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Organizational adaptability: A reflection based on ex-ante, in action and ex-post conditions*

Adaptabilidad organizacional: Una reflexión basada en las condiciones ex ante, en acción y ex post

Adaptabilidade organizacional: uma reflexão baseada em condições ex-ante, em ação e ex-post

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Abstract:

This article aims to analyze the adaptability construct in its nature and development. First, it provides an analytic study about the adaptability literature integrating to a classification based on different areas of business. Likewise, these contributions are classified in two categories: general and specific and five subcategories: strategic, structural, human talent, production and marketing approaches. Next, a dynamic model is used for representing the flexible and rigid organizational behavior for confronting a changing environment. Then, a second model developing this construct is offered with three important moments: ex-ante, in-action and ex-post as conditions of adaptive organizational behavior. In the end, a reflection about consequences of these structures is added.

JEL Codes: J53, M12.

Keywords: Environment, adaptation, flexibility, change, organization.

Resumen:

Este artículo tiene como objetivo analizar el constructo adaptabilidad en su naturaleza y desarrollo. Primero, proporciona un estudio analítico sobre la literatura que se integra a una clasificación basada en diferentes áreas de negocios. Asimismo, estos aportes se clasifican en dos categorías: generales y específicos y cinco subcategorías: estratégico, estructural, talento humano, producción y mercadeo. A continuación se utiliza un modelo dinámico para representar el comportamiento organizacional flexible y rígido para enfrentar un entorno cambiante. Posteriormente, las diversas teorías se combinan en un modelo que representa esta construcción en tres momentos importantes: ex ante, en acción y ex post como condiciones del comportamiento organizacional adaptativo. Finalmente se agrega una reflexión acerca de estas estructuras.

Códigos JEL: J53, M12.

Palabras clave: Ambiente, adaptación, flexibilidad, cambio y organizaciones.

Resumo:

Este artigo tem como objetivo analisar o construto da adaptabilidade em sua natureza e desenvolvimento. Em primeiro lugar, fornece um estudo analítico da literatura que se integra a uma classificação baseada em diferentes áreas de negócio. Da mesma forma, essas contribuições são classificadas em duas categorias: gerais e específicas e cinco subcategorias: estratégica, estrutural, talento humano, produção e marketing. Em seguida, um modelo dinâmico é usado para representar o comportamento organizacional flexível e rígido para lidar com um ambiente em mudança. Posteriormente, as várias teorias são combinadas em um modelo que representa essa construção em três momentos importantes: ex-ante, em ação e ex-post como condições do comportamento organizacional adaptativo. Por fim, acrescenta-se uma reflexão sobre essas estruturas.

Códigos JEL: J53, M12.

Palavras-chave: Ambiente, adaptação, flexibilidade, mudança e organizações.

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Introduction

In the management literature the changing situation of the current context of business has been recognized by scholars like D'Aveni (2010), Drucker, (1980) and Kotler & Caslione (2009). Particular phenomena requiring attention in the present world are:

- Problems with globalization
- Emergent countries challenges
- A multipolar world
- Disruptive technologies
- Educated clients
- Environmental trends
- Preference of consumers oriented to organic products
- Risk and uncertainty in an interconnected world
- Terrorism
- Migrations

These conditions have provoked an interest in how a firm fits to its environment, and the first answer is: by means of a strategy. Thus, following the pioneers of strategic management (Andrews, 1980; Ansoff, 1988; Steiner, 1979) a strategy was understood as a means for responding to the changes of external circumstances. Then, based on the contingent theory (Burns & Stalker, 1961; Lawrence & Lorsch, 1973) the focus was put on the organizational structure and this was seen as one way for obtaining organicity for confronting a turbulent situation. At last, dynamic capabilities were another way to response to the volatile environment; and by this road, the conclusion was: The more dynamic is the environment, the more dynamic capabilities result. In this sense, dynamic capabilities outstood as a vehicle for understanding the adaptability problems, especially concrete capabilities such as strategic alliances, innovation, organizational learning and coordination (Eisenhardt & Martin, 2000; Teece, 2009).

However, a comprehension of the organizational fitness needs a profound study of the environment-firm relationship and it involves an analysis of the construct *organizational adaptability*. In this article a study of the literature of organizational adaptability is accomplished, and based on it, a theoretical proposal is elaborated for understanding the organization-environment interaction that is concentered in two models: one examining environment-organization interaction by means of learning and inertia and another following the adaptability dynamic.

Management evolution toward adaptation

History of Management may be analyzed from a different view of the standard approach of schools and approaches (classic, humanist, of contingency, strategic management and competitiveness). An interesting looking at is related to *the role of the environment*. In this way it is possible to establish three phases in the evolution of this discipline: closed organization, confronting a gradual environment and rapid adaptation. The first stage involves a period dominated by an interest in elevating productivity in uprising markets based on studying work methods, management processes and human tools; gradual moment (the second period) is referred to strategic planning, where the key problem was to formulate an effective strategy for taking advantage of opportunities provided for the outside reality; and finally the third phase recognizes the problems of competitive advantage in a changing world with models such as value chain and the resources and capabilities view; nowadays this moment has implied a concentration of the researching in disruptive topics as critical events, shocks and catastrophes (Patten, Whitworth, Fjermestad & Mahindra, 2005; Chakrabarti,

2015; Koronis & Ponis, 2018; König, Graf-Vlachy & Schöberl, 2021). Precisely, the adaptation topic corresponds to the last period and its core problem is how to confront turbulent environments.

