Leveraging Entrepreneurial Bricolage and Innovation Performance among Manufacturing SMEs in Malaysia Under a Resource Constrained Environment

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***Abstract*— SMEs are essential to Malaysian economy as they became one of important economic driver in the nation. In order for Malaysia to reach high-income nation, SMEs have to be more resilient toward business uncertainty. In order to survive in globalize market, SMEs have to embrace innovation to maintain their competitive edge. However, investing in innovation comes with cost attached and due to their sizes, SMEs also encounter various external and internal resource constraints. Under logical assumption, these constrains may hinder firms to invest in innovation however, that is not the case as some SMEs are able to strive in resource constrained environment. In order to understand the underlying factors that contribute to this scenario, a research framework has been proposed. This study has adopted the concept of bricolage to explain innovation performance among manufacturing SMEs in Malaysia that operate under resource-constrained environment. By adopting quantitative approach, this study has collected 217 sets of data from the Federation of Malaysian Manufactures (FMM) Directory for 2016. The response rate of the survey is at 43.4% and the data is analysed through PLS-SEM. After the establishment of construct's validity and reliability, the study has confirmed a significant positive relationship between entrepreneurial bricolage and innovation performance. The study has also found that constraints in financial and human resources have a positive influence on bricolage behaviour, although the explanatory power for this relationship is not strong. Nevertheless, this study has provided an answer to scenario where some firms may strive even in resource-constrained environment. This study is original and valuable with respect to data and context. The findings of this study may play a substantial role in the economic stability of Malaysia by enriching the SMEs sector.**

***Keywords*—** *Finance, human resources, technology, entrepreneurial bricolage, innovation performance, research model*

1. Introduction

At present, SMEs in Malaysia have been performing as noteworthy protagonists in nurturing the economic growth of the country. After considering them as the backbone of economic development, the Malaysian government has provided SMEs with various support mechanisms and incentives to improve their performance. After the global economic recession in 2007–08, the growth in the global SMEs sector needs some time to properly recover its business and to contribute to the national gross domestic product (GDP) of any country. The resolutions have regarding the faced challenges have been mentioned and described as well [10][53].

SME corporations' survey pointed out that 98.5% of all business establishments in Malaysia are SMEs, most of which are in the services sector, besides mining, quarrying, agriculture, manufacturing, and construction. Despite the challenging environment in 2016, SMEs celebrated a real GDP growth of 5.2%, which increased the country's GDP by 36.6%. In addition, SMEs have also significantly raised the employment bar. SMEs contributed up to 65.3% of the total employment in Malaysia in 2016, thereby successfully achieving the SMEs Master-plan target of 65%, where the service sector's share was 63%. Other sectors like manufacturing (16.5%), construction (10.4%), agriculture (9.8%), and mining and quarrying (0.3%) also generated the targeted employments. To become a higher income nation by 2020, the Malaysian government introduced the SMEs Master-plan, which aims to develop a new breed of globally competitive SMEs that will enhance wealth creation and improve the social well-being of the nation. To turn Malaysia

into an innovation-led economy by 2020, the SMEs Master-plan outlined four strategic goals, one them being increasing the number of SMEs, which have high growth potential and are innovative [58][59].

Usually, SMEs suffer from certain constraints like lack of capital, difficulties in procuring raw materials, lack of access to relevant business information, low technological capabilities, problems caused by cumbersome and costly bureaucratic procedures, and policies and regulations that generate market distortions. Despite these constraints, SMEs display a very special relationship between innovation and performance. In the last five years various scholars have studied this relationship [15][27][35].

Some researchers have suggested that innovation positively impact the SME performance. On the otherhand, few other schoalrs' have revealed that among 7,222 firms in the manufacturing sector, only 11.8% embark in some form of innovation, while the other 88.2% do not innovate at all. By including the career matrix relating to innovation and sustainability in the SMEs sustainability in the performance also increase. Although this finding is limited to the manufacturing sector, it works as an encouraging factor for researchers to study the underlying reasons and factors that hinder firms to innovate. It is important to identify and understand the factors that create obstacles in innovation. Each firm in the market is unique, so such factors vary among firms due to their sizes. Unlike larger firms, SMEs operate in a smaller scale. Owing to their size, they might face limitation in terms of internal resources. Nevertheless, scholars also discussed about various firms' factors and modelling structures for more comprehension. Researchers also argue that SMEs are more likely to confront financial constraints, which will pose a major risk to their productivity and growth [3][7][41][43] [44] [57] [4] [5][8] [26][36].

However, facing limitations is not always a bad thing as some other researchers argue resource constraints lead towards positive improvements on a firm's innovative efficiency, creativity, and ability to recognize unexpected ideas. Therefore, instead of avoiding those challenges, SMEs must recognize them and strive to conjure successful innovation outcomes. Interestingly, the processes to develop the framework from the factors found from these challenges. Nevertheless, it would be difficult to recognize the factors contributing to positive outcomes regarding a firm's ability to innovate without a proper framework. For this reason, this study proposes a framework by providing supporting empirical evidence that could help SMEs to improve their innovation performance through entrepreneurial bricolage [1][37][6][11] [12].

Entrepreneurial bricolage is another concept in understanding innovation where firms use existing resources to create a new system or innovative solutions. After observing the behaviours of small firms, the concept of bricolage can explain many activities of such firms to create something from nothing by utilizing inputs ignored by other firms. In this sense, in a resource-scarce environment, firms can resolve problems or create innovative outcomes through the bricolage behaviour. To comprehend the organizational performances and the SMEs' notion, practitioners must emphasis on the re-engineered innovative models by dealing with as well. To gain more understanding of the behaviour of making do with any available resources at hand, this study adopts the concept of bricolage to explain innovation performance under a resource-constrained environment among Malaysian manufacturing SMEs [13][14][16].

