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Internationalization process and complex adaptive systems

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ABSTRACT

This article aims to analyze the characteristics of the internationalization process of companies from the Santa Cruz do Capibaribe clothing hub in Pernambuco, considering the Complex Adaptive Systems approach. The behaviors of two companies towards foreign markets over time are analyzed. The research method is qualitative, with a longitudinal approach, with the strategy being a case study. Semi-structured interviews were conducted, as well as observation and research into their documentation. Data analysis is performed by means of the steady comparison method proposed by Merriam (2009). A cross analysis of cases that generated fifteen (15) pieces of evidence is presented. It is understood that the companies in an internationalization process can be regarded as Complex Adaptive Systems.

1. INTRODUCTION

In general, studies on management are founded on the Cartesian pattern, based on cause and effect relationships. However, due to the changes that have taken place in the business world, our understanding of causal relationships is no longer sufficient to analyze the behavior of organizations (Morin, 2011), especially with regard to operating in international markets, as this involves a complex and diffuse structure in terms of resources, competences and influences (Hilal & Hemais, 2001).

It is assumed that the more complex behavior is, the more companies (a type of organization) will show adaptive flexibility in relation to the environment. Any actions taken will be suitable for constantly modifying the company when facing external changes, especially for addressing randomness, troubles and events. They will also be equally capable of modifying the environment, shaping it and adapting it (Morin, 2011).

In this sense, the Complexity Paradigm is an alternative and wide-ranging form of perceiving relationships within organizations and their interactions with the market, allowing for multiplicity and uncertainty. Of the approaches that defend this broader view of phenomena, in which organizations come to be seen as a constant interaction process in an attempt to self-organize and adapt to the environment, the Complex Adaptive Systems (CAS) approach stands out (Kelly & Allison, 1998). These authors attempt to explain the evolution of CAS through levels of adaptation, ranging from closed relationships to relationship networks.

Therefore, this article aims to analyze the characteristics of the internationalization process of two private companies in the Santa Cruz do

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Capibaribe clothing hub in Pernambuco, considering the Complex Adaptive System approach. The Santa Cruz do Capibaribe clothing hub was chosen because it is representative not only of the state of Pernambuco, but also the Northeast region of Brazil in general. Furthermore, internationalization activities have become a frequent practice of companies in the region (MDIC, 2016).

2. THEORETICAL BACKGROUND

2.1 Internationalization Behavioral Approach

The behavioral approach seeks to explain internationalization as a gradual process in which the degree of involvement with international markets increases from the acquisition of experiential knowledge (Johanson & Vahlne, 1977; Cavusgil, 1984). The U-Model, or Uppsala Model, is the main branch of this approach.

The initial focus of study for the development of the Uppsala Model is individual companies. In general, it is assumed that the development of activities and the solution of possible problems require knowledge on how the market works, which implies the growing commitment of resources (Johanson & Vahlne, 1977).

Thus, companies begin to export to countries whose Psychic Distance is lower than that of the country of origin, in other words, whose factors that hinder or impede the flow of information are smaller (Eriksson et al., 1997). However, the difficulty of obtaining knowledge could be an obstacle to internationalization, as an essential part of this knowledge can only be gained through experience (Johanson & Wiedersheim-Paul, 1975).

Thus, the course of action towards international markets follows a chain of establishment: initially, export activities are not regular, followed by export through independent representatives (agents), the establishment of a sales branch and, finally, subsidiaries for production (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977).

Since its publication, several scholars have attempted to evaluate the applicability and validity of the model. Consequently, the work of Johanson and Vahlne (1977) is the most frequently cited in articles published by the Journal of International Business. The applicability of the model has been demonstrated in a number of countries: for American companies (Cavusgil, 1984), Australian (Wiedersheim-Paul, Olson & Welch, 1978), Japanese (Calof & Beamish, 1995) and Brazilian (Hilal & Hemais, 2001). In other cases, the concepts of the model are not considered congruent with practice (Calof & Beamish, 1995; Welch & Luostarinen, 1988).

In a later work (Johanson & Vahlne, 2006), the seminal Uppsala authors suggest a series of clarifications with regard to the erroneous interpretation of their assumptions in a number of studies. Even so, the authors recognize that the initial model (Johanson & Vahlne, 1977) has some limitations.

In response to the criticisms and continuing the studies that have paved the way, the analysis of the internationalization process is extended from the perspective of relationships. One way of analyzing the relationships between partners in internationalization is to adapt the triad perspective, when buyer, seller and intermediary are constantly in touch with each other, with the relationship directly involving the three parties (Havila, Johanson & Thilenius, 2004).