Evolutionism and adaptability

Similarly to the evolutionist approach in biology, in Economics an evolutionary theory of the firm has been proposed (Nelson & Winter, 1982, 2002), the idea states that a firm change with external change and two ways may be presented (Nooteboom, 2009): an experiential or reactive, where firm is matched by means of a trial and error mechanism or thumb rule, and another consisting in establishing a deliberated and intentional process. And other wisdom divides the evolution into two classes: gradual and radical. Spontaneous and gradual view is represented by traditional approach of evolutionism, while the mainstream in adaptability recognizes the importance of direction for applying significant shifts for confronting a turbulent time. This later is the Teece insight (2009, 2018) and the first one is the Nelson and Winter position (1982, 2002).

In spite of the effort spent for studying this topic, the traditional evolutionist theory is problematic because it appreciates change as a gradual process at the long range and, after an extended period of time, a radical change is presented according a disruptive environment. This transformation is a necessary condition for surviving and developing. An example of this position is Nelson & Winter (1982) who considers capabilities as routines changing when the results are modified as consequence of an environmental transformation. In this sense, to confront emergent and salient circumstances in a short range is difficult. In contrast, resource and capabilities theory (Penrose, 1959; Teece, Pisano & Shuen, 1997) propose a more active conception where top management plays an important role. Truly these opposite views are a translation to management of the debated conceptions about human evolution by Darwin (natural selection) and Lamarck (internal forces).

- Evolutionism appreciates change as a gradual aspect, avoiding radical change for a disruptive environment. The fitness is executed in an automatic manner, a mechanical responsiveness, as a biological responsiveness based on intuition or reason, neglecting organizational imagination for designing new ways of execution, not recognizing the human capability of organization for structuring a new response.

- The role of direction is not relevant in this process. According to this viewpoint, the general direction as a suprasystem has not any discretion for proposing a vision, mission, objectives and strategies as important forces in the organization. Thus, it is not a key factor to be considered a resource as was stated by Penrose (1959). For the evolutionary theory, organizational behavior is the only determinant factor of change.

Conceptions about adaptability

In spite of many efforts for solving the problem of the relationships between enterprise and environment –the first insight about adaptability began in the 80's because of the competitiveness in a global market (Suarez, Cusumano & Fine, 1995)– there are few referents to direct treatment about adaptability as an organizational characteristic. In truth, a few texts or papers focus directly on this topic. Among the outstanding works the following contributions may be recognized:

De Green (1982) considers that the dynamics of environment creates perturbation in a system generating instability and impelling to system to obtain a new equilibrium. In respect to this, adaptability implies: scanning the environment, interpreting it and giving an answer to it. He recognizes elasticity as a capacity to absorb information from the environment. And adaptability needs to manage the organization-environment border.

McKee, Varadarajan & Pride (1989) propose three ways to adapt the firm: instable, stable and neutral states; in the first, a company is not responsive to environmental change (goes back of the environment), in

the stable adaptation there is an imitative behavior and in the neutral case a firm effectively adapts to external changes.

Suarez, Cusumano & Fine (1995) adopt an operationally focused posture and divide the manufacturing flexibility into three categories: product mix, production technology and volume. Mix flexibility is measured by products number in a portfolio and variety of them; flexibility of production technology is produced when automated machinery is used for manufacturing different goods, and certain kind of production management may increase flexibility because of augment of the learning, facilitating adaptability to environment. Likewise, a positive relation with supplier and outsourcers' impacts flexibility, and human talent is related to the volume flexibility, for instance, use temporary worker and salary linked to performance.

Volberda (1997) highlights the controllability of the environment and organization as a base for adaptability. He distinguishes three kinds of flexibility: operational (related to technology of production), structural (referent to organization and management), and strategic (involving the own adaptation, reaching objectives in a dynamic context). Likewise, he introduces the concept of metaflexibility as the learning or monitoring capacity for confronting the environment. He proposes a classification of firms based on adaptability: rigid, planned, chaotic and flexible, and he considers that only in a flexible organization, where the enterprise changes in tone with the environment, there is adaptability. Volberda (1997) also introduces a dynamic analysis in a line of adaptation; he provides a trajectory approach about how a firm may change from a rigid organization to a flexible organization for best adjusting to the fluid context. This view goes according to the position of the systems approach that considers that the disturbances originated from the environment (De Green, 1982) create instability in the system becoming a dissipated structure (Prigogine & Stengers, 1997). Here the stability is a mechanism used by the system for controlling the environment.

Oktemgil & Greenley (1997) establish three types of adaptation: market/product, marketing and responsiveness. On the other hand, Small & Chen (1997), in a restrictive sense, divide flexibility into two aspects: time dimension as the capacity for answering to the client needs and a range dimension referent to satisfy the client's needs in a different manner, using creativity.

Haeckel (1999) considers adaptability as the capabilities of scanning the environment, interpreting information about it and decision making for confronting it. He outlines the importance of direction for adaptation, rejecting positions such as the contingency theory and defending complexity.

