The Relationship of Technological Innovation Capabilities and Business Innovation Capabilities on Organization Performance:

Preliminary Findings of Malaysian Food Processing SMEs

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***Abstract*— Due to the increasing of global competitive pressure, shortened product life cycles and ease of imitation, organizations must continue to innovate to ensure the organization sustainability. One of the major factors contributing to organization sustainability is innovation. Previous studies have shown significant impact of organizational innovation capabilities on product and service quality. Literature has identified various types of innovation in organization. Among them are business innovation capabilities and technological innovation capabilities. In the Malaysian context, business and technological innovation capabilities-related research, particularly among food SMEs are still not comprehensive. Many studies have overlooked at the process of successful TIC building in the industrialization of developing countries. To address the gap, this current empirical research identifies the relationship of BIC and TIC components at 30 Malaysian food SMEs in northern area. Using case study approach, the questionnaires were distributed among the top and middle management level staff. A total of 30 respondents involved in the survey. Data were analyzed using descriptive and inferential techniques. The study found that, BIC and TIC have moderate relationship on organizational performance. Business innovation capability was found to have the most influential impact. The findings could help food SMEs particularly in order to increase the level of innovation. The paper finalizes with some conclusions for industry and other actors, and also future research.**

Keywords—Business Innovation Capabilities; Technological Innovation Capabilities; Organization Performance

I. INTRODUCTION

In a period of rapid change, the only ones who survive are those who innovate and create change. Inability to know how to innovate is the single largest reason for the failure of new ventures. Innovation is defined as exploiting new ideas leading to the creation of a new product, process, service or system for the benefit of others or organization [1]. A study done by The Associated Chinese Chambers of Commerce & Industry of Malaysia in 2012 confirmed that all businesses want to be more innovative. The study revealed, 31% of the respondents, practice innovation activities to enhancement the quality of products and services, whereas 12% or 116 respondents indicated that innovation activities are not important to them [2]. Based on a survey conducted by [3], most SMEs practiced incremental innovations rather than radical innovations, and more engaged with product innovation than with process and service innovation. In term of organization size, according to [4] findings, SMEs in low-technology industry are more likely to innovate compared to their counterparts in medium-high technology industry. Previous research on innovation have impacted SMEs in many ways; such as 30% increment of sales [5], increase technical skill and workforce productivity [6].

II. RESEARCH BACKGROUND

A. Innovation in Food SME

The impact of innovation on firm performance has been a matter of significant interest to economists and policy makers for decades. Although innovation is generally regarded as a means of improving the competitiveness of firms and their performance on domestic and foreign markets, this relationship has not been supported especially in the context of food SMEs. There are significant gaps in the research base on innovation in the food industry specifically studies that discuss drivers of innovation, types of innovation, and innovation orientation in food sector [7][6]. Recognizing its importance, in recent years, the relationship between innovation among food SMEs and firm performance has been modeled by various indicators. However, most of the studies carried out in the agricultural setting among European countries [8][9]. Studies dedicated to innovation in the food processing sector are still less carried out, particularly from Malaysia. There are only a few researchers who conducted the survey among SMEs based foods such as [10][11][12]. Through previous studies conducted in Europe, the food sector has a pattern of innovation that is different from the manufacturing sector. Food SMEs develop more process innovations, than product innovations, and that the majority of product innovations are

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incremental. Additionally, [6] argued that food SMEs are involved in incremental product and process innovations with a low rate of radical process innovations [13].

Although the effects of TIC, BIC and its influence on organizational performances have been discussed by previous scholars, there are limited empirical examinations that investigate the relationship from Malaysian context specifically from food industries. Most previous studies relating to innovation in Malaysia focuses more on manufacturing sector [14] and telecommunication and ICT based industries [15]. To bridge the gap in existing literatures, this study aims to examine the relationships of BIC and TIC on organization performance.

