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Hala Alsabatin *Editors*

From Industry 4.0 to Industry 5.0

Mapping the Transitions

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Foreword

It gives me a great pleasure to introduce the book *From Industry 4.0 to Industry 5.0: Mapping the Transitions* which presents critical chapters that provide an insight to researchers, academics, and policymakers to consider while transitioning to Industry 5.0 that covers the three core pillars: sustainability, human-centricity, and resilience.

Digitalization has become a vital component in every individual life, and digital transformation was a key aspect for Industry 4.0 Revolution that created a culture of artificial intelligence and the use of data in decision-making. Although Industry 4.0 created an impact on not just industry but also Higher Education Institutions that acted as a main pillar toward the shift. However, digitalization is dynamic, and a transition to Industry 5.0 is a niche that should be considered in terms of sustainability with assurance of stakeholder's well-being and resilience.

From my professional experience with the editors, I am confident that you will find a high-quality book with different topics that could be extracted and applied in the real world. The diversified editors from different regions were careful with the selection of topics to create an impact to industries, education providers, and researchers. This book also encourages industries and education providers to commit to United Nations Sustainable Development Goals (UNSDGs) specifically SDG4 Education Quality and SDG9 Industry Innovation and Infrastructure.

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Preface

The collaboration and interaction between man and machine have given rise to Industry 5.0. With the prime objective of Industry 5.0 to create a benefit for the human beings while tapping on to the advantage of Industry 4.0, in no case does it replace what has already been achieved. In fact, it brings to light what can be done in order to make life better. While Industry 4.0 offered extraordinary technological advancement, Industry 5.0 reasons out that technology alone is not sufficient to answer everything or provide a solution, but it is an amalgamation of both machine and human interaction to create that difference. In fact, with the impact of widespread digitalization that has led to dehumanization of the industrial makeup, the interest of global researchers has increased toward mapping how the human creativity and brainpower can be reconciled with the intelligent systems that can enhance process efficiency.

Industry 5.0 has touched upon some of those key domains which are of much concern and debate globally including resilience (both business and cyber), environment and sustainability, diversity and inclusion, values and ethics, vision and purpose, circular economy, understanding the human–machine collaboration, and the 'human-touch' in the production process.

This transition that has taken place in moving from Industry 4.0 to Industry 5.0 has essentially created a need to pay cognizance to the role of 'human' in the process which creates an enhanced focus toward the right kind of skills and competencies, identification of training and developmental needs, talent acquisition and management, safety and well-being, future of work as well as hybrid working models.

Undeniably, the pace with which Industry 4.0 has been accelerating has by-passed the first three industrial revolutions, which is definitely a consequence of the fast introduction of new and cutting-edge technologies. While organizations are already in analyzing the context, mapping this transition and the flow of activities from Industry 4.0 to 5.0 is gaining attention as Industry 4.0 lacked personalization and customization. This co-existence of man and machine creates a pathway for newer prospects and opportunities to emerge and expand possibilities of personalization with the empowerment of 'human' in the production process.

This lays the foundation for this book. This book aims at bringing together global researchers to generate thought on how this transition from Industry 4.0 to Industry 5.0 could make a difference to the globe for larger good. It will adopt a forward-looking approach by bringing in research and contributions that facilitate in mapping the consereasons, consequences, and solutions for 'man+machine' across industries. This book shall serve as a guide not just to academia but also to the industry to adopt suitable strategies that offer insights into global best practices as well as the innovations in the domain.

This book includes 87 chapters. A part of the chapters of this book was based on direct personal invitations, while the other part was carefully selected from the ICBT'2022. All of the chapters have been evaluated by the editorial board and reviewed based on double-blind peer-review system by at least two reviewers.

