

# Business Coevolution: Considerations from the Mobile Telecommunication Sector in Latin America Economy

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## Abstract

The dynamic and interaction between companies and the environment leads to atypical emergences addressed by the strategic business direction mainstream. In this document the introduction of *CoEvolutionary Relationships* is presented to explain how some groups of companies that are facing business turbulence, not only survive, but grow rapidly in an internal dynamic space and transformational environment, becoming an attractive investment option. To explain this phenomenon, the field of mobile telecommunications in Colombia is studied, applying a mixed methodology that includes semi-structured interviews and the analysis of documentary content (ADC). The findings reflect a structural link between a turbulent environment and a group of companies that developed growth in their sector despite the turmoil.

**Keywords:** Analysis of documentary content (ADC), coevolution, mobile communication, strategic behavior, turbulent environment

## 1. Introduction

Additionally of the study and the understanding of internal company factors as a source of advantage, the field of strategic management has addressed the notion of environment and its impact on business performance. The first approach to the concept, focuses on environment reflection as a variable or set of independent variables, capable to affect positively or negatively (Andrews, 1971) the results and the strategic behavior of firms (Emery & Trist, 1965; Khandwalla, 1972, 1974; Ansoff, 1987), deterministically. Thus, the environment influences the opportunities and/or threats (Anderson & Payne, 1975; Jauch & Kraft, 1986) in a group of companies that the director diagnoses, plans and executes actions to adapt to new enterprises states and conditions (Rumelt, 1984; Ansoff, 1987), either anticipating future configurations reality (Godet, 1995) or to react to new emerging conditions (Mintzberg & Waters, 1982).

At the same time, framework advances of the general system theory (Von Bertalanffy, 1956) allow the recognition of an organic nature for the company (Burns & Stalker, 1961), meaning that the same way as it is in open systems and its environment, companies are contained by an environment built from the interaction of their own actions and decisions, the idea of *company-system* pretends to recognize the existence of cycles and relations between those two components, relocating the environment from an independent position, to a sensitive manipulation of surrounding structures, and companies themselves.

In this area, the strategic direction focuses an important part on development the understanding of business-environment relationships (Burns & Stalker, 1961; Ansoff, 1965; Aguilar, 1967; Thompson, 1967 Miles & Snow, 1978; Pfeffer & Salancik, 1978) where both components complement one another, forming a whole, this is why is not possible to understand the phenomena and behaviors of enterprises independently. In contrast, they must be linked to understand the environment where it operates. Given these conditions, the next challenge for the strategic direction was focused on going in-depth on understanding the own characteristics of the *company-system*, studding aspects such as, the dynamic of the interactions between different integrator components of the company and its environment. Furthermore, the study of flows and their consequent variation sensitivity in the initial conditions, which allowed to formulate typologies to describe the *company-system* environment, some of them defined it as uncertain, munificent, hostile, dynamic and/or abrupt.

This typologies diversification, rather than clarifying the understanding of the environment-company relationship, generated a greater divergence given the theoretical differences of each to approach, for which Dess and Beard (1984), Gueguen (1997), Crossan, Vera and Nanjad (2008), among others, proposed to group all these types under the category of *turbulent environment*. Although the notion of turbulence had already been introduced since the mid-twentieth century in the field of strategic management, its ability to integrate the different types mentioned has positioned itself as one of the most widely used terms to explain the properties of business environment, transformation phenomena, interaction, discontinuity and dynamic concepts.

In this area, the environment is subject to the influence that comes from the actions implemented by companies to face turbulence (Eisenhardt & Galunic, 2000; Christensen, Schmidt & Larsen, 2003; Caldart & Ricart, 2006; Stead & Stead, 2013; Murmann, 2013). Similarly, some authors identified that there are situations where companies managed to surpass turbulence generating relationships of mutual feedback with the environment (Flier, Van Den Bosch, & Volberda, 2003; Lampel & Shamsie, 2003; Lewin, Long, & Carroll, 1999). The relevance of this line of work is that the environment goes from being a change force, to also acquire a dependence condition on structures components. Thus, the understanding of the company behavior, is not given by the existence of significant relationship between two variables, instead it is given by the emerging processes resulting from the interaction of a set of variables, aligning the organization study with the general system theory (Katz & Kahn, 1993).

The literature review, evidences a predation relationship between turbulence environments and belonging companies, where environment of greater turbulence leads to a higher corporate mortality rates compared to environments with contrary conditions, characterizing turbulence as an undesirable condition for any company. However, in some cases companies competing in turbulent environments besides surviving abrupt conditions, and discontinuous changes in the environment, but also get outstanding performance than those companies operating in environments with little turbulence performance (Drucker, 1980; Cameron, 1984; Rivera, 2010; Roberts, 2015; Stieglitz, Knudsen & Becker, 2016; Pontikes & Barnett, 2016). This situation leads to a central question for this research. How some companies not only survive but show a superior performance attractive for investors despite the constant fluctuations in the environment (turbulent conditions)? In this regard, recent studies recognize that strategic changes as reactions to the changing environment, improve the survival chance for businesses when there are significant changes in environmental conditions (Zúñiga-Vicente & Vicente-Lorente, 2006). It could be seem then, that the business-environment relationship both components can develop some kind of adaptation that makes survival possible (superior performance in companies with development opportunities) in highly turbulent environments with rapidly changing business.

