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Analysis of Innovation Ecosystem from Perspectives of Entrepreneurial Self-Efficacy Concept and Lean Startup: Brazilian Context

Parallel Session 2
"Innovation support services: inspiring examples (1)"

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Abstract

Startups are enterprises that generally operate under a risky, uncertain and volatile environment (TRIMI & BERBEGAL-MIRABENT, 2012). Typically, the operating context for a startup is filled with variability and change, requiring high levels of adaptability and rapid response to market shifting demands or movements. The role of a startup leader in enabling the business to innovate and succeed is largely discussed. This paper tries to assess how some Brazilian startup leaders comprehend innovation and how much they are confident in their personal ability to foster it. This was done by means of a structured survey in which their confidence in their own capacity to guide the company to success was assessed. The survey also evaluated how much of Lean Startup methods and concepts are being implemented in the daily life of startups. All respondents of the survey are part of tech-startups, connected to fast-growing environments, such as incubators or accelerators. The main findings are related to the existence of gaps in the comprehension of Brazilian startup´s leaders regarding how innovation takes place, and a certain level of uncertainty on their own capacity to foster it, which might reveal a gap in the provision of training and developing practices in current ecosystems managed by incubators, accelerators and technology parks in Brazil.

Key words: innovation ecosystem; innovation capacity; lean startup; entrepreneurial self-efficacy; ANOVA.

1. INTRODUCTION

Innovation plays a central role in entrepreneurship (HÉBERT & LINK, 2006). According to the entrepreneurship theory of innovation, entrepreneurs are the key driver for economic development by means of innovation (SCHUMPETER, 1952). The relevance of an entrepreneur's innovation capacity has led researchers to investigate its impact on business performance (CAINELLI, EVANGELISTA & SAVONA, 2006; GUNDAY et al, 2011; JANSEN, VAN DEN BOSCH & VOLBERDA, 2006; VARIS & LITTUNEN, 2010; WOLFF & PETT, 2006).

In the context of entrepreneurship, there are ventures and startups as trends in 21st century market. There's not a unique definition for a startup in the literature (EISEINMANN et al, 2011; PATERNOSTER et al, 2014). Eiseinmann et al (2011) define startups as enterprises created to launch new products in the market. Ries (2011) describes startups as enterprises designed to create a new product or service under conditions of great uncertainty in the market, while Blank (2013) defends that the main goal of a startup is to find a business model that is both repeatable and scalable.

A business model defines the way the organization creates and delivers value to its customers (TEECE, 2010). And related to that, one of the key drivers for success of a startup will be its level of innovation capacity, defined by Szeto (2000) as continuous improvements of its capacity to explore opportunities for the development of new products to attend market needs.

A construct that can be linked to innovation capacity in an organization managed by an individual is the Entrepreneurial Self-Efficacy (ESE), which refers to the individual's belief in his/her ability to successfully achieve the tasks of entrepreneurship (CHEN, 1998). These tasks include developing new products and market opportunities, building an innovative environment, coping with unexpected challenges and some other dimensions related to innovative projects and/or companies.

More recently, some tools have emerged as a methodology focused on helping startups to validate their ideas and products, responding to the market and changes more rapidly. These tools were inspired by lean manufacturing principles from Toyota and have a strong basis in previous methodologies such as Customer Development and Agile Software Development, being then structured and incorporated into the market as a new alternative to ventures called Lean Startup.

Looking to contribute in this sense, in this work a survey was created and applied to individuals with a leading role in active startups in Brazil, all part of fast-growing environments, such as incubators or accelerators. The survey was designed drawing on concepts extracted from theories of lean startup, innovation capacity and entrepreneurial self-efficacy (ESE). An analysis of variance (ANOVA) was carried out, in order to check if there was statistical evidence that startup leaders comprehend innovation and act according to ESE concepts; also, to verify how much of lean startup tools are implemented in their organizations with the purpose of achieving higher levels of efficiency and rapidness in responding to market shifts.

2. LITERATURE REVIEW

2.1. Lean Startup

The term lean was originally coined by American academics as they studied Toyota Production System, a revolutionary management approach later termed as Lean Manufacturing. The central idea of Lean Manufacturing is to maximize customer value, minimizing waste and losses. It focus on enhancing the flow of products and services through value chain streams that flow horizontally across technologies, products and services to the clients (LEAN ENTERPRISE INSTITUTE, 2013).

According to Ries (2011), a startup is an institution conceived to create a new product or service, normally under conditions of high uncertainty. One of the main differences between existing companies and startups lies in the business model: existing companies execute an established business model while a startup is typically in search of a suitable one (BLANK, 2013).

