

CORPORATE LEVEL MANAGERIAL KNOWLEDGE AS A COMPLEX ADAPTIVE SYSTEM

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ABSTRACT

Managing a single business demands knowledge regarding how to create and sustain competitive advantage. Additionally, managing a multi-business firm requires the coordination of business diversity and the capturing of synergies, thus increasing managerial complexity. These challenges demand a different type of knowledge. Based on qualitative research, this paper presents a conceptual model of corporate knowledge as a complex adaptive system (CAS) in which multilevel agents, synergy stimuli, adaptive responses and systems of action make up the aforesaid knowledge. Managerial knowledge at the corporate level is tacit, collective, integrative and collaborative. This research uses the complex case study approach for a Colombian multi-business firm, focusing on the top management team. The resulting method helps to enhance the conception of managerial knowledge at the corporate level and facilitates the decentralization of decision-making.

Keywords: Complex adaptive systems (CAS), Multi-business firm, Managerial knowledge, Corporate strategy

INTRODUCTION

Managerial knowledge in a multi-business firm differs from that required for the management of a single business. Managerial knowledge at the corporate level is the subject of this paper and is approached via the question, *how is managerial knowledge deployed in the management of a multi-business firm?* The interest group Corporate Strategy of the *Strategic Management Society* has identified this topic. In order to approach the research problem, a theoretical framework supported by complex adaptive systems is constructed and an in-depth case study conducted from the complex perspective for a multi-business firm. Additionally, the general objective of *conceptually understanding and modeling the deployment process for managerial knowledge in a multi-business firm* is proposed. Equipped with both an answer to the above question and the objectives of this investigation, and working within the framework of the multi-business firm, this paper seeks in particular to contribute to the field of corporate strategy.

The contributions that justify and confirm that this investigation is relevant to the field of corporate strategy are as follows. **1) Theoretical:** Contributions are made to the subfield

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of corporate strategy in connection with the management of a set of businesses, with specific reference to the type of knowledge that a top management teams deploys when faced with strategic variety and difficulties in order to capture the synergies that characterize multi-business firms. **2) Conceptual:** This paper offers a definition of managerial knowledge that manifests and expresses itself in the management of a real multi-business firm and, by extension, provides a conceptual model (albeit non-generalizable) of the process of deployment for this type of collective knowledge. **3) Practical:** Modeling the deployment of managerial knowledge in a multi-business firm offers support to the management of such firms in two ways. First, by strengthening the autonomy of the business through the decentralization of decision-making. Second, by identifying the key elements of management that facilitate the process of management training.

The research reported in this text is developed in five sections: research problem, literature review, theoretical framework, methodology, findings and discussion, and, to close, some conclusions.

RESEARCH PROBLEM

Managerial knowledge in a multi-business firm differs from that required for the management of a single business. Addressing business strategy means being clear on the business in which one is invested, that is to say, knowing the logic of its creation and capturing its value (Abell, 1980; Osterwalder & Pigneur, 2010). Managing a business means recognizing how the business model was configured in the past, the form in which it operates at present, and the possible ways in which to develop it in the future. The principal difference between the management of a single business and that of a multi-business firm resides in the types of problems or questions faced by their respective managers. In a single business, attention is focused on the clients and the value proposition, that is to say, on competitive strategy (or business strategy) (Porter, 1985; Montgomery & Porter, 1987). Meanwhile, in a multi-business firm, as well as addressing business strategy, executives must define a business portfolio and manage the resulting group (Espinosa & Porter, 2011; 1987; Prahalad & Bettis, 1986; Prahalad & Doz, 2003). These strategic decisions usually relate to the controlling of business units by a corporate center or central office, collaboration between business units in order to capture synergies, and the scope of the firm, that is, the definition of its field of action (Eisenhardt & Pienzunka, 2011).

At the corporate level of strategy, it is necessary to consider the particularities that may emerge through joint management. Among these, the capturing of synergies, understood as the generation of greater economic value through the joint management of business units, stands out. Synergies are, without doubt, the main challenge for the joint management that characterizes corporate-level strategy (Eisenhardt & Galunic, 2000; Goold & Campbell, 1998).

Concern for the managerial knowledge required by the joint management of businesses gives rise to the research question, *how is managerial knowledge deployed in the*

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management of a multibusiness firm? Managerial knowledge, understood as the relationship between management and knowledge, which will be presented later, is the topic of this investigation and is therefore the theoretical construct characterized through the fieldwork and the analysis of the collected qualitative data. The multi-business firm (Campbell, Gould & Alexander, 1995; Chandler, 1991; Eisenhardt & Pienzunka, 2011; Prahalad & Doz, 2003) is the context within which managerial knowledge is investigated at the corporate level of strategy. The deployment of managerial knowledge is understood in two ways within the framework of this investigation. The first refers to the purpose of codifying the knowledge that emerges in the management of a set of businesses. The second is related to the sharing enacted by each of the directors that make up the top management team responsible for competitive as much as corporate strategy. This implies that deployment can be understood as the partial codification of the tacit knowledge that characterizes management (Mintzberg, 2010) and as the process of building collective knowledge (Hecker, 2012) through the cognitive base and individual values that directors exhibit when interacting in management meetings.