The chapters of the book are divided into five main parts:

I. *Artificial Intelligence, Tech-Management, Women Entrepreneurship and Social Implications.*
II. *Driving Innovative, Sustainability and Creative Practices.*
III. *Modern Social Media, Public Relations and its Effects on Society and Business.*
IV. *Education Management, Technology, Smart Universities, and COVID-19 Impact*.
V. *Sustainable Finance, FinTech Innovation and Business Uncertain Situations*

The chapters of this book present a selection of high-quality research on the theoretical and practical levels, which ground the uses of smart technologies in business, health care, media, marketing, education, entrepreneurship, and other vital areas. We hope that the contribution of this book will be at the academic level and decision-makers in the various economic and executive levels.

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Education Management, Technology, Smart Universities, and COVID-19 Impact

Artificial Intelligence, TechManagement, Women Entrepreneurship and Social Implications

The Impact of Digitalization Towards the Sustainability of Malaysian SMEs: The Dynamic Capabilities Perspective

Anas Abu Jaish, Rafiqa Murdipi, Dzuljastri Abdul Razak, and Norhayati Mohd. Alwi

Abstract In many developing countries SMEs is considered as one of the main contributors to their economies. However, Malaysian SMEs still face numerous challenges in all sectors. Uncertainties such as Covid-19 and digitalization are the main current uncertain issues in Malaysia. This paper examines the resource capabilities of Malaysian SMEs in handling uncertain environments by identifying the importance of digitalization in their efforts to maintain the sustainability of their market. The quantitative method was employed by using a questionnaire to collect data that represented the research objective. A preliminary study is conducted to test the reliability and validity of the questionnaire. The paper also discusses the preliminary data analysis and descriptive analysis of study variables. As a result, the researcher addressed the preliminary study findings accordingly. The study found that SMEs somehow agreed that business sustainability depends on the speed of responses towards environmental changes and digitalization are considered the long-term sustainable business plan. The study contributes to existing literatures as well as benefits both governmental and non-governmental institutions, policymakers, and agencies by providing crucial information which assists them to identify the proper plan and assistance for SMEs. The main concern for this study is to assist SMEs in being more stable and sustainable during the challenging uncertain market conditions.

Keywords SMEs · Sustainability · Resources · Uncertainties · Digitalization

1 Introduction

Malaysian economy relies more on Small and medium Enterprises (SMEs) and is considered one of the main contributors to the country. 98.5% of the Malaysian economy is obtained from SMEs [1]. Despite this huge contribution and development

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of SMEs, challenges are still existing in various sectors. All sectors such as manufacturing, food, services, etc. face several issues in different aspects such as financial issues, skills and knowledge issues, supply chain issues, globalization as well as uncertainties concerning natural disasters, politics, digitalization, and sustainability [2–9].

One of the most recent uncertainty is Covid-19 Pandemic, which cause a huge impact on businesses especially SMEs and micro enterprises. Governments and authorities worldwide had the order to close all businesses in all sectors. The business closure procedure was to reduce the spread of Covid-19 disease and ensure social distancing and minimise physical contact. SMEs found themselves in a challenge where they have to find other alternatives to continue their business operations which can assist them to create more cash to overcome the cash flow shortage. The main concern for SMEs is to maintain their cash flow for their survival. If a business is not able to generate more cash for survival, it could directly affect its business performance leading to a business failure [10]. Therefore, SMEs started to find out alternatives such as digitalizing their business operation by using online platforms and digital marketing to become more competitive in the market. Adopting technology in the business needs to have various skills and knowledge to choose the right technology. Despite the governmental support to boost digitalization, many businesses slow down their business operation due to a lack of experience (BusinessToday, 2020). Digitalizing the resources of SMEs is considered as one of the main aspects that help to sustain the business operations.

