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Gauging the Impact of the Digital Ecosystem and Skill on SMEs' Performance

Zuriyati Ahmad (Corresponding author)

Faculty of Business and Management

Universiti Teknologi MARA Cawangan Terengganu, Malaysia

E-mail: zuriy271@uitm.edu.my

Rosman Mahmood

Faculty of Business and Management

Universiti Teknologi MARA Cawangan Terengganu, Malaysia

E-mail: rosmanma@uitm.edu.my

Zatul Iffah Mohd Fuza

Faculty of Hotel and Tourism Management

Universiti Teknologi MARA Cawangan Terengganu, Malaysia

E-mail: zatul710@uitm.edu.my

Fatimah Nur Mohd Redzwan

School of Electrical Engineering

Universiti Teknologi MARA Cawangan Terengganu, Malaysia

E-mail: fatima804@uitm.edu.my

Dhona Shahreza

Faculty of Education and Social Sciences

Universitas Indraprasta PGRI, Jakarta Timur, Indonesia

E-mail: dhona.shareza@gmail.com

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Abstract

Mastering the digital ecosystem has become crucial to a business's continued success in recent years. Therefore, Malaysia has started producing entrepreneurial graduates with high entrepreneurial characteristics. To assess the effectiveness of the Malaysian university curriculum in entrepreneurship, this paper therefore tries to gauge the impact of the digital ecosystem and digital skills on the performance of university graduates in small and medium-sized enterprises (SMEs). Primary data was collected from 321 university alumni who are entrepreneurs using purposive sampling. Findings demonstrated that digital ecosystem factors such as knowledge management, e-readiness, and ICT utilization influence SME performance. Digital skill also depicts a positive significant relationship with SME performance. Overall, the findings imply that management involvement in fostering the empowerment of the digital ecosystem and digital skill in business management is required. In addition, universities' curricula must prioritize the focus areas and strategies for developing a more positive digital ecosystem and digital skill.

Keywords: digital ecosystem, digital skill, SMEs performance, e-readiness, ICT utilization, knowledge management

1. Introduction

Small and Medium-Sized Enterprises (SMEs) are integral to a nation's economic development. In the context of developing nations, the contribution of the sector is more marginal, not only as a catalyst for economic growth and job creation, but also as an important role in ensuring a more equitable distribution of income, eradicating poverty, shaping industry chains, and fostering a more balanced development. 97% of all businesses, 36% of gross domestic product (GDP), 65% of total employment, and 18% of total exports are comprised of SMEs in Malaysia, which have been a vital force in the country's economic growth and industrial resilience (Nawanir et al., 2020). In this modern era, it is not sufficient to evaluate the performance of small and medium-sized enterprises (SMEs) solely based on their traditional products; rather, it is essential to enhance other entrepreneurial skills to create a sustainable business. In reality, digital and learning capabilities are the most essential factors for enhancing the performance of SMEs. Consequently, the development of SMEs is not exempt from the requirement to employ information technology. The ability of business owners to master the digital ecosystem is a crucial factor in ensuring a company's continued success. Nonetheless, there is still a lack of digital technology in Malaysia's SMEs, and the utilization of these technologies has yet to reach the desired level.

Most small and medium-sized enterprises in Malaysia have trouble adapting to the digital ecosystem, compared to larger businesses (Fauziah, 2020). The systems designed for the SME market do not permit the management of reasonable and adaptable inter-operational business relationships between small businesses. In numerous works of literature, there is a greater emphasis on the role of the digital ecosystem in improving the performance of business organizations. Additionally, prior research has demonstrated that technology adoption significantly correlates with business performance (Brynjolfsson & Hitt, 2000; Ghobakhloo & Hong, 2014). In agreement, Westerman et al. (2011) reported that firms with above-average digital innovation values have greater profitability and revenue generation. Similarly, Weill and Woerner (2015) noted a rise in revenue growth and profit margins for businesses that embrace digital technology and operate within the digital ecosystem.