2. Literature Review

Various SMEs in Malaysia and around the world have been facing constraints in terms of financial and technological factors. Certain measures are being taken to mitigate these constraints. Other than these, human resources seem to be a huge constraint for SMEs, particularly for those that belong to the manufacturing industry. These challenges and obstacles are observed mostly in the developing countries. Only 35.8% percent of SMEs enjoy an open approach to formal credit, whereas 50.5% of them having no formal source of finance seek financial assistance from banks. Only around 50% will receive such assistance and the rest (13.7%) have restricted access to any kind of financial aid in the banking sector. Nevertheless, in developing countries with saturated job markets, the growth of more SMEs certainly contributes in creating decentralized jobs. This paper wants to deal with these SME constraints and reveal a possible pathway to channel them [3][65][66].

2.1 Constraints of finance

Since SMEs do not have immovable assets, complying with collateral requirements involves a higher level of risk. Depending on collateral issues, banks and non-banking financial institutions sometimes show reluctance to finance SMEs. This situation pushes SMEs to be less willing to invest in developing their human resources and acquire new technologies. Consequently, without decent human capital and technologies, their capacities to innovate will be hampered. SMEs face various constrains' under the complex international business environment which could impede the acquisition of information, finance, technology, and human resources. Usually, innovative SMEs are inclined to financial difficulties, given the various liabilities they possess including the limitations in resources, vulnerability due to their size, and difficulty in obtaining financial assistance for investments. Similarly, SMEs are more likely to experience financial constraints than larger firms. Few scholars also pointed out that banks are usually conservative about financing any SME because of a higher operational cost, less return, and higher risk. Since the loan size is small and the cost of operations is higher, the operations of an SME need rigorous monitoring. Another study addresses finance as a growth constraint for SMEs. The study utilizes The World Business Environment Survey data to extrapolate its findings and discovers that the limited access to finance is indeed an important growth obstacle for SMEs. In this sense, having a limited access to finance, the growth of SMEs will become stagnant and eventually impede their ability to grow to the optimal size [6][7][19][20][26][50].

2.2 Constraints of Technology

Another factor that could hamper an SME's growth is the technology. Technology comes with various definitions. Technology has two fundamental components: physical and informational. Physical components are translated as tangible items like products, equipment, blueprints, and process. Informational components refer to the knowledge, which exists in various forms such as know-how of management, marketing, production, skilled labour, and quality control. Another recent study in the literature attempts to conceptually define technology—this study addresses that technology consists of three components that are (a) something that possess the characteristic of intelligence; (b) something that has been designed to serve a purpose; and (c) a significant advantage that can be used for a purpose from logically derived knowledge. In general, the notion of technology is something that is devised with a purpose by using the knowledge gained from research and scientific methods. In the body of literature, some researchers argue that technology is crucial to SMEs. For instance, technology serves as a major factor for a firm's survival and growth. A study has been conducted to investigate the impact of technology adoption on the performance of SMEs by comprehensively reviewing past research [42][21][61][34].

The study finds that the performance of SMEs can be improved through technology adoption. Various researchers have studied the linkage between technology and SME growth. However, they not only look at encouraging factors but also investigate the limiting factors towards growth. For example, The potential constraints faced by SMEs are observed by analysing 437 datasets extracted from the top management of SMEs in Russia and Bulgaria. The result of their study shows that most of the firms included in the study have cited the financial aspect as the major constraints. However, fewer than 15% of the SMEs have perceived technological problems as an important constraint to them. These findings indicate that some company has acquired this perception by being in possession of more advance technology: These firms may have obtained new opportunities to outperform their competitors, thereby ensuring stability and survival of the business. Although the number of SMEs that have perceived the technological aspect as the main constraint is small, it is unwise to neglect the presence of this issue. Since technology is inherently intelligent in nature, it can be transferred. The process of technology transfer is not only limited towards knowledge transfer, but also associated with the learning process where technological knowledge is gradually accumulated into human resources participating in activities. Firms can improve their human capital by acquiring new knowledge and skills through the process of technology transfer. Human capital refers to the knowledge skill and experience of employees. In an organization, human capital serves as an asset as the knowledge of employees can be used by the organization to accomplish its goals. In the context of SMEs,

human capital is an essential element in converting information into valuable knowledge that eventually improves the firm's performance. However, a previous elaborates that the level of human capital may vary in keeping with industries, firm size, and ownership. Therefore, the level of human capital between SMEs and large corporations will vary [48][49][51].

2.3 Constraints of Human Resources

For pursuing innovation, human capital is essential. The importance of human capital towards the firm innovation performance has been argued by various studies in the literature. For instance, employees could play an essential role in the innovation process by generating profit-oriented ideas. Possessing employees that can generate creative ideas are valuable to firms. In a similar vein, firms have to capitalize on their employees' capacity to become more innovative. Achieving a high level of innovative performance among SMEs does not happen overnight. SMEs must gradually improve their existing competencies and continuously develop new capabilities. Such capabilities cannot be bought, but have to be developed internally. This outcome would be impossible without good human resources where employees can contribute their ideas towards the improvement of the firm as well as the building of new capabilities to boost the overall innovation performance [34].

