

THE DYNAMICS BETWEEN INTERNATIONALIZATION STRATEGIES AND INNOVATIVE PERFORMANCE WITHIN ICT COMPANIES

A DINÂMICA DA RELAÇÃO ENTRE INOVAÇÃO E INTERNACIONALIZAÇÃO EM EMPRESAS DE TIC

Submission: 25/09/2017

Accept: 27/05/2019

Polyana Karina Mendes Ximenes¹

José Ednilson de Oliveira Cabral²

Samuel Façanha Câmara³

Mônica Mota Tassigny⁴

ABSTRACT

The article aims to evaluate the existence of a coevolution between internationalization strategies and innovative performance within information and communication technology (ICT) companies located in the northeast of Brazil. In order to achieve this objective, a conceptual model was derived from the literature review contemplating the vision that internationalization and innovation within companies happen in an evolutionary and dynamic way. Methodologically, the study is characterized by being qualitative, using the technique of multiple cases. The studied companies (IVIA, IFACTORY, CPQI and GREENMILE) presented changes in both internal and external competences. Thus, a main conclusion has been that the studied companies presented a process of coevolution between innovation and internationalization strategies. In terms of business strategies, it can be verified that the presence of these two processes, guarantees the development and growth of companies in the global market.

Keywords: Internationalization. Innovation Coevolution.

1 UNIFOR, FORTALEZA, CE, Doctor of Administration from the University of Fortaleza (UNIFOR). Master in Business Administration from the State University of Ceará (UECE). Specialist in Strategic Management and Business Finance, with a degree in Business Administration. He has experience in the area of Financial Management of Companies, teaching, teaching management and Realization of projects in the area of innovation and technological prospection. E-mail: polyanaximenes@gmail.com. ORCID: <https://orcid.org/0000-0001-7885-7344>

2 UNIFOR, FORTALEZA – CE, Doctor of Economic from University of Reading, UR, England. E-mail: ednilson@unifor.br. ORCID: 0000-0002-4033-1125

3 Ceará State University – UECE, Fortaleza, Ceará, Brazil, PhD in Economics from the Federal University of Pernambuco (UFPE).

E-mail: samuel.camara@uece.br. ORCID: <https://orcid.org/0000-0002-8333-6997>

4 Universidade de Fortaleza, Brasil//Ceará/ Fortaleza, PhD in Socio-Economie du développement - Ecole des Hautes Études en Sciences Sociales (2002) and PhD in Education by the Federal University of Ceará (UFC, 2002). He is currently a full professor at the University of Fortaleza, the Graduate Law Program (PPGD / UNIFOR) and the Graduate Administration Program (PPGA / UNFOR). Full member of the Metropolitan Academy of Letters of Fortaleza and effective member of the Technical-Scientific Advisory Board of Funcap (Fundação de Amparo a Pesquisa - Ceará) for a period of two years from January 2019. E-mail: monica.tass@gmail.com
ORCID: <https://orcid.org/0000-0001-9483-0547>

RESUMO

O artigo avalia a existência de coevolução entre as estratégias de internacionalização e o desempenho inovativo em empresas de Tecnologia da Informação e Comunicação (TIC) localizadas no nordeste brasileiro. Para tanto, derivou-se da revisão de literatura um modelo conceitual contemplando a visão de que a internacionalização e inovação nas empresas acontecem de forma evolucionista e dinâmica. Metodologicamente, o estudo caracteriza-se por ser qualitativo, utilizando a técnica de múltiplos casos. As empresas estudadas (IVIA, IFACTORY, CPQI e GREENMILE) apresentaram evolução das competências tanto internas, como externas, com diferenças em cada caso analisado. Como principal conclusão, tem-se que as empresas estudadas apresentaram um processo de coevolução entre inovação e internacionalização. Em termos de estratégias empresariais, verifica-se que a presença destes dois expedientes garante a permanência sustentável das empresas no mercado.

Palavras-chave: Internacionalização. Inovação. Coevolução.

1 INTRODUCTION

The literature on international business has studied the relationship between the internationalization of companies and innovation from different angles, but little is known about how companies can transform their internationalization experience into innovation, and vice versa, that is, what is the influence of innovations on internationalization. According to Molero (1998), Pla-Barber and Alegre (2007), Roper and Love (2002) among others, there is a positive relationship between innovation and internationalization, originated mainly from the market power that this innovation confers.

In specific relation companies belonging to the Brazilian market, it appears that they tend to internationalize their activities after gaining enough experience in the domestic market. This phenomenon stems from the conception that the management of many Brazilian companies is initially focused only on the national market (BORINI et al., 2013; KOVACS; DEMORAES; DE OLIVEIRA, 2007).

