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Dynamics of Entrepreneurship Development Related to Technology Adoption in Brazilian Amazonian Region

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Abstract

Entrepreneurs develop new technology-based firms under uncertain conditions, with non-tested technologies and limited resources. However, development, technology, innovation, entrepreneurship, education and environmental preservation are relevant issues with regard to Brazilian Amazonian region. Brazil's economic, social and cultural evolution over the past three decades enabled a very considerable change in market indicators and in population well-being. Hence, entrepreneurship is considered as a regional key driver for economic growth. Within this framework, the purpose of this study is to analyze entrepreneurial attitude towards the adoption of information and communication technology in that region. Based on the theories that determine the research model linked to entrepreneurial attitude and technology adoption, we study the connection between entrepreneurial attitudes and information technology along the development phase of the entrepreneurship process. The methodology is based on a survey of a sample of small and medium-sized enterprises from the State of Amapá in Brazilian Amazonian region. Increasingly, technology entrepreneurs can also not have the exclusive control of all the necessary resources but some theories underscore the evolution and role underlying the nature of business change. Along the technological transformation phase, entrepreneurs' behavior changes and, consequently, enterprises change too.

Keywords: entrepreneurial attitude, information technology, Amazonian region

Introduction

The existing research clearly reveals how relevant the dynamics of entrepreneurship development related to technology adoption is (Aral & Weill, 2007; Cascio & Montealegre, 2016; West, 2015). Non-observed cultural values can hinder organizational development in a given region (Stuetzer, Obschonka, Brixy, Sternberg e Cantner, 2014). However, technology-based entrepreneurs face many challenges when they decide to start up their own companies and turn their ideas into profitable businesses (McPhee, 2012; Muegge, 2012). Special attention must

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be paid to scheme dimension and how heuristics is used along the process of enterprise creation (Busenitz & Lau, 1996).

The Northern Region of Brazil exhibits the lowest scores of digital entrepreneurship in Brazil. Currently, just 0.1% of entrepreneurs have knowledge on digital technology and the other regions have 99.9%. It should be noted that regarding product or process innovation in industrial activities of the ICT sector, 1203 firms in the Northern Region implemented product or process innovation and the Central-West Region also included 2608 companies. This means that the Central-West Region has achieved 46.12% more implementation of product or process innovation than the Northern Region. This difference is due to the industrial profile of Amazonia evidently directed to the production of electronic goods (IBGE, 2013).

According to GEM (2015/16), Latin America and the Caribbean, Argentina, Barbados, Brazil, Mexico and Peru present the lowest levels of innovation and the percentage of entrepreneurs in these countries who considers their products or services as innovative varies from 13.4 % in Barbados to 22.2% in Argentina. The highest levels of innovation were achieved in Chile, where more than half of entrepreneurs have innovative products or services. In nine of the 12 countries, more than 60% of entrepreneurs do not have customers in foreign markets. In these four economies - Argentina, Brazil, Guatemala and Mexico - entrepreneurs are almost totally directed towards their domestic markets. More than 85% of entrepreneurs in those countries have no international customers.

Technology entrepreneurs can also not have the exclusive control of all the resources necessary to create and capture value and they must find new ways to access those resources. However, technology entrepreneurs face many challenges in undertaking and transforming ideas into profitable businesses. In addition to the challenge of creating products or services that customers will want to pay, entrepreneurs are also faced with the challenge of creating an organization that works efficiently and contributes to the results desired by founders and investors (McPhee, 2012; Muegge, 2012).

Enterprises need to be committed to technological issues to improve production and adapt their structures in order to be more competitive in the market and to assign new product or service

with quality thus entering the market with great investments in robotics to achieve good results and economic growth.

Within this context, the objective of this study is to analyze entrepreneurial attitude linked to adoption of information and communication technology taking into account some aspects of information technology influencing entrepreneurial activity of small and medium-sized enterprises in the Amazonian region, namely in the State of Amapá.

Literature review

Entrepreneurship and Regional Development

Some cultures produce more entrepreneurs than others and also influence businesses directly or indirectly. Then, the entrepreneur must define his process and realize that cultural values can benefit enterprises or not. However, non-observed cultural values can hinder organizational development in the region. Therefore, the manager must be aware of all the processes linked to the enterprise and its management. Thus, the independence of enterprises and their managers can determine their development and capability towards the market and contribute to investors and suppliers confidence.

