

**ORGANIZATIONAL LEARNING, INNOVATION AND
INTERNATIONALIZATION: A MODEL BASED ON COMPLEX ADAPTIVE
SYSTEMS**

ABSTRACT

Literatures on organizational learning, innovation and internationalization usually relate them by considering one as the antecedent of the other. In this paper, we aim to clarify these relationships and propose a theoretical model that reinforces their mutual causality based on Complex Adaptive Systems ideas. We consider that new knowledge, new products and processes, and new country markets affect one another, and the system they constitute. Furthermore, we put forward the existence of two paradigms or stages on these relationships, the incremental and the global one. The former understands that adaptive learning, incremental innovation and incremental internationalization process are related. The latter poses that generative learning, radical innovation and born global internationalization support one another. Finally, we analyse the implications of our model to academic and management settings.

Keywords: organizational learning, innovation, internationalization, complex adaptive systems.

INTRODUCTION

Organizational learning, innovation and internationalization are essential elements of the knowledge economy of our globalized era. Our societies and economies are leaving behind the industrial world view, which was characterized by focusing on the efficient transformation of raw materials into finished goods, and entering the creative and knowledge society, characterized by organizations that require breaking their mental and physical barriers to continually innovate, learn and internationalize.

Globalization is usually described through its diversity, complexity and, above all, its holistic approach. However, its challenges are usually faced through a reductionist, traditional view or paradigm (Dent, 1999), which make solutions very difficult to find. Globalization might require thinking beyond linear causality, reductionism or determinism, and adopting a new emergent, complex and holistic paradigm. This paradigm is a new worldview characterized by certain epistemological and ontological beliefs such as holism and mutual causality (Dent and Powley, 2004; Begun, 1994; Capra, 1993; Wheatley, 1992) and serves as an umbrella term for a number of ideas, theories and research programs that are derived from a range of scientific disciplines (Burnes, 2005: 73) like complex adaptive systems (CAS), chaos theory, wholeness theory, dissipative structures, fractals etc.

In this paper, we understand the concept of CAS can help us to understand the relationships between organizational learning, innovation and internationalization, as it stresses the importance of their interconnection and mutual adaptability. CAS are increasingly being used by academics and practitioners as a way of understanding

organizations (Burnes, 2005; Antonacopoulou and Chiva, 2007; Chiva et al., 2009). CAS are made up of heterogeneous elements that inter-relate with each other and with their surroundings, and are unlimited in their capabilities to adapt their behaviour, based on their experience (Gell-Mann, 1994; Coleman, 1999; Anderson, 1999; Axelrod and Cohen, 1999; Houchin and MacLean, 2005). Consequently, they are complex in that they are diverse and made up of multiple interconnected elements, and adaptive in that they have the capacity to change and learn from experience. Adaptability is a system's capacity to adjust to changes in the environment without endangering its essential organization.

In the last years, literatures on internationalization, organizational learning and innovation have been trying to relate them through linear causality, or by considering some of them as the cause of the other one (eg. Alegre and Chiva, 2008; Molero, 1998; Wagner, 1995). However, and based on these research all these concepts could be understood as totally interrelated or linked by mutual causality, adapting each other or self-organizing. Therefore, they constitute a CAS. Furthermore, and based on the concept of co-evolution, we propose the existence of two stages or paradigms: the incremental, described by adaptive learning, incremental innovation and internationalization, and the global, defined by generative learning, radical innovation and born global internationalization.

In order to introduce our model, we briefly describe and relate each of the topics based on the literature. Secondly, we propose the model, based on the concept of CAS, and put forward the two system levels or stages: the incremental and the global. Finally, we discuss the implications of these systems.

ORGANIZATIONAL LEARNING, INNOVATION AND INTERNATIONALIZATION: A BRIEF REVIEW

Organizational Learning: New Knowledge affects innovation and internationalization

Organizational learning has for some time been one of the concepts most strongly demanded by academic and business worlds (Bapuji and Crossan, 2004; Easterby-Smith et al., 2000). In spite of its complexity, reflected in the numerous perspectives proposed (Chiva and Alegre, 2005), organizational learning might be defined as the process through which organizations change or modify their mental models, rules, processes or knowledge, keeping or improving their performance (Argyris and Schon, 1978; Senge, 1990; Brown and Duguid, 1991, Dibella, Nevis and Gould, 1996). Organizational learning is then a process that develops a new way of seeing things or understanding them within organizations, which implies new organizational knowledge.