The purpose of this study is to identify the status of digitalization movement perceived by Malaysian SMEs in stable and unstable situations by examining the SMEs' resources (digitalization) adaptation. The study also further examines the need for those resources to be more flexible and dynamic due to environmental uncertainties. This study also contributes to body of knowledge by filling up the gap of embracing more on digitalization aspect as their priority to sustain their businesses. This study contributes to all stakeholders (Governmental and Non-Governmental Institutions, Policymakers, and Agencies) and benefits them in having crucial information on the extent to which Malaysian SMEs need to concentrate more on their internal resources and it will not be a burden on the governments in the event of sudden changes such as the Covid-19 pandemic. In addition, this study is crucial to make SMEs more profitable, stable, competitive and sustainable in the market despite the existence of many challenges. This study further discusses the literatures on challenges faced by Malaysian SMEs, SMEs and digitalization, and the sustainable success of SMEs. The study also highlights the methodology, data analysis process, and the findings and conclusion.

2 Literature Review

2.1 Challenges Faced by Malaysian SMEs

Malaysian SMEs persist in facing difficulties and risks due to uncertain situations such as the Covid-19 Pandemic, natural disasters, political instability and so on. SMEs are more fragile than large companies, especially in the financial aspect. SMEs' main concern at present is overcoming the uncertainties of pandemic within the year of 2021 and 2022 and thereafter. Small and Medium Enterprises Association (SAMENTA) surveyed to determine the performance of SMEs. Sales were decreased by more than 20% for 34% of SMEs. 21% of SMEs expect low-level performance and 25% are optimistic, and 30% are unsure about their performance. New challenges have been raised during this turmoil. After shifting to digital markets, talent supply and cash flow are the primary concerns. Generally, SMEs' access to required talent and lack of suitable talents are longstanding issues. Businesses also need funding for their resources to upskill or reskill their specialists [11]. As a result of the high demand for digital skills, employees or workers may find unsuitable or irrelevant skills when they leave the work if they do not remain reskilling or practicing their skills.

Many SMEs in Malaysia are ending with a cash flow shortage, a decline in sales revenue and higher operational costs. Even though the government has pumped short-term soft loans, SMEs can't stand unless the demand rises. 45% of SMEs reserves cash for two months or less. Only 20% are more optimistic and could last for four to five months. Moreover, the continuous MCO has negatively impacted business operations, especially the microenterprises. The Chief Executive Officer of SME Corporation Malaysia (SME Corp Malaysia), Noor Azmi Mat Said highlighted that SMEs specially microenterprises have less cash flow for survival [12]. Survey has determined that 81% of respondents had only limited cash flow to survive for three months maximum, and less than 1% of respondents had cash to survive for more than one year. Hence, the main concern for SMEs is to move forward with new business plans for faster recovery. In addition to the financial matter, business owners are also liable to challenges caused by political instability.

2.2 SMEs and Digitalization

SMEs in Malaysia have contributed widely to Gross Domestic Progress (GDP), attracting economists to promote economic activity in various areas namely providing services by society, employment opportunities, etc. [13]. In addition, digitalizing business activities become a more attractive concepts to be more competitive in the market. Faridi and Malik [14] highlighted that digitalization facilitates businesses,

especially SMEs to increase their cash flow and sales by dealing with their customers smoothly and faster. Digitalization also can expand Malaysian SMEs to the global market.

Despite the SMEs' contribution to the development of the economy, several SMEs are still facing challenges in adopting digital technology because it needs huge capital to invest. Adding more, digitalizing SMEs activities are tripped by lack of knowledge, insufficient funds, lack of resources, and technology capability [2–9]. In addition, the technology adoption is getting worse by environmental uncertainties which businesses are facing. For instance, during Covid-19 pandemic, several micro-enterprises, SMEs, and oil and petrol companies have been affected negatively worldwide. Annuar [15] conducted a survey and found that SMEs in Malaysia faced various challenges, for instance, 69.9% of Malaysian SMEs lost half of their income during the Movement Control Order (MCO). MCO cause many issues such as supply chain issues, cash flows issue due to low sales and some projects cancelled and postpended.

In addition to this, the Malaysian Economic Research Institute (MIER) highlighted that Covid-19 pandemic in Malaysia causes unemployment for 2.4 million employees. Hence, Bank Negara Malaysia (BNM) has allocated stimulus packages for SMEs to boost their cash flows and assist them in sustaining their business operations. Even though the Malaysian government has supported SMEs for their survival to boost digitalization adoption, SMEs disable to integrate into digital transformation due to the previous issues mentioned above.