Several characteristics arising during business creation and its integration into the market make it possible to predict the relationship for economy and, consequently, it becomes indispensable for the perception of starting the entrepreneurship process in certain propitious and adequate regions according to entrepreneurial activity defined by the organization, “based on insights from multiple disciplines, we then theorize how regional knowledge creation, economic conditions and an entrepreneurial culture affect individual opportunity perception, which in turn affects individual start-up intentions and activity” (Stuetzer *et al.*, 2014, p. 3).

On several occasions, business development depends on the entrepreneurship process established through entrepreneurial intent promoting business creation for the purpose of producing product or service that are accepted in the market, but it is also fundamental that the entrepreneur observe the growth of the enterprise in the geographic space.

Therefore, business development comprises entrepreneurship commitment and entrepreneur’s ability to put his idea into practice and create the product or service to stay in the market and

continuously updating his product knowledge and also contributing to innovation. Thus, to improve the competence necessary to continue in the business and to establish the process of entrepreneurship as "in developing the core competencies, the entrepreneur engages in the practice of '*evolutionism*', i.e. the transformation of a promising peripheral competence into a core one or one that would be specific on the market" (Asquin and Moore, 2003, p.9).

In management, it is appropriate to emphasize cultural values that are present in decision-making and, on the other hand, knowledge acquired through experience during the organizational process, which can improve the development of entrepreneurship along business activities, "a possible avenue is to examine closely how cultural values are related to schema dimensions and how heuristics are employed in the venture creation process" (Busenitz & Lau, 1996, p. 35).

Entrepreneurs are motivated to identify the niche in the market, where they realize and must create the specific business for that locality, so they develop the business and establish the firm following the process of entrepreneurship "inspired by an entrepreneurial attitude taken in its widest sense, a business must experiment with market leverage, so that it is not only reactive but also proactive" (Asquin & Moore, 2003, p. 9).

During this planning process, enterprises require managers' specific attention to decision-making; thereby the organization achieves higher business satisfaction and quality along the business development process. Thus, through performance, economic growth is achieved and "relevant strategies in the context of business are: concentrate forces; focus on strengths and explore opportunities for synergy; use context and market opportunities; adjust objectives with resources; to create unity of doctrine, motivation, enthusiasm and unity of purpose" (Pumpin, 1990, p.17).

Then, the cognitive process linked to business activity is relevant to business creation and implementation, thus contributing to economic development and also to a new segment in the market. Therefore, "the cognition structures obtained from former experience play an important role in the process. The cognition structures could help individuals to find out the relationship among incidents or trends which looks unrelated facially. New business opportunities could be identified when the entrepreneurs are using "pattern recognition" (Yan, 2012, p. 4).

Furthermore, the planning mechanism is necessary in order to the organization not be swallowed by the process of market change, “contingency plans arise in the strategic planning process to cope with uncertainty” (Porter, 1992, p. 411). Then, the procedures determined by markets in a changing scenario are continuous, “the fact that the world is changing should not jeopardize the dimensional paradigm, but on the contrary, this paradigm can help to understand the internal logic and the implications of changes” (Hofstede, 2011).

Technology dynamics in entrepreneurial activity

Hence, technology is being modelled for regional development and towards economic growth. Skills are developed by learning and repeated performance of contextual activities. Along individual and group interaction with purposed IT, they learn, build and develop skills for their effective use (Arall & Weill, 2007). We live in a global world where technology, specially information and communication technology, is changing the way how businesses create and capture value, how and where we work, and how we interact and communicate (Cascio & Montealegre, 2016).

According to West (2015), nowadays, information technology speeds up entrepreneurial development, therefore some jobs are arising among the most part of professions, enterprises are demanding workers with technological knowledge in order they hold their own jobs. Individuals are not very effective on the detection of price differentials but computers can use complex mathematical formulas to determine where business opportunities are. Let us consider five technologies that are transforming the very bases of global business and organizations that command it: mobile and cloud computing, mega data and machine learning, sensors and intelligent manufacture, advanced robotics and drones and clean energy technologies (Cascio & Montealegre, 2016).

However, the economic system was affected by United States economic crisis at the global level along the first decade of 21st century. Therefore, several countries had to change their development strategy and enterprises followed a new planning due to the effects of the economic crisis mainly the absence of confidence of financial markets and one of the ways employers cut labor costs is by the substitution of less experienced, educated and qualified workers by more qualified workers and technology use (Kraut, Koch & Dumais, 1989).