Organizational learning has been identified as key factor for achieving competitive advantage in dynamic and turbulent markets (Slater and Narver, 1995; Hult, 1998). Previous research has linked organizational learning to important competitive issues such as market orientation (Baker and Sinkula, 1999; Slater and Narver, 1995) -which has traditionally related to internationalization (Leelapanyalert and Ghauri, 2007)-, innovation (McKee, 1992; Hurley and Hult, 1998), and firm performance (Calantone, Cavusgil and Zhao, 2002; Hult, Hurley and Knight, 2004).

Furthermore literatures of innovation and internationalization have stressed the importance of knowledge in order to develop their processes. Innovation is defined by Afuah (1998) as new knowledge incorporated in products, processes, and services. In fact, a lot of research has considered new knowledge as the base for innovation (eg. Nonaka and Takeuchi, 1995; Alegre and Chiva, 2008), by understanding innovation as an individual and collective learning process that aims to search new ways of solving problems. Innovation seems to depend on the company's capability to learn through which new knowledge is developed, distributed and used. Maybe due to the importance of knowledge in the process of innovation, this seems to stress the existence of two main stages: first, generation and development of an idea or concept (new knowledge), based on identification of the needs or opportunities, which is labelled as Fuzzy Front End (Reid and Brentani, 2004; Khurana and Rosenthal, 1998); and second, implementation or execution of these concepts or ideas, which normally includes design, production and launch (Perks et al., 2005).

On the other hand, internationalization is considered by several authors (Bilkey and Tesar, 1977; Andersen, 1993; Prashantam, 2005) as a kind of innovation and therefore knowledge takes also a vital role. In fact, Prashantam (2005) affirms that knowledge is at the core of received wisdom on internationalization, which is consistent with the notion that internationalization represents an innovation of the firm. Learning might be also understood as an input of the internationalization process (Petersen, Pedersen & Lyles, 2008). This is supported by the internationalisation process view (Johanson and Vahlne, 1977; 1990) and the need to close perceived knowledge gaps in foreign markets (Petersen, Pedersen and Lyles, 2008). From this perspective, internationalization is viewed as a process of learning and knowledge accumulation (Ling-ye, 2004).

Learning alters the manner in which firms see and interpret the world; therefore organisational routines and procedures based on experience drive firms' internationalisation sequentially. As internationalisation is trial-and-error based and firms have imperfect knowledge of the institutions and customers in the foreign market, knowledge of both is accumulated by conducting international operations. This accumulated knowledge drives internationalisation and improves a firm's capabilities to monitor and collect information. This new knowledge is assimilated into the firm's existing knowledge. Confrontation, questioning and reconsideration occur, and double-loop learning may emerge (Erikson, et. al. 2000).

In sum, when organizations have developed or created new knowledge, this might have effects on innovation and internationalization. Based on new knowledge, organizations can implement a new product, service or process and face to a new country market. According to De Clercq et al. (2005) the more knowledge a firm has gained through intensive learning efforts, the more willing it will be to utilize and exploit this knowledge through subsequent international activity.

Innovation: New Products and Processes affect organizational learning and internationalization

Innovation is also a concept that has taken increasing importance in the academic and practical worlds in the last few years. Urabe (1988) defines innovation as the generation of a new idea and its implementation into a new product, service and process. Thompson (1965) considers innovation as a broader concept that addresses the implementation of new ideas, products or processes.

Generally, literature claims a positive relationship between innovation and internationalization (Molero, 1998; Basile, 2001; Pla-Barber and Alegre, 2007) because innovation confers market power and, as a consequence, facilitates internationalization (Roper and Love, 2002). Innovative firms obtain some competitive advantages that give them the chance to compete in an active way in different markets (Filipescu, 2007). Furthermore, the international business literature proposes that internationalization depends on structural factors of the firm, management factors, and incentives and obstacles in the process of internationalisation (Bonaccorsi, 1992). Innovation capability can be considered as an essential factor to facilitate internationalization.

Innovation management literature generally predicts that innovative firms will have a tendency to enter foreign markets in order to increase sales volume and spread the fixed costs of innovation over a larger number of units (Tidd et al., 1997; Rogers, 2004). Besides several exceptions (Lefebvre et al., 1998; Becchetti and Rossi, 2000), previous research is rather consistent in supporting that innovation encourages internationalization.

On the other hand, innovation can be also be viewed as a catalyser of new knowledge, as its process itself and the feedback of the successful or unsuccessful consequences can imply a new vision of the market, the product etc. (Hurley and Hult, 1998). In sum, innovation might also be considered as the source of internationalization and organizational learning.