Nevertheless, these relationships are connected by networks that directly or indirectly influence them, an aspect that was neglected in the initial model (Johanson & Vahlne, 1977). Later, the creation of opportunities was included in the discussion and in the model itself (Johanson & Vahlne, 2009), so that network relationships contribute more than learning and can make a company an insider, in other words, include it in the business network. A company without an important position in the network is an outsider, with no access to important information (Johanson & Vahlne, 2009).

More recently, entrepreneurial capability was included, as it is understood that the entrepreneur who makes decisions on internationalization is influenced by idiosyncratic characteristics, with experiential learning being an important factor (Schweizer, Vahlne & Johanson, 2010).

2.2 Complex Adaptive Systems

Understanding organizations (more specifically, companies) as systems makes it possible to understand their capacity to learn and adapt to the environment using the information that they manage to acquire, which enables them to respond actively to what is happening around them. This capability varies, evolving in levels of complexity (or levels of adaptation). These systems ae defined as Complex Adaptive Systems (CAS) (Boulding, 1956).

Important contributions have been made by authors such as Kelly and Allison (1998), proposing the Complexity Advantage Evolutionary Fitness Model. In the evolution process, CAS undergo levels of adaptation related to their ability to identify information and learn from it. This capability is called the Complexity Advantage. In this sense, adaptation levels are established (Kelly & Allison, 1998).

In Table 1, the five levels of adaptation are shown, with indications regarding their achievement, measurement and the emphasis of the company. Achievement means where the attention is being directed and varies from the focus of the agent (Level 1) to the company and its environment (Level 5). Concerning measurement, or how company performance is evaluated, this varies between the production of random data on unknown behavior patterns (Level 1) to monitoring company patterns and coevolution with the environment (Level 5). Finally, the emphasis of the company varies between agents attempting to command and control the interactions of agents, emerging behaviors and results (Level 1) to the coevolution of the company, quantitatively understood internally and externally, reflecting continuous incremental changes or radical changes (Level 5) (Kelly & Allison, 1998).

The higher the level of adaptation, the less the focus on the individual and the greater the focus on the whole organization and its environment. The model also advocates seven characteristics, called parameters, in the definition of these levels (Kelly & Allison, 1998). They are: Scale, varying from the individual micro environment to the macro environment; Momentum, constructing and maintaining patterns of interaction and order; Becoming, how individuals, teams and company learn and adapt; Belonging, distribution of power and level of autonomy; Being, results of interactions in the business; Self-generating behaviors, degree to which a business and its people can mutually support each other; and Emergent system, how the company sees itself, varying between a closed system and an open system.

2.3 Companies in the Internationalization process as Complex Adaptive Systems

The Uppsala model has been criticized for its limitations in terms of ability to explain the different possible forms of internationalization that can reduce or eliminate the gradualism proposed by the model. The integration of the evolution of the Uppsala model, from 1975 to 2010, with the approach of Complex Adaptive systems, can help to understand how companies adapt so differently to diverse markets. This is because the evolution of the Uppsala model appears to follow the evolution of complexity levels. The focus of the model advances from the individual to the company and its environment (Johanson & Vahlne, 1977; Johanson & Vahlne, 2009). This evolution is similar to the progress of awareness in the levels of adaptation of complexity, varying from closed relationships to relationship networks (Kelly & Allison, 1998).

Tab. 1
Levels of Adaptation for the Self-organization of the Company

Adaptation Level		Spread	Measurements	Company emphasis
1	Unconscious self-organization	Agent	Produces haphazard data on unknown behavior patterns.	Managers attempt to control interactions, behaviors and results.
2	Conscious self-organization	Team	Gauges team capability as performed by game plan.	Committed and disciplined teams, open communication, learning, commitment to plans of action and evaluation of performance.
3	Guided self-organization	Unit	Tracks team performance against intentions at multiple levels, linking micro and macro emergence.	Committed and disciplined local teams propagating successful experiences, intertwining patterns through larger units in the network within the environmental context.
4	Quantitatively guided self-organization	Company	Models and analyses based on statistical processes.	Enterprise uses statistics to understand, stabilize and forecast trends in the agent network and emergent results.
5	Competent autopoiesis	Company in its environment	Tracks patterns in enterprise and coevolution with the environment.	The coevolution of the enterprise is qualitatively understood internally and externally, reflecting incremental or radical changes.

Source: Source: Adapted from Kelly, S. & Allison, M. A. (1998, p. 112). *The complexity advantage*: how the science of complexity can help your business achieve peak performance. New York.

Initially, the factor considered fundamental to the internationalization process, both in terms of choice of market to operate and entry mode, is Psychic Distance (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977). This shows that the company is understood in the model as belonging to the “Unconscious self-organization” level. This stems from the understanding that there was competition between agents and companies, with limited sharing of information, superficial commitment (mainly as a result of gradualism) and concern, above all else, with outcomes.