LITERATURE REVIEW

The literature review reveals that the dialogue between knowledge and strategy focuses on business strategy from an analytical perspective of competitive advantage.¹ In other words, knowledge is considered the central element in obtaining performances superior to those of the competition, performances that are achieved through the development of the competencies and capacities of the organization (Wernerfelt, 1984; 1995). In this sense, the resource-based view of the firm (RBVF) is not only centered on the most efficient form of organization for the generation of knowledge and capacities (Nickerson &

¹ As theorists in the field of strategy interested in management issues, the bibliographic search for the keyword “knowledge” covers, first, five years of publications (2007 to March 2013) in four of the most representative journals of this field, namely, *Strategic Management Journal*, *Academy of Management Journal*, *Academy of Management Review* and *European Management Journal*. In total, the titles and keywords of 1,733 articles were reviewed and 108 abstracts or summaries related to the topic of interest selected. In addition, since most of these summaries (55.5%) came from the *Strategic Management Journal*, an exhaustive review of all the publications of this journal was made, from 1980 to March 2013. In total, 85 relevant articles were identified, 60 of which were published during the period 2007 to 2013, which shows a recent growing interest in the issue of knowledge and its relation to management in recent years.

Subsequently, a general search was performed for the words “managerial knowledge” in the databases of EBSCO, ProQuest, JSTOR and ISI. This search yielded 18 articles. However, only one of these relates to the interests of this research. In addition, the most representative journals of Colombia in the field of management were screened, for example, *Innovate* and the *National University of Colombia*, among others. In none of these magazines was any reference to managerial knowledge found. Of the 85 articles selected, those related to reviews of the field were identified and from there the most cited texts were selected. Articles related to the perspective of complex systems were also selected, and authors such as Kathleen Eisenhardt, who approaches corporate strategy from the perspective of complexity, were identified. Therefore, 30 articles published by this author were reviewed, six of which correspond to the 1980s, and 1990s, and 24 of which to the 2000s and 2010s. Given the importance of the relationship between management and complex thinking to this research, *The SAGE Handbook of Complexity and Management* was also reviewed. It must be noted that a new bibliographic search (2014) for the keywords “managerial knowledge” identified 12 new articles, none of which provide a definition of managerial knowledge within the context of multi-business firms (Wernerfelt, 1984; 1995).

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Zenger, 2004), but also on innovation as a principal source of competitive advantage. This means that knowledge, as well as capacities and innovation, is studied from the level of business strategy. This aim is shared with the field of knowledge management (Firestone & McElroy, 2003; Kakabadse, Kakabadse & Kouzmin, 2003), which emerged with force in the nineties. This revision has allowed for a differentiation to be made between knowledge in the field of strategy and the way in which it is understood in corporate strategy in particular.

Knowledge in the field of strategy

The literature review permits us to infer that in the field of strategy knowledge is given the function of creating and sustaining competitive advantage, and that it constitutes an intangible resource essential for the differentiation of the organization. This concern is the focus of the resource-based view of the firm (RBVF), which is interested in the role played by resources and capacities in the performance and diversity of companies (Wernerfelt, 1984; 1995). For RBVF, knowledge is evoked through different terms and, principally, through collective competencies and capacities constructed through the interactions, processes and organizational routines that are oriented, in particular, towards the construction of new competitive advantages (Nag, Hambrick & Chen, 2007, p. 942; Prahalad & Hamel, 1990; Teece, 2011).

Managerial knowledge at the corporate level

The literature review has only allowed for the identification of quantitative studies that refer to managerial knowledge at the corporate level. Such knowledge is understood as input for decisions (Gopalakrishna & Goldsmith, 2006) or ways of doing the things that inform an action (Ellis & Hopkinson, 2010). Furthermore, it can be of different types according to its functional area and it is considered that managerial knowledge cannot be quantified and that its character is multifaceted (Park, 2010). Among these studies, the definition provided by Tanriverdi and Venkatraman (2005) stands out:

Managerial Knowledge by which business units are governed can also be a source of cross-business synergy (Prahalad and Bettis, 1986). Managerial Knowledge consists of managerial insights, experiences, and best practices of a firm. (p. 102)

According to the authors, managerial knowledge is conceptualized as a source of synergy, which is measured among business units. Their theoretical focus is based on the approaches of the resource-based view of the firm and, in particular, its application to the complementarities that can be achieved through processes of diversification from the knowledge that makes up the resource base of the firm. They define knowledge relatedness as “the extent to which a multi-business firm uses common knowledge resources across its business units” (p. 100). Understanding knowledge as an intangible resource essential for the competitive strategy of a business, or as a measure of the use of knowledge resources through the units of a business, constitutes a clear reduction of

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knowledge to a measurable and quantifiable resource. With the aim of overcoming the idea of the knowledge-resource, this paper turns to complexity as the theoretical framework of this research.