The Lean Startup methodology is a set of processes and approaches derived from the application of lean concepts to entrepreneurship, targeted at improving the way companies are developed and new products are launched.

The term lean seems to be first used in the startup context by Eric Ries, who defined lean startup as a combination of agile management and customer-oriented product development, and building on pre-existing systems to eliminate redundant effort (RIES, 2008). The Lean Startup concept arose trying to prevent the inefficient – and frequently considerable - investment many young organizations make in services and products that the customer/final user does not want and will be interested in purchasing. In that direction, Ries (2011) describes a methodology oriented to aid companies in making experiments and iterating searching a sustainable business model.

The Lean Startup approach introduces new concepts, such as: a prototype that efficiently tests business model hypothesis, known as minimum viable product (MVP), and changes to certain business model elements in response to failed hypothesis tests. Unlike other methods, the Lean Startup approach balances the strong drive that comes from a founder's vision of the venture advancement path with the need for redirection or adjustment that derives from market feedback, as explained by Eisenmann et al. (2011).

The methodology proposed by Ries (2011) is centered in a Build-Measure-Learn loop, as shown in Figure 1. The loop represents how startups turn ideas into products, measure customers' response and learn from this data.

The fundamental idea is that a startup must, through implementing selected ideas, build products, measure how customers respond to them and learn to keep or shift the direction, trying new hypothesis without losing its position conquered in the market. As explained by Ries (2011), after having the hypothesis clearly validated, the startup must build its minimum viable product (MVP), providing a prototype version of the product that enables a full turn of the Build-Measure-Learn loop with a minimum amount of effort and the least amount of development time.

Ries (2011) defends the idea that, if executed correctly, this cycle of evolution will provide the guidance and leadership a startup needs to achieve success, by maturing ideas and products through validated learning experiences. The process, repeated continuously, is a fundamental part of the Lean Startup method. The same loop might be applied not only on the product/service development, but also to test assumptions regarding the business model.

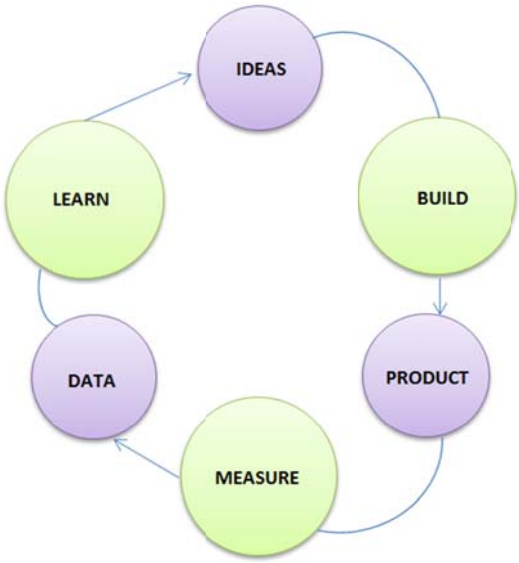

Figure 1 – Build-Measure-Learn loop

Adapted from Ries (2011)

2.2. Entrepreneurial self-efficacy

Schumpeter (1952) theorizes that the individual entrepreneur drives the introduction of innovation in order to create a competitive advantage. If we accept this statement, it is then useful to understand the expected role of the entrepreneur in relation to innovation as he/she may be a key responsible for instigating the development of innovation in their organization, as discussed by HADJIMANOLIS (2000). In this context, the concept of entrepreneurial self-efficacy (ESE), which refers to an individual's belief in his/her personal capability to perform the roles and tasks of an entrepreneur (BOYD and VOZIKIS, 1994), may play an important part. As presented by De Noble et al (1999), there are six basic dimensions underlying the concept of Entrepreneurial Self-Efficacy, adopted in this work as follows:

1. A person's belief in being able to create new products and find (commercial) opportunities, in order to have a solid foundation to launch a venture;

2. A person's belief in being able to encourage others in his/her team to try to implement a new idea or to take innovative actions;
3. A person's belief in being able to find the necessary sources for funding their venture;
4. A person's belief in being able to define and maintain a clear vision of the venture, and in being able to present and clarify it to his/her team and investors;
5. A person's belief in being able to tolerate and deal with ambiguity and uncertainty in the startup environment;
6. A person's belief in being able to recruit and retain important and talented individuals to be the engaged members of the venture.

