

Brazil: Measuring the Constructs of the Business Incubation Process

by

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ABSTRACT

With various gaps remaining in business incubation literature, developing scales that capture the multi-dimensional constructs of the incubation process remains a necessity. While living and traveling within Brazil, this author journeyed within Brazil's well-developed incubation ecosystem in order to investigate the reproducibility and validity of scales whose authors propose measure the constructs that capture the process of business incubation which were defined in their options-driven theory of business incubation as "selection performance", "monitoring and business assistance intensity", and "resource munificence". Regression analysis resulted in the data suggesting that there is no statistically significant predictive ability of the Hackett and Dilts scales when used to predict incubatee outcomes from this study's sample of incubators. The results of the analysis between total score in each of the three constructs and incubatee outcomes suggested that when the total score within the construct of selection performance increases, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator. Also, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit. The results show no predictive ability of the remaining two constructs of "monitoring and business assistance intensity" and "resource munificence" to capture business incubation performance. The item specific analysis of all correlating and inter-correlating variables for each of the dependent variables, resulting in several significant

relationships, however, many demonstrate negative relationships which also run contrary to the relationships proposed by Hackett and Dilts. These results have challenged both the validity of the Hackett and Dilts scale as a tool for investigating the constructs of the incubation process, and the ability of the options-driven theory to explain and predict business incubation outcomes.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	vi
LIST OF FIGURES.....	vii
CHAPTER	
1	1-4
Introduction	1
Objectives of Study	1
Background and Significance.....	1-4
2	5-12
Literature Review	5-9
Theory	9-11
Hypothesis	11-12
3	13-19
Variables and Scale	13-15
Population and Sample Frame	15-17
Sampling	18
Respondents Characteristics.....	18-19
4	20-31
Hypothesis Analysis.....	20-22
Construct Analysis	22-24
Item Analysis.....	24-30
Analysis Conclusion	31

CHAPTER	Page
5	32-37
Summery and Findings	32-35
Limitations, Future Research, and Contributions	35-37
REFERENCES	38-41
APPENDIX	
A Item Labels and Translation	42-45
B Descriptive Statistics/Responses	46-47
C Hackett and Dilts Scales	48-51

LIST OF TABLES

Table		Page
1.	Table 7.1: 29 Independent variables of the scale/questionnaire.....	14
2.	Table 7.2: Selection parameters of target population.....	17
3.	Table 7.3: Sample Frame Break-down	17
4.	Table 7.4: Response rate categorized by state	19
5.	Table 8.1: Descriptive Statistics: Results for overall survey.....	20
6.	Table 8.2: Model Summary: Total Score and Exit1 Outcomes	21
7.	Table 8.3: Model Summary: Total Score and Exit2 Outcomes	21
8.	Table 8.4: Correlation Analysis: Category and Outcome.....	22
9.	Table 8.5: Model Summary: Selection Performance and Exit1	23
10.	Table 8.6: Model Summary: Selection Performance and Exit2.....	23
11.	Table 8.7: Single Item and Exit Outcome Correlation Results	24-25
12.	Table 8.8: Model 1 Summary: Exit1 and Single item analysis.....	26
13.	Table 8.9: Model 2 Summary: Exit1 and Single item analysis.....	26
14.	Table 8.10: Model 1 Summary: Exit2 and Single item analysis.....	27
15.	Table 8.11: Model 2 Summary: Exit2 and Single item analysis.....	28
16.	Table 8.12: Model Summary: Exit3 and Single item analysis.....	29
17.	Table 8.13: Model Summary: Exit4 and Single item analysis.....	30
18.	Table 8.14: Model Summary: Exit5 and Single item analysis.....	30

LIST OF FIGURES

Figure	Page
1. Figure 7.1: Scale item constructs.....	15

Chapter 1

Introduction

The purpose of this study is to add to the literature surrounding the reproducibility and validity of the scales used and to provide data on business incubation outcomes that may be useful for incubator planning, process modeling and benchmarking purposes.

Objectives of study

With various gaps remaining in business incubation literature, developing scales that capture the multi-dimensional constructs of the incubation process remains a necessity. While living and traveling within Brazil, this author will draw a sample from within Brazil's well-developed incubation ecosystem in order to investigate the reproducibility and validity of scales whose authors propose measure the constructs that capture the process of business incubation. Accordingly the main objectives have been defined as:

- 1) Adding to the literature surrounding the reproducibility and validity of the scales used.
- 2) Providing data on business incubation outcomes that may be useful for incubator planning, process modeling and benchmarking purposes.

Background and Significance

The small and medium enterprise¹ (SME) sector is believed to be a powerful

¹ Facilitating the distinction between non-incubated small and medium sized businesses (SMEs) and incubated SMEs, from here on the study will refer to incubated SMEs as "Incubatees".

engine for economic development by playing a role in generating, “innovations, employment, income and growth with equity” (Lalkaka, R., Shaffer, D. 1999).

The business incubator attempts to facilitate the development and survival of new SMEs through cost containment and access to resources. The formal concept of business incubation has gained support as a powerful tool for economic and social development through fostering a community's entrepreneurial climate, the diversifying of local economies, the building of, or accelerating the growth of, local industry clusters and in the revitalization of communities (NBIA, 2010). Estimates suggest the existence of around 5000 incubators in the world (iDisc, 2010). Currently the leading incubation markets in Latin America include Brazil, Chile and Argentina, with Brazil at the forefront having an estimated 400 in service and a well-developed incubation ecosystem (Chandra, A. 2007, p. 2).

Throughout its history Brazil has invested heavily in science and technology and though known for their investments in agricultural advancement and ethanol, Brazil has also acknowledged the importance that Information Technologies have in advancing a nation's state of development. This is demonstrated by, among other things, the creation of the Brazilian Development Bank (BNDES) in 1952, which is currently focusing its efforts on ideas such as the Innovate Project, which promotes the development of small and medium-sized technology companies (Reuters 2009, para.12). Another area of government specifically assigned to the assistance of technological innovations is the Department of Technological Development and Innovation, which focuses special attention to programs aimed at the technological capacity of Brazilian companies, and coordinates studies that

contribute to the creation of policies aimed at stimulating the competitiveness in the information technology sector (Ministerio da Ciencia e Tecnologia 2009, para. 6-9). The Brazilian government has also implemented various supporting initiatives including Facil, a program aimed at simplifying the legalities of opening a business, and SIMPLEX which creates a single tax rate for small businesses (Chandra, A. 2007, p. 23).

These organizations and supporting initiatives suggest that the Brazilian government has made entrepreneurship and innovation policy priorities. This, along with its many natural resources, strong domestic market, and a well-diversified economy have brought about huge leaps forward in Brazil's economic progress and development. However, urbanization and a growing economic inequality among the population continue to define the country as a whole (World Poverty Portal, 2010). It is currently estimated that roughly 35% of the population lives on less than two dollars a day; when looking specifically at the rural population of around 28 million this number rises to 51%, the largest number in the Western Hemisphere (World Poverty Portal, 2010). Urbanization is estimated at 86%, the 24th highest compared to all countries, with a 1.8% annual rate of change (Central Intelligence Agency, 2010). The state of Sao Paulo has an estimated population of over 20 million residents (City Population, 2010). Sao Paulo city, the largest city in Brazil and currently considered to be the 8th largest agglomeration, currently has an estimated population of over 10 million (IGBE Census, 2010). It is estimated that of those 10 million residents nearly 30% live in favelas (shanty towns) and illegal settlements. Illegal occupation accounts for

43% of the population living in fast-growing peri-urban areas of the city of São Paulo (Torres, H. et al. 2007, pg. 215).

Arguably there are huge implications surrounding continued migration to large urban centers for recent immigrants , including a lack of real employment opportunity, a social services sector and city infrastructure which includes potable water systems, sewage systems, and affordable legal housing, unequipped to handle such large populations. Understanding the impact of business incubators may positively impact resource allocation decisions within urban centers, and may also allow for the efficient allocation of the usually limited funds reserved for the economic development of rural areas within Brazil and elsewhere.

Chapter 2

Literature Review

In their review of business incubation research, Sean M Hackett and David M Dilts (2004) have defined business incubation as a process enacted by business incubators, angel investors, universities and venture capital organizations in order to assist and accelerate the entrepreneurial process. The business incubator attempts to facilitate new venture development through cost containment and access to resources. They have defined the business incubator as:

A shared office space facility that seeks to provide its incubatees (i.e. “portfolio-” or “client-” or “tenant-companies”) with a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance. This system controls and links resources with the objective of facilitating the successful new venture development of the incubatees, while simultaneously containing the cost of their potential failure (pg57).