The main purpose of this article is to characterize this type of adaptive relationship proposing a new relationship category inspired by the biological metaphor, particularly in intraspecific relationships of species (Begon, Howarth & Townsend, 2014) that allow them way to evolve jointly. Typology to be known as *Coevolutionary relationship*. In this typology high levels of environment fluctuations are combined with high levels of strategic transformation behavior of firms, achieving a structural coupling that besides being an entry barrier allows companies to obtain a better performance in the market. To explain this relationship, it is needed to go in-depth on the concept of turbulence and its implications for environment-related company. Different types of relationships between companies and their environment are presented to emphasize the category called Coevolutionary relationship between turbulent environment and strategic behavior, which will be explained from the mobile telephony findings in Colombia to conclude with the presentation of punctual findings.

## 2. Theoretical Framework (Environment, Turbulence and Strategic Behavior)

One of the first approaches to the environment role in the company is developed by Pepper (1934) which highlights the effect this has on performance, in this approach the relationship between business environment would be based on the determinism precepts and causality, where changes in the company are given as responses to changes in the environment that manifest in the way of opportunities or threats (Anderson & Payne, 1975; Jauch & Kraft, 1986). Around the same time, the emergence of the open system concept of von Bertalanffy (1956) leaded several authors to study in more detail the organization-environment (Burns & Stalker, 1961 relationship; Ansoff, 1965; Aguilar, 1967; Thompson, 1967; Miles & Snow, 1978; Pfeffer & Salancik, 1978) which would build the notion of business as a system (Emery & Trist, 1965)

Within this environment concept, specific terms emerged to differentiate various types of environments, among them are: uncertain environment, munificent, hostile, dynamic and abrupt (Caldart & Ricart, 2006). This situation, rather than clarifying the understanding of the relationship between environment and business, created confusion since it is difficult to classify as environment types, but as characteristics of the turbulent environment.

In order to unify the different concepts approaches, Dess and Beard (1984), Gueguen (1997), Crossan, Vera, and Nanjad (2008) proposed to group these types under the name of *turbulent environment* that is understood as a feature present in all changing environments in terms of magnitude and *scale*.

### 2.1 The Concept of Environmental Turbulence

According with Emery and Trist (1965) turbulence is an environment property characterized by the presence of an instability or underlying rate of change and because resources and constraints are constantly changing, this forces companies to react. Meanwhile, Khandwalla (1976-1977) indicates that turbulence arises by rapid and unpredictable changes in different aspects of the environment. But it was Ansoff (1979), who popularized the notion of turbulence, stated that it is the *raison d'être* of management, and that he was the leader in managing the surprises and discontinuities of this condition. Although this theoretical reflection served as a platform to popularize the concept, it was more focused on the analysis of the responsibilities of the leader than the study of the phenomenon as such. Ansoff (1979) indicates that turbulence is characterized by the variability of the market environment, the rate of change, the intensity of competition, the abundance of technology, and the concern for reducing pressures from governments and groups of influence. Years later, Ansoff (1990, 1993) proposed different levels of turbulence, indicated that these levels are characterized by the complexity of environmental events, knowledge of the succession of events, the rapid evolution of these events, and visibility Of these future events

Accepting the ideas around the concept of turbulence, Gueguen (2001) states that this is a chain of more or less spaced events in time, more or less favorable, but its magnitude is unpredictable, and at the same time they could be sufficiently new to make an impact on businesses, generating a reconsideration of the company strategy. What distinguishes a highly turbulent environment from other environment, is that this is composed by a greater dynamism, uncertainty and complexity. The dynamism refers to the speed that the structural characteristics of an environment varies, it could be evidenced in one or many elements conforming any environment on a macro or micro scale. It is important to outstand that it is not necessary to have radical changes to evidence the presence of dynamism, simply that these changes affect the behavior of companies.

Moreover, uncertainty refers to the impossibility to determine accurately the result of inside interactions within a system, in order to indicate that this feature contributes to the configuration of turbulence, it must be presented a complete absence of certain knowledge and clarity about the environmental conditions surrounding businesses. This situation affects the decision-making process that could condition the survival of the enterprises. Finally, the complexity understood as the property that makes indeterminable the behavior's system contributes to the environmental turbulence when companies get immersed in a state where environmental factors have not only increased in number, but given the operation conditions, some interactions with them are now becoming more frequent, direct and relevant. The degree of sophistication of the activity is often subject to change, which has led companies to seek new allies, or make changes in present relations until now.

At this point, turbulence can be indicated when discontinuities in political, economic, social, technological, environmental and regulatory factors affect the behavior of a sector, leading companies to modify their strategic behavior to deal with this period of turmoil without affecting their performance. Actions taken by companies may have more than one result for example it can impact performance, and additionally it can reconfigure the behavior of the sector generating political, economic, technological, environmental and legal changes. Thus, we find that networks feedback are nonlinear (Stacey, 1996), concluding that managing turbulence implies the possibility to understand and intervene the organization and its environment from a co-evolutionary relationship in which transformation occurs in the system and the surrounding components.