In contrast to the “late” entry of Brazilian companies in the international scenario, innovation is there, acting as a catalyst in this process of entering foreign markets (TEIXEIRA, 2014; WIDMIER; BROUTHERS; BEAMISH, 2008). However, to this basic premise of these studies that innovation acts as a springboard for the internationalization of companies, there is a lack of studies with conclusive foundations on the relations of this influence, requiring scientific proof.

From this context in which innovation influences the internationalization of companies, we notice changes in the business conjuncture, mutating towards a global market, resulting in the development of a transnational client, that is, this client can be anywhere in the world, seeking the same kind of service wherever they are (PERROTTI, 2008).

In this transformation, innovation has played a key role. Thus, internationalization and innovation are fundamental trends in the age of globalization. The industrial age, based on the transformation of raw materials into finished products has been left behind for us to enter the age of a knowledge-based creative society, in which organizations must continually break down mental and physical barriers in order to learn, innovate and internationalize. Innovation and internationalization imply novelty or new actions, points of view, activities or behaviors developed by organizations (CHIVA; GHAURI; ALEGRE, 2013).

As a way to minimize the barriers encountered, companies have been adopting internationalization processes, verified as a worldwide trend, as a means of achieving the expansion of

their business and their market share, regardless of their size (TEIXEIRA et al., 2008). Thus, from a national base, companies distribute their activities of marketing, producing, researching and developing (R&D) products in various regions of the world.

In recent years, research on innovation and internationalization has been uniting these two concepts, yet this has been done by a search for linear and unidirectional causality between them (Molero, 1998), where one concept causes another, but the following concept has no effect on the first one. By taking the concepts from this perspective, the authors are taking a deterministic worldview, in which phenomena happen in a chain of subsequent events one after the other rather than in a dynamic and cyclical way.

Moreover, and given that some research (HITT et al., 1997; KOBRIN, 1991; KOTABE; HELSEN, 2010) conclude that one construct causes the other, while other studies (KUROKAWA; IWATA; ROBERTS, 2007; NONAKA; TAKEUCHI, 1995) find the opposite, researchers continue to statically evaluate the relationship between these phenomena. Seen in this way, a study on evolution of dynamics in the relationship between innovation and internationalization could be considered contradictory. However, a new approach is needed to clarify and understand the dynamics of these relationships.

Within this new and complex paradigm, it is suggested that the concept of complex systems, an essential topic within this literature (SIMON, 1996), may be a useful starting point for understanding the way innovation and internationalization interact and evolve as it underlines the importance of mutual causality and interconnections.

Thus, complex systems and evolutionary theory can assist in understanding the relationships between the two concepts mentioned above (MILES; HUBERMAN, 1994). By taking a theoretical approach (HOUCHIN; MACLEAN, 2005; TSOUKAS, 1998), emphasizing the behavior or characteristics of complex and evolutionary systems, it is therefore possible to consider that innovation and internationalization constitute a complex system and that these are composed of heterogeneous elements that relate to each other and with the surrounding environment (ANDERSON, 1999; SIMON, 1996).

Thus, the link between innovation and internationalization, despite presenting a strong theoretical framework, needs to be resized. The firm's evolutionary theory (NELSON; WINTER, 2005; ROSENBERG, 1993) has left new discoveries, (KOGUT; ZANDER, 1993) in every environment and activity developed by companies, with a link to innovation to be developed and disseminated.

In this paper we will conduct a dynamic analysis of internationalization strategies (through the development of internal and external skills) and their relationship with innovation, aiming to identify a possible coevolution between these two elements. Specifically, in relation to the product and / or innovative process of Brazilian information and communication technology (ICT) companies.

This perspective pursues the argument of how this development of ambidextrous internationalization competencies (development of internal and external internationalization competences) can co-evolve with product and / or process innovations. It is noteworthy that the strategy for the internationalization of companies in this research was considered through the acquisition of internal and / or external skills acquired by firms (PRANGE; BRUYAKA, 2016).

Based on the question of how internationalization and innovation processes evolve in the ICT companies in northeastern Brazil, qualitative research was conducted using the multiple case technique, showing that the companies analyzed in the empirical field presented a process of innovation and internationalization, and, with regard to business strategies, the influence of both methods was found to ensure the sustainable permanence of companies in the market.

2 DYNAMICS IN THE RELATIONSHIP BETWEEN INTERNATIONALIZATION AND INNOVATION: A CONCEPTUAL MODEL

The analysis of the internationalization - innovation relationship in its dynamic form is still an issue that requires further reflection in the theoretical field. However, there are already some studies developed outside Brazil in this sense (CANTWELL, 1995, 1997; CANTWELL; PISCITELLO, 2000; CARLSSON; MUDAMBI, 2003; FILIPPETTI; FRENZ; IETTO-GILLIES, 2009; LE BAS; PATEL, 2005; PISCITELLO, 2004).