III. LITERATURE REVIEW

A. Technological Innovation Capabalities (TIC)

The study define TIC as the ability to continuously transform knowledge and creative ideas into new products, processes and systems with the support of technology for the benefit of the organization and its stakeholders. There are three main elements in TIC; (i) the development of organizational resources (e.g. knowledge, skill experience and products), (ii) adaptation of organization's system and structures with technology changes and (iii) inter-organizational interactive relationships [16]. TIC can only be achieved through a complex process and it is time consuming process. TIC is much related to the R&D expenditure, R&D intensity and manpower [17]. Organizations with low level of TIC tend to follow a common organization growth pattern in which firm's growth gradually declines over times. Meanwhile, firms with high TIC tend to exhibit either a sustained or able to withstand the competitive pressure depending on the initial size of the organization's technological knowledge stock. In the case of Malaysia, SMEs in Malaysia are still not achieve the desired technological capabilities where almost all the studies carried out show the efficiency of using the technology is below the 80% that resulted in the total loss of production by 32% [18]. The key to increase the TIC level is through the efficiency with which the innovation process is undertaken [17]. Hence, the capabilities are relatively important for a firm's sustainable development. According to [19], there are four types of TICs:

1. The capacity to satisfy the market/customer requirement.
2. The capacity of produce the product using appropriate technologies.
3. The capacity of to satisfy the future needs.
4. The capacity to respond to unanticipated technology activity brought about by competitors and unforeseen circumstances.

Previous researchers measured TIC with various measurement criteria. Yam et al. [20] for example measures TIC by 7 dimensions; learning capability, R&D capability, resource allocation capability, manufacturing capability, marketing capability, organizational capability, and strategic planning capability. Meanwhile, [21] measured TIC by 3 dimension; investment capability, product capability and linkage capability. However, in this study we measure TIC in terms of learning capability, resource allocation capability and manufacturing capability. We argued that not all SMEs in Malaysia are R&D intensive, even in the biotechnology sector is still lacking of R&D investment. Ortega-Argiles et al. [22] and [5] stated that SMEs are generally have low invest in R&D due limited resources and knowledge on R&D. This is one of the reasons why many innovation projects at SMES are either abandoned or delayed [23].

I. Learning Capabality (LC)

Covin, J G [24] defined learning capability as "the capacity to generate ideas with impact, across multiple boundaries, and through specific management initiatives". Meanwhile [20] defined learning capability as the firm's ability to identify, assimilate, and exploit knowledge from the environment. Thus, learning capability enhances the speed of the technological learning. Learning results in generation of knowledge and skills needed for firms to choose, install, operate, maintain, adapt, improve, and develop technologies [25]. [26] opined that a higher level of organizational LC are highly influenced by higher levels of exploitative activities such as the accumulation of technical expertise, exploitation of current knowledge and skills, consistently improve product quality and engage in R&D activities. Learning is one of the most valuable assets for innovation. Many literatures have reflected that firm-level technological advancement is conceptualized as a learning process. Learning capability enhances technological learning through the open-mindedness, experimentation and systems perspective [27]. Leonard-Barton [28] and [29] has found positive association of organization learning on organizational innovation. In similar vein, recent research done by [30], [31] confirmed that learning capability and manufacturing capability gives the highest impact on product performance. Learning capability helps the organization to improve organization's problem solving skill, experimentation and integration of external knowledge and continuously involved in innovation activities [28].

II. Resource Allocation Capability

Resource allocation capability is defined as a firm's ability to mobilize and expand its technological, human, and financial resources in the innovation process [20]. Resource is always a critical factor for all kinds of activities and processes. Evangelista et al. [32] propose that technology resources are going to increase its importance as a strategic factor for firm's performance in near future. Human resources are other crucial issues for innovation performance. Jacobsson et al. [33] put forward the use of statistics on company staff with higher education in engineering and science as a technological innovation performance indicator. Research done by [34] has proved that higher levels of educational qualifications among the staff were found to correlate with enhanced firm innovation capacity. Human capital is an important element of regional science and technology innovation capacity resources, and is the carrier of knowledge. In addition, technological innovation activities cannot be carried out if there is no support of finance. Radas & Bozic [23] argued that

the major obstacles for introducing technological innovation are of an economic nature (i.e. lack of fund within enterprises and outside fund). A few studies also found that resource allocation capability enables firm to sustain global competitiveness [35], [36]. Therefore, SMEs need a proper procedure or decision in resource allocation strategy. A company with a good resource allocation capability may help in their company production process.

III. Manufacturing Capability

Manufacturing capability is defined as a firm's ability to transform R&D results into new products which meet market needs, and to attach importance to overall quality control and continuous improvement of manufacturing systems. The capacity of manufacturing may not only guarantee the success of the transformation of R&D outcome into product, but also ensure its quality suits customer's needs. According to [37] manufacturing capabilities improve technological learning in various ways such as;

i. Increase vendor quality contribution to the speed of production,
ii. Strengthen the quality control activities and enhance the success of pretesting new products and processes,
iii. Customization of products and processes according to customers demand,
iv. Increase level of new product flexibility (i.e. the ability to introduce new products to be manufactured) [38], and
v. Enhances the speed and volume of product/service introductions.