Next, Watiez (2000) establishes as elements of adaptability the following features:

- **Velocity:** Because it is needed for moving in changing times (Stalk & Hout, 1990; Kotter, 2014). In effect, speeding for responsiveness is a good topic for organizational fitness.
- **Flexibility:** As an attitude of change or propensity to change.
- **Intelligence:** As a way to monitor the environment (Teece, 2009; Mendoza, 2013) and to comprehend its transformation.
- **Decision:** For executing diverse proposals for attending the environment.

This author just also emphasizes initiative, creativity, functional mobility, and individual dynamic as elements of adaptability. As a result, if the firm follows these conditions, may reach a best performance by means of an effective adjustment to the external realities. In contrast, if this adjustment is presented in disequilibrium, the organization may not reach its ends and objectives.

Patten et al. (2005) consider flexibility is related to future, as to this they establish anticipation as an important ingredient of flexibility, topic must be integrated to strategic planning. They, in the same thinking line of Watiez (2000), also stand out agility as another main ability because agility facilitates a rapid adaptation to environment

Sorenson (2003) studies the adaptive relation between vertical integration and learning and he discovers that in volatile environment the vertical integration positively impacts the learning.

Hatun & Pettigrew (2006) found adaptability on flexibility and they study the latter into two topics: structural flexibility and capabilities for flexibility (heterogeneity in background and scope of managerial expertise). These capabilities generate the abilities of absorption and creativity. In addition, these authors, considering institutional theory, analyze adaptability examining possibilities of over passing isomorphism or assimilation of common practices (DiMaggio & Powell, 1983) by means of innovation in activities and strategies (Hatun & Pettigrew, 2006). Moreover, they stress on five determinants of flexibility: low macro culture embeddedness, heterogeneity of dominant coalition, low grade of centralization and formalization, and environmental and organizational identity.

From an empirical point of view, Hatun & Pettigrew (2006), in their study about flexibility of bipolar cases in four enterprises of Argentina, discover that heterogeneity in the dominant coalition provides a superior flexibility for confronting new realities in the markets. In contrast, firms with homogeneity in the dominant coalition are inflexible. In addition, flexible enterprises are less embedded to macro culture of industry, while inflexible firms are more dependent of industrial culture. They stress the importance of environmental scanning as a factor of adaptation and consider that the organizational values are obstacles to flexibility (Leonard-Barton, 1992). But they did not give any importance to structural flexibility in adaptability.

Therefore, Reeves & Deimler (2011) present four organizational capabilities allowing a rapid adaptation:

- The ability to read environment and the actor's behavior based on the changing signals as capabilities of monitoring and executing.
- The ability of experimenting, on rapid and frequent forms, with products and services, business models, processes and strategies, related to practice, using design capacity, as an innovative culture.
- Capacity to manage complex systems generated by the diverse interrelations and trends of a changing world. Here it is obvious that management is indispensable
- Ability to motivate workers and stakeholders, this is, to promote behavior by means of diverse incentives, for stimulating as internal and as external people.

Fioretti (2012) considers flexibility as the shaping of networks among subjects in the organization, and their ability to change in an uncertain environment and claims that multihierarchical or horizontal companies tend to work in education and rotation of personal for gaining flexibility in front of environmental uncertainty, using open space, informal communication, team work, but he recognizes that the flexible structure generates information and duplication of work.

Lim, Ling, Ibbs et al. (2012) identify the following factors as drivers of organizational flexibility: organizational learning, structure, skill and behavior of employees, technological capability, supplier chain capability and business strategy. When they come up with a research on firms of construction in Singapore, they discover operational flexibility is determined by connection with the supplier chain and decision making, while tactical flexibility depends on polyvalent employees, relationships with external actors for supporting logistic and operation, facilities of employees, recruitment and development of new products and markets. And strategic flexibility depends on the following factors: fixation of objectives and strategy for operation in market conditions, research on procurement options, constructions of services and responsiveness to client changes.

In the end, in their analysis of construction enterprises, these authors found out a surprising result: flexible structure and shared vision have a negative effect on flexibility, that is explained because the organizational fluidity reduces the alignment and consistence, while share vision produces rigidity, but vision and shared value have a positive impact on strategic flexibility, this is, it is important for constructing a strategy but not for a day-to-day operation. In contrast, skill, behavior, and open mind (communication) are positive for operational flexibility, specifically, learning capability, autonomy, focusing on client, polyvalent employees and open mind. Likewise, client intimacy has a great effect on strategic flexibility.

Lusch, Sagarin & Tang (2016) argue that services systems are complex, adaptive and resilient and they reacted to its environment in an innovative way that generates more uncertainty and risk. They argue that adaptation implies: to observe the service system and its changes, to response to these changes, to expand its abilities beyond current needs and to iterate.

An important topic in adaptability is confronting crisis. Wenzel, Stanske & Lieberman (2020) have proposed three strategies for coping with this kind of circumstances: retrenchment, persevering and innovation. In this view innovation is a path where crisis is seen as opportunity for increasing (Chakrabarti, 2015) while Koronis & Ponis (2018) visualize resilience as flexibility and improvisation for adapting to difficult environment.