Internationalization: New Country Markets affect organizational learning and innovation

The increasing engagement of firms in internationalization activities is now one of the most visible responses to the constantly changing dynamics of the global environment. According to Prashantam (2005), internationalization is commonly understood as the process of adapting firms' operations to international environments (Calof and Beamish, 1995, p. 116). Prashantam (2005) affirms that internationalization is an issue of importance for firms that often results in vital growth (Luostarinen, 1980), useful learning outcomes (Zahra et al., 2000) and enhanced financial performance (Lu and Beamish, 2001). We can consider that internationalization implies entering into new country markets (Filipescu, 2007), and can be broadly defined as 'expanding across country borders into geographic locations that are new to the firm' (Hitt et al., 1994, p. 298).

Hitt et al. (1994) affirm that internationalization not only allows a firm to enrich its sources of knowledge, but also provides the opportunity to capture ideas from a greater number of new and different markets, as well as from a wide range of cultural perspectives, which facilitates innovation. Thus, they emphasized that highly international firms can improve their ability to innovate by having greater opportunities to learn (Kafouros et al., 2008). Furthermore, Kotabe et al. (2002) state that internationalization can reduce costs associated with innovation: highly international firms can access many markets around the globe, they can buy materials and R&D inputs from the cheapest available sources, and locate their R&D and other departments in the most productive regions (Kafouros et al., 2008). Internationalization can also

improve the ability to innovate by allowing firms to hire better technologists and access skilled technical expertise (Cheng and Bolon, 1993, Kafouros et al., 2008). On the other hand, being more international allows a firm to achieve greater returns from innovation by utilizing many markets (Hitt et al., 1997; Kafouros et al., 2008).

Internationalization has been increasingly related to organizational learning and knowledge (Forsgren, 2002; Leelapanyalert and Ghauri, 2007). A lot of research has considered that internationalization provides organizations with different experiences that make them learn or develop new knowledge (Sullivan, 1994; Hitt et al., 1997; Gomes and Ramaswamy, 1999). In fact, some of these papers have also considered that internationalization creates new knowledge, which encourages them to innovate (Wagner, 1995; Pittiglio et al., 2009). Pittiglio et al. (2009) consider that firms active in international markets generate more knowledge than their counterparts that sell in the national market only, because the former learn more from external sources. In the same line, Keeble et al. (1998) consider that internationalization is a very important process underpinning firm's innovative activities. Criscuolo et al. (2005) and Wagner (2001) demonstrated that international firms innovate more thanks to the access to a larger flow of ideas from external sources.

A MODEL BASED ON COMPLEX ADAPATIVE SYSTEMS

Based on the previous section and the interdependencies and interactions suggested by the literature, we propose a mutual causality framework based on the tenets of CAS (Holland, 1995; Anderson, 1999; Stacey, 1996). The main characteristic of CAS is that a change in one part of the system may result in large effects in other parts or elements

of the system (Etemad, 2004). Based on these systems' ideas organizational learning, innovation and internationalization form a CAS, being each of them an element of the system.

Insert Figure 1 about here

Sherman and Schultz (1998, p. 17) define a CAS as a system composed of interacting elements following rules, exchanging influence with their local and global environments and altering the very environment they are responding to by virtue of their simple actions. CAS elements' behaviour is dictated by a schema, a pattern that determines what action the element will take (Anderson, 1999, p. 219). Changes in elements' schemas and interconnection among elements produce different aggregate outcomes in the system. Elements are partially connected to one another, so that the behaviour of a particular element depends on the behaviour of some subset of all the elements in the system (Anderson, 1999). The three topics of our model are also partially connected to one another.

Consequently, CAS continuously self-organize (Anderson, 1999; Axelrod and Cohen, 1999). Self-organization is a process in which the internal organization of a system increases in complexity without being guided or managed by an outside source. No single program or element completely determines the system's behavior, which is rather unpredictable and uncontrollable (Goodwin, 1994). Self-organization is a natural consequence of interactions between simple elements or agents (Anderson, 1999). Therefore it is very difficult to determine the effects a new product, a new knowledge or a new country market will have on the other elements of the system. The system

continuously self organize based on alterations on any of these topics.

