

The impact of monitoring and business assistance intensity on Malaysian ICT incubatees' performance

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Abstract. Business incubation has been known in the literature as an economic development tool. Around the world, and in the developing countries particularly, business incubation is deployed to stimulate the growth of small-to-medium sized enterprises or SMEs, which are the lifeblood for many countries. Malaysia's business incubation system has been established since the 1980s and in line with the country's aspirations to become a developed nation by year 2020, much has been done by the government to catalyse the growth of SMEs, particularly, ICT SMEs. Despite establishing numerous ICT incubators over the two decades, the process involved in assisting new entrepreneurs in the incubators remains fragmented. This paper examines a component critical to the business incubation process: monitoring and business assistance intensity and its impact on the performance of incubates. Quantitative method was deployed with a total of 118 incubatees from ICT incubators in Malaysia responding to an online survey questionnaire. Multinomial logistic regression analysis revealed that monitoring and business assistance intensity is statistically significant in predicting incubatee performance. The findings will provide valuable information for entrepreneurs, business incubator managers, and policy-makers on best practices of incubation management and benchmarking towards fourth-generation incubators. This paper fills the gap in the current incubation literature, contributing in several aspects including empirical data, methodology, and noteworthy findings regarding the Malaysian incubation phenomenon.

1 Introduction

The increasingly important role of business incubation as a useful strategy and effective method to accelerate growth and development of technology-based small and medium sized enterprises (SMEs) has been widely acknowledged in the economic and entrepreneurship literature [40] [28] [1] [44]. [3] state that incubators are known for their role to accelerate the growth of new businesses and to create vast employment opportunities through the generation of new businesses. Further, international benchmarking studies, such as the Global Entrepreneurship Monitor (GEM) agrees that new businesses play an important role in enhancing the nation's competitiveness through enhanced degrees of innovativeness and the exploitation of new knowledge and technology. Additionally, incubators have also been suggested to reduce failure of new businesses. These are among the main agendas of business incubators that have been highlighted in extant entrepreneurship literature.

According to [37], despite the growing body of business incubation research, literature on business incubation effectiveness suffers from several

deficiencies, including definitional incongruence, descriptive accounts, fragmentation and lack of strong conceptual grounding.

Notwithstanding the growth of research on this domain, understanding of how entrepreneurs and their businesses develop within the business incubator environment remains limited. Given the importance of relational, intangible factors in business incubation and the critical role of business incubation management in orchestrating and optimising such factors, it is suggested that theorising efforts would benefit from a situated perspective.

Hence, notwithstanding the growth of research in this domain since the early efforts to provide frameworks that link business incubation with the incubatee development process [33] [13] [46], there is still a need to understand "how" and "why" incubatee firms grow in a business incubator environment, in processual and longitudinal mode. This paper fills the gap in the current incubation literature, contributing in several aspects including empirical data, methodology, and noteworthy findings regarding the Malaysian incubation phenomenon.

2 Literature review

The NBIA defines business incubator as ‘a business assistance program targeted to start-ups and early stage firms with the goal of improving their chances to grow into healthy, sustainable companies’ [4]. Alternatively, the [10] defines business incubator as ‘a new hybrid type of economic development facility that combines features of entrepreneurship, business facilitation and real estate development’.

The development of business incubation practices has been a subject of significant interest because of its proven ability in stimulating economic growth through job and wealth creation as seen in the United States and the United Kingdom [30] [52] [12]. The reported impacts of business incubation have largely been in the increased number of SMEs as well as increased competitiveness in new venture creations. Subsequently, business incubators are also known to create employment opportunities [8] and have impacted gross domestic product (GDP) of countries such as the US and China [38]. Various agencies from the public and private sectors as well as research institutes and universities have taken deep interest in business incubation, leading to the accumulation of literature on the subject matter [17] [51] [27].

2.1 Monitoring and Business Assistance Intensity

Monitoring of incubatees and providing business assistance to the incubatees have been part of incubator services for quite some time. Literature on incubation acknowledged the need for incubatee monitoring to ensure that businesses progress smoothly at the incubators [49] [41] [19] [13] [20] confirm in their studies that monitoring of incubatees is a source of value that incubators can offer to their incubatees. [7] views it as a critical success factor for incubators. [47] confirmed in their study that business assistance is associated with business incubation performance.