As highlighted by Bandura (1977), the self-efficacy dimensions above influence the motivation and ability regarding the engagement in specific activities, and are in such a way fundamental conditions of creative productivity and discovery of new knowledge in young enterprises.

Individuals with different levels of self-efficacy beliefs are expected to systematically differ in the amount of effort they spend on goal-directed tasks, the magnitude of coping activities they initiate to overcome impediments, and the degree to which they maintain persistent goal pursuit despite obstacles (BANDURA, 1997; STAJKOVIC and LUTHANS, 1998).

Before initiating and pursuing goal-directed tasks, an individual invokes personal cognitive capabilities to weigh, evaluate and integrate information about personal skills relative to specific challenges and to form beliefs about probabilities of attaining success. The strength of these beliefs and the certainty with which they are held are personal self-efficacy beliefs related to that set of challenges.

Simply stated, individuals with high self-efficacy for a certain task are more likely to pursue and then persist in that task than those individuals who possess low self-efficacy (BANDURA, 1997). According to Chen et al (1998), when viewed as a key antecedent to new venture intentions, self-efficacy is referred to as Entrepreneurial Self-Efficacy (ESE).

2.3. Innovation capacity

The Organization for Economic Cooperation and Development defines innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations (OECD, 2005).

The above definition is similar to the one postulated by Schumpeter (1952), and adopted by many others researchers, of innovation as the introduction of new products or production methods, the opening up of a new market or source of new materials, and the creation of new organizational structures in industry.

When it comes to innovation capacity, though, there is little agreement concerning the meaning and its measurement. The term itself has also variations, such as innovative capacity, innovation capacity and international innovation capacity.

According to Fuchs et al (2000), innovation capacity is the ability to mold and manage multiple capacities. Guan and Ma (2003) define innovation capacity as a construct consisting of seven dimensions: R&D capacity; marketing capacity; manufacturing capacity; learning capacity; organizational capacity; resource exploitation capacity; and strategic capacity.

In this study, the concept of Cohen and Levinthal (1990) is adopted, of innovation capacity as being the ability to continuously transform knowledge and ideas into new products, process and systems for the benefit of the firm and its stakeholders.

3. OBJECTIVES

This paper aims to analyze the relationship between the usage of lean startup tools, as presented by Ries (2011), and the self-efficacy concept, a cognitive belief in the leader's ability to succeed (MCGEE et al. (2009).

The main goals are to understand how both concepts contribute to company innovativeness, identifying trends that might help supply technology parks, incubators and accelerators with a current "picture" of startups behavior that could be stimulated to foster innovation.

4. METHODOLOGY

The study uses an exploratory and descriptive research method since there is still a perceived gap in instruments to measure innovation capacity and assess its relation to self-efficacy and lean startup tools. To identify factors that might affect the three theoretical dimensions involved, a literature review

of articles related to the research problem was carried out. Based on this review, a questionnaire was designed, structured into four constructs and 18 items.

The first three constructs (Entrepreneurial Self-Efficacy, Innovation Capacity and Lean Startup) were composed by five declarations, while the last one (Validation) consisted of three. A 5-point Likert scale

(1 = Strongly disagree, 5 = Strongly agree) was used to evaluate how much the respondents agreed with the statements in ESE and Lean Startup constructs.

To assess the Innovation Capacity construct, a 5-point Likert scale evaluating frequency (1 = Never, 5 = Always) was also applied, in order to measure how often respondents performed certain activities.

The last construct was structured with the purpose of validating the former three. Startup leaders answered whether they agreed or not with three statements, which summarize the main idea of previous evaluated dimensions of ESE, Innovation Capacity and Lean Startup. Appendix 1 shows all constructs and its statements organized in an 18-item questionnaire.

The survey was announced using an online social network that connected important Brazilian startups. The results were collected over a period of a month, with 19 responses obtained. A compilation of the collected data was done, to verify the existence of outliers and missing values. No abnormalities were found. The questionnaire´s consistency was validated using Cronbach's alpha analysis (Cronbach's alpha in the sample = 0.771). Then, each item mean and standard deviation value was calculated. Finally, a one-way analysis of variance (ANOVA) was performed to verify the reliability of each construct's answer with its validation item.

5. RESULTS

The population of this study is compound by 19 Brazilian startups from eight different states. Almost 70% were IT startup companies while the remaining 30% corresponded to startups in varied areas, such as healthcare, agribusiness and beauty market.

The first analysis consisted in calculating the means and standard deviations obtained for each construct. As seen in Table 1, the highest mean (3,92) belongs to the Lean Startup dimension, which also had the highest standard deviation (1,06); that might be explained by the fact that those startups use one or another Lean Startup tool on a routine basis, but do not adopt the entire methodology.