Laser (2020) analyzes the dynamics between organizational flexibility and stability and he establishes a continuum with extremes in total stability and totally flexibility that is determined by the environment turbulence and an optimization rule based in marginal utility and cost. This is an interesting point that introduces the organizational identity, the consistence in the organizational behavior and the path dependence as forces breaking flexibility but important for the social recognizing of a company.

Sarta, Vergne & Durand (2021) consider adaptation has two necessary concepts: intentionality as attention to environment and relationships as interaction between organization-environment, conditioning as co-evolutionism and convergence that is close interaction to environment.

Dynamic capability movement has shed new light on adaptability. These capabilities are a set of organizational abilities for confronting changing circumstances of environment (Teece, Pisano & Shuen, 1997; Teece, 2009). Then, adaptability is related to dynamic capabilities because it is focused on external situations. Adaptability may, likewise, be divided into several subcapabilities such as:

- To perceive changes in outside phenomenon. An ability that is incorporate to relational capability. This may be named *monitoring*,
- To absorb or internalize external realities,
- To design an answer for them,
- To execute or to implement this answer,
- Do follow up for maintaining equilibrium.

Every this happens in an incessant cycle where do follow up means to initiate a new perception. It is convenient to highlight those dynamic capabilities, as forms of confronting environment, such as innovation, learning, relating and coordination, continually serves to adaptation. Thus, they are essential for surviving in a volatile world. Whereby they are necessary to develop and preserve the firm. Besides, dynamic capabilities serve for facing with the environment uncertainty (Teece, 2018) and, in this sense, they are linked to agility (Patten et al., 2005).

Neuroscientists have provided important contributions to understand the problems of adaptability. The most important concepts here are: plasticity, mental flexibility and creativity. Plasticity is a common neural phenomenon based on synaptic interaction that produce learning (Bueno, 2016; Dierssen, 2018), mental flexibility allows change the attention from a thing to another one different, and is rooted to the right ventrolateral prefrontal cortex and creativity has traditionally been related to the right lobe; but a new view locates it to the *default network* that joints prefrontal lobe and parietal lobe (Golberg, 2018). Ultimately there is a recent contribution of the *allostasis* concept as contrary to homeostasis indicating an anticipated way for adaptation, a kind of preparation for destabilizing situations (Tafet, 2018). For complementing the previous study, it is possible to extract some definitions and concepts of adaptability in literature that are presented in table 1.

TABLE 1
Nature of adaptability and flexibility. Definitions and concepts

Author	Definitions or concepts
Tomlinson (1976)	Adaptability: Ability of an organization to change itself, or the way in which it behaves in order to survive in the face of external change.
De Green (1982)	Adaptable organization is a set of forces field that may anticipate probable alternatives and elaborates a structure for self-organizing and self-regulating.
Sánchez (1995)	Flexibility: ability of a firm to respond to various demands from its dynamic competitive environment.
Volberda (1997)	The controllability on the environment and organization is a base for adaptability.
Patten, Whitwork, Fjermestad & Mahinda (2005)	Adaptability is referred to changes in the system to accommodate change in its environment, the modification of behavior in response to environmental changes, and the adjustment to changing requirements.
Lim, Ling, Ibbs et al. (2012)	Flexibility: ability of an organization for effectively utilizing its resources and capabilities to respond or adapt to the environmental changes in a timely and reversible manner through continuous learning processes.
Fioretti (2012)	Flexibility is the shaping of networks among subjects in the organization and their ability to change in an uncertain environment.
Eichholz (2016)	An adaptive change rises by the tension we are feeling, but it happens if we are able to maintain the disequilibrium and sustain the tension during this period.
Sarta, Vergne, & Durand (2017)	Adaptability is intentional decision making undertaking organizational members, leading to observable actions that aim reduce the distance between an organization and its economic and institutional environments

Source: Own elaboration.

For understanding the different positions related to adaptability, in figure 1 is presented a taxonomic synthesis about the main contributions of diverse authors.

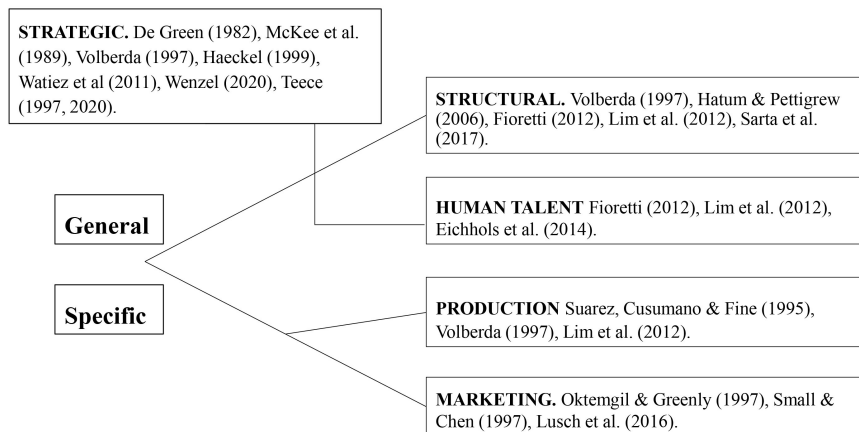


FIGURE 1
Synthesis of authors
Source: Own elaboration.