### 2.2 Relationship between Environment and Strategic Behavior of Firms

From the literature review it is needed to take into account the environment as an explaining and predicting factor of the occurrence of the companies when they face turbulence. In addition, it is observed that in the relation between a turbulent environment and a strategic behavior, the environment is addressed as a driving force that influences in the modification of the competitive positions. However, strategy literature has also stopped to document how the environment changes as a result of business decisions to face turbulence. The main changes are presented in regulatory aspects, changes in demand and the increase on sectorial competition. At this point, it can be conclude that business environment and conditions have motor skills and dependence when turbulence occurs, as concluded on much of the available turbulence and strategy literature.

In this article it is recognized the existence of a variety of relationship types between systems (e.g. companies, associations, foundations) with their environment, which have significant implications for the strategic behavior. It is then proposed four types of relationships: 1) Unidirectional 2) Single bidirectional 3) Bidirectional circular 4)

Bidirectional co evolutionary.



Figure 1. Scheme - way relationship. Prepared

Unidirectional relationships (Figure 1) have been described specifically for closed systems (Bertalanffy & Almela, 1976) referring to interactions between systems and/or components of a system where there is no feedback. Within the business sector, there is evidence that unidirectional relations could only be conceived as imaginary, this is due to the natural learning feature that every company has (Senge, 1994). However, a form of closed system can be explicated from the business axioms, where variability in environmental conditions does not affect the structure of the idea.; in the supermarket business "*customer is always looking for products that meet their needs*" and this unalterable axiom, the effects of changes in the paradigms of thinking, new business practices, the emergence of new explanatory models, transformations in the political and economic models, among others, do not pose any measure a variation of this axiom.

In contrast, the possibility of two-ways or bidirectional relationships imply their existence only in open systems or feedback systems, which are particularly described by Bertalanffy and Almela (1976) as reality systems, among other reasons for their learning ability which in business terms are significant. Bi-directionality becomes as the explanatory principle of the relationship between the environment and businesses, where in the same way as the environment has the ability to influence the behavior and performance of enterprises, the company can also influence behavior and environmental performance.



Figure 2. Diagram of two - way relationship. Prepared

The first type of relationship in this category has been denominated as simple bidirectional (Figure 2), referring to this basic property of the (Von Bertalanffy & Almela, 1976) open system. Although this is a two-way communication between the system and its environment, there is no evidence of the existence of a relationship mechanism between the causes, effects, and system variables. It also excludes time as interaction parameter. This means that the simple bi-directionality is expressed exclusively by the interaction pattern that the system has with its environment. Following the example of supermarkets, a simple two-way relationship is explicit in the interaction structures simplified, like the competitiveness of the sector. The model "*Market pull/Technology push*" (Escorsa & Valls, 2003) discloses a two-way relationship where the level of competitiveness of a sector is determined by the degree of incidence of market producers and marketers given changes in the existing needs, generating the effect of staking, while at the same time the group of companies that compete in product improvements in order to influence the purchase decision process in the market.

As a third type of relationship it has been defined the bidirectional circular (Figure 3) from the inclusion of a third element which develops a feedback cycle, energizing both the system and its environment. This is the initial space where the biological metaphor makes sense in the comprehension of the co-evolutive system behavior. Unlike simple relationships, circular bidirectional relationships assume the existence of two additional phenomena: 1) The dynamics of the system (O'Connor & McDermott, 1998), given by the constant interaction and feedback between the system and more than one component and 2) The variability of the system (Andrade et al., 2001), given by the useful changes for the system and its components as a result of interaction and feedback.

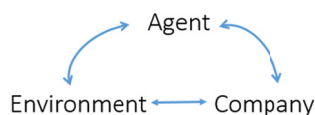


Figure 3. Schematic of bidirectional circular relationship. Prepared

Figure 3. Presents the minimum number of required elements (3) for the emergence of circularity, dynamics and characteristics of these relationships variability; however, in businesses and market systems the number of constituent elements can be significantly higher depending on their structure. In this scheme a third component called agent is integrated, an agent is an individual or structure that interacts with the environment (Gilbert, 2008) where their actions and interactions determines the system performance. In the context of the company, an agent can be treated as any individual or associated structure related to the enterprise- environment (e.g., customers, staff, shareholders, suppliers, current and potential competitors, governments, etc.)

In the example of supermarket chains, when they change its paying supplier's policy, it affects those companies in the way that it impacts their cash flow. As a result of this situation, suppliers make the decision to increase the selling price of their products as a form of pressure to companies. As a result supermarket chains also increase prices to consumers, who are forced to reduce their purchase frequency, which subsequently affects the design of the policy payment if the payment frequency decreases excessively. In this relationship we can see how the effects of supermarket chains affect suppliers at the same time that affect consumers, and thus the effects of consumers influence the supermarket chain, creating a circular relationship.

Additionally, this particular behavior determines aspects such as feedback loops of both positively and negatively enterprise systems; meaning that the overall dynamics of the system can be attenuated or amplified (Beer, 1985) according to the interaction of its components or variables. Senge (1994) presents a detailed set of examples of circular relationships explaining how they have an overall effect on system performance either by attenuating or amplifying its dynamics.