A greater degree of adaptability to the rapidly changing digital ecosystem can determine the growth of small and medium-sized enterprises (SMEs) for globalization tendencies associated with the emergence of multinational corporations and chains (Sok et al., 2013). Significant findings indicate that small and medium-sized enterprises (SMEs) play a crucial role in the economies of all nations. Therefore, the Higher Education Institutions Entrepreneurship Action Plan (EAP-HEIs 2021–2025) is one of Malaysia's most recent initiatives to produce entrepreneurial graduates with high entrepreneurial characteristics in accordance with the requirements of global competition. This initiative is to equip university students to utilize the digital ecosystem. Therefore, this paper aims to gauge the impact of the digital ecosystem and digital skills on the performance of university graduates in small and medium-sized enterprises (SMEs) to assess the effectiveness of the Malaysian university curriculum in entrepreneurship. The study's findings can aid policymakers in formulating more effective strategies to improve digital knowledge in university-based entrepreneurship education.

2. Literature Review

Substantial literature on the digital ecosystem has been produced in previous works. Numerous studies on the digital ecosystem's factors. This paper follows the Hierarchy of the Digital Ecosystem Ontology Concept which the digital ecosystem is divided into two large groups; species (leader and follower) and environment. Agile leadership is regarded as a subspecies cluster. The other factors such as e-readiness, knowledge management, and ICT utilization are the environment's variables. Digital skill is adopted to complement the concept of the digital ecosystem.

2.1 Agile Leadership

Agile leadership is a leadership style that can respond quickly business opportunities and threats that derive from changes and advances in information technology. According to Parker et al. (2015), agile leadership is characterized by a leader who can guide their team and continuously influence team behaviour by defining, disseminating, and upholding organizational vision. While Denning (2018) asserts that agile leadership entails a focus on the customer, the free flow of ideas, and the creation of new business, the ability to take risks and acquire new institutional skills and transform them into a new business is also required.

Leadership agility is essential in this digital era of IR4.0. According to Marquest (2018), the entire performance environment is swift and agility is the key to remaining competitive in business. However, business sectors face a challenge that necessitates digitizing their SME operations. Consequently, the entire SME sector must adapt to the changes and maintain a competitive advantage. One of the methods for achieving this is through agile leadership (Fachrunnisa et al., 2020). Leadership agility is one of the most important key skills for contemporary managers, and the agile manager must be multi-skilled with flexibility and quick response that can facilitate the achievement of greater organizational success and be qualified to meet the requirements of the modern world (Buhler, 2010). In addition, leadership agility is essential for influencing community members to make changes. According to Waters (2012), to develop agile capabilities, the team and the managers must change and ensure greater agility.

There are studies of agile leadership in various industries, such as telecommunications industry (Thomas, 2014) and manufacturing (Walter-Güpner, 2018). Thomas (2014) suggested that telecom industries be proactive in such a competitive environment and discovered that management changes through leadership significantly impact on employee performance in Nigeria. The study also concludes that the adaptability of managers should be a success factor in managing the human aspect of change to improve the industry's overall performance. In contrast, Walter-Güpner (2018) suggested developing leadership and organizational competencies within an agile management framework. It is supported by El Hadad et al. (2020), who discovered that inclusivity can enhance agility and demonstrated that socioeconomic intervention restores the organization’s dynamic capabilities. Therefore, the following hypothesis can be formulated:

H1: There is a positive relationship between agile leadership and SMEs’ performance

Electronic readiness is one of the components of the digital ecosystem (e-readiness). The e-readiness of a country refers to the degree to which a country and its economy have developed an information technology infrastructure that has been adopted by individuals and firms operating in that country (Dada, 2006). Meanwhile, the e-readiness of an SME is defined as the ability of an SME to successfully adopt, use and benefit from information technologies such as e-commerce (Fathian et al., 2008). SMEs need business readiness to adopt innovations to develop and utilize information and communication technology therefore that they can compete in the industrial era 4.0.