SMEs play an important part in Malaysia's economic development by generating employment prospects and by constructing convenient machineries by saving a massive amount of foreign currency. Human resources constraints may probably be regarded as a common issue among SMEs. The argument of having constraints in human resources can be traced back to the major obstacle faced by SMEs. Owing to the financial constraints, SMEs have little room to manoeuvre their investment, including the development of human resources. Financing is considered as one of the major barriers to skill development among employees. Training is the basic form of grooming employees, but it comes at a cost. Severe financial constraints may render firms to be less focused on human resource development. This situation will become worse as SME struggle to obtain skilled and competent workers from the job market. The employees' management trends that puts huge impact on the firms' performances. Evidence from a previous study points out five major obstacles faced by the Canadian manufacturing sector as it has adopted new advanced technology: One of the impediments is linked with labour-related problems like shortage of skilled worker and training difficulties. To successfully implement new technology, it is crucial to acquire a decent quality of employees. However, some studies suggest that employees are not the sole factor that could hamper a firm's innovativeness in the context of SMEs. Unlike larger firms, the management structure of SMEs is considered to be more concentrated towards the owner/manager [1][9] [17] [35][43].

So, the owner/manager have a huge impact on the decision to adopt to or invest in innovation. In this sense, if the top management fails to recognize opportunities from the external environment, it will compromise a firm's well-being. To understand the impact of the CEO's perception of the firm's technology policies and subsequent organizational impact, 86 CEOs of manufacturing companies in Canada are interviewed. The study points out the practical implications of CEOs perception, where failure to read or misinterpret the environment will lead to inadequate technology policies and accordingly adversely impact the survival of a firm. So, addressing the human resource constraint among SMEs does not solely refer to the capacity of employees to innovate, but also to the competence and orientation of the owner/top management. Under certain conditions, having limitation is not a bad thing for firms willing to innovate. For instance, German Mittelstand firms were able to achieve a high level of innovation performance regardless of having severe constraints in terms of financial and human capital. Instead of dwelling in resource-constrained problems, these firms develop a set of unique traits to compensate those problems and strive to achieve competitive advantage by leveraging their existing resources [45][47].

2.4. The Concept of Entrepreneurial Bricolage and Innovation Performance

The idea of using or combining existing resources to create a new innovative outcome can be found in the bricolage concept. The concept of bricolage described as 'working by applying a combination of resources at hand with new complications and prospects'. Even in a resource-constrained environment, firms will continue to move on and

use any existing resources to create new possibilities. This concept should be able to explain as to why some entrepreneurial firms thrive in a resource-scarce environment. This study will extend and test the concept of bricolage in explaining innovation under a resource-constrained environment among manufacturing SMEs in Malaysia. The concept of bricolage was originally introduced by Lvi-Strauss to differentiate actions between engineers and handymen—this is also known as 'bricoleur'. Instead of gathering tools and materials for the intended design, bricoleur choses to use whatever material and tools at hand. This concept has been adapted to derive the foundation for the theory of entrepreneurial bricolage, where it has been mentioned that under an impoverished environment, the entrepreneur have three options: (1) seeking external resources; (2) avoiding challenges by remaining inert, downsize, or disband; (3) embracing bricolage by working with a combination of available resources to counter new problems and opportunities. So, under a resource-constrained environment, firms may embrace entrepreneurial bricolage to overcome these constraints and stay in business [16][60].

The engagement of firms in recombining resources through bricolage is essential to improve and establish new innovative outcomes. Instead of generating substantial amounts of new knowledge, innovation may also be derived through unique combinations of existing knowledge (Schoonhoven, Eisenhardt, & Lyman, 1990). Senyard et al. (2014) have argued that recombination of existing element under bricolage should able to promote innovativeness and sometimes may produce a positive unexpected result. A previous study by Wu, Liu, & Zhang (2017) analyses a set of data from 222 firms in China and finds that bricolage has positively improved new product development under a high technological turbulence environment. The positive outcome caused by bricolage on innovativeness and new product development might also have a positive effect on the innovation performance in Malaysia's manufacturing SMEs [55][56][64].

2.5 Research Model and Hypotheses

From the literature review, this study is to elucidate the constrained factors like finance, human resources, and technology that influence the entrepreneurial bricolage in the proposed framework. It also aims to explain how such factors influence the innovation performance. The proposed framework for this study is presented in Figure 1.

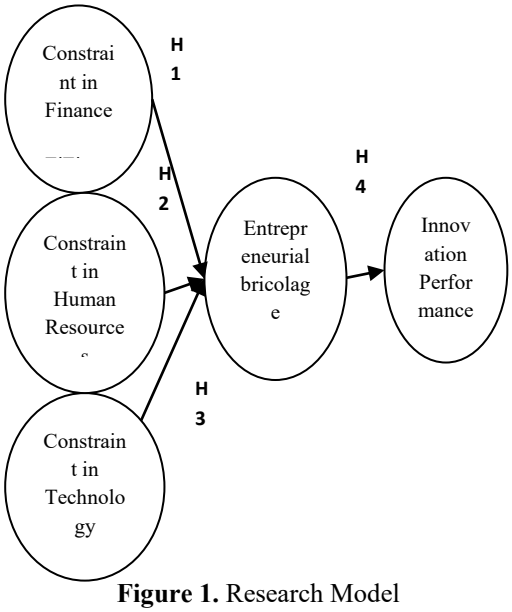

Figure 1. Research Model

Therefore, the following hypotheses are proposed;

H1: Constraints in financial resources will positively influence entrepreneurial bricolage.

H2: Constraints in human resources will positively influence entrepreneurial bricolage.