Thus, research conducted in the area reiterates a bibliographical perspective that is not tenable when it comes to ratifying that the relationship between internationalization and innovation occurs dynamically, because in general, existing literature affirms a positive, linear and unidirectional relationship between innovation and internationalization (MOLERO, 1998; PLA-BARBER; ALEGRE, 2007), mainly because innovation confers market power and, as a consequence, facilitates internationalization (ROPER; LOVE, 2002).

Thus, given the expedients of innovation and internationalization in companies, knowledge is perceived as a connection. However, to date, these relationships have not been portrayed dynamically in the theoretical framework of specialized literature.

Performing a literary retrospective (HITT et al., 1997; KUROKAWA et al., 2007; PRANGE; BRUYAKA, 2016; VON ZEDTWITZ; GASSMANN, 2002), we see the presence of technology as an important agent of exports and, eventually, of foreign direct investment, mainly in production facilities, contributing to the increased presence of companies in foreign markets. More recently, the desire to acquire technology has been the main reason for multinational companies to locate their R&D facilities abroad (CANTWELL; PISCITELLO, 2000).

This technology has become global in scope and the technology life cycles have become shorter. Companies have been responding correctly to this new order by implementing multifaceted innovation strategies that reflect a new philosophy on the interdependence of competing companies. Speed in innovation is increasingly the strategic benchmark on how competitive survival will be gauged. Therefore, companies are partnering with other companies, organizations, and institutions in an effort to survive, and they are, therefore, exchanging loss of ownership for timing (DE LA MOTHE; LINK, 2002).

In reality, this it is likely to be a two-way interactive process in which innovation and internationalization mutually reinforce each other with cumulative effects. A virtuous (or vicious) circle that sets in. Innovative companies are most successful in international business (ROGERS, 1983).

This fact puts them in touch with alternative business cultures and innovative contexts, thereby increasing their overall business knowledge. That, in turn, makes them more innovative and therefore better able to compete internationally. Companies and less innovative countries may be trapped in an opposite vicious circle (ROGERS, 2004).

Despite what has already been produced, these approaches are linear, and the literature on this causality still finds inconsistent studies, because while some research concludes that one concept affects the other, there are studies stating the opposite. Moreover, the approach of linear causality is static, which hinders understanding of the dynamics of relationships (MOLERO, 1998).

The premise that internationalization and innovation form a dynamic and causal relationship has been stated (CANTWELL, 1995, 1997; CANTWELL1; PISCITELLO, 2000; CARLSSON; MUDAMBI, 2003; CANTWELL et al., 2004; FILIPPETTI; FRENZ; IETTO- GILLIES, 2009; LE BAS; PATEL, 2005; PISCITELLO, 2004) because companies operating in many countries learn from diverse

experienced contexts to innovate and, therefore, are able to benefit from this knowledge. The sources of learning and acquiring this knowledge can be many. If a country is highly internationalized it is likely to perform better in innovation.

One way to understand how internationalization influences the returns from innovation is to focus on how it affects the factors that drive this economic return. On simplifying the conceptual framework, these factors can be grouped into two categories. The first relates to the factors that influence the company's ability to produce technological innovations (innovation capacity) and the other is the company's ability to learn and internalize this knowledge within this process.

Internationalization can also improve the capacity for innovation, allowing companies to hire better specialists and access qualified technical knowledge (Chen; Bolon, 1993). Foreign direct investment (FDI) can improve the quality of new products through networking mechanisms that enable a continuous flow of information on changing customer needs and requirements.

It has generally been recognized that, in order to unlock their economic potential, organizations must seek and explore external ideas and sources of innovation (CHESBROUGH, 2003). Kuemmerle (1997) argues that in order to innovate at the speed necessary to remain competitive, companies must absorb new research knowledge from foreign universities, competitors, and hubs of scientific excellence. Doz, Santos and Williamson (2004) point out that, if companies use similar reservoirs of knowledge in the same market, they obtain products that are easy to imitate.

On the other hand, however, a high degree of internationalization increases the risk of knowledge leakage. It is often said that one of the disadvantages of decentralization is the involuntary disclosure of knowledge from poorly controlled departments (FISCH, 2003), increasing the likelihood of competitors' access to know-how and spillovers (SANNA-RANDACCIO; VEUGELERS, 2007).