In turn, evolving to the perspective of relationship networks, that the internationalization model shifts towards “Conscious Autopoiesis” admitting the existence of collaborative interaction between agents and companies, sharing information and being concerned not only with direct outcomes but also with how these outcomes are achieved. This is more noticeable with the recognition of the role of the entrepreneur in this process (Schweizer, Vahlne & Johanson, 2010), as there is evidence that the agent is aware of his attribution as a participant of the company located in a dynamic environment.

With this relationship, it would be plausible to assume that the decision regarding choice of international markets in which to operate and the mode of entry should take into account not only the company’s level of knowledge of these markets, as demonstrated by the evolution of the Uppsala Model, but also the level of adaptation to complexity, i.e., the organization’s ability to adapt to the reality of the external market. Therefore, it can be expected that the higher the level of evolution of complexity, the less importance will be attributed to knowledge in the choice of external market or mode of operation in these markets.

This may be true when assuming that if the company can adapt more easily to the external market, forming relationships based on trust, reducing the effects of uncertainty and opportunism, its commitment to that market will be greater. Furthermore, it is possible that this commitment will be less gradual than in cases where its ability to adapt to the market is limited, with no collaboration or exchange of important information with foreign companies.

Therefore, if the company is more able to adapt to new markets, its choice of external market and mode of entry could be based on other aspects, not only Psychic Distance or knowledge level. Consequently, the company could consider the expected level of profitability or return on investment. However, if the company has little adaptive capacity (involving its ability to collaborate and share information), its choice will remain limited to its knowledge level and psychic distances.

With this logic, it may also be presumed that a higher level of complexity in companies, i.e., the existence of a greater Complexity Advantage, also means greater ability to identify opportunities and threats in international markets. This is because companies with greater evolution of complexity are the ones constantly seeking competitive adaptation, attentive and ready for change and better prepared for self-eco-organization (Kelly & Allison, 1998; Morin, 2011).

Moreover, the perception of these opportunities and threats is not viewed by the Uppsala Model as something that companies seek, but as something that occurs due to their readiness to recognize the value of information and ideas and as a result of the entrepreneur’s capacity to transform threats into opportunities or even create them (Schweizer, Vahlne & Johanson, 2010). In this sense, it may be supposed that companies with a higher complexity adaptation level would be able to identify opportunities and threats in international markets with greater ease.

This need to acquire knowledge experientially restricts operations in a specific market, including the capacity to perceive opportunities and threat, and could be substituted by participating in relationship networks or hiring someone with this knowledge (Johanson & Vahlne, 1977, 2009). This evolution also seems to be in keeping with the complexity or adaptation levels, as the need for experiential knowledge is associated with companies with characteristics closer to the “Unconscious Self-organization” level, whereas those capable of substituting this knowledge by participating in relationship networks have characteristics of the “Conscious Autopoiesis” level or levels closer to it. Thus, companies with higher levels of adaptation to complexity should find it easier to become insiders in their business networks.

In this sense, it is argued that companies are willing to form business relationships only with those capable of cooperating and sharing relevant information, these demands being characteristics of companies with a high levels of adaptation to complexity. Thus, companies with higher complexity levels are expected to be better prepared to operate in international markets.

3. METHODOLOGICAL PROCEDURES

In this study, a longitudinal perspective is adopted (Pettigrew, 1987), with a time series of critical events or states (Melin, 1992), retrospective and ex-post facto in nature (ranging from the beginning of activities in external markets until 2012 (Matos & Vieira, 2001). Critical events are understood as "facts, situations and decisions experienced or taken by the company that affected it or triggered changes" during the international process (Sousa & Freitas, 2012, p. 12).

Thus, the analysis of the characteristics of the internationalization process of the companies occurred from an attempt to evaluate how the companies behave in certain events considered critical to this process. For these critical events, the complexity levels in the companies' behavior were evaluated.

For this purpose, a qualitative approach is used (Denzin & Lincoln, 2005). Regarding the research strategy, a case study is used, which can also be used for a study with more than one case, commonly known as multiple or cross case (Merriam, 2009).

A preliminary analysis of the website of the Ministry of Development, Industry and Commerce (MDIC) shows that from 2001 to 2011, thirteen companies of the Santa Cruz do Capibaribe clothing hub exported up to US$ 1,000,000. Thus, the criterion of "planned opportunity" (Pettigrew, 1987, p. 274) was adopted to select the two companies in the study. The companies have been given fictitious names for the purposes of the study: 'Moda Praia' and 'Surf Wear'.