CAS evolve over time through the transformation of elements (Anderson, 1999). Any novelty implemented in knowledge, products and processes and new country markets affect the other ones and the systems itself. CAS continuously co-evolve (Anderson, 1999; Axelrod and Cohen, 1999; Boisot and Child, 1999), which means that systems have a mutually adaptive relationship with their environment, such that they are not simply trying to adapt to a static environment, but rather the system is learning to adapt to an environment that is itself adapting to the environment. One characteristic of a CAS is the tendency to move toward new forms of existence or new stages of development (Luoma, 2006). This is known as co-evolution. This implies that our CAS model might move towards different stages of evolution, depending on which type of learning, innovation or internationalization are put in practice. Every stage would explain a view or paradigm that all three elements should share.

By considering some of the main typologies within these literatures, in this paper we propose two paradigms, the incremental and the global, based on the dichotomies adaptive and generative learning (eg. Senge, 1990), incremental and radical innovation (eg. Henderson and Clark, 1990) and incremental internationalization process and born global approach (eg. Knight and Cavusgil 1996).

One of the most important classical typologies within OL literature is the distinction between adaptive and generative learning (Argyris and Schön, 1974, 1978; Fiol and Lyles, 1985; Senge, 1990; Arthur and Aiman-Smith, 2001). Although nowadays a

myriad of terms are used to describe these two concepts of learning, this typology was most likely introduced into the OL literature by Argyris and Schön (1974) through their distinction between single loop and double loop learning. Single loop learning permits an organization to maintain its present policies or achieve its present objectives by adjusting or adapting its behaviour. Double loop learning involves the modification of an organization's underlying norms, policies and objectives. Senge (1990) affirms that generative learning, unlike adaptive learning, requires new ways of looking at the world, whether in understanding customers or understanding how to better manage a business. According to Chiva et al. (2009), adaptive learning or single loop learning is characterized by logical deductive reasoning, concentration, discussion and improvement and generative learning or double loop learning is typified by intuition, attention, dialogue and inquiry.

It is difficult to affirm who introduced the Incremental-Radical innovation dichotomy, partly because the concept was used by many authors, often with a different terminology but expressing the same meaning. Abernathy (1978) was probably one of the first that differentiated incremental from radical innovation, apart from Schumpeter some years ago. Similarly, Tushman and Anderson (1986) defined Incremental and Breakthrough innovations and Abernathy and Clark (1984) used the terms Conservative and Radical innovations. It is widely acknowledged that in terms of innovations and their impact on both the industry and firm level, important differences exist between radical and incremental innovations (Dosi, 1982; Christensen and Rosenbloom, 1995; Christensen, 2000; Hurmelinna-Laukkanen, 2008). An incremental innovation will build upon existing knowledge and resources within a certain company, meaning it will be competence-enhancing. A radical innovation, on the other hand, will require completely

new knowledge and/or resources and will be, therefore, competence-destroying.

Concerning internationalization, there have been, in terms of time pattern, mainly two approaches. One view understands that organizations become international in a slow and incremental manner, which might be due to the lack of knowledge about foreign markets, high risk aversion and high perceived uncertainty (Madsen and Servais, 1997). This view is related to the Uppsala (Johanson and Vahlne, 1977) and Innovation related models (Cavusgil, 1980), which involve time consuming organizational learning processes and an innovative course of action, respectively. However, another view holds that firms enter international markets soon after the firm's inception. As opposed to the stages models, this approach understands that firms internationalize from inception or shortly thereafter, targeting small, highly specialized global niches and implementing a global strategy from inception (Bell, et al., 2003; McDougall et al., 2003; Oladottir, 2009). Born global firms perceive international markets as providing opportunities rather than obstacles (Madsen and Servais, 1997).

Insert Figure 2 about here

Based on these descriptions, adaptive learning, incremental innovation and internationalization are related or imply a similar approach. Both incremental innovation and internationalization involve an adaptive learning process focused on progressively learning and improving. Some factors characterising this model would be: logical deductive reasoning, concentration, discussion and improvement (Chiva et al., 2009). Similarly, generative learning, radical innovation and born global internationalization process entail a similar view: inquiring, questioning and seeing the

whole picture by full attention. According to Chiva et al. (2009) some of its characteristics would be: intuition, attention, dialogue and inquiry. We understand that mainly improvement-concentration versus inquiry-attention reflect this dichotomy. Concentration is a process of forcing the mind to narrow down to a point, whereas attention is a state in which the mind is constantly learning without a centre around which knowledge gathers as accumulated experience.