Then, in order to increase economic development and growth of enterprises, the investment in information technology is necessary so that production process achieves quality pattern supported by technology and more production in less time and at zero cost, therefore with capacity and competitively in the market. At the digital era, people are focused on the creation and commercialization of products and services by means of digital data, information and technology. This era is based on an infra-structure comprised by information and communication technology (Cascio & Montealegre, 2016).

According to Kraut, Koch & Dumais (1989), technological evolution has speeded up entrepreneurial development by means of technology adoption increasing production as the quick expansion of information and communication technologies through white collar work has forced social scientists to consider the impact of these technologies over individuals who use them directly and over workforce and economy as a whole.

However, enterprises are growing quickly and through fusions and even acquisitions of other smaller enterprises to have larger quotes of such product or service in the market. But some public managers are not realizing what is happening in the fusions market and such fact is generating the great monopoly without currencies as the big companies are administrating the other companies outside the countries of origin hence hiding the monopoly. “Current approaches linked to full time jobs will be insufficient if the work patterns change and if society need less workers to carry on basic activities” (West, 2015, p. 2).

Table 1. Examples of research subjects and authors that adopted the perspective of entrepreneurial development and technology adoption within organization

Research Subjects	Authors
What happens if robots take the jobs? The impact of emerging technologies on employment and public policy	West (2015)
How Technology Is Changing Work and Organizations	Cascio & Montealegre (2016)
Computerization, Productivity, and Quality of Worklife	Kraut, Koch & Dumais (1989)
IT Assets, Organizational Capabilities, and Firm Performance: How Resource Allocations and Organizational Differences Explain Performance Variation	Aral & Weill (2007)
The Economics of Modern Manufacturing: Technology, Strategy, and Organization	Milgrom & Roberts (1990)
Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending	Brynjofsson & Hitt (1996)
Results-Based Organization Design for Technology Entrepreneurs	McPhee (2012)
Business Model Discovery by Technology Entrepreneurs Technology	Muegge (2012)
Global from the Start: The Characteristics of Born- Global Firms in the Technology Sector	Tanev (2012)
TIM Lecture Series: Next-Generation Technology Challenges and Business Opportunities	Thomas (2012)
Trajectories, Strategic Formulas and Contingencies: pathways to entrepreneurial success	Asquin & Moore (2003)
Nature and operation of attitudes	Ajzen (2001)
A theory of entrepreneurial opportunity identification and development	Ardichvili, Cardozo & Ray (2003)
The influence of self-efficacy on the development of entrepreneurial intentions and actions	Boyd & Vozikis (1994)
Understanding regional variation in entrepreneurial activity and entrepreneurial attitude in Europe	Bosma & Schutjens (2011)
Does entrepreneurial self-efficacy distinguish entrepreneurs from managers?	Chen, Greene & Crick (1998)

Source: adapted by Affidavit authors

Methodology

This study was conducted in the State of Amapá, one of the twenty seven Brazilian Federative Units and inserted in Legal Amazonia and, in terms of Brazilian Major Regions, is located in the North. This region is one of the less developed regions in Brazil and it is situated in the extreme North of the country, it is part of the Amazon basin and it has borders with French Guiana territories. Thus, this research is focused on the analysis of entrepreneurial attitude linked to information and communication technology adoption and based on the case study of the State of Amapá.

Enterprises realized that robotics, artificial intelligence and machine learning can substitute human beings and increase quality, productivity and operations effectiveness. During the period of great recession, many enterprises were forced to reduce the dimension of their workforce due

to budget reasons. Then, they had to find ways to secure their businesses through a leaner workforce. Individuals who feel competent to use or to learn how to use new technologies are prone to experience less anxiety when that new technology is introduced. The organization or the individual are more probable to implement it. Finally, it is also important to consider the role of social factors on technology acceptance (Cascio & Montealegre, 2016; West, 2015; Brynjofsson & Hitt, 1996; Milgrom & Roberts, 1990).

Meanwhile, entrepreneurial attitude linked to the adoption of information and communication technologies (ICT) is evaluated through the questionnaire within the framework of a set of specific questions such as: I have a great diversity of instruments related to with information and communication technologies; I am a frequent user of social networks and in the Amazonian region information and communication technologies are essential to support business internationalization of micro and small enterprises.

Research model

According to Saunders, Lewis and Thornhill (2009), often to allocate strategies for an approach or any other is excessively simplistic. Besides, we must point out that any research strategy is not inheritably superior or inferior to any other. The research model is based on the elaboration of a questionnaire applied to a sample of entrepreneurs from the State of Amapá, namely small and medium entrepreneurs from the capital Macapá.