Regarding the choice of interviewees, this was done non-probabilistically (Merriam, 2009), with selection by convenience (Patton, 2001; Merriam, 2009). Members of the board of directors were interviewed (those responsible for the companies' internationalization processes) and other people involved in the process from the beginning. Thus, the data collection was the result of nine semi-structured interviews, non-participant observation and document research. The resulting data were analyzed using the Constant Comparative method (Merriam, 2009). To aid the data analysis, Atlas.ti software, Version 6.0 was used.

A cross analysis of the cases was conducted to perceive similar or diverging aspects between the cases that indicate behavior patterns (Merriam, 2009). These patterns are compared with the theoretical elements that are addressed.

3.1 The cases

Moda Praia began its operations in Santa Cruz do Capibaribe in 1980. It now has a factory and two stores to serve the public. The company has a team of 35 collaborators. However, only the owner, her daughter and the manager are directly involved in the internationalization process.

Surf Wear was founded in 1996 in the same town. It operates in the clothing sector and has 13 commercial representatives who operate in 21 Brazilian states. It has 5 stores employing 194 collaborators, as well as 210 working at the factory. Its internationalization process also involves few people. Initially, the secretary of the board of directors, the owner/director and administrative manager were interviewed, who indicated another three people involved.

There now follows an analysis of the results, describing the characteristics of each critical event in the internationalization processes of the companies.

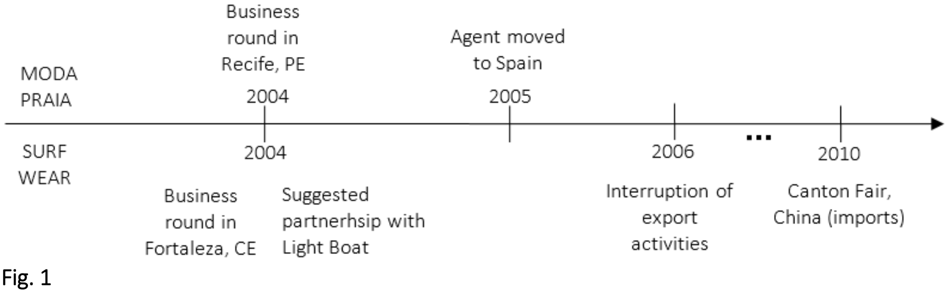

Fig. 1
Critical events in internationalization process
Source: Research data (2012)

4. DATA ANALYSIS

4.1 The Internationalization Process

An analysis of the cases showed similarities and differences. First, there was no interruption in the internationalization process of Moda Praia. Exports continued from 2004. Furthermore, there were few changes to the process. In other words, only two critical events led to changes: 1) participation in the round of business in Recife in 2004; and 2) one of the owner's children moving to Spain in 2005, as shown in Figure 1.

On the other hand, the internationalization process of Surf Wear was interrupted. The company exported from 2004 to 2006 and more recently, in 2010, it began to import. Thus, the company interrupted its internationalization for 4 years, as shown on the dotted line in the lower part of Figure 1. Furthermore, it experienced four critical events: 1) participation in the round of business in Fortaleza, Ceará State, in 2004; 2) indication made by a former designer of the company in the same year that led to a partnership with a Portuguese company; 3) decision to interrupt exportation in 2006; and, finally, 4) attending the Canton Fair in 2010. Details of all the critical events will be given below.

Despite these differences, the first critical event of the internationalization process of the two companies occurred in 2004, with very similar characteristics. These are the result of the influence of local funding agencies that were very active at this time in promoting international business rounds and including local companies in events all over Brazil and overseas. Thus, the first export experience for both companies occurred due to their participation in two international business rounds, which took place in Recife, Pernambuco State and Fortaleza, Ceará.

The characteristics of the two internationalization processes related to the first critical event are shown in Figure 2. Moda Praia participated in a business round in Recife, Pernambuco, which resulted in the company's first exports to a French customer. At the same time, Surf Wear participated in a business round in Fortaleza, Ceará, resulting in exports to Portugal. Neither company had knowledge of export processes. Nevertheless, the owner of Surf Wear already knew the country and played an important role in the perception of overseas markets. Meanwhile, the owner of Moda Praia, unlike any of her collaborators, knew the French market.

In any case, these differences did not make a considerable impact regarding the choice of entry mode to the external market or the choice of market in which to operate. These choices may have been influenced by their experiences in local markets, since before operating in other countries, both companies had already operated in other states, as suggested in previous studies (Windersheim-Paul, Olson & Welch, 1978). The following evidence can be seen:

Proof 1: The companies, before operating in other countries, operated in other Brazilian states.