The relationship between a country's e-readiness and entrepreneurial activity has been studied by Constand and Gilbert (2011). Nevertheless, the result of this study provides only weak support for a direct relationship between e-readiness and business activity. On the contrary, most of the studies (Ramayah et al., 2005; Rahayu & Day, 2015; Hashem et al., 2014; Candra & Nasution, 2014) strongly support of the need for e-readiness and business performance. Ramayah et al. (2005) for example highlighted the need for e-readiness in the digital environment in Northern Malaysia while Rahayu and Day (2015) study on developing countries found that e-readiness is a critical factor in e-business adoption. The improvement in e-readiness has led to a higher impact on business performance. Hashem et al. (2014) and Candra and Nasution (2014) suggested a similar result that e-readiness affects the company's performance. Therefore, it can be concluded that;

H2: There is a positive relationship between e-readiness and SMEs' performance

2.2 Knowledge Management

Knowledge management is the processes and activities that assist the organization in generating, acquiring, and subsequently discovering, organizing, using, and disseminating knowledge in the organization among working individuals, transforming the information and experiences that the organization possesses and employing them in its administrative activities such as decision-making, working procedures and strategic planning (Al Ti, 2016). Yadav (2013) stated that knowledge owned by the organization is usually considered a vital factor in business performance levels. Al-Shanti (2017) in line with Yadav (2013) highlighted that knowledge management enables the organization's employees to carry out continuous activities and studies to acquire, store, distribute and apply to achieve outstanding business performance. Knowledge management gains importance through its operations and practices to achieve positivity in the organization context, enriching work and enhancing productivity (Seleim & Khalil, 2012).

Byukusunge et al. (2017) mediate the relationship between knowledge management and the business performance of SMEs. It is suggested that business owners of SMEs in Rwanda adopt innovation as a conduit for knowledge management to boost their business performance. While, Dzenopoljac et al. (2018) investigated the process and level of business performance by utilizing a survey. The finding reveals that all four knowledge management processes examined (knowledge generation and development, codification and storage, transfer and sharing, and use and evaluation) positively impact perceived business performance. Additionally, the research revealed that knowledge management processes have

the highest impact on business performance.

It can be concluded that SMEs can create, expand and modify company resources be more creative and innovative, and develop dynamic capability to create company sustainability. It is in response to changes in dynamic business environments. Therefore, it is hypothesized that the relationship between knowledge management and business performance is as follows;

H2: There is a positive relationship between knowledge management and SMEs' performance.

2.3 Information and Communications Technology (ICT) Utilization

ICT utilization is essential in the digital ecosystem. Nevertheless, Karim et al. (2012) stated that the performance of SMEs' ICT usage to penetrate foreign markets is not very satisfactory. The study suggested that the usage of ICT must be in various sectors, which focuses on more than just manufacturing and services. Mwila et al. (2019) found that ICTs are a major aspect of business operations formally and informally and contribute to reducing management costs. However, the significant challenges were the expenses of ICT technology and the lack of ICT infrastructure. Meanwhile, Zaremohzzabieh et al. (2015) discussed the efficiency of ICT adoption in business performance in Malaysia. It is found that the Malaysian government has policies encouraging entrepreneurs to adopt ICT in business. Comparing Malaysia and Indonesia, Ong et al. (2016) reviewed the relationship between ICT utilization and business performance from a women entrepreneur perspective. The study indicates that a direct positive relationship is found between ICT adoption and business performance. It is also in parallel with Yap et al. (2020) who investigated the impact of ICT support on the SME's performance in Malaysia. This study supports the utilization of ICT in significantly increasing business performance. Based on the previous studies it can be hypothesized that;

H4: There is a positive relationship between ICT utilization and SMEs' performance.

2.4 Digital Skill

Digital skill is defined by the European Commission (2017) as skills and capabilities that enable businesses to exploit ICT opportunities, ensure more efficient and effective performance and explore new ways of conducting business and establishing new businesses. Mastery of the digital skills for the latest technology for SMEs in developing countries is needed to compete in the international market (Lahovnik & Breznik, 2014).

Digital skill is critical in helping SMEs to reach new markets even at the international level. With the help of skill and digital technology, entrepreneurs with limited resources can make their businesses succeed (Li et al., 2017). Parida (2010) stated that digital literacy which is conceptualized together with digital skill enhances business performance. It is supported by Deen-Swarray (2016) where digital skills are required to achieve particular goals and improve development in society. Meanwhile, Wardaya et al. (2019) applied the systematic literature review (SLR) method to show there is a significant relationship between digital skill and firm performance. Therefore, the hypothesis can be stated as follows;

H5: There is a positive relationship between digital skills and SMEs' performance.