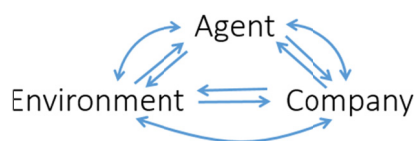


Figure 4. Co evolutionary relationship scheme. Prepared

The last type of relationship to explore is the co-evolutionary. While the literature does not refer directly, the inclusion of this classification is necessary in this article to explain the existence of relations between the system and its components, where adaptation as a differentiating phenomenon characterizes the system's ability to survive changing environmental conditions. As part of the backbone of this document, this relationship will be described in detail below. Table 1 contains a description of the relationship types previously presented in order to explain the linkage between the company and environment.

Table 1. Relations company and environment. Self-prepared

Type of relationship	Implication	Characteristic	Relationship Effect
Unidirectional	Linking components	Environmental feedback absence	Communication system
Bidirectional Simple	Open system or interaction between systems and its components	The environment influences the strategic behavior of the company, and the company influences the environment behavior	System communication in both directions unchanged in strategic behavior.
Bidirectional round	Dynamics of the system and its components	Relations between the environment and the strategic behavior have a linkage mechanism able to attenuate or amplify the dynamics of the system	Feedback loops systems
Bidirectional coevolutionary	Transformation of the system and its components	Relations with different effects than zero – sum, the dynamics between the system and its environment contributes to adaptation.	joint adaptation

From this classification of relations previously presented, this article explores a particular condition to which we have called bidirectional coevolutionary relationship which seeks to explain the permanence of companies despite the existence of environmental turbulence.

### 2.3 The Concept of Coevolution and the Emergence of Coevolutionary Bidirectional Relationships

Coevolution refers to a process of simultaneous change between two agents where their interactions culminate in adaptive results set together different than a zero-sum game. In a business system companies or businesses groups develop adjustments that allow them to adapt to new adaptive environmental conditions which also are transformed based on individual decisions and interactions of each company. The first authors which used the term were Ehrlich and Raven (1964) to refer to the interdependence between species evolution in an ecosystem. With regard to business management, Lewin and Volverda (1999) argue that the backgrounds of the concept is 1) In the Weber bureaucracy focus, the bureaucratic organization is a response of change forces presented in the industry; 2) in strategy studies by Chandler (1962) about the emergence of the *M-Form* and coevolution with the

development of other industries; and 3) in the work of Weick (1979) on the psychology of organizations, which argues that members of a company are seen as a social construction of their environment, where the environment is represented simultaneously as something endogenous and exogenous.

Thereafter, starting from the coevolution foundations as a studied phenomenon, biology researchers began to notice the concept in the light of the systems adaptability (Kauffman, 1995) to use more accurately in the field of social systems. For example, Baum and Singh (1994) state that coevolution refers to a process involving successive changes between organizations and environment.

For its part, literature some work on strategic management has also applied the idea of coevolution, outstanding those using the "effect of the Red Queen" (Van Valen, 1973, Barnett, Greeve, & Park, 1994) to explain the sustainability of enterprises from constant evolutionary adaptation to emerging environmental conditions. Wright's work (1932) in the field of adaptive landscapes from biology illustrates this replicable behavior in the context of the company.

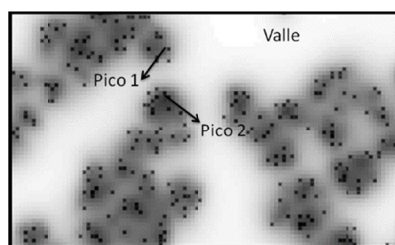


Figure 5. Representation Landscapes Adaptive made from Wright (1932)

An adaptive landscape is made up of two components 1) the height given by the ability of the genotype, referring to the ability of a property to reproduce and survive, and 2) the distance, understood as the population phenotypes average or all the possibilities of existing diversity. According to Wright (1932), living systems are constantly moving in the quest to achieve positions known as "local optima" (Peak 1) indicating that the system has been adapted to environmental conditions and survived. However, if the system seeks to evolve, i.e. move from peak 1 to peak 2, it must first move to a valley full of less adaptive intermediate states where natural selection would force it to climb the second peak in order to survive (Figure 5).

The constant movement of new states into living systems also explains a non-ergodic behavior (Kauffman & John, 2003) and thus dynamic, its ability to co-evolve in the environment they operate in parallel. Focusing on matters related to turbulence, some authors conclude that the relationship between companies and environment there are co evolutionary cycles of change before the existence of environment turbulence (Flier, Van Den Bosch, & Volberda, 2003; Lampel & Shamsie 2003; Caldart & Ricard, 2006), where the continuous transformation of system and environment, is essential for the survival of both. These cycles then assume the existence of co evolutionary bidirectional relationships between companies and their environment, enabling the evolution of the system as a whole.