Therefore, each organization considers digital transformation as one of the schemes to move forward and be competitive in the market. Most companies have confidence in digital transformation as it is the only way to achieve their goals, success, and growth. The new technology facilitates SMEs to deal with their customers smoothly and faster, potentially increasing their cash flow and sales [14]. In addition, digitalization is considered one of the opportunities for Malaysian SMEs to expand their business globally, and it could provide various options for customers in Malaysia and worldwide [16].

2.3 The Sustainable Success of SMEs

Adopting the new norm of digitalization has been suggested by many authors. According to the paper, "Accelerating Malaysian Digital SMEs: Escaping the Computerisation Trap," 2033 SMEs in Malaysia were surveyed. The study suggested that Malaysian SMEs need to leverage the capabilities of ICT to accelerate the digital transformation adoption. The study also added that SMEs need to focus more on three priorities: (1) access to digital technology, (2) literacy and knowledge of technology usage (3) the ability to create and participate in the necessary digital environment. SMEs need also to re-engineer their businesses by concentrating on strategies, infrastructures, business models, and processes aligned with digital transformation.

To achieve the stated objectives, this study has identified the dependent and independent variables that could improve the sustainability of Malaysian SMEs. The tangible and intangible resources of SMEs made up the independent variables for this study. The intangible resources are human resources, reputation resources, and innovation resources. The tangible resources are physical resources, financial resources, organizational resources, and technological resources. Studies have done wide research on the presence of direct impact that those resources have on firms' capabilities in achieving competitive advantage and sustainability [17–20]

This requirement is well-captured by the dynamic capabilities of resources as discussed by [21–23]. As such, the dynamic capabilities (digitalization) in this study is mediating the established relationship between the resources and SMEs' sustainability, while environmental uncertainties as a moderator variable.

3 Methodology

This paper aims to assess the awareness and perception of Malaysian SMEs towards proactive, systematic risk assessment initiatives and their importance as well as determine the relative importance of digitalization movement perceived by Malaysian SMEs. The paper also aims to evaluate environmental uncertainties towards the relationship between resources and the achievement of sustainability of Malaysian SMEs. The paper adopts a quantitative research design and data analysis techniques. The targeted sample of the quantitative approach will be the owners/manager of SMEs in Malaysia from different sectors. Purposive random sampling will be employed. As this study is adopting purposive sampling techniques two strategies will be used to reach the respondents. The two purposive sampling strategies are snowball and criterion. The sample size for quantitative analysis is 30 respondents to enable the achievement of determined study objectives. The collected data via questionnaires were analysed using IBM SPSS AMOS (Version 26) software. Upon capturing the fundamental information on the samples selected using descriptive analysis.

4 Data Analysis Process

The researcher conducts the procedures of preliminary data analysis to process the raw data of the preliminary study that has been collected from the questionnaire in three stages, namely (i) data coding, (ii) data screening, and (iii) descriptive analysis.

After the data collection is done, the processes of the raw data need to be used for further analysis by the researcher. Respectively, the raw data was extracted by google form and entered into an excel file for using standardized codes, and this is called data coding. As a result, all the questionnaire items are coded using numbers using an excel file and then entered into the SPSS worksheet to proceed to the following screening process. Once the data is entered and coded in SPSS, data screening is conducted to

identify and solve problems during the data analysis process. This preliminary study data consists of 30 questionnaires collected from Malaysian SMEs in different states nationwide. There were no incomplete questionnaires from this data set and found all 30 questionnaires can be used in the analysis.