COMPLEXITY AS A THEORETICAL FRAMEWORK

The multidimensional nature of knowledge (Morin, 2006) and the context of management (Mintzberg, 2010) necessitate a search for non-reductionist analytical perspectives. As a concept opposed to complexity, Mitchell (2009) refers to reductionism as one of the ideals of modern scientists, who believe it possible to reach an understanding of the whole through an explanation of its parts. However, the impossibility of reducing phenomena, such as social behavior, has significantly encouraged anti-reductionist proposals (Richardson & Cilliers, 2001). These proposals promulgate that the whole is more than the sum of its parts and have given rise to new research trends concerned with studying types of systems that cannot be explained by traditional disciplines, such as those complex systems that differ from the complicated according to certain principles.

The principles of complex systems

According to Richardson and Cilliers (2001), a complex system is “comprised of a large number of entities that display a high level of nonlinear interactivity” (p. 24). The authors present seven principles that identify such systems: 1) agents and their interaction; 2) adaptability; 3) self-organization; 4) instability; 5) influence of history; 6) permeable boundaries; and 7) irreducibility.

Agent interaction, and not the quantity thereof, is one of the characteristic principles of a complex system. This principle is crucial when addressing knowledge from a complex perspective since it allows us to refocus the topic of knowledge as a resource into knowledge as a subject/object relationship within a shared context. According to this principle, independently of the elements and/or individual agents that comprise this system, there exist interactions that alter the system over time. Through interaction the agents not only adapt but also self-organize in a process of survival, or better, of evolution. What happens in this process of evolution cannot be forecast; on the contrary, any situation or phenomenon might emerge.

The principles of adaptability and self-organization are intimately interrelated, since a complex system adapts through its processes of self-organization. Similarly, emergence is also a phenomenon that cannot be separated from adaptability and self-organization since it is through this that a new order is created to which it will be necessary to adapt again, and for this to happen self-organization is necessary. The coming and going between the emergence of a new order, the capacity to adapt to it and then a new emergence produces a fresh change that requires, once again, a different process of self-organization and adaptation, and so on and so forth. This explains the principle of instability in complex systems, since the interaction of its agents constantly updates the conditions of the

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surrounding environment and the relevant responses to the respective pressures. Additionally, this explains the influence of history in the complex system. In essence, this type of system cannot be isolated from its temporal context since it would lose its specific properties and characteristics.

The analysis of a human social system requires the selection of an analytical perspective that permits an understanding of the organization as a system of growing complexity. According to Anderson (1999), the perspective of complex adaptive systems is pertinent to this type of system insofar as it asks “*how changes in the agents’ decision rules, the interconnections among agents, or the fitness function that agents employ produce different aggregate outcomes*” (P. Anderson, 1999, p. 220). From this, it can be inferred that complex adaptive systems present an alternative for understanding managerial knowledge at the corporate level of strategy.

Complex adaptive systems (CAS)

Complex adaptive systems represent a new way to simplify the complex. According to Anderson (1999), this way of representing the complex is characterized by its various levels due to “*the notion that at any level of analysis, order is an emergent property of individual interactions at a lower level of aggregation*” (p. 219). It is for this reason that complex adaptive systems are considered multilevel models in which agents have the ability to interact with their environment and other agents, which allows them to respond to what happens around them in an intentional way or not. An agent can be a person, or a group of people, a business or a country that presents characteristics such as a place in which to operate, some capacities through which it affects the world, and a memory, that is, “*what impressions the agent can carry forward from its past*” (Axelrod & Cohen, 2000, p. 3). According to Axelrod and Cohen (2000), populations of agents are important in three ways: “*as a source of possibilities to learn from, as recipients for a newfound improvement, and as part of your environment*” (p. 5). In the context of organizations, these agents or populations of agents use adaptation in their aim deploy “strategies” in response to the pressures of their surroundings and internally imposed goals. In this sense, Axelrod and Cohen (2000) note that, “*A major way in which complex systems change is through change in the agents and their strategies*” (p. 5). The processes of change to which these authors refer are selection and adaptation. Selection is the result of mechanisms such as learning by trial and error or imitating the apparently successful strategies of agents. Furthermore, adaptation occurs when the selection process leads “*to improvement according to some measure of success*” (Axelrod and Cohen, 2000, p. 7). In other words, agents adapt when they manage to succeed despite the difficulties of their environment.

In the following, the fundamental aspects that characterize complex adaptive systems are presented.

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The characteristics of complex adaptive systems (CAS)

According to Holland (1992), Anderson (1999), and Espinosa and Porter (2011), complex adaptive systems (CAS) have particular components, characteristics and mechanisms. By way of summary, table 1 shows the central elements of a CAS according to the aforementioned authors.