This type of co evolutionary relationship between companies and their environment is also described by Maturana and Varela (1984), they explain the *structural links of second order* presented in the so-called autopoietic systems or self-generative, where *systems are coupled in their ontogeny when their interactions take on a recurrent or very stable character, resulting in a concordant historical structural assembly changes and when not disintegrate* (Maturana, 1984: 50). In this case as in businesses, the identity or set of characteristics of systems is specified by a set of processes inherent in the network structure where they interact, which explains the distinctive characteristics of a group of companies not only by the structure and individual actions of each, but also by the characteristics of the environment in addition to its internal interactions.

In order to characterize systems or sectors where there is evidence of an evolutionary behavior, below there are presented a set of factors that indicates the presence of a co evolutionary bidirectional relationship:

- 1) *multilevel* (co evolutionary implies that the effect occurs at multiple levels, within the company and between groups of homologous or complementary companies)
- 2) *multidirectional causalities* (meaning that parts of an organization co - evolve mutually with a change in the environment),
- 3) *nonlinearity* (the change can generate completely spontaneous transformations)
- 4) *Positive feedback* (influence their environment on different levels, among others, to institutions that

influence others, institutions influencing other institutions, as a consequence this repetitive interaction results in interdependencies and causality convoluted)

5) *Path dependence and history* (adaptations between companies are influenced by the knowledge and experience accumulated in the past).

Finally, a necessary condition for the emergence of co-evolution is the existence of mutually induced responses between two or more agents and / or their environment over time (Axelrod & Cohen, 2000; Eisenhardt & Galunic, 2000; Murmann, 2002). This means that the environment and businesses present successive changes where the company's feedback process affects and influences while displacing the environment to new states, and the environment feedback process affects and influences the same time the displacement of companies into new states. If reciprocity is canceled the co evolutionary process is completed and the company and the environment can evolve independently.

The presence of reciprocity also implies a mutual adaptation, i.e. the sustainability of enterprises and the environment are a joint task; thus the environment is embodied also by the existence and the dynamic of companies and vice versa. At this point, it is necessary to state the set of existing features in a co evolutionary relationship when referring to a turbulent environment. Those are:

- The general environment presents changes in political, economic, social, technological, environmental and regulatory factors in response to a stimulus or prior action of any of the agents involved.
- The link between the company and the turbulent environment leads companies to have more interactions with new sectors to carry out its business model.
- Systematical businesses, influence their environment, affecting other companies and sectors, so this repetitive interaction generates interdependence and circular causality.
- *The co evolutionary effect* occurs at multiple levels within the company and between organizations, showing multilevel.
- Both the company and its different areas co-evolve in the presence of change in the general and specific environment.

The process of mutual adaptation between business and environment is influenced by the knowledge and experience that have been building up over time.

It can be seen that, it is not enough to explore bidirectional or circular relationships; it is also necessary to explore the possible existence of a co evolutionary relationship between turbulence and strategic behavior of companies. This situation is critical because based on the literature review previously performed is seen that in the process of interaction between companies and turbulent environments both sides can adapt and/or affect each other, generating imbalances that require businesses to make reconfigurations of their strategic behavior to ensure its survival, a situation that can have an impact on the environment.

#### *2.4 Mobile Telephony in Colombia: An example of Coevolution?*

Theoretically speaking it is concluded that there is a co evolutionary relationship between turbulent environment and strategic business behavior, it becomes necessary to advance in the reflection that allows to illustrate this additional component, which does not include the explanatory apparatus of the system theory. In view of the above, it presents an analysis of the sector of mobile telephony in Colombia in 2000-2010, which seeks to illustrate this co evolutionary process between a turbulent environment and the strategic behavior of all the companies in the sector.

### **3. Methodology**

Taking into account the variables that govern the relationship of business environment are multidimensional, a flexible and holistic methodology to address all aspects involved was used. It is used an exploratory study mixed, which took as its primary source of information a set of semi - structured interviews with members of the management staff of the mobile phone companies in the country, and as secondary documentation published (e.g. information and opinion columns, reports regulatory agencies, indices and sectoral indicators, etc.) available in different media, in order to perform a triangulation process information (Yin, 1981).

According to Yin (1981), this alternative is relevant when a) Is reduced the existing research around a topic, b) It has the desire to understand a contemporary phenomenon within its context of real life, c) The boundaries between the phenomenon and context are not clearly evident, d) Multiple sources of evidence, quantitative and/or qualitative research simultaneously, are used and e) Explore situations in which the intervention evaluated



does not have a clear and unique result.

Since there is little research that explores the co evolutionary relationship between turbulence and strategic behavior this document opens a space for reflection to the elements present in the companies that takes to operate under these specific circumstances. Additionally, it is turned to semi-structured interviews and Analysis Documentary of Contents (ADC), as a method to observe and recognize the significance of the present elements (words, phrases) in messages, texts or speeches, and classify them for analysis. This method allows to convert the crude data events that can be treated scientifically and build with them a body of knowledge. It is therefore a method of knowledge that facilitates the study of the documents either in groups or individually (by Lafuente-Lopez, 2001).