This graphic presents an interesting result: 17 persons belong to general focus, with 8 lecturers in strategic category, a dominant group, 7 in structural adaptability and 3 in human talent. Whereas 7 belong to specific adaptability: 4 in operative area and 3 in marketing. It is visible the salient position of strategic, structure and production options.

The work of generalist reflexes an intellectual answer to the reality in transformation of business in the world today. Namely, they focus on the key problem of company after years 80's: as to respond to the turbulence in the global markets. Consequently, the fields attacked for generalist are: reading the market signals, designing a response, speeding a answering, changing attitude and becoming flexibility. Whereas, the specific lecturers concentrate the attention to aspects derivate of core topics with a view specialized.

Since a theoretical point of view, the discourse of adaptability, as has been presented, incorporates concepts and statements that are necessary elucidate: Important concepts are: environmental turbulence, internal

capabilities, equilibrium and disequilibrium, change and learning, future and past (rigidities), development and survival, flexibility and stability. Likewise, several propositions existent, as: An adjust is indispensable for the organizational survival and development, the more environmental turbulence, the more flexibility; if the environment is stable or soft, the organizational adjust is light and at long range, but if it is turbulent, the adjust is radical and at short term; a turbulent environment destabilizes the firm augmenting its risk, Agility improves flexibility and diversity as driver of creativity facilitates adaptation.

A model of adaptability

A general model of adaptability

To begin, as exhibit 2-1 indicates, adaptability is related to flexibility (or rigidity). When environment presents a swift, flexibility allows a transformation in organization for adjusting to the external new situation but rigidity may obstruct this change, maintaining the organization static, this is, it does not adjust to outside oscillations. Rigidity might be classified into two categories: of *resources* indicating failure to invest in resources (or abilities) or *process* referent to failure to change processes (Gilbert, 2005; König, Graf-Vlachy & Schöberl, 2021). In both cases organizational survival is in danger.

The interaction environment-company might be observed in exhibit 2-1 where the circles at right are distinctive situation of environment ($S_1, S_2, \dots, S_n$) while the circles at left present diverse states that firm may adopt ($A_1, A_2, \dots, A_n$). When there is flexibility, organization easily passes from A_i to A_{i+1} but if there is rigidity it maintains trapped to the same state (prisoner of present). This latter situation creates problems for obtaining positive results that impact the growing and profitability because of the misalignment among environment, internal instance and strategy. See figure 2.

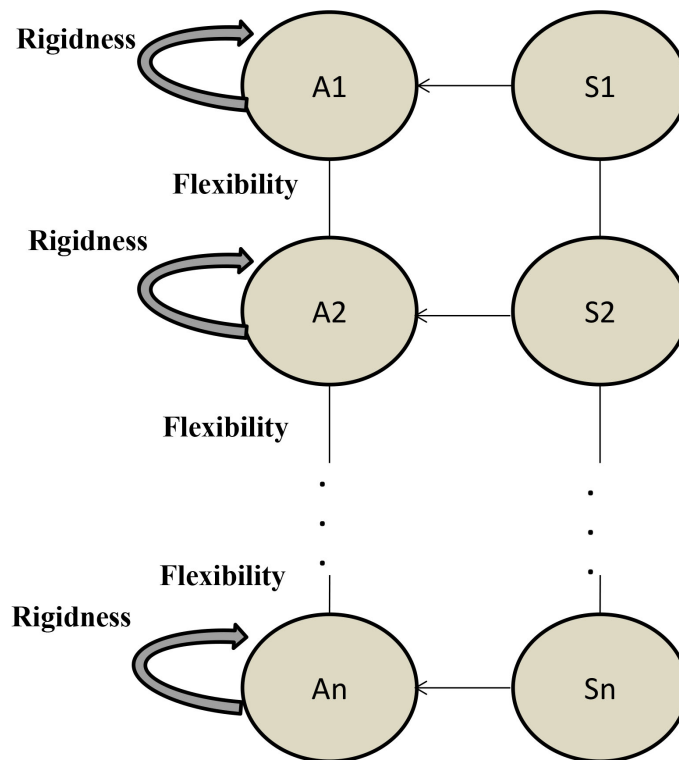


FIGURE 2
General model of adaptability
Source: Own elaboration.

For understanding how the adaptability works, it is necessary to design a comprehensive model that represents the dynamics for confronting the external reality. This model includes three moments of adaptability. See figure 3.

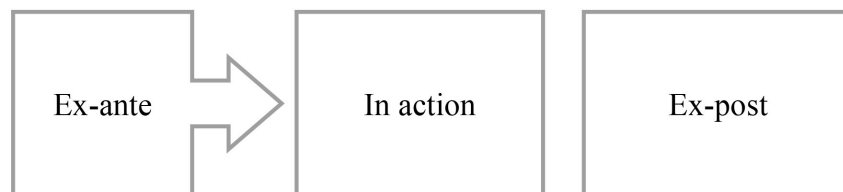


FIGURE 3
Moments of adaptability
Source: Own elaboration.

