers and policymakers to improve the performance of SMEs to make them contribute effectively to job creation and health economics in general. This study assessed the factors contributing to SMEs' innovation performance, and the results indicated that firm managers need to invest in human resources, intellectual assets, R&D, R&D collaborations, and must operate in innovation-friendly environment. Policymakers are, therefore, encouraged to put measures in place that will facilitate knowledge production and dissemination. This can be achieved through effective collaborations with regional actors in Europe. From the theoretical perspective, this study adds to the existing literature on SMEs' innovation by showing that innovations within SMEs are likely to be spurred by investment in human resources, intellectual assets, and research systems. Therefore, for SMEs to be innovative, they need to consider these determinants.

The main limitations of this paper lie in the fact that the results covered EU-wide studies. Hence, the results need to be interpreted with greater caution. One of the limitations is combining all the EU member countries as a single analytical unit. Thus, the authors cannot agree with the results that these determinants influence innovation in each country. This is because the individual countries find themselves in different innovation milieu. Although, this article suggests that the selected determinants used in this paper promote innovation.

AUTHOR CONTRIBUTIONS

Conceptualization: Michael Amponsah Odei, Petr Novak.

Data curation: Michael Amponsah Odei, Petr Novak.

Formal analysis: Michael Amponsah Odei, Petr Novak.

Investigation: Michael Amponsah Odei, Petr Novak.

Writing – original draft: Michael Amponsah Odei.

ACKNOWLEDGMENT

The paper has been prepared with the support of the grant TBU No. IGA/FaME/2020/004 provided by the Internal Grant Agency of the Faculty of Management and Economics of Tomas Bata University in Zlín.

REFERENCES

- Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented innovation: A systematic review. *International Journal of Management Reviews*, 18(2), 180-205. Retrieved from https://www.researchgate.net/publication/276852632_Sustainability-oriented_Innovation_A_Systematic_Review
- Afolabi, M. O. (2013). Growth Effect of Small and Medium Enterprises (SMEs) Financing in Nigeria. *Journal of African Macroeconomic Review*, 3(1), 193-205.
- Alikhan, S., & Mashelkar, R. A. (2009). *Intellectual property and competitive strategies in the 21st century*. Kluwer Law International BV. Retrieved from <https://www.amazon.com/Intellectual-Property-Competitive-Strategies-Century/dp/9041126449>
- Bayo-Moriones, A., Billón, M., & Lera-López, F. (2013). Perceived performance effects of ICT in manufacturing SMEs. *Industrial Management and Data Systems*, 113, 117-135. Retrieved from https://www.researchgate.net/publication/262860460_Perceived_performance_effects_of_ICT_in_manufacturing_SMEs
- Bockstedt, J., Druehl, C., & Mishra, A. (2015). Problem-solving effort and success in innovation contests: The role of national wealth and national culture. *Journal of Operations Management*, 36, 187-200. <https://doi.org/10.1016/j.jom.2014.12.002>
- Bruneel, J., d'Este, P., & Salter, A. (2010). Investigating the factors that diminish the barriers to university-industry collaboration. *Research Policy*, 39(7), 858-868. <https://doi.org/10.1016/j.respol.2010.03.006>
- Carree, M. A., & Thurik, A. R. (Eds.). (2006). *Entrepreneurship and economic growth*. Cheltenham: Edward Elgar.
- Cicea, C., Popa, I., Marinescu, C., & Cătălina Ștefan, S. (2019). Determinants of SMEs' performance: evidence from European countries. *Economic research-Ekonomska istraživanja*, 32(1), 1602-1620. <https://doi.org/10.1080/1331677X.2019.1636699>
- Classen, N., Carree, M., Van Gils, A., & Peters, B. (2014). Innovation in family and non-family SMEs: An exploratory analysis. *Small Business Economics*, 42(3), 595-609. Retrieved from <https://link.springer.com/article/10.1007/s11187-013-9490-z>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Mahwah: Lawrence Erlbaum Associates. Retrieved from <http://www.utstat.toronto.edu/~brunner/oldclass/378f16/readings/CohenPower.pdf>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 128-152. Retrieved from <https://www.jstor.org/stable/2393553?seq=1>
- Craven, B. D., & Islam, S. M. (2011). *Ordinary least-squares regression*. Sage Publications.
- D'Angelo, A., Majocchi, A., Zucchella, A., & Buck, T. (2013). Geographical pathways for SME internationalization: insights from an Italian sample. *International Marketing Review*, 30(2), 80-105. Retrieved from https://www.researchgate.net/publication/263304437_Geographical_pathways_for_SME_internationalization_Insights_from_an_Italian_sample
- Deschryvere, M. (2014). R&D, firm growth and the role of innovation persistence: an analysis of Finnish SMEs and large firms. *Small Business Economics*, 43(4), 767-785. Retrieved from <https://link.springer.com/article/10.1007/s11187-014-9559-3>
- Etzkowitz, H., & Ranga, M. (2015). Triple Helix systems: an analytical framework for innovation policy and practice in the Knowledge Society. In *Entrepreneurship and Knowledge Exchange* (pp. 117-158). Routledge.
- Gherghina, Ș. C., Botezatu, M. A., Hosszu, A., & Simionescu, L. N. (2020). Small and Medium-Sized Enterprises (SMEs): The Engine of Economic Growth through Investments and Innovation. *Sustainability*, 12(1), 347. Retrieved from <https://ideas.repec.org/a/gam/jsusta/v12y-2020i1p347-d304141.html>
- Gloet, M., & Samson, D. (2020). Knowledge management and systematic innovation capability. In *Disruptive Technology: Concepts, Methodologies, Tools, and Applications* (pp. 1198-1218). IGI Global.
- González, X., Miles-Touya, D., & Pazó, C. (2016). R&D, worker training and innovation: Firm-level evidence. *Industry and Innovation*, 23(8), 694-712. <https://doi.org/10.1080/13662716.2016.1206463>
- Gupta, V. K., & Batra, S. (2016). Entrepreneurial orientation and firm performance in Indian SMEs: Universal and contingency perspectives. *International Small Business Journal*, 34(5), 660-682. <https://doi.org/10.1177/0266242615577708>