As business incubation is a relatively new phenomenon, few studies have focused on measuring the incubation process, due to a lack of reliable and valid scales (Hackett, M.S, Dilts, D.M. 2007, p. 459). Also, these studies have been described as “anecdotal” and “fragmented”, leaning towards description for the business incubation practitioner (Hackett, M.S, Dilts, D.M. 2007, p. 459). However, several studies do attribute business incubation with providing enabling skills, knowledge and the potential for increasing a firm’s survival rate and success (Sherman, H., Chappell, D.S. 1998, Voisey, P., Gornell, L., Jones, P., & Thomas,

B. 2006, Sherman, H.D. 1999, and Akcomak, I.S., Taymaz, E. 2004). These studies have correlated the success of incubated firms with the following incubator variables: Level of development (Sherman, H., Chappell, D.S. 1998), selection process (Hackett, M.S, Dilts, D.M. 2007), procedural standardization (Bears, P., 1998), and the relationship between incubator manager and incubated firm (Udell, G.G. 1990). Hackett and Dilts point out in their review of the literature that empirical tests regarding these relationships are, however, lacking (Hackett, M.S, Dilts, D.M. 2004b). For example, Sherman and Chappell (1998), based on their study of 80 incubation programs located in the United States, concluded that incubators were “an effective economic development tool”. Criterion used to identify their sample included the age of the incubator, 5 years or older, and that each was required to have management on site (Sherman, H., Chappell, D.S. 1998). They found that on average businesses that joined incubation programs experienced an increase in gross revenue from \$167,937 from the time they entered the program to \$922,430 in 1996. Total average employment of the firms showed increases in full time positions ranging from 3.0 to 9.9 (Sherman, H., Chappell, D.S. 1998). The study attempted to establish a control group, however they abandoned the idea due to poor response rate, thus leaving the question that though the sample firms on average experienced growth while in the incubation program would this have happened anyway if they had not joined (Sherman, H., Chappell, D.S. 1998)? They also suggest that direct comparisons of survival between incubated firms and non-incubated firms perhaps are meaningless due to a selection bias resulting from the selection

criteria imposed by incubators (Sherman, H., Chappell, D.S. 1998). With regard to job creation associated with incubated firms, literature reviews by Hackett & Dilts and Markley & McNamara suggest that job creation is relatively small (Hackett, M.S, Dilts, D.M. 2004b, Markley, D.M., McNamara, K.T. 1995). However, with regard to cost associated with job creation, Markley and McNamara concluded that incubators are less expensive than traditional recruitment of large companies to an area based on results of a case study of an incubator in the US and found that when compared to the recruitment of major manufacturing plants, the incubators cost per job created averaged about \$4,000 less (Markley, D.M., McNamara, K.T. 1995). They also point out that competition for major manufacturing plants is fierce and unless a town has the right mix of factors the chance for attracting such large firms is improbable. They suggest that the establishment of a business incubator is relatively simple and potentially less costly thus creating a greater likelihood for state and local resources to lead to job creation (Markley, D.M., McNamara, K.T. 1995).

In attempting to classify the dynamic of business incubation efforts in Brazil, Etzkowitz et al. applied a “triple helix” framework to describe the cooperation that exists in Brazil between government, universities and non-governmental organizations in the development and funding of incubators (Etzkowitz, H., et al. 2005). They state that a key reason for the growth of Brazilian incubators is this collaboration that exists between the Political community, universities and private entities (Etzkowitz, H., et al., 2005). Lalkaka and Shaffer report that the goals of

incubators located in Brazil as being focused primarily on job creation, economic development and technology commercialization (Lalkaka, R., Shaffer, D. 1999).

Due to the range of data needed for experimental research designs, the many factors influencing the success and failure of new venture development, and the fact that there is no agreed upon model for describing the incubation process, or scales that capture this process, measurement is difficult and research has not yet been able to answer the question, “if the incubatee had not been incubated, would there be any difference in the survival rate of new ventures?” (Hackett, M.S, Dilts, D.M. 2004b). In their effort to fill this gap in the literature, Sean M Hackett and David M Dilts (2004a) developed an Options-based model that they say captures the incubation process. After considering the many potential theories for grounding that model, including Behavioral theories, Economic theories, Resource-based and knowledge-based views, Dynamic capabilities theory, Agency theory, Institutional theory, Structuration theory, Scaffolding theory and Option theory, they proposed that “the options lens” would be the most suitable theoretical approach for developing a theory of business incubation that can explain and predict incubation outcomes. Their theory is as follows:

Business incubation performance—measured in terms of incubatee growth and financial performance at the time of incubator exit—is a function of the incubator’s ability, developed over time and with the accumulation of new venture development capabilities and resources, to create options through the selection of weak-but-promising intermediate potential firms

for admission to the incubator, and to exercise those options through monitoring and counseling, and the infusion of resources while containing the cost of potential terminal option failure (48).

Based on this new theoretical model, Hackett and Dilts conducted an exploratory study in which they empirically tested and developed a set of scales which they suggest can be used in the, “investigation of the impacts of the process of incubating new ventures on their early stage development outcomes with a greater degree of scientific rigor” (Hackett, M.S, Dilts, D.M. 2007, p. 459). They propose that the scales accomplish this by “measuring the multi-dimensional constructs that capture the process of business incubation” which were defined in their Options-based model as: Selection performance, monitoring and business assistance intensity, and resource munificence (Hackett, M.S, Dilts, D.M. 2007, p. 442).

Theory

Lalkaka and Shaffer state that, “The small and medium enterprise sector has proven to be a powerful engine for economic development” which is playing an important role in generating “innovations, employment, income and growth with equity” (Lalkaka, R., Shaffer, D. 1999). The business incubator attempts to facilitate the development of the incubatee through cost containment and access to resources. The formal concept of incubation has gained support as a powerful tool for economic and social development through fostering a community's entrepreneurial climate, the diversifying of local economies, the building of, or

accelerating the growth of, local industry clusters and in the revitalization of communities (NBIA, 2010). As the literature suggests, business incubation tends to relate to increasing a firm's survival rate and success by providing, enabling skills, knowledge, and established networks and funding sources (Sherman, H., Chappell, D.S. 1998, Voisey, P., Gornell, L., Jones, P., & Thomas, B. 2006, Sherman, H.D. 1999, and Akcomak, I.S., Taymaz, E. 2004). These studies have also correlated the success of incubated firms with the following variables: Level of incubator development (Sherman, H., Chappell, D.S. 1998), selection process (Hackett, M.S, Dilts, D.M. 2007), procedural standardization (Bears, P. 1998), and the relationship between incubator manager and incubated firm (Udell, G.G. 1990). However, few studies have focused on measuring the business incubation process, due to a lack of reliable and valid scales, resulting in "anecdotal" and "fragmented" data, leaning toward description for the business incubation practitioner (Hackett, M.S, Dilts, D.M. 2007). Due to the many factors influencing the success or failure of new venture development, and the lack of an agreed-upon model for describing the incubation process, along with the lack of reliable and valid scales that capture this process, measurement is difficult and research has not yet been able to answer the question, "if the incubatee had not been incubated, would there be any difference in the survival rate of new ventures?" (Hackett, M.S, Dilts, D.M. 2004b). In an effort to fill this gap in the literature Sean M Hackett and David M Dilts (2004a) proposed and developed an options-driven theory which they proposed would be the most suitable theoretical approach for developing a theory of business incubation able to explain and

predict incubation outcomes. Based on this new theoretical model, Hackett and Dilts conducted an exploratory study in which they empirically tested and developed a set of scales they suggest can measure the constructs that capture the process of business incubation which were defined in their theory as selection performance, monitoring and business assistance intensity, and resource munificence (Hackett, M.S, Dilts, D.M. 2007, p. 442).

It is the goal of this study to further our understanding of the reproducibility and validity of the scales used and the incubation model on which they are based. This data may prove useful for future incubator planning, process modeling and benchmarking purposes.

Hypothesis

In an effort to investigate the reproducibility and validity of scales proposed to measure the constructs that capture the process of business incubation, this study seeks to test the following hypotheses:

H₁: incubatees within business incubators that rate highly on Hackett and Dilts established scales will have a stronger outcome state compared to incubatees within incubators that rate lower on the scales; with “outcome state” measured in terms of incubatee growth and financial performance at the time of incubator exit.