Table 1. Central Elements of Complex Adaptive Systems

Central elements	Holland (1992; 1995) ²	Anderson (1999)	Espinosa and Porter (2011)
Components	Large number of agents interacting in various ways Adaptive environment Rules of interaction	Agents interacting with schemes Self-organized networks Simple rules	Agents Subsystems Boundaries Networks Environment
Characteristics	Evolution Aggregate behavior Anticipation	Emergence Self-organization Multilevel Nested hierarchies	Emergence Self-organization Irreducibility
Mechanisms	Labeling Internal models Building blocks	Coevolution on the brink of chaos Recombination	Nonlinear feedback Coevolution

Source: Author's own elaboration

According to the contributions made by these authors, the essential components of a CAS are agents with schemes that interact with other agents and the environment, and which therefore generate self-organized networks. A CAS is characterized by open, dynamic and multilevel systems that distinguish it from other complex systems because it continually adapts. Additionally, a CAS can be distinguished from complicated systems by its capacity to self-organize, its aggregate behavior, non-linearity, the interaction of agents and diverse elements, and by responding to simple rules that allow for the anticipation of system behaviors. Furthermore, it can be distinguished by the processes of recombination and co-evolution on the brink of chaos; that is to say, small changes can generate great effects.

With regard to the above, the term CAS has distinct meanings for distinct researchers (Gell-Mann, 1994). However, the definition adopted in this investigation is that which states that a complex adaptive system is “*a collectivity of interacting adaptive agents*” (Gell-Mann, 1994, p. 17). Put differently, it describes a system in which agents or populations of agents try to adapt (Axelrod & Cohen, 2000).

² Cited by Laihonen (2006).

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Due to their composition and characteristics, complex adaptive systems provide a perspective that is holistic, integrative and non-reductionist, which permits us to address the changes in organizational behavior that occur in response to environmental pressures; it also facilitates an identification of the simple causes of complex results or, as Gell-Mann (1994) would say, the identification of how simplicity emerges from complex interactions.

Conceptual framework

From the literature review and the analytical perspective comes a contrasting comparison of the idea of the knowledge-resource and the idea of the complex knowledge system. The criteria for this comparison are presented in table 2, which is based on Richardson and Cilliers' (2001) principles of complex systems, as presented above.

Table 2. Comparison between the Knowledge-resource and the Complex System

PRINCIPLES	COMPLEX KNOWLEDGE SYSTEM (KCS)	KNOWLEDGE-RESOURCE (KR)
Agents or interacting elements	Subject(s)/Object/World (S/O/W)	Object/World (data/information)
Self-organization	Learning/Unlearning	Operationalization
Influence of history	Memory/mental schemes/patterns	Ahistorical, static, "photo" type
Irreducibility	Inseparability in the S/O/W relationship Not divisible into parts	Subject and object separable Divisible into parts
Adaptability	Learning/unlearning of interactions, entails adaptation	Unalterable by a search for objectivity
Instability	Vulnerability in the face of uncertainty and diversity	Stable, regular
Permeable boundaries	Open, cannot be isolated from environment (world)	Closed, can be isolated from environment

Source: Author's own elaboration

The relationship that characterizes the notion of the complex knowledge system expresses the way in which knowledge is constructed through the relationship between a subject and other cognizant subjects that have a particular vision of their world and thus bestow a significance or sense upon the cognizable object. The encounter between subject(s) and object(s) takes place in a shared and common world limited by the dimensions of space-time; the worldview of every subject is also characterized in a particular way. Therefore, referring to the subject/object/world (S/O/W) relationship

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indicates, in reality, a plurality of multiple interactions, such that the route of interaction among the agents cannot be distinguished.

The knowledge-resource excludes the subject and as thus refers more to information than to knowledge (in the sense of knowledge as a complex system, KCS), since its object is constructed via data that is contextualized (world) in order to obtain information that must have a practical application. This organizational process for information and operationalization distinguishes the self-organizing character of KCS, since here the subject gives sense to the data or information, enabling it to learn and unlearn according to the stimuli received from the context (world) or other subjects. This self-organizing nature permits adaptation and survival.

The concept of knowledge as a complex system is unstable precisely because it includes the subject and the context, the vulnerability and uncertainty of which are inevitable. Its subjective character explains the permeability of its boundaries, since only that which is objective can be isolated from the environment that surrounds it without any effect. Vulnerability, instability and adaptability are manifested through the influence of history; the life history of every subject, the history of the world (geographical, political, economic, social, cultural, and so on), and the history of interaction among subjects. Successively, history emerges in this way as a footprint that leaves its experience etched in the memory through mental schemes, behavioral patterns, values and sensations that construct the essence of worldviews.

The static and ahistorical character of the knowledge-resource does not imply that this does not exist, since the different codifications that we have as books, programs and manuals, among others, reveal but a fragment; an objective reduction of the knowledge unit that characterizes human nature. The knowledge-resource can be created, codified, stored, recuperated and distributed as a main factor of production in knowledge society. However, the difficulty in reviewing it lies in the illusion of control, efficiency and profitability that it promises as the result of its negation of the subjective and uncertain.