20. Hagen, B., Denicolai, S., & Zucchella, A. (2014). International entrepreneurship at the crossroads between innovation and internationalization. *Journal of International Entrepreneurship*, 12(2), 111-114. Retrieved from https://www.researchgate.net/publication/272018343_International_entrepreneurship_at_the_crossroads_between_innovation_and_internationalization
21. Harvie, C., Narjoko, D., & Oum, S. (2013). *Small and Medium Enterprises' access to finance: evidence from selected Asian economies* (ERIA Discussion Paper Series, 23). Retrieved from <https://www.eria.org/publications/small-and-medium-enterprises-access-to-finance-evidence-from-selected-asia-economies/>
22. Henry Junior, A., & Odei, S. A. (2018). The Influence of Public Support on University-Industry-Government Collaboration: The Case of the Czech Republic, Slovakia, Hungary and Romania. *Statistika-Statistics and Economy Journal*, 98(4), 352-361. Retrieved from <https://dk.upce.cz/handle/10195/72744>
23. Huang, H-C., Lai, M-C., & Huang, W-W. (2015). Resource complementarity, transformative capacity, and inbound open innovation. *Journal of Business & Industrial Marketing*, 30(7), 842-854. Retrieved from <http://xueshu.baidu.com/usercenter/paper/show?paperid=05a2591774895fdabdbf645e6b561207>
24. International Finance Corporation (IFC) (2010). *Scaling-Up SME Access to Financial Services in the Developing World*. Washington, D.C.: World Bank.
25. Jozsef, T. O. T. H., Balogh, J. M., & Torok, A. (2018). Networking theory of innovation in practice – The Hungarian case. *Agricultural Economics*, 64(12), 536-545. Retrieved from https://www.researchgate.net/publication/329485955_Networking_theory_of_innovation_in_practice_-_The_Hungarian_case
26. Kamasak, R. (2015). Determinants of innovation performance: a resource-based study. *Procedia-Social and Behavioral Sciences*, 195(3), 1330-1337. <https://doi.org/10.1016/j.sbspro.2015.06.311>
27. Kanu, A. M. (2015). The effect of corruption on small and medium enterprises: Perspective from a developing country. *International Journal of Small Business and Entrepreneurship Research*, 3(3), 12. Retrieved from <https://www.ea-journals.org/journals/international-journal-of-small-business-and-entrepreneurship-research-ijbsber/vol-3issue3-june-2015/the-effect-of-corruption-on-small-and-medium-enterprises-perspective-from-a-developing-country-2/>
28. Kastrati, V. (2015). Technological innovation of small and medium enterprises in Kosovo: Challenges and barriers. *European Journal of Sustainable Development*, 4(3), 145-145. Retrieved from <https://ecsdev.org/ojs/index.php/ejsd/article/view/294>
29. Lamprinopoulou, C., & Tregear, A. (2011). Inter-firm relations in SME clusters and the link to marketing performance. *Journal of Business & Industrial Marketing*, 26(6), 421-429. Retrieved from https://www.researchgate.net/publication/235282439_Inter-firm_relations_in_SME_clusters_and_the_link_to_marketing_performance
30. Lee, R., Lee, J. H., & Garrett, T. C. (2019). Synergy effects of innovation on firm performance. *Journal of Business Research*, 99, 507-515. Retrieved from https://www.researchgate.net/publication/319610084_Synergy_effects_of_innovation_on_firm_performance
31. Li, L. P., & Imm, A. O. C. (2007). Performance requirements in Malaysia. *Malaysian Industrial Policy*, 82-127.
32. Limaj, E., & Bernroider, E. W. (2019). The roles of absorptive capacity and cultural balance for exploratory and exploitative innovation in SMEs. *Journal of Business Research*, 94, 137-153. <https://doi.org/10.1016/j.jbusres.2017.10.052>
33. Lo, F. Y., Chiao, Y. C., & Yu, C. M. J. (2016). Network and institutional effects on SMEs' entry strategies. *Management International Review*, 56(4), 531-563. <https://doi.org/10.1007/s11575-016-0289-4>
34. Marseguerra, G., Bragoli, D., & Cortelezzi, F. (2019). *Assessing the innovative performance of Italian SMEs*. Istituto Lombardo – Accademia Di Scienze E Lettere – Rendiconti Di Lettere. <https://doi.org/10.4081/let.2016.575>
35. Martínez-Costa, M., Jiménez-Jiménez, D., & Dine Rabeh, H. A. (2019). The effect of organisational learning on interorganisational collaborations in innovation: an empirical study in SMEs. *Knowledge Management Research & Practice*, 17(2), 137-150. <https://doi.org/10.1080/14778238.2018.1538601>
36. Mohnen, P., & Hall, B. H. (2013). Innovation and productivity: An update. *Eurasian Business Review*, 3(1), 47-65. Retrieved from https://eml.berkeley.edu/~bhall/papers/MohnenHall13_innov_prod_EBR.pdf
37. Muller, P., Caliendo, C., Peycheva, V., Gagliardi, D., Marzocchi, C., Ramlogan, R., & Cox, D. (2015). *Annual report on European SMEs*. European Commission.
38. Mullins, R. R., & Panagopoulos, N. G. (2019). Understanding the theory and practice of team selling: An introduction to the special section and recommendations on advancing sales team research. *Industrial Marketing Management*, 77, 1-3. <https://doi.org/10.1016/j.indmarman.2018.03.001>
39. Muriithi, M. S. (2017). African Small and Medium Enterprises (SMEs) Contributions, Challenges and Solutions. *European Journal of Research and Reflection in Management Sciences*, 5(1), 36-48. Retrieved from [https://www.semanticscholar.org/paper/AFRICAN-SMALL-AND-MEDIUM-ENTERPRISES-\(SMES\)-AND-Muriithi/b346aa74e6494d-066974bafcf9c27c1cd4f160a5](https://www.semanticscholar.org/paper/AFRICAN-SMALL-AND-MEDIUM-ENTERPRISES-(SMES)-AND-Muriithi/b346aa74e6494d-066974bafcf9c27c1cd4f160a5)
40. Nylund, P., Arimany-Serrat, N., Ferras-Hernandez, X., Viardot, E., Boateng, H., & Brem, A. (2019).