In fact, when the knowledge framework of the local economy is poor, the costs of output spillovers may even outweigh the benefits of input spillovers (SANNA-RANDACCIO; VEUGELERS, 2007). Therefore, many innovation strategists argue that a centralized network is necessary in order to protect the embedded technology.

Another consequence of internationalization is the substantial cost that coordinating and controlling a global network entails. Granstrand, Hikanson and Sjiilander (1993) explain that, in order to promote learning and avoid duplicity, the exchange of information between individuals, teams and divisions is required. This cost can be substantial, because with the exchange of tacit knowledge, face-to-face meetings are needed to inspire confidence (VON ZEDTWITZ; GASSMANN, 2002). As such, managers and scientists need to travel to different locations to visit affiliate suppliers, contributors and universities.

Other authors emphasize that geographical distance between departments also influences communication and learning in terms of frequency, quality, and speed (VON ZEDTWITZ; GASSMANN, 2002); and that the efficiency of communication and knowledge diffusion among teams decreases exponentially with geographical distance (FISCH, 2003).

Hitt, Hoskisson and Ireland (1994) argue that internationalization not only allows a company to enrich its sources of knowledge, but also provides the opportunity to capture ideas from a larger number of new and different markets, as it facilitates the introduction of innovation based on the knowledge of a wide range of cultural perspectives.

Extending the previous research on innovation, this study empirically develops and tests a framework that unites these seemingly conflicting results. Based on theoretical knowledge of the disciplines of innovation and international business, it is argued that not all companies are able to benefit from innovation. Rather, it is proposed that the innovation-performance relationship is moderated by a degree of direct internationalization investment, that is, to the extent that it operates beyond national borders.

In other words, it is suggested that companies need a certain limit of internationalization and to be able to access a wide range of markets in order to sufficiently benefit from their new products and processes.

According to Prange and Bruyaka (2016) managers are indicated to evaluate which internationalization path would be ideal under a given set of conditions. In addition, they must balance their internationalization strategies with respect to types of innovation. Foreign multinationals can learn, from other companies in the domestic market, how to develop ambidextrous internationalization strategies.

In transnational corporations (TNCs) there is a specific and additional mechanism for the transmission of knowledge, which operates through the company's internal network. Knowledge is transmitted through contacts between each TNC unit (either branch office or parent company) and is also exchanged with the local environments where the units operate.

Internationalized companies operate in foreign countries through various modalities, ranging from direct foreign investment to franchise trading through subcontracting and joint ventures. All modalities, in different ways, give rise to a variety of networks between countries. All of these networks create spaces for the acquisition of knowledge and innovation from different environments. The mechanisms by which diffusion occurs can be through the movement of tangible or intangible products, materials and goods or through the mobility of human resources (KOGUT; ZANDER, 1993).

Many companies, especially larger ones, which are organized in units that operate in different regions, interact as an internal network, and, in the case of transnational companies, the units are located in different countries. Each unit of internationalized companies has the opportunity to learn from the context of innovation and the system of the home or host country in which it operates. Knowledge is absorbed by the unit and then transmitted, in whole or in part, to other parts of the company through its internal networks (CASTELLANI; ZANFEI, 2004, 2006).

In addition to acquiring the capacity for innovation through operations, there is also the acquisition of knowledge through other agents. Most of these agents are intermediary companies, although not all originate from internationalized companies, they contribute to the acquisition of innovation capabilities, exposing domestic companies to the needs of foreign customers or to their new products and processes.

Nevertheless, with embedded and coded knowledge, tacit knowledge plays a crucial role in driving innovation (POLANYI, 1966). Particularly with regard to the latter, because international movements of highly skilled workers are key mechanisms in the transfer of knowledge and innovation.

Thus, cross-border collaboration between companies, academic institutions and individual researchers contributes to innovation capacities as well as to international academic exchanges and training. These various elements, separately or in combination, create a causal relationship between internationalization and innovation, not only at the company level, but also at the country level (PRANGE; BRUGAYA, 2016, NONAKA; TAKEUCHI, 1995).

As described in the research conducted by Prange and Bruyaka (2016) in Chinese companies, in general, innovative processes have been developed with the objective of creating cost advantages, since innovative products usually imply the need to realize technological advantages, which require equal, or even higher, knowledge than international competitors.

Thus, while Western business internationalization theories focus on internationalization from the inside out, based on their innovative ability to internationalize, the Chinese reality is different. Most Chinese companies enjoy technological advantage and have a single owner to reach the foreign market, internationalization is rarely based on innovation (BONAGLIA et al., 2007).

Thus, while these companies often internationalize too early, developing new products, technologies or brands, in an attempt to reach their western competitors through close collaboration and learning, they develop innovations that potentially allow them to make a transition to become strong competitors on a regional or even global scale (BONAGLIA et al., 2007).