4.1 Descriptive Analysis of Study

Descriptive analysis is to analyze the quantitative data as mentioned in the analysis technique section. Descriptive analysis is a systematic scientific illustration and statistical analysis to understand the background of the targeted group. Knapp [24] clarifies that descriptive analysis is a better approach to understanding the data collected through figures and graphs. In this study, descriptive analysis delivers high-quality of information by gathering the data into numbers, percentages, mean, mode, medium, variance, range, standard deviation, minimum and maximum. In this study, the researcher gathers and summarizes the information on SMEs as follows:

i. Demographic of respondents (Owners, Managers, and employees), such as gender, age, education, number of family members involved in business, religion, years of business, skills and talents possession (owners, managers, and employees), legal form of business, industry sectors, states, locations, year of establishment, sales turnover per year, number of employees, education of employees, trademark/ copyright/ patents possession, partnerships with other business (B2B), types of support, and operation status during Covid-19 pandemic.
ii. Questions related to tangible and intangible resources, dynamic capabilities (digitalization), environmental uncertainties, proactive and systematic risk assessment, and business sustainability.

(i) **Part A—Demographic**

The total data collected for the study is 30 responses. The respondents answered the questions about demographic information about their businesses, the background on their employees, and the conditions of their business operations.

The results show that most Malaysian SMEs owners are 40 years old and above. In terms of education, the respondents have different levels of education. As for years of business, majority of the respondents have been in business for more than five years, reflecting better feedback for their experience in this study.

As for the education level of employees, the results show that the level of their employees has fluctuated from secondary to postgraduate degrees. There are 11 respondents (36.7%) who operated during Covid-19 pandemic but in lower and limited scales, followed by those who operated during Covid-19 pandemic using online platforms (n = 9, 30%), 6 respondents (20%) who shut down their business during Covid-19 pandemic, and only 4 respondents (13.3%) operated as usual.

(ii) **Part B—Study Variables**

Tangible Resources (TR)

Tangible Resources (TR) descriptive statistics reveal an overall mean score of 3.2778 (SD = 0.731). This shows a high ability to generate funds from their business operations, have proper financial records, locate in good places and easily access the customers, and adapt modern technology for their business operations. However, they do not have a high ability to generate external funds and external access funds in loans and grants.

Intangible Resources (IR)

The overall mean score of 3.673 (SD = 0.626). This indicates that most respondents agreed that they have sufficient human resources with practical skills and knowledge. In addition, their business has clear and effective human resources management, efficient relationships with local and international entities and authorities, and it has established high-quality products and services among its customers. However, they lack adequate capabilities for research and development, new product development, innovation and change.

Dynamic Capabilities—Digitalization (DCD)

Based the results, the majority of respondents do not use ePOS system in recording sales, managing payments and monitoring inventory. This indicates that some SMEs have no experience in using the ePOS system, which is considered an essential need for their daily records. Besides, the overall mean of DCD variable score of 3.757 (SD = 0.861). This shows that SMEs agreed on the importance of using digitalization for their business operations.

Environmental Uncertainties (EU)

The overall mean of EU construct score of 4.281 (SD = 0.55). This shows that most SMEs agreed that the EU cause an impact on their existing resources (tangible and intangible). The respondents strongly agreed on the significance of changing and upgrading the existing resources to enhance their business operations, workers' skills and knowledge, marketing initiatives and supply chain system. The result shows that respondents agreed on the difficulty of knowing what kind of response should be taken on the resources. In addition, the respondents agreed that the EU challenges their business sustainability. For instance, the pandemic Covid-19 has had a tremendous impact on their business operations and caused them to adapt to digitalization and adopt advisory support, motivational support, and business coaching.

Proactive and Systematic Risk Assessment (RA)

The result shows an overall mean score of 3.966 (SD = 0.8). This indicates that all respondents agreed that risk assessment tools should be utilized for the sustainability of the business and it will prevent the SMEs from failure caused by environmental changes. Besides, respondents agreed that the risk assessment tool would assist their business operation in controlling costs caused by environmental changes

and preparing a better plan for the future. The respondents also agreed that digitalization would facilitate the development of proactive and risk assessment tools in adapting technological advances and having an adequate advisory and support systems in business operations.