3. Method

3.1 Data Collection

The population of this study consists of alumni from various public universities who run businesses in SMEs. Respondents to the study were obtained from the databases of each university. The sampling technique used in this study was based on Krejic and Morgan (1970) table and purposive sampling which researchers deliberately choose individuals or groups to participate in a research study based on a specific purpose or criteria. This study selects respondents considered most relevant or useful to the research questions or objectives with the same characteristics as company owners, public university alumni and currently running SME businesses. Of the 420 alumni targeted as a sample study, 345 respondents gave their feedback and only 321 (80.3%) were used for analytical purposes.

3.2 Measures

In this study, SME performance is used as a dependent variable. The subjective performance measures used in this study are based on a modified version of Kotey and Meredith's (1997) and Gadenne's (1998) questions. Items related to SME performance are sales revenue, profitability, job creation, business stability, contribution to community development, business growth, customer satisfaction and business networking.

There are two main dimensions of independent variables namely, digital ecosystem and digital skill. The digital ecosystem has four constructs; agile leadership, e-readiness, knowledge management and ICT utilization. Measurements of all items are based on a 5-point Likert scale with possible answers ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, the control variable comprised the number of workers and experience. These controlling variables were added as controlling variables to avoid inflated results.

Several statistical analyses were conducted to determine the reliability and validity of the data. Initially, an analysis of Cronbach's alpha was run to assess the reliability of the instruments and to search for internal consistency or uniformity of the Likert scale's items. Based on Nunally (1978), Cronbach's alpha coefficients of two variables are higher than 0.7, indicating that all items used in this study are reliable. The factor loading of all constructs under innovation and firm performance variables exceeds 0.5, indicating good convergent validity.

4. Result and Discussion

The study was analyzed through multiple regression method to see the influence of each construct on SME performance. Five critical factors are involved in analyzing the digital ecosystem on SMEs' performance. The analysis is done comparatively based on the data involving three business types: manufacturing, services, retail and overall. Hierarchical multiple regressions were used to assess the ability of digital ecosystem factors and digital skills to predict SME performance. There are two models that had been constructed to examine the impact of digital ecosystem and digital skill on the SME performance. Model 1 excluded the digital skill in its' estimation, while Model 2 included digital skill. The

regression model also adds two control variables two control variables, namely the number of employees and business experience are added to the regression model. All research hypotheses are analyzed based on the findings of the study shown in Tables 1 and 2.

Table 1. Result of Multiple Regression Analysis (Without Digital Skill)

Construct	**Tolerance**	**VIF**	**Model 1**			
			Manufacturing (n=133)	**Services (n=135)**	**Retailing (n=53)**	**Overall (n=351)**
Control Variables:						
Number of workers	0.966	1.035	0.088	0.147**	0.003	0.069*
Experience	0.966	1.004	0.077	0.030	0.045	0.018
Digital Ecosystem						
Agile Leadership	0.464	2.157	0.063	0.185**	0.208	0.098*
E readiness	0.552	1.812	0.174**	0.251***	0.253*	0.223***
Knowledge management	0.414	2.416	0.240***	0.315***	0.072	0.267***
ICT Utilization	0.299	3.345	0.408***	0.147**	0.302**	0.291***
Digital Skill	0.240	4.165				
R^2			0.550	0.559	0.518	0.533
Adjusted R^2			0.529	0.539	0.454	0.524
R^2 Change			0.547	0.515	0.499	0.521
Statistics F			25.685***	27.078***	8.073***	59.478***

The results of the multiple regression analysis of Model 1 showed that the value of R^2 was 0.533. The results of multiple regression analysis for all factors are explained in Model 2, R^2 value ($\Delta R2 = 0.026$, $p < 0.01$) and total variance explain 55.8 percent of SMEs' performance. By separating the model estimations into two, the impact of digital skill among entrepreneurs on business performance can be seen more clearly through the improvement of the model's explanatory power (R^2). It implies that the factor of digital skill gives a better explanation for the variation in business performance among graduates.