### *3.1 Selected Industry*

This research focuses its reflection from the information collected in the sector of mobile telephony in Colombia since the beginnings of operations in 1994, and particularly in the period 2000-2010. The choice has been based on the presence of the essential turbulence characteristics:

- In the studied sector a number of destabilizing factors that tested the ability of businesses to operate were presented.
- As the sector is mediated by variations in available technologies, regulatory frameworks and investment intensity, the characteristics of uncertainty, dynamism and complexity, turbulent and constant changing environment is more obvious.
- As a result of the permanent changes in environmental factors themselves.
- It is a sector where the strategic behavior of companies has transformed the environment, an example of that is the change in communication patterns of people, creating "dependency" to mobile phone use.
- The actions implemented by companies have led the government to enact new regulations to ensure the normal development of the industry.
- It is a sector in which companies with their strategic decisions, can create new operating conditions by generating intentionally or unintentionally discontinuities in factors specific and/or general to the environment. This situation contributes to the generation of dynamism, uncertainty and complexity, setting up a situation of turbulence environment.

### *3.2 Collection of Information*

Previously we a revision of the literature of scientific articles was made that did not allow to determine the dimensions of the business turbulence and the elements of coevolution. For the information gathering process, scientific articles are not used because the required sector information is not available. Therefore, reports are made of official Colombian government entities to obtain financial and market information. Likewise, interviews with experts of the sector are used.

In order to identify the presence of business turbulence and subsequent the co evolutionary relationship with companies, there were initially reviewed a series of official documents issued by control entities monitoring mobile phone sector such as the Regulatory Commission of Telecommunications (CRT), the Superintendent of Public Services, the Superintendence of Industry and Commerce, the Ministry of information Technology and telecommunications. The review of these documents focused on characterizing the general environment (political, economic, social, technological, environmental factors and legal) and identify important discontinuities development since its beginnings and particularly in 2000-2010.

Complementarily were consulted and analyzed documents published by each of the mobile operators studied (e.g. financial statements, prospectuses of shares, management reports, and sectoral presentations). With this information were identified changes in business strategies as a result of financial information, market, and technological obtained. This confirmed the presence of business turbulence.

At this point it is proceeded to contract information obtained from official sources and companies, and a review is done from several fronts 1) Press articles published between year 1994 to 2010 in major newspapers of Colombia (e.g. El Tiempo, El Espectador, La Republica). 2) Business Magazines (Dinero, Semana, Cambio), 3) Research in mobile telephony (American Association of research Centers Telecommunication Enterprises (AHCET), International Telecommunication Union (ITU) , Pyramid Research (PYR) , Center for economic Research and teaching (CIDE) , 3G Americas ). 4) Entities union and the Colombian Chamber of Information Technology and Telecommunications (CCIT) 5) reports international events like ANDICOM 2003-2010



This review allowed in more detail contextualizes the environment and industry, corroborating the presence of turbulence and identifying the processes of change in each of the operators in 2000-2010.

Finally, to triangulate the information gathered, with experts interviews, two ministers of Telecommunications, 1 director of the Commission on telecommunications regulation, one director of the National Connectivity Agenda, 2 trade managers associations, 8 researchers from research centers, and 9 directors of the companies studied.

### 3.3 Characterization of the Mobile Phone Industry in Colombia

The review of the information, identified that the mobile telephony sector in Colombia since its beginnings in 1994, and during more than twenty years of operation, the industry has presented permanent changes in environmental factors that have tested the ability of firms to operate in it, which is reflected among other reasons in, sales processes, transformation and fusion (e.g. transition Celumovil - Bellsouth - Movistar, and Colombia Móvil (Ola) - Millicom (Tigo) ). In particular, the first decade of the XXI century was characterized by the presence of turbulence as a result of dynamism, uncertainty and complexity in the environment. The ADC allowed in addition to identify the most important milestones of the sector during this period, which are:

- The arrival of multinationals to the sector that invested in technological upgrading allowing them to offer new plans to users. (E.g. income Millicom (Tigo))
- The popularization of mobile telephony and the migration of consumers from fixed line to mobile, using a greater proportion service known as prepaid, leaded companies to offer products for different needs. (This is due mainly to the income in 2003 of Colombia Móvil (Ola) and to the response of competitors to face the new competition. a subsequent to the entry of this company year 74% of users used the prepaid mode)
- The union of events such as the increase in the number of users in the form of prepaid price war, and the growing use of services, sale of minutes have generated a decrease in ARPU (*Average Revenue per User*) what has forced operators to seek other sources of income, to adopt plans to reduce costs, find new users with more aggressive plans and increase revenue through services such as downloading ringtones, images and even text messages. (in 2001, the average price per minute was \$ 552, and in 2010 was reduced to \$ 41 regarding ARPU for Comcel in 2000era of \$ 666 and in 2010 of \$ 214; for Movistar in 2014 reached \$ 409 and 2010 to \$ 196)
- The increase in the dropout rate (*churn*) by users, was caused by the low *switching cost*. According to Santamaria (2009) in Colombia at the beginning of the century from 2000 to 2010 the main switching cost is the old user benefit, a situation that took advantage operators to retain customers, with permanence clauses. Since 2005, with the decrease in interconnection rates of operators, users could easily change suppliers.