Sustainability

The overall mean score of 3.833 (SD = 0.703). This indicates that SMEs somehow agreed that business sustainability depends on the speed of responses towards environmental changes, and digitalization is considered the long-term sustainable business plan. The respondents also agreed that having a good advisory and support system would assist the business to sustain itself in the longer term. In addition, the respondents somewhat agreed that strong capabilities and flexible resources facilitate businesses to face any potential environmental uncertainties.

5 Findings and Conclusion

The overall descriptive statistics for all variables are shown in Table 1. From Table 1, we can see that among the seven variables of this study, the mean response of EU is more significant than the other four variables. Also, the lowest mean values among the variables are TR and IR. Compared to the relative means values among DCD, RA, and Sustainability.

Table 1 shows Environmental Uncertainties (EU) is the most important variable than other four variables. Dynamic Capabilities—Digitalization (DCD) is also important as most respondents agreed that digitalization could contribute to their business sustainability. This indicates that SMEs in Malaysia concern more on how to make their resources more dynamic and flexible putting into consideration digitalization and environmental uncertainties aspects.

The authors conclude that working on the resources of SMEs is important for their sustainability, especially during turmoil. To improve these resources, SMEs need to obtain various assistance such as financial support, proactive support, advisory support and improving skills and knowledge to be able to choose the right technology and respond fast and effectively to any environmental changes [25]. Business

Table 1 Descriptive statistics—study variables

Variables	N	Mean	Std. deviation
Tangible resources TR	30	3.2778	0.731
Intangible resources IR	30	3.673	0.6263
Dynamic capabilities—digitalization DCD	30	3.757	0.861
Environmental uncertainties EU	30	4.281	0.55
Proactive and systematic risk assessment RA	30	3.966	0.8
Sustainability	30	3.833	0.703

sustainability requires SMEs to be increasingly profitable as well as adaptive to the environmental changes [26]. The authors recommend the researchers to search more on how to make the SMEs' resources more dynamic to achieve sustainability and be more competitive in the market.

References

1. Yuena, Y.Y., Nga, X.P.: Enhancing innovation performance of small and medium enterprises in Malaysia. Management Science Letters **11**, 2021 (2020)
2. Beheshti, H.M., Salehi-Sangari, E.: The benefits of e-business adoption: an empirical study of Swedish SMEs. Serv. Bus. **1**(3), 233–245 (2007)
3. Cui, L., Zhang, C., Zhang, C., Huang, L.: Exploring I.T. adoption process in Shanghai firms: an empirical study. Journal of Global Information Management (JGIM) **16**(2), 1–17 (2008)
4. Dharmalingam, P., Kannabiran, G.: Determinants of basic I.T. adoption by auto ancillary SMEs in India. IUP Journal of Information Technology (2011)
5. Duan, X., Deng, H., Corbitt, B.: Evaluating the critical determinants for adopting e- market in Australian small-and-medium sized enterprises. Management Research Review (2012)
6. Hashim, J.: Learning barriers in adopting ICT among selected working women in Malay-sia. Gender in Management: An International Journal (2008)
7. Jones, R.A., Jimmieson, N.L., Griffiths, A.: The impact of organizational culture and reshaping capabilities on change implementation success: the mediating role of readiness for change. J. Manage. Stud. **42**(2), 361–386 (2005)
8. Levy, M., Powell, P.: Strategies for Growth in SMEs: The Role of Information and Information Sytems. Elsevier (2004)
9. Parker, C., Castleman, T.: New directions for research on SME-eBusiness: insights from an analysis of journal articles from 2003–2006. Journal of information systems and small business **1**(1), 21–40 (2007)
10. Usahawan.com: 5 Statistik Mengejutkan: Cashflow Punca Utama Kegagalan Sesebuah Perni-agaan. Usahawan.Com (2020). https://www.usahawan.com
11. SME Corp Malaysia, Huawei: Accelerating Malaysian Digital SMEs: Escaping the Computer-isation Trap (2018). Retrieved from: https://www.huawei.com/minisite/accelerating-malaysia-digital-smes/img/sme-corp-malaysia-huawei.pdf
12. Zainuddin, M.Z.: Sebahagian besar PKS bermasalah jika PKP dipanjangkan. Berita Harian (2020). https://www.bharian.com.my
13. Das, M., Rangarajan, K., Dutta, G.: Corporate sustainability in small and medium- sized enterprises: a literature analysis and road ahead. Journal of Indian Business Research (2019)
14. Faridi, M.R., Malik, A.: Customer engagement technology in SME's in Saudi Arabia: does it ensue in disturbance or disruption. International Journal of Entrepreneurship **23**(1), 1–8 (2019)
15. Annuar, A: Covid-19: after MCO, survey finds nearly 70pc SMEs lost half in-come. Malay Mail Newspaper (2020). Retrieved from https://www.malaymail.com/news/malaysia/2020/03/27/covid-19-after-mco-survey-finds-nearly-70pc-smes-lost-half-income/1850688
16. Digital News Asia.: Malaysia's SMEs look to invest in digital technologies. (2019). Retrieved from: https://www.digitalnewsasia.com/digital-economy/malaysias-smes-look-invest-digitaltechnologies
17. Barney, J.: Firm resources and sustained competitive advantage. Journal of manage-ment **17**(1), 99–120 (1991)
18. Barney, J.B.: Strategic factor markets: expectations, luck, and business strategy. Manage. Sci. **32**(10), 1231–1242 (1986)
19. Hitt, M.A., Ireland, R.D., Hoskisson, R.E.: Strategic Management: Concepts: Competitiveness and Globalization, 10th edn., South-Western College Pub (2012)