H3: Constraints in technology will positively influence entrepreneurial bricolage.

Therefore, the following hypothesis was proposed.

H4: Entrepreneurial bricolage will positively influence the innovation performance among manufacturing SMEs.

3. Research Methodology

This study seeks to provide empirical evidence that could uncover issues addressed in the literature review above. This study is aimed to investigate the influence of a resource-constrained environment on the bricolage behaviour among Malaysian manufacturing SMEs. By using the concept of bricolage, it is hoped that this study will be able to reveal the underlying influence of bricolage behaviour on the innovation performance among SMEs operating under a resource-constrained environment. Data was gathered by a survey, with questionnaires being distributed through electronic mail to the target respondents.

The samples were chosen from the Federation of Malaysian Manufactures (FMM) Directory 2016's listed manufacturing SMEs. The FMM directory has been considered as the most comprehensive list of the SMEs database. Owing to this argument, this study selected 500 out of 1,869 listed manufacturers in the FMM Directory in 2016. Since it is important to ensure that all the respondents are SMEs in order to avoid any bias in the findings, the status of the SMEs used in this study had been decided in keeping with SMEcorp Malaysia's (2018) All the selected respondents were from manufacturing companies in Malaysia, having less than or equal to 200 full-time employees and acquiring business sales turnovers not crossing RM50 million. To ensure a high response rate, all the questionnaires in the survey used both languages like English and Bahasa. The researchers also conducted follow-ups through telephone and email to boost the response rate even further. Among the 500 distributed questionnaires, a total of 217 were returned and collected by the researcher with a response rate of 43.4% [58].

This study aims to investigate the influence of entrepreneurial bricolage on the innovation performance among manufacturing SMEs operating under a resource-constrained environment. However, in addressing the environment, the researcher was unable to include all the factors from the environment. Instead, the study will focus on the internal environment derived from the literature review. The framework of this study consists of five constructs—the constraints in financial resources, human resources, technology, entrepreneurial bricolage, and innovation performance. All the measures used to evaluate the internal resource constraints were adapted from other studies. For instance, studies were adapted to measure the constraints in financial resources faced by the SMEs. These constructs consist of five items. On the other hand, studies were adapted where eight items were developed to measure the dimension of the technology constraints. As for the dimension of constraints in human resources were adapted and five items developed to measure this particular construct. The subsequent dimension to the internal resources constraint is entrepreneurial bricolage [52][46] [29] [30].

Eight items got adapted to the previous internal consistency of 0.87, the measurement was chosen. The previous value of Cronbach's alpha ($\alpha \geq 0.8$) for entrepreneurial bricolage was good and therefore the construct was considered reliable enough to be adopted for this research. The dependent variable for this study is innovation performance, which consists of six items. The constructs were derived from the previous works, where the previous internal consistency was at 0.70, which was considered acceptable to be adopted for this study. The questionnaires of this study used the five-point Likert scale ranging from 'strongly disagree' to 'strongly agree' [25][28] [38].

To provide the empirical evidence, this study used PLS-SEM to analyse the data gathered from the survey. Since this study was considered as exploratory, PLS-SEM was considered suitable to be employed. The common practice by PLS users were to establish the evaluation of the measurement model by confirming indicator reliability, convergence validity, internal consistency, and discriminant validity. Next, the evaluation proceeds to a structural assessment. In this assessment, the researcher will test the proposed hypotheses by addressing the relevance of the relationship path as well as evaluate the predictive accuracy of the model. Instead of only confirming the significance of any relationship, PLS-SEM enables the researcher to examine the relevance of the relationship path and evaluates the ability of the predictor constructs to explain the dependent variables. In other words, PLS-SEM enables the researcher to examine the explanatory power of entrepreneurial bricolage in explaining the innovation performance among manufacturing SMEs operating under a resource-constrained environment [31].

4. Analysis and Discussion

4.1 The evaluation of measurement model

Validity and reliability of measurement model for this study has been conducted through PLS-SEM. This study has employed a reflective measurement model and therefore the assessment will covers on internal consistency, individual indicator reliability, convergent validity and discriminant validity. This assessment will provide a detailed summary on validity and reliability of measures that were used in this study. Table 1 shows the summary of measurement model, which consist of values on indicator loading, AVE, composite reliability and cronbach's alpha.

PLS-SEM provide two measures of internal consistency namely cronbach's alpha and composite reliability. Cronbach's alpha is measured, as traditional criterion for internal consistency while composite reliability is another type of reliability measure, which considers the variation of outer loadings among indicator variables. The reliability for a particular construct gets higher as the value of composite reliability increases. Values that ranging from 0.6 to 0.7 are acceptable for exploratory research and according to Table 1, all values of composite reliability for every construct in the model are greater than 0.6, signifying the presence of internal consistency. On the other hand, convergent validity was established through evaluation of indicator loadings and average variance extracted (AVE). The value of indicator loading should be higher than 0.708 while AVE should to be greater than 0.5. In Table 1, all indicator loadings were greater than 0.708 and every construct in the model possessing AVE, which higher than the threshold value, confirming the existence of convergent validity [31].