	Construct	Mean	Standard Deviation
A	Entrepreneurial Self-Efficacy	3,83	0,92
B	Innovation Capacity	3,52	1,02
C	Lean Startup	3,92	1,06
D	Validation	4,11	0,62

Table 1 – Mean and standard deviation values for each construct.

Source: the authors

The Innovation Capacity mean was lowest (3,52) with a high standard deviation (1,06), which means that some startups do not usually adopt innovative practices. The Entrepreneurial Self-Efficacy construct had the lowest standard deviation (0,92) and a high mean (3,83); this result seems to indicates that startup leaders have similar levels of confidence in their ability to lead their startups to success and have an optimistic vision about it. The Validation construct with a high mean (4,11) and low standard deviation (0,62) indicates an optimistic perception of startup leaders in their abilities, for each dimension evaluated. All variables means and standard deviations can be seen in Appendix 2.

The second analysis carried out was the anova for each item (variable) corresponding to ESE, Innovation Capacity and Lean Startup constructs with its correspondent Validation statement. This analysis aimed to identify coherence between each construct answer and the general construct validation statement. Main results and findings are presented as follows.

For the ESE dimension, significant difference was found in variables A1 (“Have ideas for new products and/or services”) and A5 (“Train, inspire and encourage startup employees”) in comparison with their validation item (“I believe in my ability in organizing and developing the activities necessary for the success of my startup”), as seen in Table 2. This difference might indicate entrepreneurs are excessively confident about their ESE since they apparently do not perform some key actions for business success, such as creating new products and engaging employees.

	Variable	F	p-value
A1	Have ideas for new products and/or services	4,6139	0,0385
A5	Train, inspire and encourage startup employees	4,5226	0,0404

Table 2 – Analysis of Variance of ESE construct

Source: the authors

When it comes to Innovation Capacity, variables B3 ("Implemented new methods to monitor production and distribution of my product/service") and B5 ("Engage in meetings of class entities and/or participate in associations related to the segment my startup belongs") were significantly different from their respective validation statement ("I try to keep up to date with themes related to innovation and I believe in my capacity to create and adopt new ideas in order to attend necessities of the market"), as seen in Table 3. This may be explained by a lack of understanding regarding the innovation capacity concept. Startups might be mainly focused in creating new products and services instead of improving internal processes and developing a strong network.

	Variable	F	p-value
B3	Implemented new methods to monitor production and distribution of my product/service	6,3529	0,0163
B5	Engage in meetings of class entities and/or participate in associations related to the segment my startup belongs	20,6897	0,0001

Table 3 – Analysis of Variance of Innovation Capacity construct

Source: the authors

Finally, the analysis of the variance of the Lean Startup dimension components showed significant difference between variable C5 ("I keep records of failures committed and learning experiences during the development of my product/service") and its validation statement ("My startup is dynamic and is ready to adapt to changes in market"), as noted in Table 4. A reason for this incoherence could be that entrepreneurs still do not have enough maturity in implementing all Lean Startup tools and/or understanding its usefulness for the business; despite that, they feel confident about their adaptation ability.

	Variable	F	p-value
C5	I keep records of failures committed and learning experiences during the development of my product/service	7,1745	0,0111

Table 4 – Analysis of Variance of Lean Startup construct

Source: the authors

In general, the analysis above seem to show that startup entrepreneurs feel assertive about their skills and abilities, their innovation capacity and their quickness in market response by using lean startup tools. However, some lack of knowledge about fundamental concepts was observed, as well as a reduced use of some methodological tools and a lack of key activities for accomplishing success.

6. CONCLUSIONS

The main objective of the study was to prospect how leaders behind Brazilian startups comprehend innovation and ESE concepts and how much of Lean Startup tools they implement in their organization, in order to achieve higher levels of efficiency and quickness in responding to market changes. The final aim was to obtain relevant data to analyze and to understand if and how theorical concepts considered relevant (ESE, Lean Startup and Innvation Capacity) are being adopted and contributing to company

innovativeness. This might help identify trends to supply technology parks, incubators and accelerators with a current “picture” of how to better foster startup behavior towards innovation.

This might be a key contribution since technology parks, incubators and/or accelerators have a growing need of methods and instruments to assess and qualify potential new companies and their leaders towards innovation.

In this sense, the data gathered and analyzed in this work tends to show that the startup leaders questioned lack important skills related to the improvement of internal business processes. For instance, some results indicate that the assessed Brazilian startups are much more focused on delivering innovative products/services than in implementing better production/distribution processes, or in participating in class entities and associations.