H₀: incubatees within business incubators that rate highly on the Hackett and Dilts established scales will have an equal or weaker outcome state compared to incubatees within incubators that rate lower on the scales;

with “outcome state” measured in terms of incubatee growth and financial performance at the time of incubator exit.

Chapter 3

Method

The following sections will outline the variables, population, sample frame and field study.

Variables and Scale

Subscribing to the Hackett and Dilts options-driven theory of business incubation expressed as: $BIP = f(SP + MBAI + RM)$, where business incubation performance (BIP) – measured in terms of incubatee growth and financial performance- is captured by variation in the measures of the multidimensional constructs of: selection performance (SP), monitoring and business assistance intensity (MBAI), and resource munificence (RM); This study proposes that if the Hackett and Dilts 29 item scale does in fact measure these constructs, then responses to the scale by incubator managers should forecast with significant accuracy its incubatee outcomes revealing business incubation performance. Accordingly, the dependent variable has been defined as incubatee “outcome state” which is measured in categorical terms of growth and financial performance at the time of incubator exit. Operationally, there are five different mutually exclusive incubatee outcome states at the completion of the incubation process (i.e., when the incubatee exits the incubator):

1. EXIT1: The incubatee is surviving and growing profitably.
2. EXIT2: The incubatee is surviving and growing and is on a path toward profitability.
3. EXIT3: The incubatee is surviving but is not growing and not profitable or only marginally profitable.

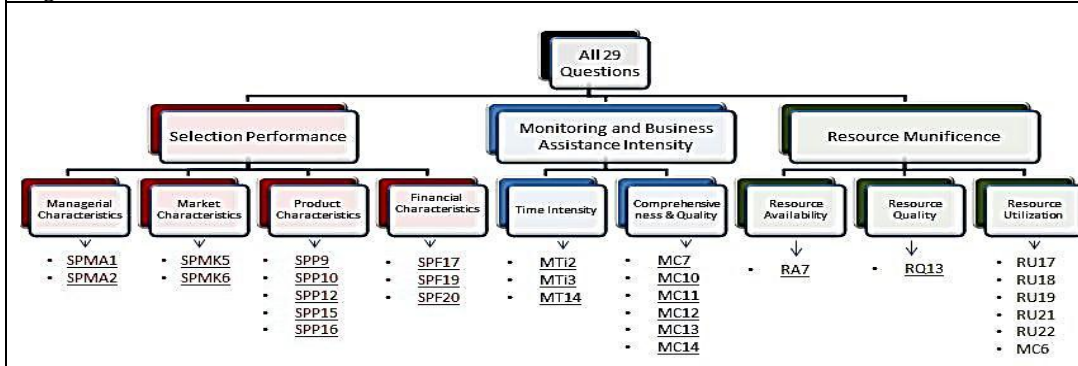
4. EXIT4: Incubatee operations were terminated while still in the incubator, but losses were minimized.
5. EXIT5: Incubatee operations were terminated while still in the incubator, and the losses were large.

The independent variable consists of the Hackett and Dilts 29 item scales. (See Table 7.1 for each item and Figure 7.1 for their construct).

	Label	Item
1.	<u>SPMA1</u>	The prior work experience of the start-up company's management team in the field they plan to enter.
2.	<u>SPMA2</u>	The prior management experience of the start-up company's management team.
3.	<u>SPMK5</u>	The long-term growth potential of the market the start-up company plans to enter.
4.	<u>SPMK6</u>	The size of the target market that the start-up company plans to enter.
5.	<u>SPP9</u>	The uniqueness of the product.
6.	<u>SPP10</u>	Whether the product has patent protection.
7.	<u>SPP12</u>	Whether the product has relative advantage over competitor's products.
8.	<u>SPP15</u>	The substitutability of the product the start-up company is proposing to sell.
9.	<u>SPP16</u>	Whether the product demonstrates defendable competitive position.
10.	<u>SPF17</u>	Whether the profit potential of the start-up company is high.
11.	<u>SPF19</u>	Whether the start-up company has the potential to attract investment participation from venture capitalists.
12.	<u>SPF20</u>	Whether the start-up company has multiple, harvestable exit (i.e., cash-out) options.
13.	<u>MTi2</u>	Our incubator manager devotes sufficient time to assisting incubatees.
14.	<u>MTi3</u>	The incubator manager and incubatees in our incubator spend sufficient time interacting.
15.	<u>MTi4</u>	Interactions among the incubator manager and incubatees in our incubator reduce the likelihood of the incubatees' making expensive business mistakes.
16.	<u>MC7</u>	Our incubator excels at providing strategic planning assistance to our incubatees.
17.	<u>MC10</u>	Our incubator excels at providing production-related advice to our incubatees.
18.	<u>MC11</u>	Our incubator excels at providing operations-related advice to our incubatees.
19.	<u>MC12</u>	Our incubator regularly validates the quality of potential new strategic service providers.
20.	<u>MC13</u>	Our incubator ensures the quality of its services by regularly reviewing them.
21.	<u>MC14</u>	Our incubator manager actively seeks ways to continuously improve the level of customer service satisfaction inside the incubator.
22.	<u>RA7</u>	Our ability to provide incubatees with access to marketing specialists.
23.	<u>RQ13</u>	Our incubator excels at presenting business-related information to incubatees in a way that is easy for them to understand.
24.	<u>RU17</u>	Our incubatees utilize advice obtained from the incubator manager.
25.	<u>RU18</u>	Our incubatees utilize the knowledge obtained by fellow incubatees.
26.	<u>RU19</u>	Our incubatees learn to utilize knowledge from other incubatees.
27.	<u>RU21</u>	Our incubatees act upon the advice they receive from fellow incubatees.
28.	<u>RU22</u>	When we introduce an incubatee to one of our incubator's network contacts, the incubatee maximizes the opportunity present in the introduction

29. **MC6** Fellow incubatees teach each other strategies for achieving business success.

Figure 7.1: Scale item constructs



Using a 7-point Likert scale, respondents were asked to rate levels of “importance”, “agreement”, and “ability” concerning the 29 items. The highest score possible on the scale is 203 and the lowest is 116.

The scale was translated by a native Portuguese speaking member of the American Translators Association. A translated version of each question is attached as Appendix A.

Population and Sample Frame

The literature review pertaining to the Brazilian incubation market suggested the existence of around 400 active incubators. However, an initial attempt to verify these reports found them to be inaccurate at the time of this study. Due to the overinflated estimates produced by possibly false reports, dated information/statistics, and the lacking of an open-source, up-to-date, and exhaustive database of incubators within Brazil, it was decided that before the study could begin, the current population would need to be identified and catalogued.

After a comprehensive investigation conducted by this researcher consisting of in-person, telephone, and online points of contact, roughly 190 business incubators were identified².

Sample selection criterion was focused on targeting incubators which are optimally located within Brazil's incubation framework in the hopes of obtaining a sample of "best-case-scenario" incubators; reasoning that if the scale used could not predict outcomes within this group then it could be assumed that it would also not predict outcomes of a sub-optimally located group. These locations were selected after comparing state GDP, number of universities, literacy rates, and total Anprotec³ (the national association representing the interests of business incubators, technology parks and innovative ventures in Brazil) associated organizations which was used to assess strength of incubation ecosystem within that state. These statistics were found to correlate well with the total number of incubators within the state, and after applying these parameters the states of Sao Paulo, Rio de Janeiro, Minas Gerais, Rio Grande do Sul, Parana and Santa Catarina were selected. See table 7.2 for a detailed view.

² Though the investigation identified 190 incubators, the exact number of active incubators within Brazil proves extremely difficult to obtain resulting in the small potential for "missing" incubators. It could be argued that these "missing" incubators are so far removed from the Brazilian incubation ecosystem that they would not have met the sample selection frame for this study.

³ Association with Anprotec is somewhat costly, this helps identify incubators healthy enough to have the required fees. Also, associated incubators gain access to knowledge networks that non-associated incubators do not have. State specific associations had been planned to be used as a criteria, but after visiting Brazil and speaking with a variety of managers it was discovered that most states did not have well developed incubation association.