Contrasting the highlighted events previously mentioned the characteristics of turbulence (Ansoff, 1979; Gueguen, 2001), allow to conclude that the sector studied in 2000-2010 was turbulent. The main reason to affirm it is the chain of unpredictable events and discontinuous in time is presented, favorable at some time and unfavorable in others, leading companies to make permanent changes in their strategic behavior. From interviews results and the consulted documentation is possible to determine that the major changes in the strategic behavior of Comcel were product development, the development of strategic alliances. As for Movistar, the most decisive changes were strategic market development and product development. Finally, Colombia Móvil has developed a fusion strategy, product development and market.

## 4. Discussion

### 4.1 Co evolutionary Relationship between Variables

In conducting the characterization of the sector studied features of a co evolutionary relationship are present, since the information obtained from different sources does not present a trend towards balance between performance and behavior of the environment and performance and strategic behavior of firms within the sector; on the contrary, fluctuations in the analyzed data in different periods of time were so high and discontinuous that led to question the existence and survival of the sector itself from the system paradigm.

When a co evolutionary bidirectional relationship occurs, it can be generally identified the starting point of this relationship, but it cannot be indicated a point of completion. In the analyzed period, the co-evolutionary process had its starting point when the Colombian government authorized by decree 575 of 2002 income of PCS operators to the telecommunications sector, leading to the entry in November 2003 of a Colombian Mobile enterprise with its OLA brand. The offer of the company is based on prices 10 times cheaper than competitors, and the launch of the latest technology. In just two months the company achieved more than 400 thousand users.

This situation changed the behavior of the industry, generating an effect on suppliers, customers, competitors, substitutes, investors, etc., leading to the existing operators to make adjustments to their strategic behavior in

order to face turbulence. The operators implemented several strategies such as, product development, market development, diversification, mergers, and alliances implementation. The average price per minute of \$ 183 in 2013 to \$ 105 in 2014.

As a result of these changes, companies and environment presented a process of mutual adaptation generating a link of the entire system. Thus, companies were able to face the turmoil, this contributed to the growth in users and revenue. The sector grew from 6.1 million users in December 2003 to 10.4 in December 2004, which led to an increase in telecommunications GDP from 3.4% to 12%. Revenues generated by the sector increased from 1,585 million to 2,319.

Between 2000 and 2005, and the government adjusted its regulatory conditions according to the new conditions in the sector, and the country's economy took a new configuration in which the mobile phone took a momentous role. The users changed their communication habits, indirectly leading companies to offer new applications that facilitate connectivity. Regulators assumed a more active role in the industry, not only exercising the role as regulators but to protect both users and competitors.

From 2010, the process of mutual adjustment continues, and there is still presenting strategic changes in companies from the sector, which in turn generates direct or indirect impacts in others. There have been environmental factors that have test the ability of companies, it is the case of the consolidation of an application like Whatsapp; changes in regulation that allowed Avantel be the fourth mobile operator Virgin Mobile and Mobile success Uff, enter as MVNOs. Likewise, it implements 4G technology, the merger of operations UNE and Tigo, the elimination in 2012 of permanence clauses compulsory for users.

These changes had various impacts on the sector. On one hand it generated a reorientation of the equipment market smartphones. The high-end equipment resented, and medium and low range grew, this measure has generated an increase in the theft of cellular equipment. To deal with this, among other measures, the national government in late 2015 established measures to import and export mobile phones, and established the mandatory requirement by users to register the IMEI mobile code.

Prices plans have dropped and companies started charging per second consumed. These measures led to growth in the number of users by the end of 2015, they reached 57 million. Some 13 million more than at the end of 2010. They have been changes in the regulatory environment, especially in the promulgation of regulations to control charging per second consumed, terms of permanence, extension of the spectrum. As usage habits, users use. A more detailed description is presented in the Table 2 of some effects of the turbulent environment and strategic behavior found relationship in the area studied.

Table 2. Coevolution Business environment and strategic behavior

Coevolution	Original situation	Consequences
Policy issues	The Colombian government stipulated the entry of a PCS operator. Aware of the competition to come, existing operators prepared new offers aimed at meeting the needs of users and to consolidate its presence in the market. Each made an investment of 250 million dollars in updating the networks	<p>The new company offered lower prices, a different technology platform, and a wider range of phones. This increment rivalry, and accelerated the number of users expanding the service in low-income strata, which increased prepaid plans. Additionally, with the arrival of a new operator, suppliers' revenue increased and fixed telephony lost more ground.</p> <p>New regulations on tariff matters were generated, interconnection charges between incumbents and operator PCS, measures to protect the user in terms of customer service and change in operating conditions of radio companies (<i>trunking</i>).</p> <p>Users were maximizing the use of text messaging and the use of social networks as a communication alternative, leading to the decline in voice traffic.</p>
Economics issues	In the period under review, the conditions of the economy had a direct impact on the sector studied. Demand for mobile phone service was affected positively or negatively depending on the conditions of the economy and performance indicators such as devaluation, level of employment, GDP	<p>These fluctuations in demand led operators to aim to achieve a greater market share, and it made adjustments in the management and development method. They went to expansion strategies, external and cooperative development.</p> <p>Looking to protect users and ensure fair competition, regulators took action on tariff matters, creating taxes,</p>