Furthermore, concerning the entry mode to overseas markets, both companies began by using the intermediation of export agents. Likewise, their inter-state actions were restricted to sales representatives or customers who resold the products to other states. There were no subsidiaries or production facilities in any state outside Pernambuco. This shows that the companies may

Fig. 2
First critical event for the internationalization process.
Source: Research data (2012)

have extended their operations from local markets to external markets, suggesting that:

Proof 2: the interstate mode of operation can influence choice of entry mode to other countries.

Regarding the choice of market, this decision did not occur in either case. The Uppsala Model suggests that companies choose to export to countries of which they have knowledge or where there is a lower Psychic Distance in relation to the country of origin (Johanson & Vahlne, 1977). However, there was no deliberate choice. These markets emerged as opportunities at international business rounds, presented to the companies by export agents who already negotiated with the external markets, indicating that:

Proof 3: The companies began to operate in external markets through independent agents, irrespective of Psychic Distance.

In turn, the differences between the cases regarding prior knowledge of the external markets had no impact on the choice of the first country of export. The difficulties resulting from this lack of knowledge could be overcome by the export agent who brokered the negotiations. This suggests that:

Proof 4: The need for knowledge to choose an external market can be substituted by the knowledge of export agents.

However, these differences regarding the companies' knowledge of external market might have had an important influence when it came to continuing their operations in these markets. Moda Praia, which did not know the French market before beginning its exports, despite having visited the company later to participate in a business round, did not succeed in remaining in this market. Surf Wear, which already knew the Portuguese market before exporting, managed to remain in the market, indicating that:

Proof 5: Prior knowledge of external markets can facilitate the continuing operations of the company in these markets.

Furthermore, another important aspect of the internationalization process, according to the Uppsala Model (Johanson & Vahlne, 1977), is the Psychic Distance between the country of export and the local market. The fact that Moda Praia did not continue exporting to France (a psychically distant country) while Surf Wear continued to export to Portugal, actually becoming more closely involved in the market (when it began to outsource Light Boat products), may be a sign that Psychic Distance does indeed influence the possibility of a company's involvement in overseas markets, although it had no impact on the choice of markets. Thus:

Proof 6: The Psychic Distance may not have an influence on the choice of market, but rather on the continuity of operations in that external market.

This occurs especially when the difficulties imposed by the Psychic Distance are overcome by the intermediation of export agents or the contribution of relationship networks that are capable of including

Fig. 3
Second critical event in internationalization process.
Source: Research data (2012)

companies in external markets and facilitating the flow of information between markets.

The influence of relationship networks is more evident in the second critical event in the internationalization process of the companies. In this case, there were several similarities between the cases in question: The Psychic Distances between the markets were similar, both considered small; both companies had knowledge of the export processes; there was no direct influence on the part of the entrepreneur, but the export occurred through the emergence of opportunities; and, once again, there was no choice of market, as the markets emerged due to the knowledge of the external agents. This latter characteristic indicates that the lack of knowledge, once again, was compensated for by the actions of the agents. The characteristics of the events are shown in Figure 3.

However, there are also differences. Moda Praia's relationship with the export agent was much stronger than Surf Wear's with its representative. This had an important impact on the internationalization process of the companies. The negotiations between Moda Praia and its Spanish customers became dependent on the agent, and when the agent could no longer act as an intermediary, the company lost touch with its customers. On the other hand, Surf Wear's agent operated only as a facilitator for contact between company and its customer, Light Boat, and the relationship between the companies could be established and maintained irrespective of the presence of the export agent, characterizing a triad (Havila, Johanson & Thilenius, 2004).

In this sense, substituting the company's need for knowledge of external markets with the actions of export agents has an important influence on the choice of export market and facilitates the company's access to them. However, when it comes to continuing the relationship, the intermediation of agents can limit the company's ability to remain in the market, making it dependent on these agents. In other words:

Proof 7: Operations in external markets with the intermediation of export agents can make the company's relationship with these markets dependent on the agents.

Therefore, these two critical events for each company were considered the most important regarding the changes in their export activities. The internationalization behavior of Moda Praia continues to follow the same pattern of characteristics, with no changes regarding how they operate, the choice of market, how they acquire knowledge or any other aspect.

However, in 2006, Surf Wear decided to interrupt its export activities, characterizing another important part of its internationalization process, as shown in Figure 4.

Contrary to the underlying logic of the Uppsala Model, Surf Wear had characteristics indicative of being able to continue its internationalization process, including to evolve in the Chain of Establishment, for example, no longer working through independent agents to working through a sales subsidiary. The company had knowledge of the market and processes. It operated in companies with a low psychic distance and the entrepreneur, like the relationship network, played important roles in the success of the company in overseas markets. However, the company preferred to interrupt is export activities.