Table 1: Summary of measurement model

Dimension	Items	Outer oading	AVE	Composite reliability	Cronbach's alpha
Constraint in finance (CF)	CF1	0.811	0.772	0.944	0.926
	CF2	0.888			
	CF3	0.930			
	CF4	0.875			
	CF5	0.886			
Constraint in human resources (CH)	CH1	0.848	0.820	0.958	0.945
	CH2	0.924			
	CH3	0.932			
	CH4	0.909			
	CH5	0.912			
Constraint in technology (CT)	CT1	0.874	0.777	0.965	0.958
	CT2	0.909			
	CT3	0.892			
	CT4	0.904			
	CT5	0.927			
	CT7	0.900			
	CT8	0.685			
	Ct6	0.936			
Entrepreneurial bricolage	EB1	0.833	0.712	0.952	0.942
	EB2	0.876			
	EB3	0.844			
	EB4	0.816			
	EB5	0.866			
	EB6	0.869			
	EB7	0.884			
	EB8	0.756			
Innovation performance	IP1	0.858	0.734	0.943	0.927
	IP2	0.859			
	IP3	0.875			
	IP4	0.859			
	IP5	0.881			
	IP6	0.808			

As the convergent validity has been established, researcher needs to confirm the discriminant validity. This validity assessment confirms whether the assigned items are measuring the variance of their constructs. This study has applied Fornel-larcker criterion to determine the discriminant validity by using latent variable correlation. The value from square root of AVE for a particular

construct needs to be higher than its uppermost association with other construct in order to prove the existence of discriminant validity. By comparing the latent variable correlation and square root of AVE for each construct in Table 2, it is safe to say that all items are measuring their own construct and therefore supporting the evidence of discriminant validity [31].

Table 2: Discriminant validity assessment

Dimension	CF	CH	CT	EB	IP
CF	0.879				
CH	0.393	0.905			
CT	0.648	0.420	0.882		
EB	0.220	0.237	0.139	0.844	
IP	0.178	0.157	0.070	0.709	0.857

4.2 Structural model assessment

As the reliability and validity for measurement model has been confirmed, the next procedure in PLS-SEM is the structural model assessment. This assessment consist of collinearity evaluation, hypotheses testing and model's predictive capabilities. Collinearity evaluation was carried out in order to test the presence of collinearity among constructs. The assessment was carried out through SPSS and collinearity issue was determined through VIF value. The presence of collinearity issue can be detected as VIF value scored greater than 5.0. According to Table 3, the result of collinearity assessment has showed that all predictors construct were not linearly related. This means that each predictor constructs (constraint in financial, constraint in technology and constraint in human resources) contain different phenomenon in explaining entrepreneurial bricolage which highly desirable in regression model [31].

Table 3: Collinearity assessment

Model	Collinearity Statistics	
	Tolerance	VIF
CF	0.561	1.783
CT	0.545	1.834
CH	0.799	1.251
a Dependent Variable: Entrepreneurial bricolage		

As the collinearity issue has been settled, the structural model assessment has proceeded towards hypotheses testing, evaluation of predictive capabilities, predictive relevance and effect sizes. The result on significance test for all relationship in the model was presented in Table 4. According to the Table 4, out of four hypothesized paths, H1, H2, H4 were considered significant as their p-value scored below than 0.1. On the other hand, H3, which represent a path between constraint in technology and entrepreneurial bricolage, have no significant relationship since the p-value scored higher than 0.1.

Table 4: Hypotheses testing

Relationships	Path Coefficient	Standard Deviation	Standard Error	T-Value	P-value	Level of Significant
H1: CF -> EB	0.185	0.087	0.087	2.118	0.035	*
H2: CH -> EB	0.190	0.074	0.074	2.570	0.011	**
H3: CT -> EB	-0.061	0.080	0.080	0.764	0.446	NS
H4: EB -> IP	0.709	0.036	0.036	19.654	0.000	***
*p < .1. **p < .05. ***p < .01.						

This study used coefficient determination or R^2 which known as a common measure applied to estimate structural model. The coefficient characterizes the united effect of predictor constructs (constrain in financial, constrain in human resources and constrain in technology) in explaining entrepreneurial bricolage. According to Table 5, the R^2 value for entrepreneurial bricolage scored at 0.08. This implies that three of its predictor constructs (constrain in financial, constrain in human resources and constrain in technology) have small predictive power in explaining entrepreneurial bricolage. On the other hand, the R^2 value for construct of innovation performance scored at 0.5. Agreeing to rule of thumb, this value considered as moderate in terms of predictive accuracy. Apart from that, this study will also evaluate Stone-Geisser's Q^2 value as in order to determine model's predictive relevance. The Q^2 value has been calculated through the method of cross-validated redundancy. According to Table 5, entrepreneurial bricolage scored at 0.05 while innovation performance scored at 0.37, providing support for model's predictive relevance on behalf of both constructs [31].

Table 5: Model's predictive capabilities

Constructs	R^2 value	Q^2 value
Entrepreneurial Bricolage	0.08	0.05
Innovation Performance	0.50	0.37

In order to examine the relevance of predictor constructs (constrain in financial, constrain in human resources and constrain in technology) in explaining entrepreneurial bricolage, each construct were evaluated by calculating f^2 and q^2 effect sizes. According to Table 6, out of three predictor constructs that explain entrepreneurial bricolage, the construct of constrain in human resources scored highest f^2 value (0.034) then followed by the construct of constraints in financial (0.034) and constraints in technology (0.005). In terms of q^2effect size, similar scenario has been observed as the construct of constrain in human resources scored highest q^2value (0.022) and followed by the construct of constraints in financial (0.014) and constraints in technology (0.002). The rule of thumb for evaluation of both f^2 and q^2 effect sizes were similar as result of 0.02, 0.15, and 0.35 were interpreted as small, medium and large. Therefore, all three predictor constructs are considered small in terms of effect sizes in explaining entrepreneurial bricolage [31].