Table 7.2
Selection parameters of target population

State	Percentage of total GDP/ Rank within Brazil	Total Universities/ Rank within Brazil	Literacy Rate	Total Anprotec associated organizations/ Rank within Brazil	Total Claimed Incubators / Rank within Brazil	Confirmed and functioning incubators/ Rank within Brazil
São Paulo	33.9/1	25/1	0.95	102/1	69/1	38/1
Rio de Janeiro	11.2/2	15/3	0.96	54/3	41/2	18/3
Minas Gerais	9.1/3	15/4	0.92	52/4	32/4	22/2
Rio Grande do Sul	6.6/4	23/2	0.95	63/2	27/5	15/5
Paraná	6.1/5	13/5	0.93	32/6	37/3	17/4
Santa Caterina	4.1/6	10/7	0.95	35/5	22/6	9/6

Sample selection criterion also included the following parameters: 1) Age: no younger than 4 years since its establishment⁴. Since most incubators have a 3 year graduation timeline for incubatees, included incubators will have had time to produce graduates and/or failed companies. 2) Management structure: Incubator must have a full-time manager on site.

Of the total 190 identified incubators within Brazil, 119 are located within the selected states. Of these 119, 86 qualified for this study. See Table 7.3.

Table 7.3
Sample Frame Break-down

	Total in Brazil	Total in Selected states	Total Qualified			
Total in Brazil	190 / 100%	63%	45%			
Percentage breakdown by included state.						
	Sao Paulo	Minas Gerais	Parana	Rio	Rio Grande do Sul	Santa Caterina
Total Incubators	39	20	13	16	15	9
Included in target sample	27	16	12	12	13	6
Percentage included	69%	80%	92%	75%	87%	67%

⁴ Literature review suggests a 5 year cutoff but considering low response rate it was decided to include the one participant with less than 4 years.

Sampling

The time-frame of the field study began May of 2011 and ended December of 2011. Following generally accepted methods in the use of survey instruments (Fowler, Jr. F.J. 1993, p.62-63), managers of the 86 incubators which met the criteria for inclusion in the study were contacted via email with a request for participation and access to the survey instrument hosted by SurveyMonkey.com. An offer to share the research results served as the only enticement for participation. Due to high number of non-respondents, contact attempts via email were sent every two weeks between May and August. One final email attempt was sent in September after which telephone contact attempts for non-respondents began mid-October. Those incubators that accepted telephone calls most often reported that they did not have time or interest in participating. The literature suggests difficulty with obtaining participation by managers due to a high number of research requests, and during conversations with many managers this was confirmed to be the case in Brazil as well. Although non response bias may be present, since almost every incubator manager who partook in the study seemed very busy, it appears likely that non-response bias was not an influencing factor.

Respondent Characteristics

Responses totaled 14 resulting in a 16% total response rate from within the target population, drawing the highest number from Sao Paulo with a 19% response rate and the lowest from Minas Gerais with a 6% response rate. See table 7.4.

Table 7.4						
<i>Response rate categorized by state</i>						
	Sao Paulo	Minas Gerais	Parana	Rio de Janeiro	Rio Grande do Sul	Santa Caterina
Total Responses	5	1	3	2	2	1
Percentage of Sample Frame	19%	06%	25%	17%	15%	17%

Chapter 4

Data Analysis

The following sections will outline the results from our hypotheses test, followed by the analysis between constructs and incubatee outcomes, and finally results of an item specific analysis are discussed.

Hypothesis Analysis

As seen in table 8.1, responses totaled 14 resulting in a 16% response rate from within the target population with a high score of 183, a low score of 127 and a mean score of 162.64. There were a total of 312 incubatees included in the data.

	N	Minimum	Maximum	Mean	Std. Deviation	
(TOTAL) Total score	14	127	183	162.64	16.681	
Valid N (listwise)	14					
	Exit1	Exit2	Exit3	Exit4	Exit5	Total
Mean	6.86	5.79	4.14	3.50	2.0	
SD	5.842	3.806	5.655	5.019	2.184	
Range	20	11	20	18	5	
Minimum	0	1	0	0	0	
Maximum	20	12	20	18	5	
Total no. of Exit Outcomes	96	81	58	49	28	312
N=14						

A correlation analysis was conducted to examine the relationship between the total score of the overall survey and each of the five exit outcomes. We found that correlations were only significant for EXIT1 and EXIT2. Results showed a negative correlation opposite of those proposed by Hackett and Dilts (Hackett, M.S, Dilts, D.M. 2004a, p. 49-51) where EXIT1 outcome results produced ($r = -0.518$, $n = 14$, $p = 0.029$) and EXIT2 outcome results produced ($r = -0.462$, $n =$

14, $p = 0.048$). Linear regression analysis was used to test if the total score significantly predicted EXIT1 outcomes. The results produced ($R^2_{adj}=.207$, $F(1, 12) = 4.39$, $p > .05$), suggesting that a one unit increase in the total score achieved on the scale is associated with a .518 unit decrease in EXIT1 outcomes with an intercept not significantly different from 0 ($\beta = -.518$, $p = 0.058$). Linear regression analysis of total score and EXIT2 outcomes produced ($R^2_{adj}=.148$, $F(1, 12) = 3.25$, $p > .05$), suggesting that a one unit increase in the Total score is associated with a .462 unit decrease in EXIT2 outcomes with an intercept also not significantly different from 0 ($\beta = -.462$, $p = 0.097$). Tables 8.2 and 8.3 summarize these results. These results suggest no statistically significant predictive ability of the Hackett and Dilts scales when used to predict Incubatee outcomes from this studies sample of incubators.

Accordingly, we fail to reject the Null hypothesis which states, “incubatees within business incubators that rate highly on the Hackett and Dilts established scales will have an equal or weaker outcome state compared to incubatees within incubators that rate lower on the scales; with ‘outcome state’ measured in terms of incubatee growth and financial performance at the time of incubator exit”.

Table 8.2
Model Summary: Total Score and Exit1 Outcomes

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (Total Score)	.518 ^a	.268	.207	5.203	-.181	-.518	4.391	.058 ^a

a. Dependent Variable: (EXIT1) The incubatee was surviving and growing profitably at time of incubator exit.

Table 8.3
Model Summary: Total Score and Exit2 Outcomes

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (Total Score)	.462 ^a	.213	.148	3.514	-.105	-.462	3.250	.097 ^a

a. Dependent Variable: (EXIT2) The incubatee was surviving and growing on a path toward profitability at time of incubator exit.

The results of this analysis not only challenge the validity of the Hackett and Dilts scales as a tool for measuring the constructs of business incubation established by their options-driven theory, but it also brings into question whether the constructs themselves capture business incubation performance. In order to shed some more light on this state of affairs, an analysis was conducted on each of the constructs.

Construct Analysis

Though the results of the hypothesis analysis indicate a lack of any significant predictive value in the scale as a whole, correlation analysis was conducted to investigate the possibility of any significant correlations between total score in each of the three constructs and incubatee outcomes. As seen in table 8.4, results indicate a negative correlation between SP & EXIT1 ($r = -0.718$, $n = 14$, $p = 0.002$). Also a negative correlation between SP & EXIT2 ($r = -0.538$, $n = 14$, $p = 0.024$), and a negative correlation between RM & EXIT2 outcomes ($r = -0.491$, $n = 14$, $p = 0.037$).

	(SP)	(MBIAI)	(RM)
(EXIT1)	$r = -.718^{**}$, $p = 0.002$	$r = .044$, $p = 0.441$	$r = -.455$, $p = 0.051$
(EXIT2)	$r = -.538^*$, $p = 0.024$	$r = -0.047$, $p = 0.437$	$r = -.491^*$, $p = 0.037$
(EXIT3)	$r = 0.198$, $p = 0.249$	$r = 0.097$, $p = 0.371$	$r = 0.068$, $p = 0.408$
(EXIT4)	$r = -0.150$, $p = 0.305$	$r = 0.094$, $p = 0.375$	$r = -0.142$, $p = 0.314$
(EXIT5)	$r = -0.379$, $p = 0.091$	$r = -0.052$, $p = 0.430$	$r = -0.264$, $p = 0.181$

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

Stepwise linear regression analysis of all three categories against each dependent outcome resulted in the removal of all pairings except SP - EXIT1 and SP - EXIT2. The results between SP and EXIT1 produced ($R^2_{adj}=.476$, $F(1, 12)$)

=12.81, $p < .05$), suggesting that a one unit increase in the total score for SP alone is associated with a .718 decrease in EXIT1 outcomes with an intercept significantly different from 0 ($\beta = -0.718$, $p = 0.004$).