Coherent with knowledge as a complex system, for the present research the definition of knowledge offered by Boisot (2005; 2011) is adopted, which addresses the management of knowledge from a complex perspective. For Boisot (2005; 2011), knowledge is a system of action, a living system that reacts to the stimuli of its surroundings. The conceptual framework allows us to suggest two theoretical propositions according to which the research problem can be addressed:

Proposition 1: Knowledge is a system composed of stimuli and agents that, upon interacting, produce data and information that, upon passing through the mental maps and the values of the agents, trigger the emergence of adaptive responses that enable them to survive and prosper.

Proposition 2: Managerial knowledge in an organization is a complex system, the environment of which offers a large quantity of stimuli perceived by a great variety of agents related in a non-linear way. Permanent interaction among these agents implies

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interaction among a diversity of cognitive maps, life histories and behavioral patterns, that when faced with uncertainty and variety in their surroundings respond in an adaptive manner in order to self-organize and prosper.

To summarize, the central elements, components, characteristics and mechanisms of managerial knowledge as a complex system are shown in table 3.

Table 3. The Central Elements of Managerial Knowledge as a Complex System

Central elements	Managerial knowledge as a <i>complex system</i>
Components	Agents of distinct business units and divisions, at the corporate and business levels
Characteristics	Collective Tacit
Mechanisms	Feedback between levels Emergence of adaptive responses

Source: Author's own elaboration

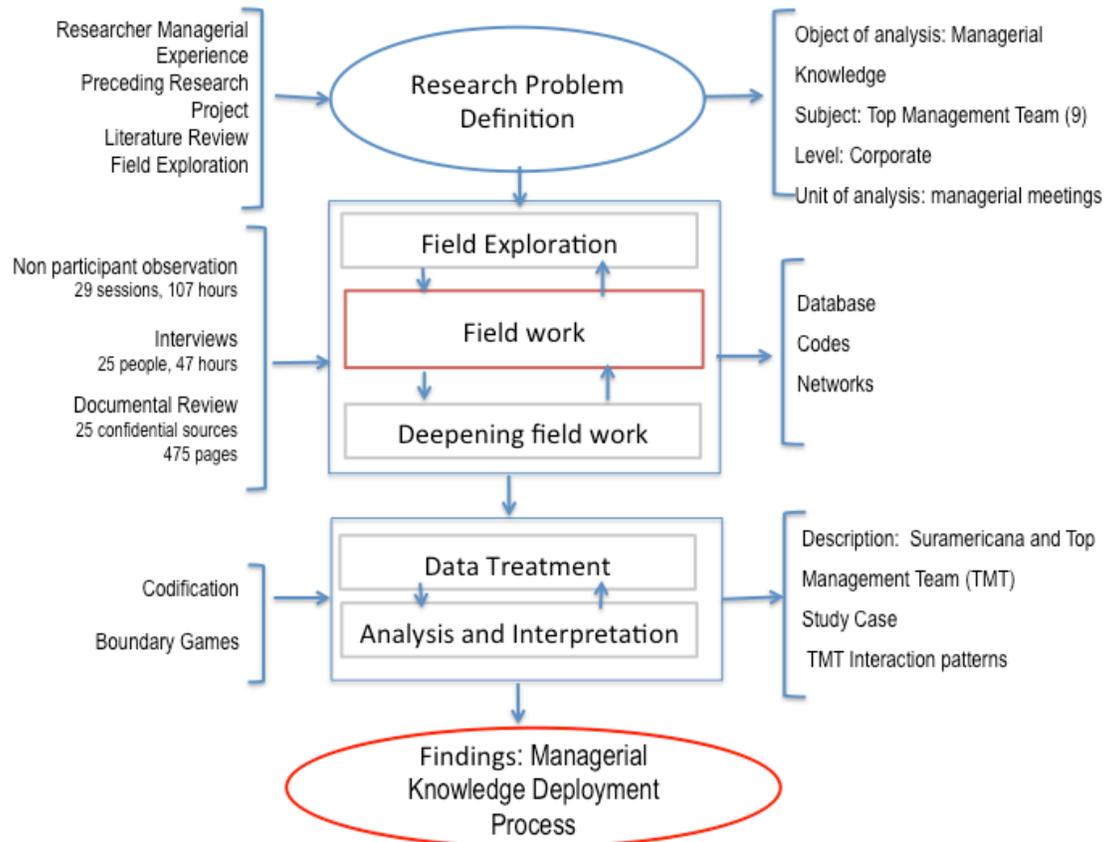
The role of the agent is thus relevant to this research. In this sense, in this investigation knowledge amplifies the vision of resources or capital that has been bestowed upon knowledge from economic perspectives so that it can be considered as a complex system that emerges from interactions among agents. Accordingly, the knowledge present in organizations is principally collective in character.

METHODOLOGY

To address the research question, the case study method (Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Yin, 2009) is used from the complex perspective (R. Anderson, Crabtree, Steele, & McDaniel, 2005). The techniques drawn on for data collection comprise: non-participant observation (Patton, 2002), interviews (Guber, 2001) and document review (Patton, 2002). In total, 29 observations of managerial meetings were made (107 hours) – steering committees, planning sessions, primary groups of vice-presidents – during a period of approximately two years.³ Additionally, 27 interviews were conducted (47 hours) with directors and ex-directors at the corporate and business-corporate levels, as well as with non-managerial personnel such as analysts and project leaders. The document review not only consisted of an attentive look at the information freely available on the websites of the various businesses that make up the firm, but also the revision of 25 confidential source documents (475 pages) (see figure 1).