Table 6: The evaluation of effect sizes

	Entrepreneurial Bricolage		
Relationship Matrix	Path coefficient	f^2 Effect size	q^2 Effect size
CF	0.185	0.024	0.014
CH	0.190	0.034	0.022
CT	-0.061	0.005	0.002

5. Discussion and Implication

This study has investigated the influence of entrepreneurial bricolage behaviour on the innovation performance among manufacturing SMEs in Malaysia under a resource-constrained environment. In addressing the constrained environment, researchers were unable to include all the factors. Owing to this limitation, the study has only focused on the constraining factors from the internal environment of SMEs. By reviewing the relevant literature, this study has pointed out three major constraints faced by SMEs—constraints in financial, human resources, and technology. To examine the impact of these constraints on bricolage behaviour, a framework has been proposed. The proposed framework consists of three dimensions of constraints, entrepreneurial bricolage, and innovation performance. From the framework, the researcher has drawn four hypotheses [33].

The result of this study shows that financial and human resources constraints have a positive significant influence on entrepreneurial bricolage. However, both relationships have little explanatory power, which is translated by a low R^2 value on entrepreneurial bricolage (0.08). This low explanatory power may due to the firms' perception that strongly responds to these constraints. The constraints linked with financial and human resources may be perceived as too great by firms and this outcome may limit their innovation activities. Findings from this study suggested that manufacturing SMEs have not fully overcome their resource constraints, but nevertheless, they have shown a positive sign to embrace innovation, albeit at a slower pace. In future, with decent policies and a support structure promoted by the government, such SMEs will hopefully overcome their resource constraints and maintain their competitive edge through continuous improvement. In addition, the findings also point out that entrepreneurial bricolage has a significantly positive influence on innovation performance with a p-value of less than 0.01. This finding has similarities, where bricolage has a positive effect on innovativeness. Moreover, entrepreneurial bricolage has displayed a moderate explanatory power to innovation performance with R^2 value of 0.5. This outcome indicates that even in a constrained environment, manufacturing SMEs can indulge in innovation by embracing bricolage behaviour in their operations [46][56].

Last but not least, the study confirms a significantly positive influence between entrepreneurial bricolage and the innovation performance of SMEs. In addition, through the concept of bricolage, certain ambiguities are cleared about the methods of innovativeness for SMEs operating in a resource-constrained environment. Despite the non-significant relationship between the technology constraint and entrepreneurial bricolage, this study provides new findings to the theory of entrepreneurial bricolage and provides some insights into the bricolage behaviour among manufacturing SMEs in Malaysia, thereby contributing to the body of literature in academic research [33].

5.1 Limitations and Recommendations for future work

During this study, it initially became quite difficult to get the SMEs to talk about their innovation performances. This is because they are small firms and have fewer opportunities to change the strategy absolutely if it gets copied. So, we had to invoke trust in them with confidential declarations.

Moreover, regarding entrepreneurial bricolage, the SMEs had the same sort of mind to share the issues since the product concepts and designs have the possibility to get stolen or copied since the firms are mostly manufacturing and developing products and we had to deal with utmost care. Furthermore, we had to decide on the number of firms out of a large number of the firms and population in the similar area to determine the sample size. Nevertheless, this study can extend and deal with a few other important constructs like employee rights and employee satisfaction by controlling grievances that will expand the possibilities of the developed frameworks for the SMEs. Future researchers can view this work as a basis and suggest even better frameworks. In the practical arena, if commercial banks open branches to support SMEs with finances, the financial constraint can be reduced as well [5][7][8].

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Conflict of Interest
No conflict of interest.

References

[1] Almeida, H., Hsu, P.H. & Li, D. "Less is more: Financial constraints and innovative efficiency", 2013

[2] Al-Rashidi, Y. A., *Factors Affecting SMEs decision-makers risk perceptions associated with exporting: A comparison study of emerging and advanced markets*, 2012

[3] Andalib, Tarnima W., Azizan, N A, Darun, Mohd Ridzuan, Halim, Hasliza Abdul, "Case Matrices and Connections of Entrepreneurial Career Management Module", International *Journal of Entrepreneurship*, 23(3), 10, 2019

[4] Andalib, Tarnima W., Azizan, N A, Darun, Halim, H A, Sajjad, BM, Sultana US, Danilla N, "Towards building a Conceptual Model for the Primary Educational Institutions via FGD", *Test, Engineering and Management*, 83 , 2020

[5] Andalib, Tarnima W., Azizan, N A, Halim, H A, Adresi, A M, Darun, MR, Sultana, US,"Converged Entrepreneurial Framework integrating blockchain for the SMEs of the emerging economy: Case studies with soft systems analysis", *Test, Engineering and Management,* 83 , 2020

[6] Andalib, Tarnima W., Darun, MR, Halim, H A, "Green Compensation Package of HRM Framework and it's the Supply Chain Management in Bangladeshi Manufacturing Companies' ", *International Journal of Supply Chain Management*, 9 (1), 366-374, 2020

[7] Andalib, Tarnima W., Darun, MR, Halim, H A, "Leading Determinants for Sustainability of SMEs in Bangladesh: Multiple Case Studies", *International Journal of Supply Chain Management*, 9 (2), 175-181, 2020

[8] Andalib, Tarnima Warda and Darun, Mohd. Ridzuan, "An HRM Framework for Manufacturing Companies of Bangladesh Mapping Employee Rights' Protocols and Grievance Management System", Indian Journal of Science and Technology, 11, 17, pp. 1-13,2018