	growth.	reallocation of bands of the electromagnetic spectrum, customer service, position control domain, etc. This situation again hit demand and behavior of the sector.
<i>Social Aspects</i>	To the extent that people adjusted their communication needs as a result of internet development and consolidation of social networks, the industry adjust or its portfolio of products and marketing strategies were different.	The operators offered new plans focused on applications that facilitate social network communication, text messaging and data transfer.  This increment or demand, which grew GDP sector. On the other hand, monitoring bodies took new measures to monitor new products and protect users, creating new effects on the behavior of operators.
<i>Technology</i>	The development of new technology platforms for the industry, which consolidates the use of digital technology. The operators made investments in order to increase their capacity in networks and technologies third and fourth generation, seeking to offer plans that include value - added services that operate over the Internet.	New offerings plan increase the number of users, who quickly replaced fixed telephony by mobile changing their consumption patterns using less voice traffic to text messaging and social networks.  As a result of these changes, the economy benefited from sectoral GDP growth, which took the regulator agents to take steps to protect user's entities. It can be seen what began as a technological breakthrough, had an influence on products development and a change in social economic and regulatory conditions.
<i>Environmental aspects</i>	In the studied period a process of structural coupling environmental activities in the turbulent relationship between environment and strategic behavior of firms, punctually introduced changes have generated changes in ecosystem protection as a result of progress in the sector. According to the former	The Colombian government was forced to enact measures that will control the location of cellular infrastructure to control the visual pollution. Because of the growth of cellular coverage in the country, environmental regulation would have taken many years and perhaps would not have occurred.
<i>legal aspects</i>	With regard to regulatory aspects that generate coevolution in the sector, it may be noted that during the studied period permanent changes were presented in regulation, which made the companies adjust their strategic behavior. Some of these provisions were enacted to ensure the sector's growth, control operators, protection of users, implementation of new technologies, setting new taxes, tariff control.	In other cases, as a result of the dynamism and of the emergence of new operators or the launch of new business models, the rules generated in the market led regulators to modify the existing regulations, seeking to protect the sector in general.  The regulation promulgated by the regulator intended to adjust the conditions of the industry, but is also result in technological change (emergence of new devices, new platforms) that impacted usage patterns by users. Thus, the regulation evolved to respond to users.

## 5. Conclusions

In reviewing the features mentioned previously for the presence of a coevolution situation in a turbulent environment, it is confirmed that the sector studied presented in the study period this condition.

Companies systematically affected their environment, influencing other companies and sectors, so this repetitive coevolutionary interaction creates interdependencies and causality. In this case the country's economy was consolidated by the business of mobile telephony, new businesses were developed, revenue from excise duties contribute to income generation for the country, and cultural transformation occurred to be replaced fixed telephony to mobile. Raided new international operators with new investments.

The link between the company and the turbulent environment leads companies to have more interactions with new sectors to carry out its business model. In this case, the mobile operators facing turbulence joined with other sectors to generate new products and services. Marketing of products is carried out in supermarkets, there are alliances with financial sector companies generating content etc.

The coevolutionary effect occurs at multiple levels within the company and between organizations, presenting to multiple levels. This situation was evident because companies made adjustments in different units, both in the areas of marketing, such as community relations, financial, etc., seeking to generate strategies that would address turbulence. Many of these adjustments were due to government requirements in technological and regulatory

matters as user protection provisions, implementation of new technologies. Thus the different areas of the company co-evolve mutually in the presence of change in the general and specific environment

The process of mutual adaptation between business and environment is influenced by the knowledge and experience that have been building up over time. Each of the operators took based on events occurring that could generate previously threats to the sector decision.

Based on the evidence discussed, emerges a seminal question: are the co evolutionary relationships a singularity of the telecommunications sector in Colombia? Or on the contrary these relationships are common and natural for most of the sectors today. While reaching a possible answer would mean repeating this study making use of heterogeneous samples in different sectors, observation evidenced the existence of similar behavior in other sectors, marked in those where a higher rate of innovation is a constant demand manner.

In this sense, it seems that the co - evolutionary behavior of these sectors is typified as a variety problem (Ashby, 1956). By studying the flow of information in computer systems. In a system-environment relationship, each system must be able to accommodate at least the total of possible states of the environment, otherwise the system will disappear. In conclusion, only variety can absorb variety (Ashby, 1956).

Then, the particular characteristic of sectors such as telecommunications in Colombia is that high levels of turbulence condition the survival of the system as a whole. Demonstrating the existence of coevolutionary relationships in real economic sectors means to observe, as stated Kauffman and John (2003) that the key for development of economies is not managing limited resources but rather the diversity management system. This research then opens a space for discussion to this notion of sector and company where the basis of superior performance is diversity.

It is evident in the study that the most significant contribution is the characterization of the coevolutionary relationship between the company and its environment, which involves emergent properties such as adaptation and the mutual survival, in addition to the structural coupling and the symbiosis present particularly in living systems. This finding helps to expand the knowledge base available to the study of the company as a dynamic system of constant adaptation, as well as opening the possibility to further studies, which could take as its starting point the transformative nature of the company.

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