[43] highlighted the significance of monitoring, or coaching, which is referred to as training and educational workshops offered, seminars, programs, either for a fee or free of charge to the incubatees as factors associated with increasing incubatee graduation rates. [19] stated that the incubation process needs to include monitoring and evaluation of incubatee progress to commercialise business ideas, but warned that an overly formal system has the potential to inhibit entrepreneurial flair and thus may fail to take account of the bespoke nature of business development.

2.2 Time Intensity

Studies show that frequent interaction with incubator management creates a better relationship and ultimately contributes to the incubatees’ and incubators’ success [36] [21]. From a social-capital perspective, more frequent counselling interactions

enable the creation of stronger ties that facilitate transfer of knowledge and learning between the incubator management and the venture. This includes venture learning from the incubator management, and for incubator management to learn about the needs of the venture, thus allowing them to offer relevant assistance [21]. The authors hence postulated more frequent counselling interactions can lead to both better business and technical assistance.

Furthermore, [34] suggested that the relationship between the incubator manager and the incubatee is of some importance to the development of the business proposal. A study by [15] found in the context of university incubators that incubator management must form closer ties with incubatees to ensure incubator success. A model proposed by the authors suggests an integrative framework encompassing the involvement of incubator management and the sharing of duties with each incubatee. Rice [34] postulated incubator manager-incubatee dyads co-produce the incubation process, implying that the time intensity of business assistance interventions must be strategically allocated by the incubator manager to the incubatees, and that incubatees must be properly prepared to utilise the advice and insights resulting from such intervention.

[21] acknowledged that prior research supports the notion that counselling interactions are a valuable form of business assistance. They further suggested that more frequent counselling interactions will allow the incubator management to learn better about the needs of the venture, and thus offer more relevant business assistance [48] and the transfer of related knowledge, either directly or by support to the venture to utilise the incubator network successfully [34]. Alternatively, [9] found that advice and frequency of interaction between incubator managers and incubatees do not have a positive influence on economic performance, particularly on job creation.

2.3 Comprehensiveness and Quality

The types of business assistance that incubators claim to provide include administrative-related assistance and services, production-related advice, and operations-related advice [23] [26]. Several studies revealed that the level of business assistance provided at the incubators has a positive influence on the incubation process outcome [34] [48] [5]. The [38] study revealed that while there is no strong correlation between business assistance practices of the incubators and outcomes such as incubatee sales and revenue growth, positive correlations were found between assistance practices and equity investment, patents, research grants, and copyright and licensed intellectual property. Despite that, studies have shown that the range of business assistance provided by a business incubator is instrumental in business incubation success [25].

Literature suggests that incubators ensure the quality of their services by regularly reviewing and obtaining feedback on them [22] [32]. The literature

also reveals that incubator managers actively and continuously seek ways to improve the level of customer service satisfaction inside the incubator [45]. Consistent with the findings from a recent study comparing technology incubators and non-technology based incubators in North European Union countries [11], [25], [6] and [22] confirmed that the quality of business assistance provided is essential for successful business incubation.

[44] acknowledged incubator development as one of the main prongs of business incubator-incubation research, alongside research done at incubatee level, entrepreneur level, and system level. Research suggests that incubator level research involves issues that generally relate to the institutional aspects of the incubator; for example, profile of incubators, examination of the physical constitution of incubators, benefits of co-locating within incubators, types of services at the incubators, best practices of business incubators and critical elements of success of the incubators. Incubator level research has been undertaken quite extensively with the purpose of profiling the incubator types according to their objectives, services and facilities offered and their role in enhancing the economic development. Among the studies that have considered the issues related in the incubator level include [2] view on positive environment for entrepreneurs provided by the incubators and [16] study on the role played by incubator organizations in promoting growth-oriented firms. Both studies discussed incubator characteristics and the relationship between incubators and small firms. Similar-themed studies were also found in [14] and [31] where topics discussed include business incubator life cycle, types of funding available for incubators, benefits of incubation, and how incubators play a role in developing new enterprises. Another key research that was done in this area was by [50] where they suggested that business incubation is an effective development tool and requires modest investment while providing excellent return on investment to regional economies.

3 Research Methodology

The objective of this research is to empirically examine the impact of monitoring and business intensity on incubatee performance. To meet this objective, we have addressed the following research question:

To what extent does Monitoring and Business Assistance Intensity impact on the incubatee performance?