³ The first exploratory observation was made for an expanded primary group in August 2011 (a steering committee plus other management levels from the various business units, approximately 60 people) and the last observation was made in July 2013.

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Source: Author

Figure 1. Research Process

The selection of Suramericana S.A.⁴ as the case study complies with three criteria: the nature of multi-businesses, which the firm has possessed since its inception; the management on the part of professional administrators (it is not a family group); and the disposition of the firm with regard to allowing the non-participant observation of its organizational rituals, as well as the interviewing of its management team, ex-presidents and other employees. Additionally, it was possible to gain access to all of the information solicited for the document review.

Data processing was realized using two complementary techniques (Rivas, 2014): codification (Strauss & Corbin, 2002) and Boundary Games (Velez-Castiblanco, 2011, 2012).⁵ Codification has allowed for characterizations of the multi-business firm (the case

⁴ Holding firm of insurance and social security for Grupo SURA (Grupo de Inversiones Suramericana S.A.). Comprises more than 10 business units, the principle businesses being general insurance, life insurance, professional risk management and a health promotion firm. It is recognized as the best insurance firm in Colombia and Latin America (Fasecolda, 2014).

⁵ Boundary Games are a proposal by Velez-Castiblanco, who is interested in “the importance of intentions for to practice of interventions” (2012a, p. 13). These games can be used to describe the way in which the participants of a meeting about an established boundary interact initially. A boundary is defined as the difference between what is and what is not relevant to a problematic situation.

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study) and synergy, one of the major concerns for the top management team at the corporate level. Boundary Games has allowed for an analysis of interactions among members of the top management team, understood as the subjects of analysis. Through these analyses it has been possible to identify the most relevant stimuli, as well as some adaptive responses from the agents (top management team).

FINDINGS AND DISCUSSION

The case study of Suramericana S.A. as a multi-business firm has allowed for the characterization the three essential elements of knowledge: cognizant subject, cognizable object and context. The characterization of the cognizant subject consists of an analysis of the observable characteristics and dominant logics of the top management team; synergy emerges as the most recurrent cognizable object in the team's interactions; and the context comprises the multi-business firm Suramericana, which has a history of more than 70 years.

This paper specifically presents a description of managerial knowledge at the corporate level.⁶ The analysis of agent interactions shows that managerial knowledge adheres to the definition of a complex adaptive system due to the multiple multilevel interactions involved. For the case study, in addition to the corporate and business levels (referred to by strategy theorists), there exists an interface level that is referred to in this research as the corporate/business level. This level is expressed in the role played by divisional vice-presidencies, as recognized in the analysis of sequences in discussions relating to synergy; in particular, in the most-debated moments. Furthermore, it is expressed in the analysis of the CRM Program (Customer Relationship Management Program) in which it is made evident that in decisions regarding the allocation of resources and the confirmation of working groups, the role of the vice-presidents is definitive.

The multilevel interactions observed in the case study can be described as vertical and as top-down and bottom-up in type. However, horizontal interactions are also present, such as those between the agents of the vice-presidencies, between the agents of the shared services center, between the different members of the steering committee and probably between the business units and functional areas.⁷ Furthermore, non-linear interactions are present in "interdisciplinary" work teams, where different business units, corporate divisions and, in general, different agents that play roles at differing levels of the organization are represented. Such is the case for the different types of project, such as the aforementioned CRM program, so that not only are internal non-linear interactions present, but also interactions with external agents such as consultants.

Within the conceptual framework referred to above, the central elements of managerial knowledge are presented as a complex system. In connection with this approach, the case

⁶ For further information see doctoral thesis, Rivas (2014), Conocimiento gerencial en empresas multinegocios. Caso Suramericana S.A. <http://hdl.handle.net/10784/4278>

⁷ The word "probably" is used because the business and functional levels fall outside the scope of this research. However, this type of interaction is evident in the observations and interviews.

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study also allows us to infer that managerial knowledge, in Suramericana, constitutes a complex adaptive system. This statement is based, first, on the confirmation of the two propositions initially formulated through a revision and analysis of the relevant literature and, second, on the in-depth analysis of the case study.

Here proposition 1 is confirmed by identifying the variety of corporate issues that act as stimuli for a variety of agents, which, in turn, and according to their role, develop different perceptions of recurring corporate matters. In this regard, one of the most striking examples of this can be found in the diversity of perceptions expressed about the concept of synergy and the various projects and initiatives that reveal the multiple adaptive responses of the agents that have enabled them to evolve, not just survive.