Results from analysis of SP and EXIT2 produced ($R^2_{adj}=.230$, $F(1, 12) = 4.89$, $p < .05$), suggesting that a one unit increase in the total score for SP is associated with a .538 unit decrease in EXIT2 outcomes with an intercept significantly different from 0 ($\beta = -0.538$, $p = 0.047$). Tables 8.5 and 8.6 summarize these results.

Table 8.5
Model Summary: Selection Performance and Exit1

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (SP)	.718 ^a	.516	.476	4.229	-.430	-.718	12.805	.004 ^a

a. Dependent Variable: (EXIT1) The incubatee was surviving and growing profitably at time of incubator exit.

Table 8.6
Model Summary: Selection Performance and Exit2

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (SP)	.538 ^a	.290	.230	3.339	-.210	-.538	4.894	.047 ^a

a. Dependent Variable: (EXIT2) The incubatee was surviving and growing on a path toward profitability at time of incubator exit.

This data suggests that when the total score within the construct of selection performance increases, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator. Also, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit. These suggested negative relationships run contrary to the positive relationship between all constructs and incubatee outcomes proposed by Hackett and Dilts in their “Study A” (Hackett, M.S, Dilts, D.M. 2004a, p. 49-51).

Also, these results show no predictive ability of the additional two constructs of “monitoring and business assistance intensity” and “resource munificence” to capture business incubation performance.

Item Analysis

A large number of item specific correlations (see Table 8.7) motivated further analysis. Due to the large number of independent variables and the potential effects of inter-correlating variables masking the true nature of the output, the following is an analysis of all correlating and inter-correlating variables for each of the dependent variables. Also, as a safeguard against the well-established biases and shortcomings of stepwise regression within the statistical literature (i.e. bias in parameter estimation, inconsistencies among model selection algorithms, an inherent problem of multiple hypothesis testing, and an inappropriate focus or reliance on a single best model) (Whittingham, M.J. et al. 2006, pg. 1182), further exploration beyond a preliminary stepwise analysis was conducted to exhaust all avenues in each of the item specific regressions. The following subsections will detail the steps taken and the data outcomes for each dependent variable separately.

	Exit1	Exit2	Exit3	Exit4	Exit5
SPMA2	r = -0.707, p = 0.002	r = -0.520, p = 0.028			
SPMK5	r = -0.558, p = 0.019				
SPMK6	r = -0.469, p = 0.045				
SPP15	r = -0.751, p = 0.001				r = -0.533, p = 0.025
SPP16	r = -0.700,	r = -0.538,			

	p = 0.003	p = 0.024			
MTi4	r = -0.461, p = 0.048				
RU17	r = -0.551, p = 0.021	r = -0.614, p = 0.010			
RU19	r = -0.483, p = 0.040				
RU22	r = -0.461, p = 0.048				
RU18	r = -0.569, p = 0.017	r = -0.551, p = 0.020			
MC12		r = -0.487, p = 0.039			
SPF19			r = 0.492, p = 0.037		
SPP9				r = -0.462, p = 0.048	
MC13					r = -0.527, p = 0.026
SPMA1					r = -0.527, p = 0.027

Single Item and EXIT1 Outcomes Analysis

EXIT1 correlated with ten items (see Table 8.7). Stepwise linear regression analysis of all 10 resulted in the removal of all except SPP15. Inter-correlates introduced into the analysis revealed no differences in the final outcome. Results from analysis produced ($R^2_{adj}=.528$, $F(1, 12) = 15.53$, $p < .05$), suggesting that a one unit increase in the respondent perceived importance of SPP15 is associated with a -0.751 unit decrease in EXIT1 outcomes with an intercept significantly different from 0 ($\beta = -0.751$, $p = 0.002$).

This data suggests that when more importance is placed on the substitutability of the product the start-up company is proposing to sell, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator. See Table 8.8.

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (SPP15)	.751	.564	.528	4.015	-3.021	-.751	15.529	.002

A backwards regression analysis was then completed with all correlates and inter-correlates. Removing the least significant variables until the model breaks down (in order to find the model with the least quantity of variables), we were left with a 3 variable model consisting of SPP15, RU17 and RU21 which produced ($R^2_{adj}=.666$, $F(3, 10) = 9.65$ $p < .05$). It was found that SPP15 significantly predicted EXIT1 outcomes ($\beta = -0.670$, $p = .001$), as did RU17 ($\beta = -0.458$, $p = .002$). However, results for RU21 within the model suggest that a one unit increase in the respondent agreement of RU21 is associated with a .253 unit increase in EXIT1 outcomes with an intercept not significantly different from 0 ($\beta = -253$, $p = 0.176$). Table 8.9 summarizes the analysis results.

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model	.862	.743	.666	3.376			9.645	.003
(SPP15)					-2.696	-.670		.003
(RU17)					-3.337	-.458		.028
(RU21)					1.712	.253		.176

This suggests that when more importance is placed on the substitutability of the product the start-up company is proposing to sell, along with a stronger agreement with the phrase, “our incubatees utilize advice obtained from the incubator manager”, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator.

RU21 is also included in the model however; data suggests the lack of any significance on its own.

Single Item and EXIT2 Outcomes Analysis

EXIT2 correlated with 5 independent variables. Stepwise linear regression analysis of all 5 resulted in the removal of all except RU17. Results from analysis produced ($R^2_{adj}=.325$, $F(1, 12) = 7.26$, $p < .05$), suggesting that a one unit increase in the respondent agreement of RU17 is associated with a .614 unit decrease in EXIT2 outcomes with an intercept significantly different from 0 ($\beta = -0.614$, $p = 0.020$). This data suggests that the stronger a manager’s agreement with the phrase, “our incubatees utilize advice obtained from the incubator manager”, the less the likelihood of outcomes were the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit. See Table 8.10.

Table 8.10								
<i>Model 1 Summary: Exit2 and Single item analysis.</i>								
	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (RU17)	.614	.377	.325	3.127	-2.915	-.614	7.258	.020

A backwards regression analysis was then completed with all correlates and inter-correlates. Removing the least significant variables until the model breaks down we were left with a 3 variable model consisting of MC12, RU18 and RQ13 (note that RU17 has been removed). The multiple regression model with all three predictors produced ($R^2_{adj}=.686$, $F(3, 10) = 10.46$, $p < .05$). It was found that RU18

significantly predicted EXIT2 outcomes ($\beta = -0.705, p = .002$), as did MC12 ($\beta = -0.778, p = .002$), as well as RQ13 ($\beta = 0.576, p = .013$).

This suggests that the stronger the manager’s agreement with the phrases, “Our incubatees utilize the knowledge obtained by fellow incubatees”, and “Our incubator regularly validates the quality of potential new strategic service providers” in conjunction with a stronger disagreement with the phrase “Our incubator excels at presenting business-related information to incubatees in a way that is easy for them to understand”, there is a reduced likelihood of outcomes were the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit. Table 8.11 summarizes the regression results.

Table 8.11
Model 2 Summary: Exit2 and Single item analysis.

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model	.871	.758	.686	2.134			10.456	.002
(RU18)					-3.008	-.705		.002
(MC12)					-2.739	-.778		.002
(RQ13)					5.149	.576		.013

Single Item and EXIT3 Outcomes Analysis

EXIT3 correlated with one independent variable, SPF19, resulting in a positive correlation between the two variables ($r = 0.492, n = 14, p = 0.0370$). Results from the regression analysis produced ($R^2_{adj}=.179, F(1, 12) = 7.26, p < .05$), suggesting that a one unit increase in the respondent’s perceived importance of SPF19 is associated with a .492 unit increase in EXIT3 outcomes with an intercept not significantly different from 0 ($\beta = 0.492, p = 0.074$).

Results of Linear Regression analysis of both the single correlating variable and also with inter-correlates of SPF19 resulted in the same outcome.

This data suggests that when more importance is placed on whether the start-up company has the potential to attract investment participation from venture capitalists, there tends to be an increased likelihood of incubatee outcomes where the incubatee was surviving but is not growing, and is not profitable or is only marginally profitable at the time of the incubator exit. Table 8.11 summarizes the regression results.