When it comes to Entrepreneurial Self-Efficacy, respondents showed confidence in their ability to lead startups to success, but demonstrated doubts in their capacity of having new ideas and inspire their teams. Finally, the results showed that startups are using some Lean Startup tools and concepts on a routine basis, but the methodology is not yet fully implemented.

In general, the results obtained indicate that there might be a poor understanding of theoretically key innovative practices in the Brazilian startup environment. The startup leaders prospected generally see Lean Startup tools as positive and are confident in their ability to guide their startups to success, but with limitations.

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Appendix 1

Structured Survey

A ENTREPRENEURIAL SELF-EFFICACY

	I have confidence in my ability to...	**Totally Disagree**	**Disagree**	**Indifferent**	**Agree**	**Totally Agree**
		1	**2**	**3**	**4**	**5**
A1	Have ideas for new products and/or services					
A2	Estimate customer demand for a new product and/or service					
A3	Create a network of individuals that find identification and believe in my vision and plans for my startup					
A4	Organize and keep financial records of my startup					
A5	Train, inspire and encourage employees of my startup					

B INNOVATION

	For this set of statements, understand as "new" something that is unprecedented for your business and/or segment your startup is inserted. **Since the creation of my startup, I...**	**Never**	**Seldom**	**Sometimes**	**Often**	**Always**
		1	**2**	**3**	**4**	**5**
B1	Introduced a new product in the Market or used a new/enhanced product delivering a service					
B2	Introduced a new style of service or a different way of interaction with the customer					
B3	Implemented new methods to monitor production and distribution of my product/service					
B4	Talk to potential partners to consider developing products/services along					
B5	Engage in meetings of class entities and/or participate in associations related to the segment my startup belongs					

C LEAN STARTUP

	During the initial planning and management of my startup, I...	**Totally Disagree**	**Disagree**	**Indifferent**	**Agree**	**Totally Agree**
		1	**2**	**3**	**4**	**5**
C1	Prefer to use Canvas to traditional Business Plan					

C2	Talk to potential customers to better understand their problems and provide a better solution					
C3	Can develop a prototype of my product/service or a new version in about a month					
C4	Talk to customers and ask for feedbacks to improve my product/service					
C5	Keep records of failures committed and learning experiences during the development of my product/service					

D VALIDATION

		Totally Disagree	**Disagree**	**Indifferent**	**Agree**	**Totally Agree**
		1	**2**	**3**	**4**	**5**
D1	I believe in my ability to organize and develop activities necessary for the success of my startup					
D2	I try to keep up to date with themes related to innovation and I believe in my capacity to create and adopt new ideas in order to attend necessities of the market					
D3	My startup is dynamic and is ready to adapt to changes in market					

Appendix 2

Mean and Standard Deviation values for each statement

	Variable	Mean	Standard Deviation
A1	Have ideas for new products and/or services	**3,68**	**0,749**
A2	Estimate customer demand for a new product and/or service	3,74	0,872
A3	Create a network of individuals that find identification and believe in my vision and plans for my startup	3,79	1,084
A4	Organize and keep financial records of my startup	4,32	0,885
A5	Train, inspire and encourage employees of my startup	**3,63**	**0,895**
B1	Introduced a new product in the Market or used a new/enhanced product delivering a service	3,89	1,150
B2	Introduced a new style of service or a different way of interaction with the customer	3,68	0,820
B3	Implemented new methods to monitor production and distribution of my product/service	**3,26**	**0,933**
B4	Talk to potential partners to consider developing products/services along	3,89	0,994
B5	Engage in meetings of class entities and/or participate in associations related to the segment my startup belongs	**2,84**	**0,834**
C1	Prefer to use Canvas to traditional Business Plan	3,74	1,284
C2	Talk to potential customers to better understand their problems and provide a better solution	4,37	0,831
C3	Can develop a prototype of my product/service or a new version in about a month	3,84	0,765
C4	Talk to customers and ask for feedbacks to improve my product/service	4,05	1,311
C5	Keep records of failures committed and learning experiences during the development of my product/service	**3,58**	**0,902**
D1	I believe in my ability to organize and develop activities necessary for the success of my startup	4,16	0,602
D2	I try to keep up to date with themes related to innovation and I believe in my capacity to create and adopt new ideas in order to attend necessities of the market	3,89	0,567
D3	My startup is dynamic and is ready to adapt to changes in market	4,26	0,653