The company justified interrupting its exports due to a strategy of preparing to operate in external markets only when it had become much stronger in the local market. The initial goal was to gain knowledge of export processes to be prepared when

Fig. 4
Third critical event of internationalization process.
Source: Research data (2012)

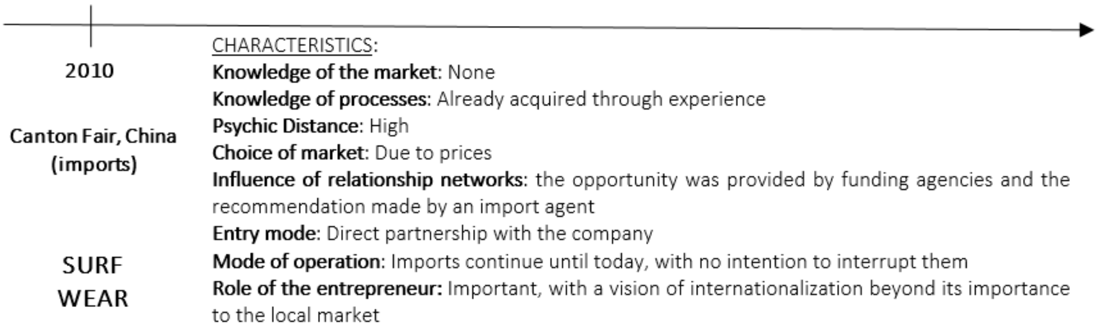

Fig. 5
Fourth critical event in internationalization process
Source: Research data (2012)

exporting became necessary to maintain company performance, as local companies were looking to external markets, encouraged by incentives from funding agencies.

Nevertheless, when it acquired the knowledge it needed, Surf Wear perceived that operating in external markets hindered its local market strategy, which was to strengthen and expand the brand in Brazil. This led the company to interrupt its operations overseas. This behavior shows that internal aspects, such as the company's strategy and capabilities, can equally influence the internationalization process, as shown in critiques of the Uppsala Model, (Calof & Beamish, 1995; Welch & Luostarinen, 1988). Therefore:

Proof 8: Internal aspects can influence the internationalization process as much as external aspects.

Finally, the event that resulted in the biggest difference between the internationalization processes of Moda Praia and Surf Wear was that the latter attended the Canton Fair in China in 2010. While Moda Praia's exports retained the same characteristics, Surf Wear interrupted its exports in 2006, resuming the internationalization process in 2010. However, instead of exporting, the company began importing from China.

When presenting the basic concepts of international business, Cavusgil, Knight and Riesenberger (2017) assume that internationalization is "the tendency of companies to deepen their international business activities" and that international trade involves "the exchange of products and services across national borders, typically through exporting and importing" (Cavusgil, Knight & Riesenberger, 2017, p. 5). In this sense, for the purposes of this study, it is assumed that the internationalization process of the companies, i.e., their international business activities, also include importing, as it allows them to gain knowledge of markets and processes linked to international trade.

This event has characteristics similar to those identified in the company's export events, such as the existence of knowledge on processes, the influence of relationship networks, entry mode and the role of the entrepreneur. However, several other characteristics distinguish this event from the company's other critical events, such as lack of knowledge of the Chinese market, choice of market and the high psychic Distance, as shown in Figure 5.

These three characteristics are related. Although the company did not know the Chinese market and the market had a high Psychic Distance from the country of origin, the company decided to import form it due to the low prices charged by the Chinese suppliers. This behavior is not in keeping with the premise of the Uppsala Model that companies choose markets due to their knowledge and the low Psychic Distance (Johanson & Vahlne, 1975, 1977). Therefore, instead of seeking to heighten their commitment to markets that it already knew, the company sought a new, unknown and psychically distant market to continue its internationalization process.

In this sense, the company did not consider these aspects, which are considered relevant in the Uppsala Model. It only considered the benefits of price to be gained in terms of price from this choice. The considerable differences in terms of culture, language and ways of doing business, for instance, could be overcome with the help of import agents (Proof 4). Even so, the company maintains direct contact with the supplier and is thus not wholly dependent on this agent, which reduces the effects of Proof 7. Another important aspect involved in the