The ex-ante moment is referred to the previous conditions of adjusting to changes of the outside circumstances and it is essentially flexibility, the most studied aspect of adaptability, as may be deduced

of the review presented (in table 1 and figure 1). Indeed, for flexibility purpose does not matter the specific environment because it is a preparation of the organization for responding to whatever external fact, independent from the present reality. This moment is according to dynamic capability because it has a potential character; thus, if a company is prepared for changing in the environment, the match is easier. In particular, here the micro foundation is applicable in term of sensing, and seizing (Teece, 2009). In addition, it is a situation of allostasis because is anticipation.

The second moment (in action) corresponds to the way selected by an organization (particularly its top direction) for confronting specific changing environment. And the ex-post moment initiates when the action for responding has been completed and it includes a feedback and an organizational learning derived from experience.

Ex-ante moment: Flexibility

Flexibility is the attitude or disposition for changing. For generating adaptability, flexibility has to be directed and orientated because flexibility is multidirectional, this is, the organization may move towards any part.

Flexibility has been studied by diverse authors. The outstanding lecturers in this cases are: Hatum & Pettigrew (2006), who base adaptability on flexibility, Volberda (1997) focuses on the controllability on the environment and organization as essence of adaptability; Small & Chen (1997) also provide a division of flexibility into two aspects: time dimension as the capacity for answering to the client needs and a range dimension referent to satisfy in a different manner the needs of clients. Fioretti (2012) considers flexibility in communication terms of the network level; Suarez, Cusumano & Fine (1995) concentrate their attention to manufacturing flexibility and Reeves & Deimler (2011) maintains organizational capabilities allowing a rapid adaptation. Besides, different authors have proposed different kind of flexibilities, such as:

A. Strategic flexibility. If an analysis of classical methods of strategic planning is made, it may be observed that the most important techniques are inflexible, with rigid plans, and they must be followed with rigor and generally work with only one scenario, the most probable one. In contrast, nowadays planning is a flexible exercise about the ways of how to confront a volatile environment (Catmull & Wallace, 2014). Table 2 presents the differences in the ways to understand planning in the past and today.

TABLE 2
Strategic planning, yesterday and today

Strategic planning yesterday	Strategic planning today
Detailed	Panoramic
Focused on tools	Focused on learning process
Top-down sense	Participative and inclusive
One scenario	Several scenarios
Quantitative	Quantitative and qualitative
Long range	Short and medium range
Permanent	Periodically reviewed
Based on reason	Based on imagination too
Evolutive	Innovative

Source: Own elaboration.

The right column indicates that the change has been significant. In effect, nowadays is more important to adopt a wider approach, to formulate a long avenue for running, instead of a set of specific activities that speedily become obsolete, and is converted in a high constrain for the creativity of people. Learning is emphasized because it allows a comprehension of the actual situation, prospection for the future and to fix objective and activities for being executed. Learning is a key factor for carrying out plans. Likewise, when people participate in the plan design, they use their imagination, reason and other mental functions for

improving the quality of the plan and elevating the probability of success, and so, a superior compromise of collaborators for execution is generated.

B. Flexible production. Over the last years, flexible manufacturing has been dominant in the operations area, and this not has been a random fact. Yet it implies production systems where a machine may produce diverse goods. Examples of this kind of production are: platform systems, very common in the automotive industry, modular system, where it is possible to integrate different mechanisms with similar pieces, and concurrent engineering that makes flexible the process of new products by means of the participation of diverse parts of the firm. Technology plays a key role in manufacturing flexibility. Thus, internet facilitates a one-to-one relationship which clients, allowing the adaptability to the market on a base of customization. This aspect, joined to data bases and big data, has permitted a huge personalization of products and attention. Robotics is pertinent, as much as new systems of design that, added to telematics, support the simultaneous participation of people from different countries, including clients.

Technology is needed to examine applications for flexibility. The fact is that the cycle of technology is shorter day by day (Cooper, Edgett & Kleinschmidt, 2001; Davidson, 1998), so it may rapidly become obsolete. Consequentially, organizations have also to be flexible in this field that means they have to know the technologic development for buying early, when the life cycle is beginning, to control investment and to avoid money waste, according to the grade of freedom of technology. And finally, flexibility is essential for getting updated and to take advantage of the technological change. Besides, practice flexibility is the possibility to change routines based on changes in work conditions (Ngoa & Loib, 2008) and business process (Mates, Rychly & Hruska, 2014).

C. Human flexibility. A first negative point in this case is the hyper specialization that produces low organizational interaction and waste of human talent reducing the flexibility. Another positive case is the pay related to the seasonality of demand, when high periods of sale are followed by low demand: in the latter situation a waste is generated if salary is expressed in a fixed way. Thus, in the stage of low season a high employment level is obtained and in the high phase is needed to deal with part-time people for covering additional demand. Wage policy is constructed by means of a low payment in the low cycle and in the high cycle the firm pays a variable salary.

The planed rotation of people is another way of flexibility allowing understanding the integral situation of a firm, augmenting the human capability for doing other jobs and the empathy, facilitating communication and human interaction and permitting the people replacement. Some subjective aspects are important here such as the positive attitude toward risk and fail, the former promotes change and innovation and the latter allows being successful in difficult times. If the firm has aversion to risk and fail is difficult it may confront new realities, thus generating inflexibility. Some emotional characteristics as self-control are important for flexibility, facilitating quiet detection of the environment shifts and having control on the events. Besides, the firm needs adaptability in its people for adjusting its behavior to new circumstances, and that implies flexibility. Self-control is important for maintaining adequate levels of sensibility and contention to the fall-and-rise of context (Eichholz, 2016).