Insert Figure 3 about here

DISCUSSION

In this paper, we propose a theoretical model to analyse the relationships between organizational learning, innovation and internationalization. This framework is based on CAS, steeped in the new science of complexity, which is proposed due to the importance is taking in our age of globalization and creativity. CAS tenets help us to suggest the relevance of mutual causality, interdependence, self-organization and co-evolution of our model. Our system's evolution is based on the development of new country markets, new products and processes and new knowledge. All of them are linked and depend on the other. Any novelty in any of these topics could imply changes in the other ones and in the system itself. Based on co-evolution, two evolutionary stages of our system are proposed: incremental and global. The former implies adaptive learning, incremental innovation and internationalization. The global understands that generative learning, radical innovation and born global internationalization are connected through a similar view.

This research has important implications for academic and business worlds. First, any of the elements analysed affect to the other ones, which imply the lack of causality among them. Any alteration in the elements has consequences in the other ones, which provoke self-organization of the system. Second, when organizations tend to face adaptive learning, usually also adopt incremental innovation and internationalization. When organizations use generative learning, also meet radical learning and born global internationalization because they have a similar approaches focused on inquiry and attention. Based on these ideas, managers that work on these areas should understand organizations with this holistic approach that links these three issues.

In sum, this paper seeks to provide a more holistic way of understanding these important concepts. We consider our proposal as a first step.

REFERENCES

- Abernathy, W., Clark, K.B. (1984) Innovation: mapping the winds of creative destruction, *Research Policy*, vol. 14, 3-22.
- Abernathy, W.J. (1978) *The productivity dilemma. Roadblock to Innovation in the automobile industry*. Baltimore, Johns Hopkins Univ. Press.
- Afuah, A. (1998). *Innovation management: Strategies, implementation, and profits*. New York: Oxford University Press.
- Alegre, J., Chiva, R. (2008) Assessing the impact of organizational learning capability on product innovation performance: An empirical test, *Technovation*, 28: 315–326.
- Andersen, O. (1993) On the Internationalisation Process of Firms: A Critical Analysis, *Journal of International Business Studies*, 24 (2), 209–231.
- Anderson, P. (1999) Complexity theory and organization science. *Organization Science*, 10, 216-232.
- Antonacopoulou, E. and Chiva, R. (2007). The social complexity of Organisational Learning: the dynamics of learning and organizing. *Management Learning*, 38 (3), 277-295.
- Argyris, C. and Schön, D. (1978). *Organizational learning: a theory of action perspective*. Reading, Mass. Addison-Wesley.
- Argyris, C., and Schön, D. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey Bass.
- Arthur, J. and Aiman-Smith, L. (2001) Gainsharing and organizational learning: An analysis of employee suggestions over time. *Academy of Management Journal*, 44, 737-754.
- Axelrod, R. and Cohen, M. D. (1999). *Harnessing complexity*. New York: The Free Press.
- Baker, J. M. and W. E. Sinkula (1999). The synergetic effect of Market Orientation and learning orientation on Organizational Performance. *Journal of the Academy of Marketing Science*, 27(4), 411-27.
- Bapuji, H., and Crossan, M. (2004). From raising questions to providing answers: Reviewing organizational learning research. *Management Learning*, 35 (4): 397-417.
- Basile, R. (2001) Export Behaviour of Italian Manufacturing Firms over the Nineties: The Role of Innovation, *Research Policy*, 30 (8), 1185–1201.
- Becchetti, L. and Rossi, S. (2000). The positive effects of industrial district on the export performance of Italian firms. *Review of Industrial Organization*, 16(1), 53-68.
- Begun, J. (1994) Chaos and complexity: frontiers of organization science, *Journal of management inquiry*, 3 (4): 329-335.
- Bell, J.; McNaughton, R. Young, S. and Crick D. (2003), 'Towards an Integrative Model of Small Firm Internationalisation', *Journal of International Entrepreneurship*, 1(4), 339-362.