With regard to proposition 2, in the case study we observe that, first, multiple interactions among agents reveal the multilevel nature and multiplicity of non-linear relations that are distinctive of complex systems (Anderson, 1999). Second, multiple interrelations are not only established between the corporate center and the business units, but also among the emergent levels, such as corporate/business. Third, managerial knowledge in the firm is the result of behaviors and adaptations in the face of a large quantity of stimuli perceived within the environment by the agents. In particular, this proposition is also confirmed by the dominant logic identified for insurance and, at the same time, by the diversity of cultures present within the different business units. Suramericana's values and culture, collectively labeled "ADN Sura", describe a common pattern of behavior that has been configured historically and defended from generation to generation. But it is also possible to distinguish the specificities or distinct ways in which the business units, corporate divisions or areas respond differently to stimuli, for example, to synergy. This is made concrete by the way in which synergy is operationalized, according to its history and context, which has led to the coexistence of different types of synergy.

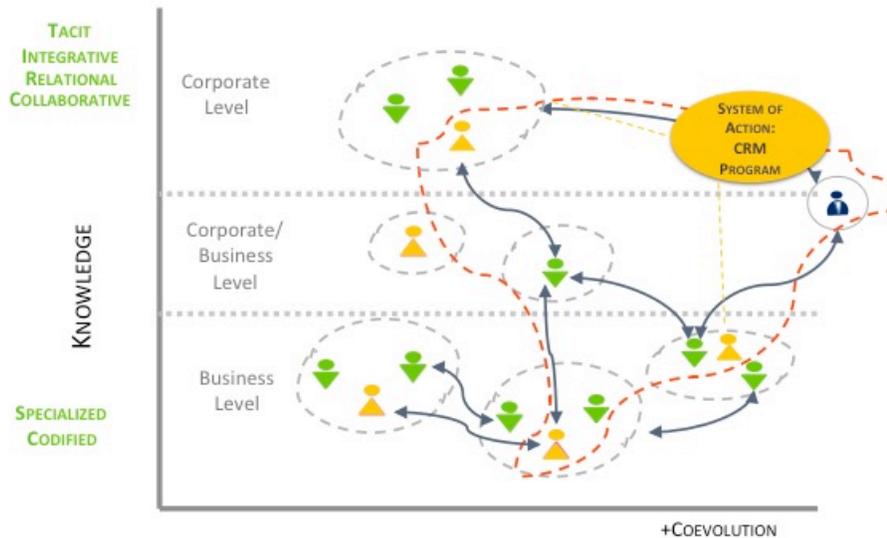
It must be noted then that the two propositions formulated from the relevant literature have not only guided the fieldwork and analysis of the results, but also contributed to establishing the foundations of the findings, which, in turn, allow for an elaboration of the answers to the questions formulated in the research.

Managerial knowledge in Suramericana S.A.

The fieldwork has allowed us to identify the components, characteristics and mechanisms of complex systems. However, in addition to those raised from within the conceptual framework – built from the review and analysis of the relevant literature – other elements are highlighted, namely the presence of agents at the corporate/business level, the integrative, collaborative and relational nature of managerial knowledge, the rupturing of stores of knowledge and the feedback between different levels. Feedback between the levels reveals the agents' interactions and their multi-directionality. Furthermore, managerial knowledge deployed in the internal management of a group of businesses is not only that which Tanriverdi and Venkatraman (2005) consider to be a source of synergy, but also that which is deployed in the constant search for synergies. Nor is it only that by which business units are governed, as these authors confirm, but also that

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which emerges from interactions among agents and among the levels of the organization: corporate, corporate/business and business. Furthermore, managerial knowledge is not only made up of insights, experiences and best practices, but also multilevel agents, adaptive responses and systems of action. Figure 1 shows the deployment of managerial knowledge in the case study.



Source: Author's own elaboration

Figure 2. Managerial Knowledge in the Case Study

Managerial knowledge at the corporate level

The fieldwork undertaken for this research allows us to state that the concept of knowledge in the multi-business firm studied herein is not only that of a resource but also that of a complex system. In turn, managerial knowledge – at the corporate level in the multi-business firm case study – can be conceptualized as a complex adaptive system. As described above, in the case of complex adaptive systems order is an emergent property of the interactions of individuals at a lower level of aggregation. In this sense, it follows that a complex adaptive system is distinguished from a complex system by being multilevel, a characteristic known as aggregate behavior that results from the interaction of agents.

In the case study, the agents in the organizational context are populations of agents that, in addition to being a source of learning possibilities and the recipients of new findings and improvements, are part of the environment itself. In other words, the agents constitute self-organized networks that connect through feedback loops. Therefore,

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organizational changes are explained by changes in the agents and the strategies that emerge from their interactions and feedback loops. These changes represent the ways in which agents adapt to the environment and how the evolution of CAS is facilitated. In addition, extensive interaction among the population of agents and the aggregate behavior that emerges from this leave a footprint, a story that is expressed through patterns, cognitive maps or rules that permit anticipation. All of these features justify the conceptualization presented in this paper.

In the case of managerial knowledge in the multi-business firm case study – conceptualized as a complex adaptive system – behavior can be explained as a deployment process that throughout time, upon occurring over and over again, allows for the coevolution of the population of agents, as cognizant subjects, and the multi-business firm as the context that they share.