B. Business Innovation Capabilities (BIC)

Business innovation capabilities is based on changes introduced in the organizational structure of the company and the administrative process, aspects that are more related to management than with the organization's main activities. According to [39], business innovation consists of new organizational structures, administrative systems, management practices, processes, and techniques. Examples of this type of innovation include total quality management (TQM), just-in-time production, and quality circle, cost accounting and 360 degree feedback.

I. Administration Innovation

Damanpour & Arvind [39] defined administration innovation as the introduction of new internal processes and practices to improve productivity/ reduce costs. Meanwhile, [40] defined administrative innovation as performance derived from the changes to organizational structure and administrative process, reward and information system, and it encompasses basic work activities within the organization which is directly related to management. From this perspective, administrative innovation is considered as a part of process innovation. In similar vein, [41] measured administrative innovation in four criteria; the development of new channels for products and services, customer engagement and feedback, computer-based administrative, new employee reward/training schemes and new departments or project teams. Administrative innovation is highly dependent to the top management support and innovation policy.

II. Management Practices

Birkinshaw and Mol [42] defined management of innovation as "as the generation and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals". Mol & Birkinshaw [43] further postulated that management innovation should address 4 main questions; (i) what is being innovated? (ii) Is the innovation new to the organization that implement it or new to the state of art? (iii) Does management innovation involve conceptualizing a new practice or implementing a new practice, or both? And lastly (iv) what are the activities taken to improve organizational performance? In the study, management practices are measure in terms of the management of innovation, new innovation strategy and management commitment towards innovation. Management practices can be view in four perspectives; institutional perspective, fashion perspective, cultural perspective and relational perspective. In the context of this study, we intended to look at the role of managers in inventing and implementing new management practices. This perspective build on the stance that an individual puts forward an innovative solution to address a specific problem that the organization is facing, and he or she then champions its implementation and adoption. The relational perspective will later relate with the innovation strategy made by the organization. Innovation strategy is conceptualized as an articulation of the organization's commitment to the development of products that are new to itself and/or to its markets [44]. In the literature, scholars principally have adapted measures from strategic management research to explore the existence, nature and extent of innovation strategy.

III. Organizational Structure

Organizational structure concern the way staff are grouped. There has been considerable work on the situational and psychological factors supportive of innovation in organizations. Indeed, it has been widely demonstrated that the perceived work environment (comprising both structural and cultural elements) does make a difference to the level of innovation in organizations. According to [45], centralization organization structure is more favored when innovative opportunities in the industry are moderate and when innovative opportunities are richer or the ideas is complex. When instead innovative opportunities are sufficiently rich then decentralization is more likely to be preferred.

C. Organization Performance

There are five ways of measuring SME performance; quality, time, finance, customer satisfaction and human resource. Accounting or finance measures such as sales growth, return on sales, return on assets, and return on equity are commonly used performance indicators in a range of fields such as entrepreneurship. Although the firm performance in financial terms is always the best indicator, firms would not easily reveal any confidential financial information and different firms might adopt varied accounting conventions in

their inventory valuations, depreciation, and salaries computation. And for some cases the data is obsolete and note properly record. Alternate measures should be used to secure adequate responses. We therefore use three types of performance indicators in this study; sales performance, speed to market and new product performance. Those measures are widely adopted in different innovation studies and appropriate to the context of Malaysian SMEs.

IV. CONCEPTUAL FRAMEWORK AND HYPOTHESES

This study is a continuation work done by [46]. The study involved two main independent variables; TIC and BIC, while the dependent variable is organizational performance. Among the seven factors of the TIC, only three factors will be used in the research, namely; learning capability, resource allocation capability and manufacturing capability. For BIC measurement, the study adapted the measurement instrument designed by [47] in order to achieve construct validity. Fig. 1. visualizes the conceptual framework used in this research. The framework consists of a dependent variable, organization performance, and two explanatory factors: (i) Technological Innovation Capabilities (TIC) and (ii) Business Innovation Capabilities (BIC). The framework builds upon the model developed by [20], with different context of study. According to this model, it is suggested that the greater the presence of TIC and BIC, the higher the level of organization performance. We develop two hypotheses based from the framework. The hypotheses are as follows;