In relation to human talent, different types of flexibilities have been presented about abilities, behavior and practice (Wright & Snell, 1998) which, according to the resources and capabilities theory, are considered as satisfying conditions of VRIN, this is, they create value, are rare, inimitable and not tradable, whereby they create sustainable competitive advantage. Flexibilities as abilities are referred to the diverse uses of worker's competences and how they may be re-utilized; behavior flexibility is related to the possibility of adjusting behavior to a changing situation instead of following a unique standard pattern or practice. Likewise, polyvalent workers are a source of labor flexibility.

Related to human flexibility, Fernández Martin & Sánchez (2015) divide flexibility into two categories: internal or functional and external or numerical. The first refers to polyvalent human capital and the second is related to manage the number of workers in front of an environmental situation (Easiness to retire and hire). It is possible to introduce a new category that may be named differentiating flexibility that aims adaptation

by way of creating value as the quality of products, service and innovation. Diversity is a key topic for human adaptability and it has a direct impact to creativity that generates ductility. A special case is the diversity of background of the high management team. Multiculturalism is essential for operating in the global market for adapting to different scenarios that are accompanied by learning. Finally, inclusion amplifies diversity and elevates the motivational level in the organization (Acemoglu & Robinson, 2012).

D. Management flexibility. The management models are a source of flexibility, but for that this might happen several conditions have been defined in organizational literature. Thus, organizational structure has to present a high grade of flattening, horizontal communication, reduced hierarchical power, decentralization and empowerment and a few use of handbooks of strict functions and roles. These are some ways of responding to external changes allowing to reestablish the organizational equilibrium with the environment, according to the velocity that the environment imposes.

Leadership is different in a flexible firm. More probably it has to be situational as Fiedler (1981) and Goleman (2017) have maintained. Managers need to combine the director's role with participation according to the situation, for example, in urgent situations they need a directive behavior but in complex circumstances is needed a profound study and a deliberative style, and in this case flexibility is essential. In practice, big enterprises have admitted this aspect by imitating small and medium businesses, dividing into groups of autonomous functions. Internal contradictions, supported in a positive climate, also contribute to flexibility, giving opportunity to new alternatives to analyze the situation (Day & Schoemaker, 2005) and impelling change.

High management in the organizations generally has an elevated grade of inflexibility because it is compromised with status quo derived from past decisions, while medium management is more open to change because of its contact with the environment (Grove, 1997). Likewise, top management builds a dominant logic that may generate mental models (Prahalad & Bettis, 1986). Coordination by means of a cross-functional team and cultural alignment may facilitate action for confronting changes but it might create rigidity by means of uniformity.

But maybe the administrative function that needs transformation with flexibility ends is control, a function that has been fortified in the last decade with the huge use of Balanced Score Card and the extensive growth of information and communication technology. This point has augmented centralization reducing administrative capability for facing the environment. Organizational communication system is valuable for flexibility because provides new information input in real time for making rapid decision, facilitating the human interaction for a speedily response to environment contingences and enhancing creativity

E. Financial flexibility. The main end of flexibility is to maintain the survival and growth of a firm, in a dynamic environment. This point is outstood in today's world because of the rapid and significant change that is the basic characteristic in the business, and has augmented the risk. Thus, perdurability today is more difficult than in any other time. Consequentially, companies require control on several financial indicators and to keep monitoring on their financial performance. Important metrics that need be scanned are: leverage or use of debt, for avoiding default risk; controlling liquidity, using a currency indicator; elevating profit retention level, for financing the company's growth and avoiding great investments in assets that conduces to a high waste, general costs and risk of obsolescence, and finally, going out of industry.

Flexibility is an important aspect of modern business that has been structured like a key area in the finance field denominated risk management (Deloitte, 2013). In a competitive world as today operational costs are important as a way of competing; thereby a firm has to be worried for keeping low costs. This an important contributor to strategic flexibility in risk management (Lim et al., 2012).

F. Mental flexibility. Organizational thinking is dominated by fixed mental models as a truthful obstacle for an effective adaptation that may be named paradigmatic resistance and it augments when the organization becomes old. This phenomenon makes difficult the unlearning, an aspect sometime more important than learning, because in a moment of change, company needs first to erase the old paradigm and to absorb

the new realities (Levinthal & Cohen, 1990). In this sense, a key tool that provides many possibilities is the questioning, the permanent asking about the validity of our suppositions about the business that opens opportunity for new alternatives.

Another source of mental flexibility is being alert and having a proactive attitude (Day & Schoemaker, 2005) and a permanent monitoring of environment (Teece, 1997) that supposes a relational capability of organization (Helfat, Finkelstein, Mitchell et al., 2009) accompanied of organizational extroversion. In practical terms, this means a firm has to do constant evaluations of its environment according to its dynamic.

The dynamic analysis capability considers the business world is in a flow state, in line with the Heraclitean conception (Curd & McKirahan, 2001): Everything flows, everything changes. An important approach here is the dialectic thinking that may be studied in Hegel (2001), Engels (1940) and Adorno (1973). It is clear that dynamic analysis creates in managers a position adequate for understanding a changing world, consolidating the mental flexibility.