Table 1 shows the influence of agile leadership on the SME. It is found that the service sector ($\beta = 0185$, $p < 0.05$), and the overall result ($\beta = 0.098$, $p < 0.1$), show that there is a significant relationship between the agile leadership variable and SME performance. In contrast, the manufacturing and retailing sector depicts no relationship between the two variables. Model 2 shows that the relationship between the agile leadership variable and SME performance for the three sectors is insignificant. This result directly affects the overall data, empirically showing that the factor has no significant relationship with SMEs' performance.

Table 2. Result of Multiple Regression Analysis (With Digital Skill)

Construct	Tolerance	VIF	Model 2			
			Manufacturing (n=133)	Services (n=135)	Retailing (n=53)	Overall (n=351)
Control Variables:						
Number of workers	0.966	1.035	0.081	0.126**	0.001	0.065*
Experience	0.966	1.004	0.072	0.016	0.052	0.024
Digital Ecosystem						
Agile Leadership	0.464	2.157	0.056	0.122	0.207	0.074
E readiness	0.552	1.812	0.147*	0.160**	0.249	0.175***
Knowledge management	0.414	2.416	0.225**	0.254***	0.019	0.216***
ICT Utilization	0.299	3.345	0.216*	0.070	0.213	0.084*
Digital Skill	0.240	4.165	0.247*	0.416***	0.181	0.327***
R^2			0.562	0.606	0.524	0.558
Adjusted R^2			0.538	0.584	0.448	0.549
R^2 Change			0.012	0.046	0.005	0.026
Statistics F			22.956***	27.88***	6.914***	56.370***

These findings are consistent with what has been described by several previous researchers such as Walter-Güpner (2018) and El Hadad et al. (2021) who found that the need for agile leadership improves the performance of SMEs. The failure of management to understand the needs and problems of staff and the inability to address challenges in the shift of change will negatively influence the SMEs' performance. Even though the study found an insignificant relationship, the findings accept the H1 that agile leadership positively influences SMEs' performance.

In Model 1, the relationship between the e-readiness and the SMEs' performance for all data sets is positive and significant, namely manufacturing ($\beta = 0.174$, $p < 0.05$), service ($\beta = 0.251$, $p < 0.01$), retailing ($\beta = 0.253$, $p < 0.1$) and overall ($\beta = 0.223$, $p < 0.01$). Model 2 also shows that all the data that explain the relationship between the two variables are positive and significant, namely manufacturing ($\beta = 0.174$, $p < 0.1$) dan service ($\beta = 0.160$, $p < 0.05$). The relationship between the two variables for retailing insignificant. However, the overall analysis of the data shows that there is a significant positive relationship ($\beta = 0.175$, $p < 0.01$). The finding reveals that the e-readiness of a business in mastering digital technology including the use of internet facilities in business management at maximum capacity will indirectly have a positive impact on business performance. These findings are consistent with most of the results that have been conducted such as Hashem et al. (2014), Candra and Nasution (2014) and Ramayah et al. (2014). The study, therefore confirms the hypothesis of H2 which states a positive relationship between knowledge management and SMEs' performance.

Table 2 shows the analysis of the relationship between knowledge management and SMEs'

performance. In Model 2, the findings depict that the manufacturing sector ($\beta = 0.240$, $p < 0.01$) and service ($\beta = 0.315$, $p < 0.01$) show a positive and significant coefficient value between knowledge management variables and SMEs' performance. The retailing sector shows that there is insignificant relationship between the two variables. However, the analysis of the overall data reveals that there is a significant positive relationship ($\beta = 0.267$, $p < 0.01$) between the two variables. Similar findings are described in Model 2, manufacturing sector ($\beta = 0.225$, $p < 0.05$), and service ($\beta = 0.254$, $p < 0.01$). This result explains that knowledge management is positively significant in influencing the performance of SMEs. Nonetheless, the study found that knowledge management does not affect the performance of SMEs in retailing sector.