- Bilkey, W.J. and G. Tesar (1977) The Export Behaviour of Smaller Sized Wisconsin Manufacturing Firms, *Journal of International Business Studies*, 8 (1), 93–98.
- Boisot, M. and Child, J. (1999). Organizations as adaptive systems in complex environments: the case of China. *Organization Science*, 10: 237-252.
- Bonaccorsi, A. (1992). On the relationship between firm size and export intensity. *Journal of International Business Studies*, 23, 605-635.
- Brown, J.S. and Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation, *Organization Science*, 2 (1), 40-57.
- Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, 7 (2): 73-90.
- Calof, J. and Beamish, P.W. (1995), Adapting to foreign markets: explaining internationalization, *International Business Review*, Vol. 4 No.2, pp.115-31.
- Capra, F. (1993) A systems approach to the emerging paradigm. In M. Ray and Rizler, A. (eds.) *The new paradigm in business: emerging strategies for leadership and organization change*. New York: G.P. Putnam's son.
- Cavusgil, S. T. (1980) On the internationalization process of firms. *European Research*, vol. 8, pp. 273-81.
- Cheng, J.L.C., Bolon, D.S., (1993). The management of multinational R&D: a neglected topic in international business research. *Journal of International Business Studies* 24, 1–18.
- Chiva, R. and Alegre, J. (2005) Organizational Learning and Organizational Knowledge: Towards the Integration of Two Approaches, *Management Learning*, 36 (1): 47–66.
- Chiva, R., Grandío, A. and Alegre, J. (2009) Adaptive and Generative learning: implications from Complexity Theories, *International Journal of Management Reviews* (in press).
- Christensen, C. (2000) *The innovator's dilemma*. Boston, MA: HarperBusiness; Harvard Business University Press.
- Christensen, C. and Rosenbloom, R. (1995) Explaining the attacker's advantage: technological paradigms, organizational dynamics, and the value network. *Research Policy*, 24, 233-257.
- Coleman, H. J., Jr. (1999). What enables self-organizing behaviour in business? *Emergence*, 1: 33-48.
- Criscuolo, C., J. Haskel and M. Slaughter. (2005). *Global engagement and the innovation activities of firms*. NBER WP no. 11479.
- De Clercq D. Sapienza H.J. Crijns H. (2005). The internationalization of small and medium-sized firms: the role of organizational learning effort and entrepreneurial orientation. *Small Business Economics*. 24 (4): 409 -419.
- Dent (1999). Complexity Science: A Worldview Shift. *Emergence*, 1 (4): 5-19.
- Dent, E. and Powley E. (2004), Worldview assumptions: Paradigm shift in progress? *Journal of Behavioral and Applied Management*, 5 (3): 280–306.

- Dibella, A.J., Nevis, E.C. and Gould, J.M. (1996). Understanding organizational learning capability. *Journal of Management Studies*, 33(3), 361-379.
- Dosi, G. (1982) Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. *Research Policy*, 11, 147-162.
- Easterby-Smith, M., Crossan, M. and Nicolini, D. (2000). Organizational learning: Debates past, present and future. *Journal of Management Studies*, 37: 783-796.
- Eriksson, K., Johanson, J., Majkgard, A. and Sharma, D. (2000). Effect of variation on knowledge accumulation in the internationalization process. *International Studies of Management and Organization*, 30, (1), 26-44.
- Etemad, H. (2004) International Entrepreneurship as a dynamic adaptive system: towards a grounded theory, *Journal of international Entrepreneurship*, 2, 5-59.
- Filipescu, D. (2007) *Innovation and Internationalization. A focus on Spanish exporting firms*. University Autonomia de Barcelona.
- Fiol, C. M. and Lyles, M.A. (1985). Organizational Learning. *Academy of Management Review*, vol. 10, pp. 803-813.
- Forsgren, M. 2002, The Concept of Learning in the Uppsala Internationalization Process Model: A Critical Review. *International Business Review*, 11.
- Gell-Mann, M. (1994). *The quark and the jaguar. Adventures in the simple and the complex*. New York: WH Freeman.
- Gomes, L. and Ramaswamy, K., An Empirical Examination of the Form of the Relationship between Multinationality and Performance, *Journal of International Business Studies*, 30, 1999, 173–188.
- Goodwin, B. (1994). *How the leopard changed its spots: the evolution of complexity*. London: Weidenfeld and Nicholson.
- Henderson, R.M and Clark, K. (1990) Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms, *Administrative Science Quarterly*, 9-30.
- Hitt, M. A.; Hoskisson, R. E. and Kim, H., (1997) International Diversification: Effects on Innovation and Firm Performance in Product-diversified Firms, *Academy of Management Journal*, 40, 767–798.
- Hitt, M., Hoskisson, R., Kim, H., (1997). International diversification: effects on innovation and firm performance in product-diversified firms. *Academy of Management Journal* 40 (4), 767–798.
- Holland, J. H. (1995). *Hidden order. How adaptation builds complexity*. Reading, MA: Addison-Wesley.
- Houchin, K. and MacLean, D. (2005). Complexity theory and strategic change: an empirically informed critique. *British Journal of Management*, 16: 149-166.
- Hult, G. T. M. (1998). Managing the International Strategic Sourcing Process as a Market-Driven Organizational Learning System. *Decision Sciences*, 29(1), 193-216.

- Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: An integration and empirical examination. *Journal of Marketing*, 62, (3), 42-54.
- Hurley, R.F., Hult, G.T. (1998), "Innovation, market orientation, and organizational learning: an integration and empirical examination", *Journal of Marketing*, Vol. 62 pp.42-54.
- Hurmelinna-Laukkanen, P., Sainio, L. and Jauhiainen, T. (2008) Appropriability regime for radical and incremental innovations, *R&D Management*, 38, 3, 278-289.
- Johanson, J., & Vahlne, J.-E. (1977). The Internationalization Process of the Firm -- A Model of Knowledge Development and Increasing Foreign Market Commitments. *Journal of International Business Studies*, 8, 23-32.
- Kafouros, M.I., Buckley, P.J., Shapr, J.A. and Wang, C. (2008). The role of internationalization in explaining innovation performance. *Technovation*, 28, 63-74.
- Khurana, A. Rosenthal S. R. (1998) Towards Holistic "Front Ends" in New Product Development; *The Journal of Product Innovation Management* 15 (1): 57-74
- Knight, G. and Cavusgil, S.Tamer. (1996). "The born global firm: a challenge to traditional internationalization theory". *Advances in International Marketing*, 11-26.
- Kotabe, M., Srinivasan, S.S., Aulakh, P.S., (2002). Multinationality and firm performance: the moderating role of R&D and marketing capabilities. *Journal of International Business Studies*, 33 (1), 79-97.
- Leelapanyalert, K. and Ghauri, P. (2007) "Managing International Market Entry Strategy: The Case of Retailing Firms", *Advances in International Marketing*, 17:193-215.
- Leelapanyalert, K. and Ghauri, P. (2007) Managing international market entry strategy: the case of retailing firms. *Advances in international marketing*, 17, 193-215.
- Lefebvre, L.A., Lefebvre, E. and Bourgault, M. (1998). R&D-related capabilities as determinants of export performance. *Small Business Economics*, 10, 365-377.
- Ling-yee, L. (2004) An examination of the foreign market knowledge of exporting firms based in the People's Republic of China: Its determinants and effect on export intensity, *Industrial Marketing Management*, Vol. 33 pp.561 - 572.
- Lu, J.W. and P.W. Beamish, 2001, 'The Internationalization and Performance of SMEs', *Strategic Management Journal* 22, 565-586.
- Luoma, M. (2006). A play of four arenas: how complexity can serve management development. *Management Learning*, 37 (1): 101-123.
- Luostarinen, R. (1980) *The internationalization of the firm*. Helsinki School of Economics, Helsinki
- Madsen, T. and Servais, P. (1997) The Internationalization of Born Globals: An Evolutionary Process?, *International Business Review*, 6(6), p. 561-583.
- McDougall, P.P., Oviatt, B.M., & Shrader, R.C. (2003). A comparison of international and domestic new ventures. *Journal of International Entrepreneurship*, 1, 59-82.