- Internal and external financing of innovation: Sectoral differences in a longitudinal study of European firms. *European Journal of Innovation Management*, 23(2), 200-213. <https://doi.org/10.1108/EJIM-09-2018-0207>
41. Odei, S. A., & Stejskal, J. (2019). Do Firms R&D Collaborations with the Science System and Enterprise Group Partners Stimulate Their Product and Process Innovations? *Economies*, 7(2), 1-12. Retrieved from <https://ideas.repec.org/a/gam/jecomi/v7y2019i2p43-d229777.html>
 42. Osakwe, C. N., Verter, N., Bečvářová, V., & Chovancová, M. (2015). SMEs growth in the Czech Republic: Some macroeconomic perspectives. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 63(6), 2077-2084. Retrieved from <https://pdfs.semanticscholar.org/de1a/11d697ed4f6c1187b80611c593e3aa82579a.pdf>
 43. Prokop, V., Odei, S. A., & Stejskal, J. (2018). Relationship of University-Industry Cooperation and Innovative Activities. *Marketing & Management*, 52(2), 85-95. Retrieved from <https://journals.lib.pte.hu/index.php/mm/article/view/367>
 44. Ramadani, V., Hisrich, R. D., Abazi-Alili, H., Dana, L. P., Panthi, L., & Abazi-Bexheti, L. (2019). Product innovation and firm performance in transition economies: A multi-stage estimation approach. *Technological Forecasting and Social Change*, 140, 271-280. Retrieved from https://www.researchgate.net/publication/329786729_Product_innovation_and_firm_performance_in_transition_economies_A_multi-stage_estimation_approach
 45. Ritala, P. (2012). Coopetition strategy – when is it successful? Empirical evidence on innovation and market performance. *British Journal of Management*, 23(3), 307-324. <https://doi.org/10.1111/j.1467-8551.2011.00741.x>
 46. Ruediger Kaufmann, H. A. N. S., Tsangar, H., & Vrontis, D. (2012). Innovativeness of European SMEs: Mission not yet accomplished. *Economic research-Ekonomska istraživanja*, 25(2), 333-360.
 47. Schumpeter, J. A. (2010). *Capitalism, socialism and democracy*. Routledge.
 48. Ukko, J., Saunila, M., & Rantala, T. (2020). Connecting relational mechanisms to performance measurement in a digital service supply chain. *Production Planning & Control*, 31(2-3), 233-244. Retrieved from <https://doi.org/10.1080/09537287.2019.1631466>
 49. Zimon, G. (2018). Influence of group purchasing organizations on financial situation of Polish SMEs. *Oeconomia Copernicana*, 9(1), 87-104. Retrieved from <https://ideas.repec.org/a/pes/ier-oec/v9y2018i1p87-104.html>