Guerring (2004) argues that the diversity of a case study is more clearly understood when introduced internally inside a broader set of methodological selections. In order to understand what a case study is first we must realize both sides, what is or is not. However, the basic approach should consider all the strategies through a pluralist way as part of an almanac to carry on research in social sciences and the researcher may design according to the situation (Yin, 1994). This strategy is particularly interesting when we pretend a greater understanding of the context of the object under study and in this specific case the entrepreneurs from the Amazonian region.

Selection of the sample

In this research, the option was, in its whole, to use a sample defined by convenience and applied to a universe of 9972 entrepreneurs from the State of Amapá, according to registration of the Federal Revenue of Brazil. A sample of insufficient size can lead to erroneous results and incorrect conclusions.

Treatment of business activity sectors comprises small and medium entrepreneurs in full commercial activity facing career decisions and change that the market offers. Therefore, the sample was considered as representative of the population of interest. The best approach to be considered in the orientation of intentional sampling strategies must be based on the conduction of maximum variation sampling or theoretical sampling based on individual attributes, attitudes and behaviors (Creswell, Shope, Plano, Clark, and Green, 2006).

Methodological Procedures

According to Lowder (2009), along the quantitative analysis procedures, the researcher analyzes the raw data obtained in the period of quantitative research to determine if there is an expressive relationship among the variables. The quantitative and qualitative terms are largely used in management and business research to distinguish such data collection techniques and data analysis procedures (Saunders *et al.*, 2009).

In this case, the quantitative analysis procedure was used and the data collection technique (survey by questionnaire) enabled a response rate quite high, considering that from 400 questionnaires distributed and entrepreneurs confirmed only 30 did not respond. So 370 questionnaires were answered, which adds up to a rate of 92.5% answers. This number of valid questionnaires, in spite of being inferior to the 385 obtained as minimal dimension of the sample, can be considered as sufficient to ensure the representativeness of this study.

The questionnaire once applied and the response rate evaluated, we proceeded to the coding of questions and the information to the conduction of statistical data analysis was prepared. Since most of the variables considered in the questionnaire are multiple choice or scale attitudes, i.e. dichotomous or categorical and the purpose of the study is primarily descriptive we proceeded to

a descriptive statistical analysis in which the central tendency and distribution of dispersion are met. For the purposes of this study, we used SPSS 22.0 software.

Results

According to the results displayed in Table 2, entrepreneurial attitudes linked to technology use in the enterprise considering the answers to the variable “I have a great diversity of instruments related to information and communication technologies” reveal a frequency of 27 entrepreneurs corresponding to 7.3% (strongly disagree) and a frequency of 83 entrepreneurs corresponding to a percentage of 22.4% (strongly agree). In spite of the validated percentage being relevant among the answers (strongly disagree and strongly agree), the entrepreneurs from the State of Amapá evidenced a fragility in relation to technology adoption.

Table 2

I have a great diversity of instruments related to information and communication technologies					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	27	7.3	7.3	7.3
	Disagree	32	8.6	8.6	15.9
	Disagree a little	47	12.7	12.7	28.6
	Neither disagree nor agree	56	15.1	15.1	43.8
	A little agreement	52	14.1	14.1	57.8
	I agree	73	19.7	19.7	77.6
	Strongly agree	83	22.4	22.4	100.0
	Total	370	100.0	100.0	

Source: Results of the survey

Based on Table 3, the system of networks enables the user to distinguish other connected users therefore there is the possibility of suggesting or achieving businesses, the use of social networks also enables several contacts and the achievement of great businesses. In the case of the State of Amapá, the data show that just a small proportion of entrepreneurs is using Internet as a means of communication. The reason behind this is possibly caused by the inexistence of Internet provided by optical fiber (broadband Internet connection) in the majority of the states in the Amazonian region. This represents a negative factor to entrepreneurial development. However, this study reveals that this tool appliance is as important as economic growth for a region.

According to data of this research, in a population of 370 entrepreneurs only 100 confirmed to use social networks and it corresponds to 27% of the total. Entrepreneurs seek contact with their clients, relatives, colleagues, do searches and clarify doubts. The recent and fast uprising of tools provided by online social networks enabled to do this easily and effectively at large scale (Morris, Teevan & Panovich, 2010).