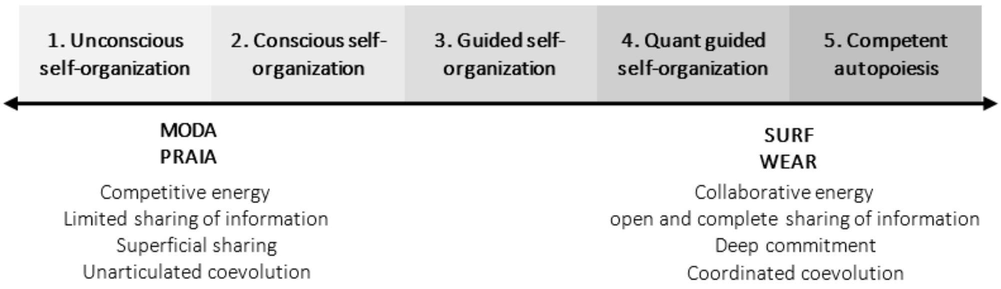

Fig. 6
Level of complex adaptation
Source: Research data (2012)

choice of such a psychically distant market was that the company was already familiar with export processes, with knowledge of international transactions. This could mean that:

Proof 9: Knowledge of processes may be more important than knowledge of the chosen market for operations.

A cross analysis will now be presented of the cases in relation to their levels of complex adaptation.

4.2 Complex Adaptation Levels

The companies' behavior patterns show that they are at opposite extremes concerning their complex adaptation, as demonstrated in the continuum presented in Figure 6.

The behavior of Moda Praia indicates greater competitive interaction, limited sharing of superficial information and unarticulated coevolution, characteristics of companies at Level 1 of complex adaptation (Unconscious Self-organization). At this level, the company's activities are developed independent from the understanding of the agents or their intentions, as the management seeks to control their actions, focusing on results. However, the company also demonstrates behavior typical of Level 2 (Conscious Self-organization), such as sharing information and knowledge with some colleagues in the same work teams. The agents understand the means through which results can be sought (Kelly & Allison, 1997).

In the case of Surf Wear, the behavior patterns are closer to those desired for the company to achieve a Complexity Advantage (collaborative interaction, open and full sharing of information, deep commitment and articulated coevolution). There is evidence that the company is at Level 5 of complex adaptation (Competent Autopoiesis), with improved activities in the continuous process. The collaborators are attentive, capable of identifying the need for change and to evolve together with the company. Knowledge is the result of previous experiences (Kelly & Allison, 1997). However, the company still displays some behavior patterns typical of Level 4 (Quantitatively Guided Self-organization), such as monitoring changes instead of anticipating them (Kelly & Allison, 1997).

Thus, it can be seen how different the behaviors of the companies regarding their ability to identify information and learn from it, to adapt competitively and self-organize. The evidence indicates that Surf Wear has a considerable Complexity Advantage over Moda Praia. In other words, Surf Wear is better equipped to adapt to unstable environments, for instance.

4.3 Can companies in an internationalization process be considered Complex Adaptive Systems?

It is known that both cases are in opposite situations with regard to complex adaptation (Moda Praia at Level 1 and Surf Wear at Level 5). Furthermore, the owner of Surf Wear knew practically all the countries for export while the owner of Moda Praia did not know any, as shown in Proof 4 (The need for knowledge to choose an external market can be substituted by the knowledge of export agents).

Thus, irrespective of the complexity level, knowledge of the markets or lack thereof did not influence the choice of country for export. However, Moda Praia continued to adopt this behavior of not choosing markets. In turn, Surf Wear, after gaining experience, chose the market in which to operate, in the case of importing from China, of which it had no knowledge.

Thus, it is believed that in addition to the importance of the complex adaptation level of the company, the knowledge gained with regard to the export process also influenced the later choice of market. In this respect, it can be understood that when choosing an external market, companies with a higher evolution of complexity level tend to attribute less importance to the need for knowledge of these markets. This occurs especially when they have knowledge of the processes (ERIKSSON et. al., 1997), i.e., experiential knowledge on the necessary procedures for operating in international markets, indicating that:

Proof 10: When choosing external markets in which to operate, the more evolved the level of complexity, the less importance will be attributed to knowledge of these markets, as long as the company has knowledge of the processes.

Furthermore, due to Surf Wear's ability to adapt to external markets (characteristic of its complex adaptation level), the choice of external market may be based on other aspects than knowledge level or Psychic Distance, such as expected profitability level or return on investment. This was made clear when Surf Wear decided to outsource products from China based on the prices offered by that country's suppliers, despite not knowing the market and the considerable Psychic Distance from the local market. Thus, it may be added that:

Proof 11: The higher the evolution of complexity level, the less important Psychic Distance will be when choosing of external markets.

Moreover, the choice of mode of operation is expected to be influenced by the company's level of complexity rather than only be factors proposed in the Uppsala Model (knowledge of markets and Psychic Distance). In this sense, despite both companies working through export agents, Moda Praia, with a lower complex adaptation level, is more dependent on export agents than Surf Wear.