Analysis of the overall data involving the three business sectors shows that the knowledge management variable ($\beta = 0.216$, $p < 0.01$) significantly influences the SMEs' performance. The importance of the knowledge management factor on the SMEs' performance is in management ‘s ability to mobilize employees to increase knowledge, transfer appropriate knowledge and skills to employees, and the company's ability to retain a skilled workforce, especially in ICT to remain in the company. These findings are consistent with the study conducted by Dzenopoljac et al. (2018) and Byukusunge et al. (2017). Based on these findings the study confirmed H3.

Model 1 clearly shows that the coefficient value of ICT utilization for all sectors namely manufacturing ($\beta = 0.408$, $p < 0.01$), service ($\beta = 0.147$, $p < 0.05$), retailing ($\beta = 0.302$, $p < 0.05$) and overall ($\beta = 0.291$, $p < 0.01$) are significant to explain the influence of these variables on the performance of SMEs. Meanwhile ICT utilization in Model 2 revealed that only the manufacturing sector ($\beta = 0.216$, $p < 0.1$) shows a significant positive relationship between ICT utilization and SMEs' performance. Nonetheless, the findings indicate no relationship between the two variables in the service and retailing sectors. The overall data ($\beta = 0.084$, $p < 0.1$) reveals a relatively weak significant positive relationship between ICT utilization and SMEs' performance. These findings explain the company's ability to adopt ICT in business management will positively impact operating cost savings, the ability to build collaboration with various stakeholders, and solve problems that occur in the company effectively. Findings on the relationship between the ICT utilization and SMEs' performance are consistent with what has been described by previous researchers such as Mwila et al. (2019) and Zaremohzzabieh et al. (2015). Therefore, the findings in Model 2, confirm H4 which hypothesizes that ICT utilization positively affects the performance of SMEs.

The impact of digital skill on SME's performance is shown in Model 2. The study depicts a significant positive relationship between digital skill and SMEs' performance in two sectors, namely manufacturing ($\beta = 0.247$, $p < 0.1$) and services ($\beta = 0.416$, $p < 0.01$). In contrast, it is found that there is no relationship between the two variables the retailing sector

The overall data analysis involving all sectors ($\beta = 0.327$, $p < 0.01$) shows that the digital skill factor significantly and positively influences SME performance. Empirical evidence suggests that these variables have the most significant influence on the SMEs' performance compared to other factors under the digital ecosystem involved in the study. The findings of

the study are consistent as described by Baker et al. (2015), Wardaya et al. (2019), Deen-Swarray (2016) and Parida (2010). Therefore, the study confirms H5.

5. Conclusion

This study aims to gauge the impact of the digital ecosystem on SME performance among university graduates. The focus is on the perception of alumni from various public universities in Malaysia regarding the influence of the digital ecosystem on SME performance using digital ecosystem factors such as e-readiness, agile leadership, knowledge management and ICT utilization as well as digital skill. Findings indicate that three identified factors under the digital ecosystem (e-readiness, knowledge management, and ICT utilization) significantly influence on SMEs' performance with a significance level of less than 0.01. Meanwhile, agile leadership showed no significant relationship with business performance among university graduates. Digital skill is important in influencing digital skill, implying that the digital ecosystem is not functioning without being equipped with digital skill.

These findings imply that the digital ecosystem plays a vital role in the success of SMEs among university graduates who run businesses. As the entrepreneurs involved are the younger generation under 30 who are highly exposed to information technology, their skills, knowledge of information technology and readiness for change have had a huge impact on their entrepreneurship. Besides, the SMEs also need to prioritize the areas to be focused on and strategies to create a more positive digital ecosystem. Besides that, the findings implied that the commitment of SME entrepreneurs should enhance their digital skill which could be done through entrepreneurs' active participation, motivation, and demonstration of eagerness to see that their employees are involved in the networked economy.

Engagement by more alumni, including those from private universities is recommended for future research. Other factors could also be employees' past experience, funding support to the SMEs, issues specific to a particular industry, maturity and incentives in the usage of telecommunication infrastructures, and political, legal, and social.

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