3.1 Research design

The study adopts the quantitative approach using survey questionnaire to solicit response from incubates. The survey questionnaire link was distributed via email and in person to 180 ICT incubatees from ICT incubators in Malaysia. The survey yielded a response rate of 65% where 118 valid responses were considered for analysis. The survey questionnaire was developed by the researcher incorporating previously tested and validated scales by [25] and current incubation literature.

‘Monitoring and Business Assistance Intensity’ refers to “the degree to which the incubator monitors and helps incubatees with the development of their ventures, including helping them to learn about risks involving the resources invested in a business, and about containing the cost of potential (terminal) failure” [47]. [47] state that the time intensity of assistance provided, comprehensiveness of assistance provided, and the quality of the assistance provided all characterised this component of business incubation process. ‘Time intensity of assistance provided’ refers to “the percentage of working hours devoted to monitoring and assisting incubatees” [47], while ‘comprehensiveness of assistance provided’ is a measure [47] adapted from [26], and it refers to “the degree to which strategic, operational, and administrative-related assistance are provided by the incubator to the incubatees” [47]. Table 1 presents the items used to measure the Monitoring and Business Assistance Intensity construct.

Table 1: Items for Monitoring and Business Assistance Intensity

Monitoring and Business Assistance Intensity (1=Strongly Disagree, 5=Strongly Agree)
<p>Time intensity</p> <p>Q1. On average, our company receives appropriate time in assistance</p> <p>Q2. On average, our company spends appropriate time interacting with other incubatees in the incubator</p> <p>Q3. On average, our company receives sufficient time working directly with the incubator manager</p> <p>Q4. Our company reduces the likelihood of making expensive business mistakes through the interactions with incubator manager and other incubatees.</p>
<p>Comprehensiveness and quality</p> <p>Q5. Our company receives business planning assistance from the incubator</p> <p>Q6. Our company receives business feasibility analysis assistance from the incubator</p> <p>Q7. Our company receives administrative assistance and services from the incubator</p> <p>Q8. Our company receives production-related advice from the incubator</p> <p>Q9. Our company receives operations-related advice</p>

from the incubator
 Q10. The incubator regularly validates quality of potential new strategic service providers
 Q11. Our incubator ensures the quality of its services by regularly reviewing them
 Q12. The incubator manager actively seeks ways to continuously improve the level of customer service satisfaction inside the incubator
 Q13. The other incubatees teach alternate or new strategies for achieving business success

3.2 Data collection procedures

Participants for the survey questionnaire were initially identified through the websites of their respective incubators. Through contacts with the incubator managers, government agencies such as MDeC and SIRIM, as well we privately formed association such as NINA, basic information regarding the name of the incubatees, email addresses and phone numbers were then obtained. These agencies have shown immense support for this research by providing the researcher with the list of incubatees and expediting their responses for the quantitative part of this research. The participants were made up of companies that are tenants of incubators that have been chosen for the qualitative part of the research. These companies are mostly ICT-based companies with diverse business natures ranging from mobile and wireless communication to internet-based business applications in the financial sector. A letter of invitation was first extended to incubatees through email to obtain their consent to be part of the study.

3.3 Data analysis procedures

Data analyses were undertaken in three principal stages (data screening, exploratory factor analysis, and multinomial logistic regression) using PASW Version 18.0. As part of the preparation and screening process, data were tested for violations of statistical assumptions (e.g., multicollinearity, outliers, and normality) as well as identifying missing data. Data screening revealed that there were no missing data. The statistical procedures involved two main processes: exploratory factor analysis (EFA) and multinomial logistic regression. Factor analysis was conducted to assess the unidimensionality of the four constructs developed in examining relationships with incubation performance including ‘Selection Performance’, ‘Monitoring and Business Assistance Intensity’, ‘Resource Allocation’, and ‘Professional Management Services’. This paper discusses the results of the multinomial logistic regression in recognizing the impact of monitoring and business assistance intensity on incubatee performance.