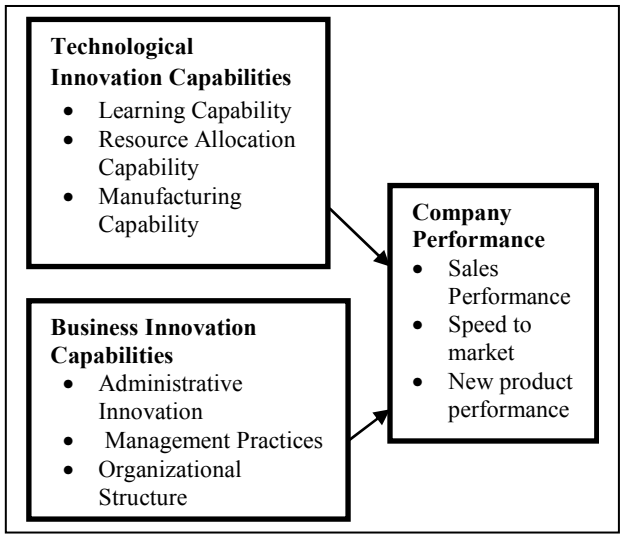

Fig. 1. Conceptual Framework.

- H_1: Technological Innovation Capabilities (TIC) are positively correlated to organization performance
- H_2: Business Innovation Capabilities (BIC) are positively correlated to organization performance

V. RESEARCH METHODOLOGY

In order to verify the conceptual framework, a survey was conducted among small food firms at Malaysia northern area. Questionnaires were chosen to collect data, as they were deemed suitable for gathering a large amount of data and collecting accurate information [48]. Quantitative research method is suitable for measuring phenomena and enables this study to generalize in identifying innovation patterns. Although the research is still at the initial stage, yet the measurement items can be replicate by future researchers. Besides, questionnaires are also the main method of data collection in many previous innovation studies [7][6][4]. The target population included small food manufacturing organizations with between 3 and 50 employees. Purposive sampling was used in the survey. We employed purposive sampling because of a high power distance country such Malaysia, usually achieved low response rate [49] compared to western countries. Furthermore, the study is done at the organizational level. The targeted respondents of the survey were managers, engineers and production line technical support. The information obtained from the questionnaires was coded. Data were analyzed using SPSS 19.0 (Statistical Package for Social Science). Multiple Linear Regression (MLR) analysis was used to test the hypotheses. Prior to using the MLR, testing of multivariate assumptions which include normality distribution testing, univariate correlation, homoscedasticity and independence of error terms were conducted.

To determine whether there is a positive correlation between TIC and BIC on organizational performance, Pearson correlation test based on the Guildford's (1973) Rule of Thumb was used as shown in Table 1.

TABLE I. RULES OF THUMB FOR SIZE OF A CORRELATION COEFFICIENT

Size of Correlation[a]	*Interpretation*
.90 to 1.00 (-.90 to –1.00)	Very high positive (negative) correlation
.70 to .90 (-.70 to -.90)	High positive (negative) correlation
.50 to .70 (-.50 to -.70)	Moderate positive (negative) correlation
.30 to .50 (-.30 to -.50)	Low positive (negative) correlation
.00 to .30 (.00 to -.30)	Little if any correlation

[a] *Adopted from Guildford (1973)*

Likert scales were used in the section B, section C and section D of the questionnaire. Respondents answer their respond towards the ranking given which are value ‘1” represent strongly disagree, “2” represent disagree, “3” neutral, “4” represent agree, and “5” represent strongly agree.

VI. DATA ANALYSIS & RESULTS

A. Reliability Statistics

This study used Cronbach's Alpha to determine the reliability of the item measurement. Table II. indicates the result. The study achieved a total value of 0.914 with 30 respondents with each sub dimensions has achieved the suggested threshold value of 0.7 for an acceptable level of reliability [50].

TABLE II. RELIABILTY STATISTICS

Factors	Measurement	CA[b]	N of items
TIC	Learning Capability	0.691	3
	Resource Allocation Capability	0.845	4
	Manufacturing Capability	0.801	3
	TOTAL	**0.852**	**10**
BIC	Administration Innovation	0.705	5
	Management Practices	0.809	8
	Organization Structure	0.736	7
	TOTAL	**0.855**	**20**
Organization Perfromance	Total	0.779	5

[b.] Cronbach's Alpha.

B. Demographic Profiles

The majority of the respondents are female 17(56.7%), while only 13(43.3%) are male respondents participated in the survey. Of the total respondents, 7 respondents are among the top-level management, while the rest are middle level management. The organizations have employees who have work experience that is almost balanced. Most of the respondents have work for the company for more than 8 years (10 respondents). On average, the organizations have managers with experiences of 4-7 years in production.