	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (SPF19)	.492	.242	.179	5.123	3.221	.492	3.839	.074

Single Item and EXIT4 Outcomes Analysis

EXIT4 correlated with one independent variable, SPP9, resulting in a negative correlation ($r = -0.462$, $n = 14$, and $p = 0.048$). Results of stepwise regression analysis of both the single correlating variable and inter-correlates of SPP9 resulted in the same outcome of all variables being excluded. However, after using backwards regression with all correlates and inter-correlates and removing the least significant variables until the model breaks down we are left with a 2 variable model consisting of SPP9 and MC7. The multiple regression model with both predictors produced ($R^2_{adj}=.658$, $F(2, 11) = 10.59$, $p < .05$). It was found that SPP9 significantly predicted EXIT4 outcomes ($\beta = -0.953$, $p = .001$), as did MC7 ($\beta = 0.827$, $p = .003$). This suggests that when less importance is placed on the

uniqueness of the product in conjunction with a strong agreement with the phrase “our incubator excels at providing strategic planning assistance to our incubators”, there tends to be an increased likelihood of incubatee outcomes where operations were terminated and losses were minimized at the time of the incubator exit. Tables 8.13 summarize the regression analysis results.

Table 8.13								
<i>Model Summary: Exit4 and Single item analysis.</i>								
	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model	.811	.658	.596	3.191			10.585	.003
(SPP9)					-7.212	-.953		.001
(MC7)					2.970	.827		.003

Single Item and EXIT5 Outcomes Analysis

EXIT5 correlated with three independent variables. Results of regression analysis of all three correlating variables and also their inter-correlates resulted in all variables being excluded except SPP15. The regression was a rather poor fit ($R^2_{adj} = .225$), however, the overall relationship was significant ($F(1, 12) = 4.77, p < .05$). This data suggests that placing more importance on the substitutability of the product the start-up company is proposing to sell tends to correspond with a decrease in incubatee outcomes where operations were terminated and losses were large at the time of the incubator exit. Though this relationship is statistically significant, it is not very strong.

Table 8.14								
<i>Model Summary: Exit5 and Single item analysis.</i>								
	R	R ²	Adj R ²	Std.Error	B	Beta	F	Sig.
Model (SPP15)	.533	.285	.225	1.923	-.802	-.533	4.774	.049

Analysis Conclusion

The results of the hypothesis analysis suggest no statistically significant predictive ability of the Hackett and Dilts scales when used to predict incubatee outcomes from this study's sample of incubators. The results of the analysis between the total score in each of the three constructs and incubatee outcomes from this study's sample demonstrated no predictive ability of the constructs of "monitoring and business assistance intensity" and "resource munificence", however, analysis suggested that when the total score within the construct of selection performance increases, there tends to be a decrease in EXIT1 outcomes and also EXIT2 outcomes. The negative relationships however, run contrary to the positive relationship between all constructs and incubatee outcomes proposed by Hackett and Dilts. The item specific analysis of all correlating and inter-correlating variables for each of the dependent variables, resulting in several significant relationships, however, many demonstrate negative relationships which also run contrary to the relationships proposed by Hackett and Dilts.

These results challenge both the validity of the Hackett and Dilts scale as a tool for investigating the constructs of the incubation process, and the ability of the options-driven theory to explain and predict business incubation outcomes expressed as: $BIP = f(SP + MBAI + RM)$. Further research is needed in order to validate the ability of the options-driven theory to explain the inner workings of the business incubation process.

Chapter 5

Conclusion

This study tested scales whose authors propose measure the constructs that capture the process of business incubation which were defined in their options-driven theory of business incubation as “selection performance”, “monitoring and business assistance intensity”, and “resource munificence”. Data was collected from 14 incubators within Brazil resulting in a 16% total response rate from within the target population. In the sections below, a summary of this study’s findings are offered, followed by the limitations of this study, concluding with the contributions and suggestions for future research.

Summary of Findings

The results of the hypothesis analysis resulted in the data suggesting that there is no statistically significant predictive ability of the Hackett and Dilts scales when used to predict incubatee outcomes from this study’s sample of incubators. The results of the analysis between total score in each of the three constructs and incubatee outcomes suggested that when the total score within the construct of selection performance increases, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator. Also, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit. The results show no predictive ability of the remaining two constructs of “monitoring and business assistance

intensity” and “resource munificence” to capture business incubation performance. The item specific analysis of all correlating and inter-correlating variables for each of the dependent variables resulting in several significant relationships:

- SPP15 significantly predicted EXIT1 outcomes suggesting that when more importance is placed on the substitutability of the product the start-up company is proposing to sell, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator.
- EXIT1 was also predicted by a 3 variable model consisting of SPP15, RU17 and RU21 which suggests that when more importance is placed on the substitutability of the product the start-up company is proposing to sell, along with a stronger agreement with the phrase, “our incubatees utilize advice obtained from the incubator manager”, there tends to be a decrease in incubatee outcomes where the incubatee was surviving and growing profitably at the time of its exit from the incubator. RU21 is also included in the model; however, data suggests the lack of any significance on its own.
- RU17 significantly predicted EXIT2 outcomes suggesting that the stronger a manager’s agreement with the phrase, “our incubatees utilize advice obtained from the incubator manager”, the less the likelihood of outcomes where the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit.

- EXIT2 outcomes were also predicted by a 3 variable model consisting of MC12, RU18 and RQ13. The results of this model suggest that the stronger the manager's agreement with the phrases, "Our incubatees utilize the knowledge obtained by fellow incubatees", and "Our incubator regularly validates the quality of potential new strategic service providers" in conjunction with a stronger disagreement with the phrase "Our incubator excels at presenting business-related information to incubatees in a way that is easy for them to understand", there is a reduced likelihood of outcomes where the incubatee was surviving and growing on a path toward profitability at the time of the incubator exit.
- SPF19 significantly predicted EXIT3 outcomes, though the regression was a rather poor fit, the overall relationship was significant, suggesting that when more importance is placed on whether the start-up company has the potential to attract investment participation from venture capitalists, there tends to be an increased likelihood of incubatee outcomes where the incubatee was surviving but is not growing and is not profitable or is only marginally profitable at the time of the incubator exit.
- EXIT4 was predicted by a SPP and MC7 suggesting that when less importance is placed on the uniqueness of the product in conjunction with a strong agreement with the phrase "Our incubator excels at providing strategic planning assistance to our incubators", there tends to be an increased likelihood of incubatee outcomes where operations were terminated and losses were minimized at the time of the incubator exit.

- SPP15 significantly predicted EXIT5 outcomes suggesting that placing more importance on the substitutability of the product the start-up company is proposing to sell tends to correspond with a decrease in incubatee outcomes where operations were terminated and losses were large at the time of the incubator exit. Though this relationship is statistically significant it is not very strong.

The inability of the scale as a whole and the two constructs of “monitoring and business assistance intensity” and “resource munificence” to predict outcomes of this study’s sample, along with the negative relationship between exit outcomes, the construct of selection performance, and several item specific negative relationships challenge both the validity of the Hackett and Dilts scale as a tool for investigating the constructs of the incubation process, and the ability of the options-driven theory to explain and predict business incubation outcomes expressed as: $BIP = f (SP + MBAI + RM)$. Further research is needed in order to validate the ability of the options-driven theory to explain the inner workings of the business incubation process.

Limitations, Future Research, and Contributions

Data for this research was collected by soliciting participation from a subset of incubators operating in the Brazilian states of Sao Paulo, Rio de Janeiro, Minas Gerais, Rio Grande do Sul, Parana and Santa Caterina. Implications from this research may not be generalized beyond this sample. The size of the sample is also an area of concern. During this study it was made clear by the literature

review, the data collection process, and in-person conversations with incubator managers that most managers are stretched for time and have been overwhelmed with research participation requests, therefore obtaining manager participation and an appropriate sample size has become extremely difficult. Future research must address this obstacle. Hackett and Dilts have pointed out the difficulty of obtaining data on failed incubatees due to “political implications that can result in a decrease or elimination of operating subsidies” (Hackett, M.S, Dilts, D.M. 2004). In-person conversation with incubation managers and data collection results verified this concern. Had incubation managers been more open to sharing “sensitive” data on graduation outcomes, the sample for this study would have been larger. There were many respondents who answered all questions on the questionnaire however, they refused to provide data on graduation outcomes. Attempts should be made in future studies to address this obstacle.