4 Results and Discussion

The individual model analysis examines monitoring and business assistance intensity items and their relationship with incubatee performance. Results of the logistic regression analyses show that the monitoring and business assistance intensity construct was statistically significant Performance ($p < .05$) as shown in Table 2, indicating its strength in predicting incubatee’s success. The chi-square values also suggest that similar relationships with high values for F1, F2, and F4, and a lower value for F3. The interaction of all four constructs reveals the strongest effect as a predictor ($p = .003$, $\chi(3) = 14.024$). This suggests that business incubation management will be at its optimum with the inclusion of all factors including proper selection performance, adequate monitoring and business assistance intensity, allocation of resources, and is provision of professional management services

Table 2: Full model evaluation

Predictors	Chi-Square	df	Sig.
Intercept	18.43	3	.000
Selection Performance (F1)	13.02	3	.005
Monitoring and Business Assistance Intensity (F2)	9.50	3	.023
Resources Allocation (F3)	2.75	3	.431
Professional Management Services (F4)	13.39	3	.004
F1Total * F2Total * F3Total * F4Total	14.02	3	.003

The dependent variable in this study is incubate entrepreneur performance which is measured by four categorical outcomes. Logistic regression enables independent variables to predict group memberships, and as this study uses four outcomes, one of the outcomes (our company is barely surviving) has been used as a reference category. Hence, there are three models generating from this data: Model 1, Model 2 and Model 3. Based on data presented in Table 3, the first model shows no significant relationship between the constructs and incubatee performance with all values of p greater than .05. However, Model 2 and 3 show significant relationships with incubatee performance with some constructs having p -values of less than .05.

Table 3: Parameter estimates for the full model

Model 1	β	SE β	Wald's χ^2	p	e^β (odds ratio)
Predictor					
Constant	.176	2.943	.004	.952	
Selection Performance (F1)	-.001	.024	.002	.963	.999
Monitoring and Business Assistance Intensity (F2)	.000	.061	.000	.998	1.000
Resources Allocation (F3)	-.057	.043	1.762	.184	.944
Professional Management Services (F4)	.020	.026	.585	.444	1.020
Model 2					
Constant	-35.271	14.425	5.979	.014	
Selection Performance (F1)	.195	.075	6.731	.009	1.215
Monitoring and Business Assistance Intensity (F2)	.258	.107	5.828	.016	1.295
Resources Allocation (F3)	.026	.084	.098	.754	1.027
Professional Management Services (F4)	.122	.047	6.618	.010	1.130
Model 3					
Constant	-41.092	22.568	3.315	.069	-

Selection Performance (F1)	.265	.134	3.914	.048	1.304
Monitoring and Business Assistance Intensity (F2)	.145	.182	.640	.424	1.156
Resources Allocation (F3)	.083	.138	.356	.551	1.086
Professional Management Services (F4)	.202	.099	4.162	.041	1.223

The Wald statistic is equal to the ratio of β divided by SE squared; it has a chi-square distribution. For each Wald statistic, $df = 1$ and $p = .0000$.

4.1 Goodness-of-fit statistics. Goodness-of-fit statistics assess the fit of a logistic model against actual outcomes. Two descriptive measures are presented in Table 4, which are the R^2 indices, defined by Cox and [18] and [39], respectively. These indices are variations of the R^2 concept defined for the OLS regression model. Due to the limited interpretation of the R^2 in logistic regression [42], the R^2 indices can be treated as supplementary to each other, more useful evaluative indices, such as the overall evaluation model, tests of individual regression coefficients, and the goodness-of-fit test statistic [42]. The Cox and Snell R^2 measure indicates a greater model fit with higher values, but with a limit of less than 1 (<1) [24]. The Nagelkerke R^2 is an adjusted version of the Cox and Snell R^2 and covers the full range from 0 to 1 [24], and therefore it is often preferred. The R^2 values indicate how useful the explanatory variables are in predicting the response variable and can be referred to as measures of effect size.

Table 4: Goodness-of-fit tests of the full model

	Chi-Square	df	Sig.
Pearson	257.923	297	.951
Deviance R^2	217.464	297	1.000
Cox and Snell			.297
Nagelkerke			.326

The research focuses on the *performance outcomes* of the incubatees which is the dependent variable with four categories: *our company is barely surviving; our company has met its break-even and moving on a path*

toward profitability; our company is making profit; and our company is highly profitable. We obtained a ubiquitous outcome variable for all 118 firms, and found that 32 firms (27.1%) were barely surviving, 44 firms (37.3%) had met their break-even, 38 firms (32.2%) were making profit and 4 firms (3.4%) were highly profitable.