Other companies focus first on domestic market penetration and then try to find foreign target markets. Existing research in international business has rarely investigated strategies involving internationalization from the inside out and from the outside in, although many companies engage in dual internationalization, that is, they compete in the domestic market with foreign competitors and go abroad to compete with the same players, in order to increase their competitiveness.

Thus, there is in this process the presence of knowledge in companies, both in the acquisition of internal skills for internationalization afterwards, as well as in the acquisition of skills in the foreign market, for innovation afterwards. This acquisition of skills is directly linked to the acquisition and incorporation of knowledge, and this knowledge may be explicit or tacit (PRANGE; BRUYAKA, 2016).

For the process of knowledge production to be consumed, it must be applied, and this phenomenon occurs when an organization manages to achieve dynamic interaction between tacit and explicit knowledge, that is, putting them in constant exchange. This reciprocity resembles dialectics, where phenomena or events are not opposite to each other, because there is a point of intersection between such knowledge in the real world.

Learning, however, does not involve the full spectrum of knowledge, since its process is much more complex and permeated by sides and setbacks. Within the core of this process of knowledge creation, organization amplifies the process, while individuals execute the action. What organizations can and should do is stimulate and create the right conditions for these individuals to create knowledge (PLA-BARBER; ALEGRE, 2007).

When an organization is able to transform tacit knowledge into explicit knowledge and vice versa, that is, when there is a mutual interaction between these two forms of knowledge, the knowledge base of that organization increases.

Table 1 - Knowledge Creation Process1

Knowledge conversion modes	Description of knowledge conversion modes	Combination of entities in knowledge creation
Tacit to tacit = socialization	Socialization: Sharing and building tacit knowledge through direct experience.	Socialization: individual to individual;
Tacit to explicit = Externalization	Externalization: Expressing tacit knowledge through conversations and reflection.	Externalization: individual to group;
Explicit to explicit = combination	Combination: Systematizing and overlapping explicit knowledge and information.	Combination: group to organization;
Explicit to tacit = internalization	Internalization: Instructing and acquiring applied original tacit knowledge.	Internalization: organization for individuals.

Source: Adapted by the authors (2016) based on Nonaka and Takeuchi (1995).

Given the dynamic relationships shown in Table 1, we demonstrate the model that embodies the dynamic, cyclical and coevolutionary thinking present in the internationalization and innovation processes at companies, with knowledge working as a link.

2 METHODOLOGY

The research takes on a qualitative footprint, due to the nature of approaching the issue through research (TRACY, 2013), of an exploratory characterization, because it intends to build theory, as it seeks to unveil if there is coevolution between innovation and internationalization, in addition to analyzing the examples that stimulate understanding (GIL, 2007), as well as through a descriptive characterization, because it is suitable for studies that aim to describe facts and phenomena that are related to a given reality.

Regarding the type of empirical field definition technique, we chose to use the case study, more specifically the multiple case study. To Feagin, Orum and Sjoberg (1991) and Yin (2005) the case study is a way of conducting empirical research, which usually involves questions such as “how” and “why” and investigating phenomena involving social life, in situations where the boundaries between the phenomenon and the context are not clearly established.

Multiple case study is an ideal methodology when in-depth holistic investigation is required (FEAGIN; ORUM; SJOBERG, 1991; MINAYO et al., 2005). Multiple case studies have been used in various investigations, particularly in sociological studies involving societies or organizations whose focus is to function as a sample of the society.

Data collection was conducted through combined triangulation methods, involving: documentary research with the use of text, image and video files; prolonged unstructured interviews; and, direct observation.

The first steps of the research entailed the creation of categories, which are present in the researched theoretical framework. This comparison on specialized literature aimed to establish the sets of variables that will be sought in the data collected. Therefore, these comparisons were performed when the categories were previously defined.

In this sense, the following categories were defined as described in Table 2:

Table 2 - Categories used for analysis

Categories	Concepts	Types (Examples)
Innovation	Schumpeter (1942): defines innovation as a process of creative destruction, where something previously nonexistent is created. Urabe (1988) defines innovation as the generation of a new idea and its implementation in a new product, service or process.	Creation of a nonexistent product; existing product improvement; creation of non-existent technology; improvement of existing technology; nonexistent service and / or process creation; service improvement and/or existing process.
1.1 Product innovation	Concerns the introduction of materialized product innovations (BARBIERI, 1997).	Creation of new product or improvement of existing product.
1.1.1 Dramatic product innovation	Market insertion of innovative product, not yet existent (BARBIERI, 1997).	Product creation not yet available in the market.
1.1.2 Incremental product innovation	Consumers perceived improvements in a product (BARBIERI, 1997).	Insertion of some kind of improvement adding greater value.
1.2 Process Innovation	Creation or improvement of processes that will start a new path in the organization (BARBIERI, 1997).	Insertion of a new form of production or improvement of an existing production.