[9] Andalib, Tarnima Warda; Darun Mohd Ridzuan and Azizan, Noor Azlinna. "EastAsian Trends of Human Resources Management: Theories and Practices," International Journal of Human Resources Development and Management, 19,2, 2019

[10] Andalib,Tarnima Warda and Halim, Hasliza Abdul. "Convergence of Conceptual Innovation Model to Reduce Challenges Faced by the Small and Medium Sized Enterprises'(SMEs) in Bangladesh", Journal of Open Innovation: Technology, Market and Complexity 5 (3), 63, 2019

[11] Andalib, Tarnima W., Halim-Abdul, Hasliza, Islam, "Coding mechanism and soft systems technique applied to integrate the fuzzy based Decision Support System with HRM factors in the SMEs of Bangladesh", *IOP Conference Series: Materials Science and Engineering,* 769 (1), 012042

[12] Andalib, T. W.,"A study on convergence of international employee rights within human resources management practices in Bangladesh (Doctoral Dissertation)", Ph. D. Thesis, Universiti Bangladesh Pahang, Pahang, Malaysia

[13] Andalib,T. W., Darun, M. R. & Azizan, N. A. "Frustration of employees: Reasons, dimensions and resolving techniques", WCIK E Journal of Integration Knowledge,In: Proceeding of the World Conference on Integration of Knowledge (WCIK 2013), Langkawi, Kedah, 25-26 November, 1 (11), 15-25, 2013

[14] Andalib, Tarnima W., Darun, Mohd. R, Halim-Abdul,Hasliza,"Reengineered and Integrated Industrial Relations Model for Governance Integrity: Multiple Case Studies in Bangladesh", KnE Social Sciences, 12541270, 2019

[15]Atalay, M.,Anafarta,N. & Sarvan,F. "The relationship between innovation and firm performance:An empirical evidence from Turkish automotive supplier industry", *Procedia-Social and Behavioral Sciences*,75, 226–235, 2013

[16]Baker, T. & Nelson, R. E. , "Creating something from nothing: Resource construction through entrepreneurial bricolage", *Administrative science quarterly*, 50(3), 329–366. SAGE Publications Sage CA: Los Angeles, CA, 2005

[17]Baldwin, J. & Lin, Z., "Impediments to advanced technology adoption for Canadian manufacturers"*, Research policy*, 31(1), 1–18, 2002

[18]Beck, T. & Demirguc-Kunt, "A, Small and medium-size enterprises: Access to finance as a growth constraint", *Journal of Banking & finance*, 30(11), 2931–2943, 2006

[19]Beck, T. & others. "Financing constraints of SMEs in developing countries: Evidence, determinants and solution*s"*, *KDI 36th Anniversary International Conference (pp. 26–27)*, 2007

[20]Brancati, E., "Innovation financing and the role of relationship lending for SMEs", *Small Business Economics*, 44(2), 449–473, 2015

[21]Carroll, L. S. L., "A Comprehensive Definition of Technology from an Ethological Perspective", *Social Sciences*, 6(4), 126. Multidisciplinary Digital Publishing Institute, 2017

[22]Chelliah, S., Sulaiman, M. & Yusoff, Y. M., "Internationalization and performance: Small and medium enterprises (SMEs) in Malaysia", *International Journal of Business and Management*, 5(6), 27.2010

[23]D'Espallier, B. & Guariglia, A., *"*Does the investment opportunities bias affect the investment-cash flow sensitivities of unlisted SMEs?", *The European journal of finance*, 21(1), 1–25, 2015

[24]Darroch, J., "Knowledge management, innovation and firm performance"*, Journal of knowledge management*, 9(3), 101–115, 2005

[25]Denan, Z., Ismail, N. & Amir Ishak, N., "The impact of environmental dynamism on knowledge absorptive capacity-innovation performance relationship amongst manufacturing SMEs in Malaysia", *Social and Management Research Journal*, 6(1), 63–85. Research Management Institute (RMI), 2009

[26]Ferrando, A. & Griesshaber, N., *Financing obstacles among euro area firms: Who suffers the most?,* 2011

[27]Gërguri-Rashiti, S., Ramadani, V., Abazi-Alili, H., Dana, L.-P. & Ratten, V., ICT, innovation and firm performance: the transition economies context*, Thunderbird International Business Review*, 59(1), 93–102, 2017

[28]Gundry, L. K., Kickul, J. R., Griffiths, M. D. & Bacq, S. C., Creating social change out of nothing: The role of entrepreneurial bricolage in social entrepreneurs' catalytic innovations, *Social and sustainable entrepreneurship* (pp. 1–24),2011

[29]Hadjimanolis, A., *The management of technological innovation in small and medium size firms in Cyprus,* 1997

[30]Hadjimanolis, A., Barriers to innovation for SMEs in a small less developed country (Cyprus, *Technovation*, 19(9), 561–570,1999

[31]J.F. Hair, G.T.M. Hult, C.M. Ringle, M. Sarste dt, *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.), Sage, Thousand Oaks, CA, 2017

[32]Halim, H. A., Ahmad, N. H., Ramayah, T. & Taghizadeh, S. K.*, "*Capturing The Pioneering minds' via Human Capital: The Impact on Innovative Performance of Malaysian SME*s*, *Asian Academy of Management Journal*, 21, 2016

[33]Halim-Abdul, Hasliza, Andalib, Tarnima W., Ahmad, N H, Ramayah, T, "The Effects of External Barriers on Entrepreneurial Bricolage among SMEs in an emerging economy", *Test, Engineering and Management,* 83 , 2020