The Model Fitting Information in Table 5 suggests the overall fit of the model. Firstly, the chi-square statistics for this model show that *Comprehensiveness* and *Quality* of the business assistance contributes significantly to the model, ($p < .05$) while *Time Intensity* of the interaction is not a significant predictor to the model ($p > .05$).

Table 5: Model-fitting information table for Monitoring and Business Assistance Intensity Construct

Predictors	Chi-Square	df	Sig.
Intercept	4.387	3	.223
Comprehensiveness and Quality	10.598	3	.014
Time Intensity	.665	3	.881

The parameter estimates in Table 6 shows that *Comprehensiveness* and *Quality* of the business services appear to be a significant predictor to the outcome ‘our company is making profit’, ($p = .003$; Wald’s $\chi^2 = 8.925$). The odds ratio also suggests that the more comprehensive and better quality the business assistance provided, the more incubatees are making profit.

Table 6: Parameter estimates for Monitoring and Business Assistance Intensity construct

Model 1	S		Wald’s χ^2	p	e^β (odds ratio)
	β	β			
Constant	-.882	1.8	.229	.632	
Comprehensiveness	.051	.02	3.255	.071	1.052
Time Intensity	-.012	.09	.016	.898	.988
Model 2					
Constant	-	2.2	4.098	.043	
Comprehensiveness	.117	.03	8.925	.003	1.124
Time Intensity	.064	.10	.345	.557	1.066
Model 3					
Constant	-.931	3.5	.070	.791	

Comprehensiveness	.004	.05	.005	.944	1.004
Time Intensity	-.060	.18	.104	.747	.942

The classification table (Table 7) below for analysis of Monitoring and Business Assistance Intensity elements suggests a 38.0% correct prediction, indicating a reduced ability to predict the model compared to Selection Performance.

Table 7: Classification table predicting membership of outcome categories by Monitoring and Business Assistance Intensity

Observed	Predicted				
	Our company is barely surviving	Our company has met its break-even and is moving on a path toward profitability	Our company is making profit	Our company is highly profitable	Percent Correct
Our company is barely surviving	10	11	8	0	34.5%
Our company has met its break-even and is moving on a path toward profitability	7	13	19	0	33.3%
Our company is making profit	1	17	18	0	50.0%
Our company is highly profitable	1	3	0	0	.0%
Overall Percentage	17.6%	40.7%	41.7%	.0%	38.0%

5 Conclusions

This paper investigates the relationship between monitoring and business assistance intensity and incubatee performance among Malaysian ICT incubators. The results of the multinomial logistic regression showed monitoring and business assistance intensity was statistically significant in predicting incubatee performance categories. This indicates that incubators that provide monitoring and comprehensive business assistance along with adequate interaction with incubator management are related to having incubatees that are making profit. Specifically, the component ‘comprehensiveness and quality’ appears to

be a stronger predictor within this construct than the component 'time intensity'. The significance of the 'Comprehensiveness and Quality' component suggests that incubators with a range of business assistance and those that seek feedback regarding their services tend to perform better than those without. The second component of the Monitoring and Business Assistance Intensity construct, 'Time Intensity' revealed non-significance to predicting business incubation performance. This suggests that the amount of interaction between incubatees and incubator managers could not predict the incubatees' outcomes. However, this should not be interpreted as insignificant as a lack of monitoring and business assistance intensity and lower frequency in interaction between incubatees could lead to problems including lack of confidence in incubatees, lack of product sophistication, and limited understanding of market environment leading to delayed graduation of incubatees. Emphasis could be placed on the range of business assistance that fit to the demands of the incubatees. Incubators would only know what fits the demands of the incubatees if they implemented a feedback system to gauge the quality of their current services.

The impact of Monitoring and Business Assistance Intensity on incubatee performance is evident in producing profit-making incubatees and higher number of incubatee graduates. This supports *the study's proposition: Incubatees are more likely to perform when monitoring and business assistance are provided.* This finding is consistent with [29] who highlighted the significance of monitoring, or coaching as factors associated with increasing incubatee graduation rates, and [35] who stated that frequent interaction with incubator management results in better relationship and ultimately contributes to the incubatees' and incubators' success. This suggests a positive relationship between providing monitoring and business assistance intensity and incubatee performance.

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