It was also observed that within Brazil exist a large number of “skeleton” or “zombie” incubators, where funding appears to simply keep the doors open. These incubators appear on the surface to be functioning, however, the value adding processes we associate and expect with business incubation have, for the most part, stopped. Any future research within Brazil, and perhaps elsewhere, should take this into account during sample selection. This study has also shed light into the Brazilian Incubation ecosystem. The literature review pertaining to the Brazilian incubation market suggested the existence of around 400 active incubators, however, an initial attempt to verify these reports found them to be

inaccurate at the time of this study. After a comprehensive 5 month search of all incubators within Brazil, roughly 190 were identified as active.

As with any “new” subject, business incubation research is in its early stages. The results of this study have challenged the validity of the Hackett and Dilts scale as a tool for investigating the constructs of the incubation process. These results also put into question the ability of the options driven theory to explain and predict incubation outcomes. Ultimately we are left with several questions including: Is it the scale that is not measuring the constructs? Are the constructs not capturing business incubation performance? Are Brazilian incubators, or this study’s sample, an anomaly which are not able to be captured by the Hackett and Dilts theory and/or scale? Future research is required to investigate these questions. There are huge gaps within the research limiting the foundation on which this study could be based. It is the belief of this author that research must focus on understanding the value-adding processes involved within the incubator, and learn how to measure those processes. Until these tools are established, research findings will remain “fragmented” and “anecdotal”.

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APPENDIX A
ITEM LABELS AND TRANSLATION

Labels	Item	Portuguese Translation
SPMA1	The prior work experience of the start-up company's management team in the field they plan to enter.	A experiência anterior de trabalho da equipe de gestão da empresa "start-up" no campo em que pretendem inserir (entrar).
SPMA2	The prior management experience of the start-up company's management team.	A experiência prévia da equipa de gestão da empresa "start-up"
SPMK5	The long-term growth potential of the market the start-up company plans to enter.	O potencial de crescimento a longo prazo do mercado que a empresa "start-up" planeja entrar
SPMK6	The size of the target market that the start-up company plans to enter.	O tamanho do mercado alvo que a companhia planeja entrar
SPP9	The uniqueness of the product.	A exclusividade do produto
SPP10	Whether the product has patent protection.	Se o produto tem proteção patentária
SPP12	Whether the product has relative advantage over competitor's products.	Se o produto tem vantagem relativa sobre os produtos do concorrente
SPP15	The substitutability of the product the start-up company is proposing to sell.	A possibilidade de substituição do produto que a empresa start-up propõe por a venda
SPP16	Whether the product demonstrates defendable competitive position.	Se o produto demonstra uma posição competitiva defensável
SPF17	Whether the profit potential of the start-up company is high.	Se o potencial de lucro da empresa start-up é elevado
SPF19	Whether the start-up company has the potential to attract investment participation from venture capitalists.	Se a empresa start-up tem o potencial para atrair a participação de investimento de capitais de risco
SPF20	Whether the start-up company has multiple, harvestable exit (i.e., cash-out) options.	Se a empresa start-up tem múltiplas opções de mercado, escoamento da produção, (exemplo, liquidez monetária ou solvabilidade)
MTi2	Our incubator manager devotes sufficient time to assisting incubatees.	Nosso gerente de Incubadora dedica tempo suficiente para assistir as empresas incubadas
MTi3	The incubator manager and incubatees in our incubator spend sufficient time interacting.	O gerente de incubadora e as empresas incubadas em nossa Incubadora passam tempo suficiente interagindo

MTi4	Interactions among the incubator manager and incubatees in our incubator reduce the likelihood of the incubatees' making expensive business mistakes.	As interações entre o gerente de incubadora e as empresas incubadas em nossa Incubadora reduzem a probabilidade das empresas incubadas a cometer erros caros de negócios
MC7	Our incubator excels at providing strategic planning assistance to our incubatees.	Nossa Incubadora se destaca no fornecimento de assistência de estratégia de planejamento as nossas empresas incubadas
MC10	Our incubator excels at providing production-related advice to our incubatees.	A nossa Incubadora se destaca no aconselhamento relacionado com a produção para com nossas empresas incubadas
MC11	Our incubator excels at providing operations-related advice to our incubatees.	A nossa Incubadora se destaca no aconselhamento relacionado com as operações para as nossas empresas incubadas
MC12	Our incubator regularly validates the quality of potential new strategic service providers.	Nossa Incubadora regularmente valida a qualidade de potenciais novos prestadores de serviços estratégicos
MC13	Our incubator ensures the quality of its services by regularly reviewing them.	Nossa Incubadora garante a qualidade dos seus serviços, analisando-os regularmente
MC14	Our incubator manager actively seeks ways to continuously improve the level of customer service satisfaction inside the incubator.	Nosso gerente de Incubadora procura ativamente maneiras de melhorar continuamente o nível de satisfação de serviço de atendimento ao cliente dentro da incubadora
RA7	Our ability to provide incubatees with access to marketing specialists.	Nossa capacidade de fornecer as empresas incubadas acesso a Especialistas em Marketing
RQ13	Our incubator excels at presenting business-related information to incubatees in a way that is easy for them to understand.	A nossa Incubadora destaca-se na apresentação de informações empresariais para as empresas incubadas de forma que seja fácil de compreender
RU17	Our incubatees utilize advice obtained from the incubator manager.	Nossas empresas incubadas utilizam pareceres emitidos pelo gerente da incubadora
RU18	Our incubatees utilize the knowledge obtained by fellow incubatees.	Nossas empresas incubadas utilizam os conhecimentos adquiridos por sua empresa incubada colega

RU19	Our incubatees learn to utilize knowledge from other incubatees.	Nossa empresas incubadas aprendem a utilizar o conhecimento de outras empresas incubadas
RU21	Our incubatees act upon the advice they receive from fellow incubatees.	Nossa empresas incubadas agem com base em conselhos recebidos das empresas incubadas colegas
RU22	When we introduce an incubatee to one of our incubator's network contacts, the incubatee maximizes the opportunity present in the introduction	Quando apresentamos uma empresa incubada a um dos contatos da nossa rede de Incubadora, a empresa incubada maximiza a oportunidade presente na introdução
MC6	Fellow incubatees teach each other strategies for achieving business success.	Empresas incubadas companheiras ensinam umas às outras as estratégias para atingir o sucesso nos negócios
EXIT 1	The incubatee was surviving and growing profitably at time of incubator exit.	A empresa incubada estava sobrevivendo e tendo um crescimento rentável no momento da saída da incubadora
EXIT 2	The incubatee was surviving and growing on a path toward profitability at time of incubator exit.	A empresa incubada sobrevivia e crescia a caminho á rentabilidade no momento da saída da incubadora
EXIT 3	The incubatee was surviving but is not growing and is not profitable or is only marginally profitable at time of incubator exit.	A empresa incubada sobrevivia , mas não estava crescendo e não era rentável, ou era só marginalmente rentável no momento de sua saída da incubadora
EXIT 4	Incubatee operations were terminated while still in the incubator, but losses were minimized at time of incubator exit.	As operações da empresa incubada foram terminadas enquanto ainda estava na Incubadora, mas as perdas foram minimizadas no momento de sua saída da incubadora
EXIT 5	Incubatee operations were terminated while still in the incubator, and the losses were large at time of incubator exit.	As operações da empresa incubada foram encerradas enquanto ainda estava na Incubadora, e as perdas foram grandes no momento de sua saída da incubadora

APPENDIX B

DESCRIPTIVE STATISTICS/RESPONSES

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
(SPMA1)	14	1	7	5.07	1.940	3.764
(SPMA2)	14	1	7	5.21	1.762	3.104
(SPMK5)	14	1	7	5.64	2.023	4.093
(SPMK6)	14	1	7	5.29	1.978	3.912
(SPP9)	14	5	7	6.14	.663	.440
(SPP10)	14	4	7	5.93	.917	.841
(SPP12)	14	6	7	6.64	.497	.247
(SPP15)	14	1	7	5.57	1.453	2.110
(SPP16)	14	1	7	5.71	1.684	2.835
(SPF17)	14	4	7	5.93	.730	.533
(SPF 19)	14	4	7	5.86	.864	.747
(SPF20)	14	4	7	5.93	.9169	.841
(MTi2)	14	2	7	5.86	1.406	1.978
(MTi3)	14	2	7	5.36	1.598	2.555
(MTi4)	14	4	7	5.86	.864	.747
(MC7)	14	2	7	5.43	1.399	1.956
(MC10)	14	3	7	5.43	1.158	1.341
(MC11)	14	2	7	5.43	1.399	1.956
(MC12)	14	4	7	5.64	1.082	1.170
(MC13)	14	4	7	5.71	1.069	1.143
(MC14)	14	5	7	6.21	.6993	.489
(RA7)	14	3	7	5.71	1.139	1.297
(RQ13)	14	6	7	6.21	.426	.181
(RU17)	14	4	6	5.21	.802	.643
(RU18)	14	4	6	5.21	.893	.797
(RU19)	14	4	6	5.14	.864	.747
(RU21)	14	3	6	4.86	.864	.747
(RU22)	14	4	7	5.57	.938	.879
(MC6)	14	3	7	4.86	1.167	1.363
(EXIT1)	14	0	20	6.86	5.842	34.132
(EXIT2)	14	1	12	5.79	3.806	14.489
(EXIT3)	14	0	20	4.14	5.655	31.978
(EXIT4)	14	0	18	3.50	5.019	25.192
(EXIT5)	14	0	5	2.00	2.184	4.769
Valid N (listwise)	14					