- McKee, D. (1992). An organizational learning approach to product innovation. *Journal of Product Innovation Management*, 9, (3), 232-245.
- Molero, J. (1998), Patterns of Internationalisation of Spanish Innovatory Firms, *Research Policy*, 27 (5), 541-558.
- Nonaka, I., and Takeuchi, H. (1995). *The knowledge-creating company*. New York: Oxford University Press.
- Oladottir, A.D. (2009) Internationalization from a small domestic base: an empirical analysis of foreign direct investments of Icelandic firms. *Management International Review*, 49, 1.
- Perks, H; Cooper, R. and Jones C. (2005) Characterizing the Role of Design in New Product Development: An Empirically Derived Taxonomy. *Journal of Product Innovation Management*, 22 (2) 111-127.
- Petersen, B., Pedersen, T. & Lyles, M.A. (2008). Closing gaps in foreign markets. *Journal of International Business Studies*, 39, (7), 1097-1113.
- Pittiglio, R.; Sica E. and Villa S. (2009) *Innovation and internationalization: the case of Italy. The Journal of Technology Transfer*.
<http://www.springerlink.com/content/h676u02m83339362/>
- Pla-Barber, J. and Alegre, J. (2007): "Analysing the link between export, innovation and size in a Science based industry". *International Business Review*, 16, 275-293.
- Prashantham, S. (2005), Toward a Knowledge-Based Conceptualisation of Internationalisation, *Journal of International Entrepreneurship*, 3 (1), 37-52.
- Reid, S.E. and de Brentani, U. (2004). The Fuzzy Front End of New Product Development for Discontinuous Innovations: A Theoretical Model. *Journal of Product Innovation Management*, 21 (3): 170 – 184.
- Rogers, M. (2004). Networks, firm size and innovation. *Small Business Economics*, 22, 141-153.
- Roper, S. Love J H. (2002) German Manufacturing Plants', *Research Policy*, 31.
- Senge, P. (1990). *Fifth Discipline*. New York: Doubleday.
- Sherman, H. and Schultz, R. (1998) *Open Boundaries*. New York: Perseus Books.
- Slater, S. F. and J. C. Narver (1995). Market Orientation and the Learning Organization. *Journal of Marketing*, 59(3), 63-74.
- Stacey, R.D. (1996). *Complexity and creativity in organizations*. San Francisco: Berrett-Koehler publishers.
- Sullivan, D., (1994) Measuring the Degree of Internationalization of a Firm, *Journal of International Business Studies*, 25, 325–342.
- Thompson, V. (1965) Bureaucracy and Innovation. *Administrative science quarterly*, 10, 1-20.
- Tidd, J., Bessant, J. and Pavitt, K. (1997). *Managing Innovation*. Chichester: John Wiley & Sons.
- Tushman, M. and Anderson, P. (1986) Technological discontinuities and organizational environments, *Administrative Science Quarterly*, 31, 439-65.

- Urabe, K. (1988). Innovation and the Japanese management system. In K. Urabe, J. Child, & T. Kagono (Eds.), *Innovation and management international comparisons*. Berlin: Walter de Gruyter.
- Wagner, J. (1995). Exports, firm size, and firm dynamics. *Small Journal Economics*, 7(1), 29-39.
- Wagner, J. (2001). A note on the firm size – export relationship. *Small Journal Economics*, 17(4), 229-237.
- Wheatley, M.J. (1992) *Leadership and the new science: learning about organization from an orderly universe*. San Francisco: Berrett-Koehler Publishers.
- Zahra, S.A., R.D. Ireland, and M.A. Hitt, (2000), International Expansion by New Venture Firms: International Diversity, Mode of Market Entry, Technological Learning, and Performance, *Academy of Management Journal* 43 (5), 925–950.

Figure 1. A CAS model based on novelty

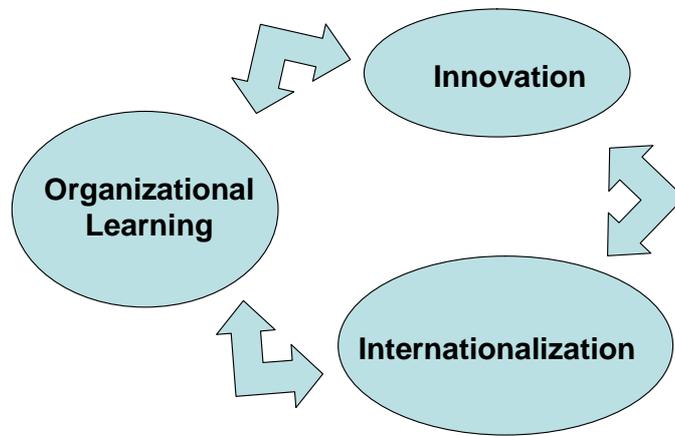


Figure 2. The incremental paradigm

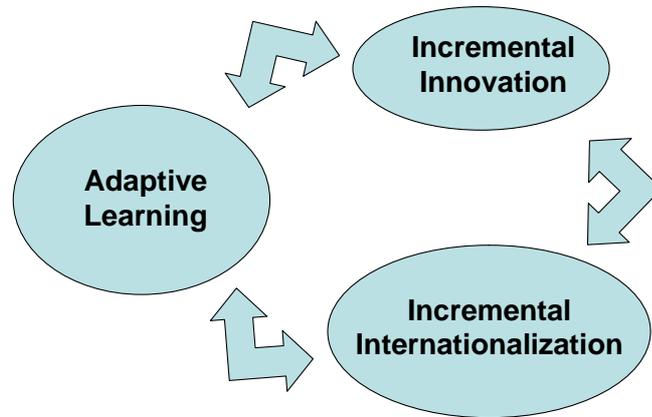


Figure 3. The global paradigm