20. Madhani, P: Resource Based View: Concepts and Practices, pp. 3–22 (2009)
21. Madhani, P.M.: Resource Based View (RBV) of Competitive Advantage: An Overview (2010)
22. Milliken, F.J.: Three types of perceived uncertainty about the environment: state, effect, and response uncertainty. Academic Management Review **12**(1), 133–143 (1987). https://doi.org/10.5465/amr.1987.4306502
23. Teece, D., Leih, S.: Uncertainty, innovation, and dynamic capabilities: an introduction. Calif. Manage. Rev. **58**(4), 5–12 (2016). https://doi.org/10.1525/cmr.2016.58.4.5
24. Knapp, H.: Introductory Statistics Using SPSS. Sage Publications (2013)
25. Fanelli, R.M.: Barriers to adopting new technologies within rural small and medium enterprises (SMEs). Social Sciences **10**(11), 430 (2021)
26. Linnenluecke, M.K.: Resilience in business and management research: a review of influential publications and a research agenda. International Journal Management Review. **19**(1), 4–30 (2017). https://doi.org/10.1111/ijmr.12076

Entrepreneurial Intention and Pre-start-up Behaviour During Covid-19 Era Among the Working Adults in Bangladesh

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Abstract Entrepreneurs are the lever of economic development and can promote the economic activities instigating job creation, technology revolution and general economic growth. The developing economies must facilitate entrepreneurial intention and instigate general pre-startup behavior, specifically during COVID-19. The current work aims to explore the formation of entrepreneurial intention and start-up behaviour with the extension of the theory of planned behaviour in the COVID-19 time. The authority and self-realization are added to the theory of planned behavior influencing pre-startup behavior. The cross-sectional data were collected from Bangladesh, and the final analysis was performed with 310 valid responses. The final analysis was performed using the partial least square regression equation modelling (PLS-SEM) on the SmartPLS 3.3. The analysis revealed that attitude and perceived behavioral control significantly influence entrepreneurial intention. Authority and entrepreneurial intention significantly impact start-up behavior. The current work contributes to theory by adding the factor of authority and self-realization, harnessing the start-up behavior. For the practice, the government agencies must facilitate the subjective norms that can instill entrepreneurial intention. The study limitation and future research guidelines are offered at the end.

Keywords Entrepreneurs · Intention · Start-up · Behavior · COVID-19

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