C. Descriptive Statistics

To test the hypotheses, we first employed descriptive statistics (e.g. mean and standard deviation) for each dimensions. Table III shows the results obtained through descriptive statistics. From the BIC measurement, the item mean *of the feedback on employee performance and staff knowledge* is the highest with the mean of 3.80 and standard deviation of 0.761. While the item mean of *change price when company faced with pressure to lower the prices from competitors* achieved the lowest mean among all (mean of 2.47 and standard deviation of 0.681). This shows that the companies are confident that the products are of high quality and in accordance with the prices offered in the market.

TABLE III. DESCRIPTIVE STATISTICS

Factors	Num. of Item	Mean	Std. Dev
Technological Innovation Capabilities	9	3.87	0.497
Business Invocation Capabilities	20	3.29	0.368
Organizational Performance	5	3.45	0.486

From the TIC measurement, the highest mean score is 4.20, and the element is *work teams encouraged to identify opportunities for improvement* with the standard deviation value is 0.761. Meanwhile, the *capability of manufacturing personnel* item get the lowest mean compared to other elements in the TIC with the mean of 3.53 and standard deviation of 0.730. For the dependent variable-company performance, the element with the highest mean is *company sales growth* with standard deviation of 0.648. While the lowest mean is *new product development* with the value 2.30 and 0.596 for standard deviation. This is in line with findings by [34]. They claimed managers in SMEs concentrate on efficient day-to-day operations, as opposed to focusing on new product development.

D. Hypotheses Testing

The study employed Multiple Linear Regression analysis to test the hypotheses developed earlier. Result in Table IV. indicates the Pearson correlation between TIC and organizational performance is 0.568. Based on the Guildford's (1973) Rule, the relationship is in moderate level. In this test, there were 32.2% variation (R^2) can be explained by the independent variables, while 67.8% is unexplained. Thus, hypothesis H_1 is accepted at significant level $p<0.00$.

TABLE IV. RELATIONSHIP OF TIC AND BIC TOWRADS ORGANIZATIONAL PERFORMANCE

	Pearson Correlation, R	***R Square***	***p***
TIC	0.568	0.322	0.001
BIC	0.613	0.376	0.000

Meanwhile, the Pearson correlation for BIC is 0.613.The relationship also shows a moderate level. In this test, there were 37.6% variation (R^2) can be explained by the independent variables, while 62.4% is unexplained. Hence, hypothesis H_2 is accepted with significant level of $p<0.001$. In conclusion, all developed hypotheses were supported and null hypotheses were rejected.

VII. CONCLUSION & RECOMMENDATION

This study was conducted to examine the relationship between the dependent variable (organizational performance) with the independent variables (Business Innovation Capabilities and Technological Innovation Capabilities). This study aims to prove that the independent variable have significant relationship against the dependent variable.

Although empirical research measuring innovation impact towards SMEs performance have been done in various sector; yet, research generates some contradictory results, arguably as a result of the different sectors in which the studies have been conducted. Accordingly, this study is significant and could help models development in particular model of innovation among SMEs. From past literature, the effectual use of technological innovation capabilities and business innovation capabilities are the key that unlocks the innovativeness in a firm. The suggested model is deemed valuable to both practitioners as well as managers as it will prepare them towards improving the organizations' innovation performance. Overall, there is a moderate relationship between the independent and dependent variable. The findings this study also indicate that, in Malaysian food processing SMEs, TIC

and BIC has significantly impacts on organizational performance, which are confirmed by previous studies [51], [7]. This study has shown that SMEs in the food processing sector, at least, has been involved with the activities that contribute to the development of technical and business innovations. The practitioners in food sector SMEs can use the developed framework to benchmark their innovation activities and further develop their innovation strategy to better manage the range of types of innovation.

This study also not spared from certain limitations. These findings are still limited to a specific region of northern Malaysia. Language constraints also resulted in some respondents did not understand the meaning conveyed by the researchers. The small sample limits the findings generalization in different regions since the study was still ongoing in several other regions. The finding is valid for the food manufacturing sector. Different manufacturing sectors are likely to have different results. To obtain more accurate results and comprehensive, research done in future should be extended in terms of data collection and the number of respondents involved. This is very important because the accuracy of analysis found would be more reflective. It is important that future research to acknowledges and accommodates the full diversity of types of innovation. Yet, further develops innovativeness scale in Malaysian context.

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