1.2.1 Incremental process innovation	Insertion of improvements into an existing process (BARBIERI, 1997).	Improvements to an existing process usually aim to reduce costs, improve quality and/or increase production capacity (BARBIERI, 1997).
1.2.2 Dramatic process innovation	Creation of a new process, whether in management, production and / or service (BARBIERI, 1997).	Creation of a new way of "doing things" at the company, introduction of an innovative process, making the preexisting one obsolete.
Internationalization	Can be defined as companies involved in international operations (WELCH; LUOSTARINEN, 1999).	When the company begins the marketing process with other countries.
2.1. Inside-out Internationalization	The company first develops skills in the domestic market and then internationalizes its activities.	The internationalization process can begin by exporting products and/or services or otherwise.
2.2. Outside-in Internationalization	The company already begins its operational activities acting in the international market.	The activities developed by the company can be developed by exporting products and/or services, as well as another modality.
2.3. Ambidexterity Internationalization	The company begins to internationalize its activities, both at the beginning of its activities, while seeking to acquire skills in the foreign market.	The company is usually globally born and seeks to structure itself in the domestic market and to act strongly in this market.
3. Knowledge	The greater the knowledge of companies, the greater their autonomy and the greater their market sustainability.	Knowledge is seen in a broad sense, in the sense of organizational learning, as a result of the corporate process of innovation and internationalization.
3.1. Tacit knowledge	It is the knowledge incorporated into the organization, but not yet formally described, it is part of the informal structure of the company.	International movements of highly skilled workers (SAL 1991, 1997; OECD 2002) are key mechanisms in the transfer of knowledge and innovation.
3.2. Explicit knowledge	Knowledge formally incorporated into the organization and transcribed into management documents.	Reports and other documents written for the purpose of transferring knowledge.

Source: Adapted by the authors (2016) based on Nonaka and Takeuchi (1995).

For these categories we analyzed the coevolution between innovation (measured by time) and internationalization (measured by time), with knowledge as a feedback element between these two key points.

The sample was defined by four companies that agreed to participate in the survey. A larger number was attempted, yet could not be achieved, and this number is due to the lack of accessibility to companies that contain the characteristics for the research. However, this is a satisfactory number for the intended analysis, since they comprise approximately 80% of the companies with the outlined profile, present in the Northeast region of Brazil.

For data collection, we used the process that is considered as a biographical history, where the entire life of the company is captured in time, from its foundation to the present (CHANDLER, 1998; MINAYO et al., 2005; MINTZBERG, 1978; YIN, 2005). Data analysis initially included the historical description of the process of innovation and internationalization of the companies surveyed to understand the "moments" of the main events. To this end, coding was performed by labeling and linking incidents using ATLAS TI software. Managing the use of ATLAS TI encompasses the design and management of fundamental objects whose function was to support the theory that was built. Data obtained through unstructured interviews was treated by the content analysis technique (BARDIN, 2011).

3 RESULTS OBTAINED

In the analyzes performed with the use of the ATLAS TI version 7.0 software, all transcripts of the interviews were inserted along with the documents referring to the companies under analysis.

According to the theoretical framework that deals with the innovation process characterized by the innovative performance, which evolves in time, at the ICT companies, the aforementioned statement is clearly confirmed through the analyzes related to the researched companies, It should be noted that the innovation processes, even at companies showing different trajectories, evolved in relation to the aspect of time.

In order to make the empirical evidence found in the research more understandable, a decision was made to build Table 3, containing the cases under analysis, with the respective portrayal of what occurred in relation to innovation, internationalization and knowledge, portraying the comparisons of the occurrences at companies, especially with regard to the three points listed.