APPENDIX C
HACKETT AND DILTS SCALE

Construct	Dimensions of the construct /hypothesis:	Items/references
<p><u>Selection performance (independent variable) Definition:</u> <u>Selection performance refers to the degree to which the incubator behaves like an ‘ideal type’ venture capitalist when selecting emerging organizations (options) for monitoring and business assistance and resource infusion.</u></p>	<p>Selection based on managerial characteristics <i>H2a: Business incubation performance is positively related to selection performance, as measured by an incubator’s propensity to select an applicant for incubation based on the applicant’s managerial characteristics.</i></p>	<p>1. The prior work experience of the start-up company’s management team in the field they plan to enter (Hall & Hofer, 1993). 2. The prior management experience of the start-up company’s management team (Hall & Hofer, 1993).</p>
<p><i>Directions:</i> Please answer the questions below keeping in mind the companies that have applied for admission to your incubator over the past five years.</p>	<p>Selection based on market characteristics <i>H2b: Business incubation performance is positively related to selection performance, as measured by an incubator’s propensity to select an applicant for incubation based on the applicant’s targeted market characteristics.</i></p>	<p>3. The long-term growth potential of the market the start-up company plans to enter (Hall & Hofer, 1993; MacMillan, Siegel, & Narasimha, 1985). 4. The size of the target market that the start-up company plans to enter (Tyebjee & Bruno, 1984).</p>
<p><i>Question stem:</i> Historically, when we decided whether to admit an applicant (i.e., a start-up company) to our incubator, we rated the following factors as...</p>	<p>Selection based on product characteristics <i>H2c: Business incubation performance is positively related to selection performance, as measured by an incubator’s propensity to select an incubatee for incubation based on the applicant’s product characteristics.</i></p>	<p>5. The uniqueness of the product (Tyebjee & Bruno, 1984). 6. Whether the product has patent protection (Tyebjee & Bruno, 1984). 7. Whether the product has relative advantage over competitor’s products. Barney, 1991). 8. The substitutability of the product the start-up company is proposing to sell (Barney, 1991; MacMillan et al., 1985). 9. Whether the product demonstrates defendable competitive position (Hall & Hofer, 1993).</p>
<p><i>Likert-type scaled responses :</i> 1. Extremely Unimportant 2. Unimportant 3. Mildly Unimportant 4. Neutral 5. Mildly Important 6. Important 7. Extremely Important</p>	<p>Selection based on financial characteristics <i>H2d: Business incubation performance is positively related to selection performance, as measured by an incubator’s propensity to select an incubatee for incubation based on the applicant’s financial characteristics.</i></p>	<p>10. Whether the profit potential of the start-up company is high. 11. Whether the start-up company has the potential to attract investment participation from venture capitalists. 12. Whether the start-up company has multiple, harvestable exit (i.e., cash-out) options.</p>
<p><u>Monitoring & business assistance intensity (independent variable) Definition:</u> <u>Monitoring & business assistance intensity refers to the degree to which the incubator observes and assists incubatees with the development of their ventures, including helping them to learn from low-cost failures and containing the cost of potential terminal failure.</u> <i>Directions/question stem:</i> Please indicate to what extent you agree with the following</p>	<p>Degree of time intensity with which the Incubator monitors and assists the incubatees <i>H3a: Business incubator performance is positively related to the time intensity of monitoring and business assistance efforts, as measured by the percentage of working time that the incubator manager monitors and assists the incubatees.</i></p>	<p>13. Our incubator manager devotes sufficient time to assisting incubatees (NBIA). 14. The incubator manager and incubatees in our incubator spend sufficient time interacting (NBIA). 15. Interactions among the incubator manager and incubatees in our incubator reduce the likelihood of the incubatees’ making expensive business mistakes.</p>

Construct	Dimensions of the construct /hypothesis:	Items/references
<p>statements by selecting the most appropriate indicator. Likert-type scaled responses:</p> <ol style="list-style-type: none"> 1. Strongly disagree 2. Disagree 3. Mildly disagree 4. Neutral 5. Mildly agree 6. Agree 7. Strongly agree 		
	<p>Degree of comprehensiveness & quality with which the Incubator assists the incubatees H3b: Business incubator performance is positively related to intensity of monitoring and business assistance efforts, as measured by perceived level of comprehensiveness and quality of the assistance efforts.</p>	<p>16. Our incubator excels at providing strategic planning assistance to our incubatees (NBIA; Fry, 1987). 17. Our incubator excels at providing production-related advice to our incubatees (Ansoff, 1965; Chrisman, 1989). 18. Our incubator excels at providing operations-related advice to our incubatees (Ansoff, 1965; Chrisman, 1989). 19. Our incubator regularly validates the quality of potential new strategic service providers (NBIA). 20. Our incubator ensures the quality of its services by regularly reviewing them (Kaplan & Norton, 1992). 21. Our incubator manager actively seeks ways to continuously improve the level of customer service satisfaction inside the incubator (Kaplan & Norton, 1992).</p>
<p><u>Resource munificence (independent variable)</u> <u>Definition:</u> <u>Resource munificence refers to incubator resource availability, quality and utilization.</u> <u>Resource availability directions/question stem:</u> <u>Please rate the ability of your incubator to make the following different resources available to incubatees by choosing the most appropriate answer.</u> <u>Likert-type scaled responses:</u></p> <ol style="list-style-type: none"> 1. Extremely bad 2. Bad 3. Mildly bad 4. Neutral 5. Mildly good 6. Good 7. Extremely good 	<p>Degree of resource availability H4a: Business incubator performance is positively related to resource munificence, as measured by perceived level of resource availability.</p>	<p>22. Our ability to provide incubatees with access to marketing specialists (Brooks, 1986; Hansen et al., 2000; Smilor, 1987a).</p>
<p><u>Resource quality directions/question stem:</u></p>	<p>Resource quality H4b: Business incubator performance is</p>	<p>23. Our incubator excels at presenting business-related information to</p>

Construct	Dimensions of the construct /hypothesis:	Items/references
<p>Please indicate to what extent you agree with the following statements by selecting the most appropriate indicator</p> <p>Likert-type scaled responses:</p> <ol style="list-style-type: none"> 1. Strongly disagree 2. Disagree 3. Mildly disagree 4. Neutral 5. Mildly agree 6. Agree 7. Strongly agree 	<p>positively related to resource munificence, as measured by perceived level of resource quality.</p>	<p>incubatees in a way that is easy for them to understand (Autio & Klofsten, 1998; Campbell, 1989; Rice,2002; Scheirer, 1985).</p>
<p>Resource utilization directions/ question stem:</p> <p>Please indicate to what extent you agree with the following statements by selecting the most appropriate indicator</p> <p>Likert-type scaled responses :</p> <ol style="list-style-type: none"> 1. Strongly disagree 2. Disagree 3. Mildly disagree 4. Neutral 5. Mildly agree 6. Agree 7. Strongly agree 	<p>Resource utilization H4c: Business incubator performance is positively related to resource munificence, as measured by perceived level of incubatee resource utilization</p>	<ol style="list-style-type: none"> 24. Our incubatees utilize advice obtained from the incubator manager. 25. Our incubatees utilize the knowledge obtained by fellow incubatees. 26. Our incubatees learn to utilize knowledge from other incubatees. Manager. 27. Our incubatees act upon the advice they receive from fellow incubatees. 28. When we introduce an incubatee to one of our incubator’s network contacts, the incubatee maximizes the opportunity present in the introduction 29. Fellow incubatees teach each other strategies for achieving business success (Rice, 2002).