Table 3

I am a frequent user of social networks					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	36	9.7	9.7	9.7
	Disagree	29	7.8	7.8	17.6
	Disagree a little	35	9.5	9.5	27.0
	Neither disagree nor agree	44	11.9	11.9	38.9
	A little agreement	64	17.3	17.3	56.2
	I agree	62	16.8	16.8	73.0
	Strongly agree	100	27.0	27.0	100.0
	Total	370	100.0	100.0	

Source: Results of the survey

In Brazil, orientation towards international markets is very restricted and, in the Amazonian region, small and medium-sized enterprises are still developing in order to achieve businesses in the international market but many entrepreneurs have little knowledge about the process, despite the existence of directives issued by the federal government through the office of Brazilian Ministry of Foreign Affairs, many entrepreneurs do not have the information on how the international negotiation process operates. This is fundamental to the entrepreneur who invests and increases economic growth of his business and mainly in the Amazonian region so rich in natural resources.

In Table 4, data allow us to identify another characteristic of entrepreneurs from the State of Amapá. In the variable “In the Amazonian region information and communication technologies are essential to support business internationalization of small and medium-sized enterprises”, in a frequency of 35 entrepreneurs corresponding to 9.5% (strongly disagree) and 92 entrepreneurs corresponding to 24.9% (strongly agree), it is evidenced that most entrepreneurs need to expand commercial relationships with other countries.

Table 4

In the Amazonian region the information and communication technologies are essential to support business internationalization and small and medium-sized enterprises					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	35	9.5	9.5	9.5
	Disagree	22	5.9	5.9	15.4
	Disagree a little	41	11.1	11.1	26.5
	Neither disagree nor agree	63	17.0	17.0	43.5
	Neither disagree nor agree	60	16.2	16.2	59.7
	I agree	57	15.4	15.4	75.1
	Strongly agree	92	24.9	24.9	100.0
	Total	370	100.0	100.0	

Source: Results of the survey

Conclusion

Planned attitudes within the organization establish the procedures necessary to emerge in the market and on the other hand reveal the capacity of programmed development towards the market where entrepreneurial skill, experience and strategy are required taking into account the changes increased by technological knowledge. Our data highlight entrepreneurs' perceptions on attitude and technology adoption, evidencing also performance and access to technological experience within enterprises according to different perceptions on strategic objectives. Thus, a greater attitude towards ICT shall contribute to profit and quality business but due to the difficulty of access to information technology, many entrepreneurs are still constrained of operating important businesses at the national and international levels.

Information technology can help in this process in two ways at least. First, it can incorporate some qualification and knowledge directly; therefore the user needs less (Kraut, Koch & Dumais, 1989). Enterprises need Internet and apps which are very useful for entrepreneurial resources planning, customer relationship management, supply chain management, material resources demands and human resource management to provide support to business processes and inter organizational activities (Cascio & Montealegre, 2016).

Entrepreneurs' attitudes linked to technology use within enterprises, according to their answers in the variable "I have a great diversity of instruments related to information and communication technologies", were evidenced, in a frequency of 27 entrepreneurs corresponding to 7.3%

(strongly disagree) and in a frequency of 83 entrepreneurs representing the majority and accounting for 22.4% (strongly agree). In spite of being relevant, the valid percent (strongly disagree and strongly agree) reveals State of Amapá entrepreneurs' fragility in relation to technology adoption. Although data analysis was conducted focused on research objectives to find out organizational practices effects or information technologies specific effects on productivity, research should pursue data to estimate specific models (Bartel, Ichniowski & Shaw, 2004).

Although this research can open up new ways and dimensions to the technological process within entrepreneurial activity and, therefore, create value from a perspective based on resources promoting gain in the market mechanism through the adoption of technology, this study experienced some constraints and on the other hand the great challenge of knowledge linked to the area of information technology. Relevant literature on this domain was fundamental to contribute to in-depth knowledge which is proposed to future researchers in social sciences. Finally, along this research, several features linked to technology adoption along entrepreneurial activity were identified and evidenced that entrepreneurial development depends on information and communication technology. Networking with national and foreign enterprises is fundamental to suggest or achieve businesses at large scale. In the case of the State of Amapá, data show a small proportion of entrepreneurs using Internet as a means of communication as in the Amazonian region most states do not have access to Internet provided by optical fiber (broadband Internet connection). This is a negative factor to entrepreneurial development as the ease of doing business and the access to appropriate technological infrastructure are vital to business success and this study reveals that this tool appliance is as important as economic growth to create new business opportunities and to promote a digital entrepreneurial culture.

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