[34]Hanadi, A. & Aruna, M, Technology Innovation for SME Growth: A Perception for the Emerging Economies*, Technology,* 4(3),2013

[35]Hashi, I. & Stoj\vci'c, N., The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4, *Research Policy*, 42(2), 353–366, 2013

[36]Hewitt-Dundas, N., Resource and capability constraints to innovation in small and large plants, *Small Business Economics*, 26(3), 257–277, 2006

[37]Hoegl, M., Gibbert, M. & Mazursky, D., Financial constraints in innovation projects: When is less more?, *Research Policy*, 37(8), 1382–1391, 2008

[38]Johannessen, J.-A., Dolva, J. & Kolvereid, L., Perceived innovation success in the Russian market, *International Journal of Information Management*, 17(1), 13–20, 1997

[39]De Jong, J. P. & Den Hartog, D. N. , "How leaders influence employees' innovative behaviour", *European Journal of innovation management*, 10(1), 41–64, 2007

[40]Kemp, R. G., Folkeringa, M., De Jong, J. P. & Wubben, E. F., *Innovation and firm performance. EIM Zoetermeer*, The Netherlands, 2003

[41]Kocak, A., Carsrud, A. & Oflazoglu, S., "Market, entrepreneurial, and technology orientations: impact on innovation and firm performance", *Management Decision*, 55(2), 248–270, 2017
[42]Kumar, V., Kumar, U. & Persaud, A., "Building technological capability through importing technology: the case of Indonesian manufacturing industry", *The Journal of Technology Transfer*, 24(1), 81–96, 1999
[43]Lee, K. W., *Skills training by small and medium-sized enterprises: Innovative cases and the consortium approach in the Republic of Korea,* 2016
[44]Lee, R., Lee, J.-H. & Garrett, T. C., "Synergy effects of innovation on firm performance", *Journal of Business Research,* 2017
[45]Lefebvre, L. A., Mason, R. & Lefebvre, E., "The influence prism in SMEs: The power of CEOs' perceptions on technology policy and its organizational impacts", *Management science*, 43(6), 856–878, 1997
[46]Madrid-Guijarro, A., Garcia, D. & Van Auken, H., "Barriers to innovation among Spanish manufacturing SMEs", *Journal of Small Business Management*, 47(4), 465–488, 2009
[47]De Massis, A., Audretsch, D., Uhlaner, L. & Kammerlander, N., "Innovation with Limited Resources: Management Lessons from the G erman M ittelstand", *Journal of Product Innovation Management*, 35(1), 125–146, 2018
[48]Mubarik, M. S., *Human Capital and Performance of Small & Medium Manufacturing Enterprises: A Study of Pakistan,* 2015
[49]Muda, S. & Rahman, M. R. C. A., ″Human capital in SMEs life cycle perspective", *Procedia Economics and Finance*, 35, 683–689, 2016
[50]Oum, S., Narjoko, D. & Harvie, C., *Constraints, determinants of SME innovation, and the role of government support*, ERIA Discussion Paper Series, (2014-10), 2014
[51]Pissarides, F., Singer, M. & Svejnar, J., "Objectives and constraints of entrepreneurs: evidence from small and medium size enterprises in Russia and Bulgaria", *Journal of comparative economics*, 31(3), 503–531, 2003
[52]Prajogo, D. I. & Ahmed, P. K., "Relationships between innovation stimulus, innovation capacity, and innovation performance", *R&D Management*, 36(5), 499–515, 2006
[53]Rahman ,2017
[54]Griffith University.Roos, J., "Exploring the Concept of Intellectual Capital (IC"), *Long Range Planning*, 1(31), 150–153, 1998.
[55]Schoonhoven, C. B., Eisenhardt, K. M. & Lyman, K., "Speeding products to market: Waiting time to first product introduction in new firms", *Administrative Science Quarterly*, 177–207. JSTOR., 1990
[56]Senyard, J., Baker, T., Steffens, P. & Davidsson, P., "Bricolage as a path to innovativeness for resource-constrained new firms", *Journal of Product Innovation Management*, 31(2), 211–230. Wiley Online Library, 2014
[57]Shafi'i, M. & Ismail, N. W., Innovation and Productivity: Evidence from Firms Level Data on Malaysian Manufacturing Sector, *International Journal of Economics \& Management*, 9(1), 2015
[58]SMEcorp., *SME Development and Outlook*. Retrieved 25–6, 2018, fromhttp://www.smecorp.gov.my/images/SMEAR/latest/ChapteR2.pdf, 2017
[59]SMEcorp Malaysia., *SME Definition*, Retrieved 3–7, 2018, fromhttp://www.smecorp.gov.my/images/SMEAR/Appendix_4.pdf, 2017
[60]Lvi-Strauss, C., *The savage mind*, University of Chicago Press, 1967.
[61]Subrahmanya, M., Hussain, Z. & Chand, M. A., "External technology acquisition of SMEs in the machinery industry of Bangalore", *Asian Journal of Innovation and Policy*, 3(1), 50–71, 2014
[62]Teece, D. J., Pisano, G. & Shuen, A., "Dynamic capabilities and strategic management", *Strategic management journal*, 18(7), 509–533, 1997
[63]Wahab, S. A., Rose, R. C. & Osman, S. I. W., "Defining the concepts of technology and technology transfer: A literature analysis", *International business research*, 5(1), 61, 2012.
[64]Wu, L., Liu, H. & Zhang, J., Bricolage effects on new-product development speed and creativity: The moderating role of technological turbulence, *Journal of Business Research*, 70, 127–135, 2017