Accordingly, the first proposition that emerges as a result of this research is:

P1. Managerial knowledge at the corporate level of a multi-business firm is a complex adaptive system in which the agents that make up the top management team interact with the various agents that form part of several business units and divisions at the corporate, corporate/business and business levels to face the variety of businesses and capture synergies (stimuli).

Upon addressing this diversity a second proposition emerges, which can be formulated in the following terms:

P2. The agents exhibit observable characteristics and particular dominant logics that allow them to generate a variety of adaptive responses that, upon being discussed in the different spaces of managerial interaction, reinforce each other in a way that triggers the emergence of a new order, a new system of action.

In turn, the dynamic of these systems of action leads to the formulation of a third proposition in the following terms:

P3. The constant updating of the complex adaptive system occurs by way of recurrence in the discussions of adaptive response proposals and feedback loops that arise among multilevel agents allowing, in time, for the coevolution of the multi-business firm, despite environmental uncertainty.

The managerial knowledge of the multi-business firm, conceptualized as a complex adaptive system, comprises particular components, characteristics and mechanisms that, at the corporate level, account for its specificity, as illustrated in table 4.

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Table 4. Characterization of Managerial Knowledge in the Multi-business firm

Central elements	Managerial knowledge as CAS	Managerial knowledge in Suramericana as CAS
Components	Agents of various business units and divisions at the corporate and business levels	Agents at the business, corporate/business and corporate levels
Characteristics	Collective Tacit Integrative Collaborative	Collective Tacit Integrative Collaborative Relational
Mechanisms	Feedback between two levels Integration of specialized knowledge Emergence of adaptive responses Construction of systems of action Learning/unlearning	Rupture of “stores of knowledge” (unlearning) Integration of specialized business knowledge Feedback among three levels Emergence of adaptive responses Construction of systems of action (creation of new managerial knowledge at the corporate level) Learning of concepts from distinct business units at the corporate level and learning in the corporate sense on the part of business units

Source: Author’s own elaboration

Given that the case study shows that the individual knowledge that the agents exhibit may be technical or specialized – and that, when pooled in the spaces of interaction, takes on the character of being collective and, possibly, integrative (among the contributions of the agents of various business units and levels) – a fourth proposition is formulated as follows:

*P4. The managerial knowledge that the top management team of the multi-business firm acquires through its management practices in the different business units or divisions is a personal tacit knowledge that, upon being debated in the spaces of interaction with other agents of different levels of the firm, **unfolds** as a knowledge that integrates other codified (specialized) forms of knowledge.*

Managerial knowledge as a complex adaptive system implies a knowledge where agents, as cognizant subjects, are the protagonists in the coevolution of the multi-business firm. This stands in contrast to the traditional view of corporate strategy, which considers that this role falls on the directors of the corporate center. Additionally, the coordination of

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activities among distinct business units and the basic promise of synergy that such organizations exhibit are constituted in relevant stimuli in this type of multi-business firm. This is how the deployment of adaptive responses, which may differ from those of a single business firm, is induced. Therefore, a fifth proposition is formulated as follows:

P5. From the interactions among levels, adaptive responses emerge that, through recurrence in discussions of adaptive response proposals and feedback loops, are reinforced to facilitate the emergence of systems of action (or strategies) that the agents exhibit in order to anticipate and coevolve.

In this research, and in contrast to the managerial knowledge proposed by Tanriverdi and Venkatraman (2005) – made up of managerial insights, experiences and firm best practices – managerial knowledge is conceptualized as a complex adaptive system. Therefore, from the complex perspective, the findings presented define managerial knowledge at the corporate level in the following terms:

Managerial knowledge in the multi-business firm case study constitutes a complex adaptive system made up of agents in multilevel interactions, stimuli, adaptive responses and systems of action. This knowledge is deployed when agents respond adaptively to the guidelines of synergy, allowing for the emergence of systems of action understood as strategies and/or structures that permit joint value creation and coevolution with the market.

The findings and case study analysis allow us to state that managerial knowledge in the dynamic of the complex adaptive system contributes to the evolution of the firm in an environment that is changeable, uncertain and full of challenges.

CONCLUSIONS

This research forms part of the academic field of strategy and, specifically, the field of corporate strategy and the theoretical trend of top management; hence the interest in studying the relationship between management and knowledge at the corporate level. The complex perspective adopted in this paper in order to study managerial knowledge at the corporate level constitutes a way in which to address interactions between agents, known as the top management team (TMT), in their administrative practices within the context of the multi-business firm. The data collection techniques used (non-participant observation, semi-structured interviews and document review) enrich the analysis by way of codification (used by grounded theory) and Boundary Games. The data processing and analysis of the collected data have enabled the development of a holistic case study in terms of Yin (2009) and a complex case study in terms of Anderson et al (2005). This case study has facilitated the elaboration of a conceptual model that characterizes managerial knowledge at the corporate level in a multi-business firm.

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