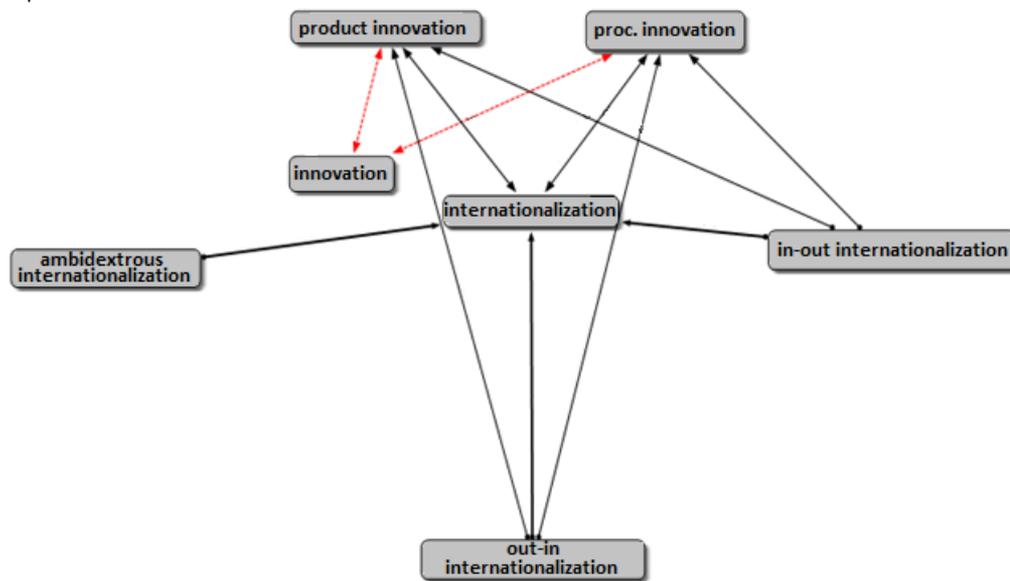
Table 3 - Comparisons of the cases analyzed

CONSTRUCT / COMPANY	COMPANY - IVIA	COMPANY - IFACTORY	COMPANY - PCQI	COMPANY - GREEN-MILE
INNOVATION	Innovation present since the beginning of the company through innovative products. First product innovation occurred and later process innovation. Currently the company's innovative process is focused more on process innovation.	Innovation present since company inception through product innovation. Currently, both process innovation and product innovation coexist at the company, yet the latter is much more evident.	Innovation present since the creation of the company. In the beginning, innovation was focused more on product innovation, Currently, there is product innovation, as well as process innovation. It can be assumed that the company can act intensively in both areas.	Innovation present since the foundation of the company. The company focused on investments centered on product innovations, which was given greater concern. Currently, investments continue in the same direction. The company works with the commercialization of products and not with services, as is the case of the other companies analyzed, thus focusing more on product, and not to process, innovation.
INTERNATIONALIZATION	Company internationalization occurred from the inside out (IN-OUT). The internationalization process took place in stages, which the company completed by opening a branch abroad.	The company is characterized as born-global (OUT-IN). Currently there is ambidextrous action (AMBI) in relation to internationalization, due to the strong performance in foreign and domestic markets.	The company is characterized as born-global (OUT-IN). Currently the company continues to expand its business in the international market, without much operation in the domestic market.	Internationalization at this company took place in steps (IN-OUT), having gone through all stages for its entry and establishment in the international market.
KNOWLEDGE	The organization's acquisition of knowledge intensified with the implementation of process innovations. This is currently a strong point in the organization.	The company addresses the issue of learning in the organization systematically and consistently, but the character is more technical and less focused on organizational processes. This fact may be due to action focused more on product innovation, as opposed to process innovation. All employees are responsible for the multiplication of knowledge, acting as multipliers.	The company works to acquire knowledge very intensely. At the beginning of the company operations, the effort to acquire knowledge was focused more on the technical area. As the organization matured, it can be assumed that there is similar concern, both regarding the acquisition of knowledge concerning products, as well as processes. This may be due to investments directed at both product innovation, as well as at process innovation.	The acquisition of knowledge at this company is focused more on the technical area, emphasizing knowledge related to products. This fact may surround the investments made by the company, which are focused mostly on product innovation, rather than process innovation.

Source: Prepared by the authors from the survey data (2016)

The existence of a relationship creating positive and mutual influence between internationalization skills and innovative performance at the researched ICT companies is notably confirmed. The constructs show that this relationship indiscriminately produces a positive influence (Figure 1), which is verified both when internationalization occurs by acquiring skills in the domestic market for the company to go international in the future, as well as when the company acquires skills in the foreign market, as is the case with companies born-global and also when companies acquire skills in the domestic and foreign concomitantly (ambidextrous internationalization) to their internationalization processes.

Figure 1 - Framework of the relationship of positive and mutual influence between internationalization skills and innovative performance.



Source: Prepared by the authors based on survey data (2016).

As a way to exemplify the occurrence of the relationships shown in figure 1, from the output of information entered in ATLAS TI, a summarized table (table 4) was prepared, containing all the information considered in the research.

Table 4 - Existence of a positive and mutual influence relationship between internationalization skills and innovative performance at companies.