On the contrary, Surf Wear, despite having similar opportunities to operate in external markets, as shown in the first two critical events for both companies, adopted a behavior in internationalization that was less dependent on agents, who often served only to facilitate access to markets, information on them and the external partners. This evidence refers to Proof 7 (Operations in external markets with the intermediation of export agents can make the company's relationship with these markets dependent on the agents). However, considering the levels of complexity, the following caveat may be included:

Proof 12: Operating in external markets through export agents can make the company's relationships dependent on these agents its complex adaptation level is low.

Thus, Surf Wear was capable of adapting more easily to the external market, forming direct partnerships with the market, relationships based on trust, reducing the effects of uncertainty and opportunism. This meant that the company's relationship with the markets became less dependent on agents, even though it had no knowledge of these markets. However, in the case of Moda Praia, the effects of the lack of knowledge and consequent uncertainty had to be compensated by relationships of trust formed by the export agents in the external markets.

Thus, the higher the company's evolution of complexity, the less dependent it becomes on agents and their knowledge of external markets, as it is more ready to adapt to different realities irrespective of the level of knowledge it has of them. Thus, the evidence presented suggests that:

Proof 13: The higher the evolution of complexity level, the less important knowledge of external markets will be when choosing the mode of operation.

Companies with a higher complex adaptation level are also expected to be better prepared to recognize opportunities and threats in international markets. The owner of Surf Wear, before beginning to export, already knew of these opportunities due to his yearly trips abroad, either to identify fashion trends or technologies used in production. Thus, he deliberately sought opportunities, while Moda Praia was unaware of export opportunities, which arose unexpectedly. Thus:

Proof 14: Companies with a higher complex adaptation level may be able to identify opportunities and threats in international markets more easily.

Finally, the second critical event for both companies was the results of indications from their relationship networks. This shows that, in both cases, the companies had relationships in the local markets that played an important role in their internationalization processes.

However, given that Moda Praia remains dependent on export agents to remain active in external markets, while Surf Wear showed that it was capable of forming direct partnerships with companies located in other countries, it can be said that:

Proof 15: Companies with a higher complex adaptation level find it easier to become insiders in business networks located in external markets.

Thus, some aspects presented in the theoretical approaches were confirmed, while others were complemented.

5. FINAL CONSIDERATIONS

The analysis of the results showed that both companies showed similar behavior in their export processes, with two similar critical events occurring at the time, the external influences and the characteristics presented by the companies. However, one of the companies interrupted its export activities and began importing, while the other maintained the same behavior patterns adopted from the outset. The company that begin importing changed important aspects of its behavior, such as choice of market, creating two events considered critical for its internationalization, with evolutionary characteristics compared with the first events.

Several behaviors were identified as being in keeping with the Uppsala Model, such as beginning operations in external markets through independent agents. Even so, many others were contrary to the model, corroborating almost four decades of criticisms, such as the companies, even after acquiring knowledge of the external markets, not strengthening their commitment to them or changing their form of operation. The analysis of the internationalization behaviors identified nine (9) proofs that refute or corroborate the premises of the model.

Furthermore, the divergences in the companies' behaviors could be related to their levels of complex adaptation. The two companies in question showed opposite behavior patterns with regard to their complex adaptation levels. While Moda Praia displayed characteristics of Level 1 of complexity, evolving to the second level, Surf Wear showed that it was at Level 4, drawing close to the fifth and highest level. This is evidence that Surf Wear is better prepared to adapt to different environments, as the company is able to learn collectively from its past experiences and use this learning to organize itself in response to external events.

The analysis of the results also suggests six (6) proofs indicating the existence of some associations between the complex adaptation levels of the companies and their behaviors in internationalization. This is especially true when it comes to the choice of external markets, mode of operation, the importance attributed to knowledge of the markets and processes, the Psychic Distance, the company's relationship with external agents, ability to identify opportunities and threats in external markets and the participation of the companies in international relationship networks.

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Processo de internacionalização e sistemas adaptativos complexos

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RESUMO

O presente artigo tem como objetivo analisar as características do processo de internacionalização de empresas do polo de Confecções de Santa Cruz do Capibaribe, em Pernambuco, considerando a abordagem dos Sistemas Adaptativos Complexos. São analisados os comportamentos de duas empresas em direção aos mercados externos ao longo do tempo. O método de pesquisa caracteriza-se como qualitativo, com abordagem longitudinal. A estratégia adotada é a de estudo de casos. Foram realizadas entrevistas semiestruturadas, além de observação e pesquisa documental. A análise dos dados é realizada a partir do método de comparação constante, proposto por Merriam (2009). É apresentada a análise cruzada dos casos, que gerou quinze (15) evidências. Entende-se que as empresas em processo de internacionalização podem ser consideradas como Sistemas Adaptativos Complexos.

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