YEAR OF THE EVENT	IVIA						IFACTORY						CPQI						GREENMILE					
	INTERNATIONALIZATION			INNOVATION			INTERNATIONALIZATION			INNOVATION			INTERNATIONALIZATION			INNOVATION			INTERNATIONALIZATION			INNOVATION		
	IN-OUT	OUT-IN	AMBIDEXTROUS	PRODUCT	PROCESS		IN-OUT	OUT-IN	AMBIDEXTROUS	PRODUCT	PROCESS		IN-OUT	OUT-IN	AMBIDEXTROUS	PRODUCT	PROCESS		IN-OUT	OUT-IN	AMBIDEXTROUS	PRODUCT	PROCESS	
1997	export of product			hostweb access																				
1998																								
1999				e-business																				
2000	export of product			corporate software																				
2001				e-gov																				
2002				software SPB																				
2003					implement new processes																			
2004	hiring a representative abroad (EU)				new process' methodologies																			
2005																							product groundbreaking	
2006				creation of the department of R&D	creation of the department of R&D			Company Opening EUA																
2007					MPSBR																			
2008	export to the USA and Canada								R&D department	R&D department														
2009					GPTW																			
2010					COMPUTERWORK D/INFO																			
2011					NEW METHODOLOGIES OF WORK O																			
2012					COMPUTERWORK D/INFO/EXAME																			
2013					MANAGEMENT PROCESSES																			
2014	Hiring representatives abroad																							
2015					CMMI																			
2016	Opening in the USA																							

Source: Prepared by the authors using the survey data (2016).

In the analysis of the information, it is verified that all companies were able to internationalize their activities due to innovation. The innovations found at the surveyed companies are more clearly configured as product innovations at the expense of process innovations, considering the beginning of the activities at the analyzed companies. The presence of process innovations is more strongly verified as mature organizations, when they have more experience in the market.

The analysis of data demonstrated that the internationalization process, from the acquisition of skills in the domestic market, only after the company began the internationalization process of its operations, was verified to occur under the modality of internationalization related mostly to process innovation, which encompasses product innovation, even on a discontinuous basis, since process innovation, once implemented, becomes commonplace at companies, given that its maintenance requires a smaller amount of resources, as reported by the CEOs of the surveyed companies.

4 CONCLUSION

The validity of the research was mainly ensured from the theoretical constructs of Nelson and Winter (2005), Nonaka and Takeuchi (1995), Prange and Bruyaka (2016) and through clear operational definitions of each variable employed. These definitions were used in the script guiding the interviews and duly clarified for each interviewee to avoid misinterpretation.

Regarding the matter of research written on how internationalization and innovation processes occur at ICT companies in the Northeast of Brazil, it was confirmed that these co-evolve, by showing that the relationships between the constructs are bi-directional, deriving a framework that contemplates the disclosure of present relationships, which is the main theoretical and empirical collaboration of this research.

This study was not intended to show how much these influences occur between processes of internationalization and innovation, in terms of impact percentages, which element has the greatest weight in relationships, which process influences more and which process influences less. What can be seen from the analysis of the data is that all these elements are interconnected and coevolve, confirming the aforementioned constructs when considering the time lines.

The qualitative approach of this multiple case study research has strengthened the arguments for a widespread view that internationalization and innovation systematically co-evolve at ICT companies, and similar results can be obtained when applied to companies in other sectors.

The companies surveyed presented diverse forms of management, each with its own characteristics, despite belonging to the same area of activity and all having a present characteristic of internationalization and innovation.

It was also characterized that the mechanisms between internationalization competencies and innovation performances coevolve in ICT companies in the Northeast region of Brazil. Internationalization skills were classified following the theoretical construct of Prange and Bruyaka (2016) considering In-out, Out-in and ambidextrous processes, as well as characterizing the innovative performance of processes and products, based on knowledge (NONAKA; TAKEUCHI, 1995).

However, this study does raise certain limitations. The main limitation lies in the difficulty of finding other variables that evidence processes of internationalization and innovation to compose analyzes to be performed, as a way of providing more robustness and security for other research. Proposals for future research may include the insertion of new variables for elaborating a model to be applied in other sectors of the economy.

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Contribution of authors

Contribution	[Author 1]	[Author 2]	[Author 3]	[Author 4]
1. Definition of research problem	x	x		
2. Development of hypotheses or research questions (empirical studies)	x	x		
3. Development of theoretical propositions (theoretical work)	x	x		
4. Theoretical foundation / Literature review	x	x		
5. Definition of methodological procedures	x	x	x	
6. Data collection	x		x	x
7. Statistical analysis	x			
8. Analysis and interpretation of data	x		x	
9. Critical revision of the manuscript	x			x
10. Manuscript writing	x			x
11. Other (please specify)				