To change mental models is maybe the first step for doing organizational change because serves as an opening for assimilating new visions. Other point is the plasticity in thinking, that may be defined as the ability of feeling comfort and complacency with ambiguity and uncertainty that is a key factor in a situation of change. In this sense, to accept antinomies is part of tolerance, of ambiguity and reflexes mental flexibility. In management, antinomies are very common, for instance, executives think in either adding value or reducing cost as a strategy but, they do not possible have both. This antinomy has driven many firms based on value to fail because they forget costs. At last, there is a common antinomy today: globalization and localization are presented as opposite ends or excluding elements but really neither exist as complete globalization nor as complete localization, thus is valid the phrase; to think globally and to execute locally.

The action moment

This is the truth moment of adaptation, as Lusch et al (2016) say adaptation is action. It contains the actions set to be carried out by the organization and its top management for attending the emergent situations of the environment. In particular, the action has to concentrate on time, and works with speeding criteria. Basically there are two elements related to the action moment in adaptability: Strategy, as adjustment for long range, starting to analyze external landscape, self-examination, making decision and applying it. According to strategy, Carley (1996) defends organization responses to environment applying downsizing, expansion or re-engineering. And Oktemgil & Greenley (1997) establishes three types of adaptation: market/product, marketing and responsiveness. While McKee et al. (1989) propose three ways to adapt a firm: Instable, stable and neutral states. In the first one, the firm is not responsive to environmental change, in the stables adaptation it has an imitator behavior and in the neutral case, the firm effectively adapts to external changes. The other element for confronting external reality is responsiveness, as a behavior of short range including monitoring outside emergencies, designing an answer and applying it. The difference between these two manners to answer to the environment may be observed in table 3.

TABLE 3
Difference between two ways to answer to the environment

Strategy	Responsiveness
Medium or long range	Short range
Focused on future	Focus on present
Gradual	Disruptive
Extensive	Intensive
Reason	Perception, intuition and imagination

Source: Own elaboration.

On the other hand, adaptability implies change, manage change, this is, to change in front of the environment. This involves the dynamic capability of change attitude and a strategy for changing. It is obvious, adaptability as an action, requires energy that is based on emotional life in the organization connected to will power. In effect, emotions have been considered a key factor for adaptation (Håkonsson, Eskildsen, Argote et al., 2016). As action is related to strategy of adaptation Carley (1996) establishes four categories of strategies of adaptation: Hire, fire, reassign organizational agents or re-engineer, and he considers that the most successful organizations tend to be highly flexible and it has more changes than the least successful one.

Eichholz (2016) analyzes change as a core aspect to adaptability and studies specially sensibility for scanning environment and contention for adopting a realistic position in front of the external change. Adaptability implies environment, firm and performance. Only when the firm is adjusted to environment is possible get a satisfactory performance. This outlines the importance of adaptability for the organizational perdurability. As factor of successfulness, adaptability allows three states: fail, survive and increase.

Likewise, adaptability may be positioned in a continuing form that begins in low level till high level or from completely blended to high- delivered. Only at the latter case may be said there is a good performance. In addition, high level of adaptability may be divided into alert, analytical and projective behavior, the first consists in an ex ante attitude for monitoring, the analysis is needed for evaluating the situation and a projective attitude places the mind in a position of future.

But the fit to environment depends on its favorability grade. When the environment is favorable, adaptability allows organizational increases (Ansoff, 1988), but when environment is unfavorable the responsiveness is in terms of reduction. Another point is turbulence. In this case, it is impossible to keep the success because the results are stochastic: for adapting to this situation, thus, these enterprises need to implement an innovative strategy. In opposition, when the environment is gradually changing, an evolutionary strategy or continuing improvement is needed.

Related to adaptability, three possible states of organization may be registered: inadaptability, when firms do not adjust to environment, partial or ill adaptable, that conduces to survive and total adaptable, when the fitting is as perfect that guarantees success. Likewise, adaptability is related to act in the future. Consequently, past is less useful when environment is turbulent. Past is a problem for adapting because mental models, identity (culture) and consistence brakes the adaptation process.

Finally, it is necessary comment that the Teece micro-foundation model is connected to this action-moment requiring three abilities for confronting environment: sensing as scanning skill for external reality that is seemed to exploration capacity proposed in the ambidexterity theory (March, 1991; Håkonsson et al., 2016), seizing as creative decision-making and transformation as managing of organizational change.

The ex-post moment

Organizational learning lecturers as Argyris & Schon (1978) and Senge (1990) have provided a suggestive mechanism for taking advantage of the adaptation experiences. When an experience of adaptation finishes, the firm takes a learning opportunity from this experience, assimilating it, internalizing based on the organizational memory (individual memory plus information system) and changing its behavior. Indeed, this feedback implies analyze the adaptive experience that is a rational exercise, absorb it and introject it for modifying the organizational memory; and use the accumulated information for future acting.

Thus, ex post moment requires a dynamic capability of learning (Eisenhard & Martin, 2000; Levinthal & Cohen, 1990; Garzón, 2018). Moreover, in this situation a company uses a follow up mechanism. So, the information collected in the scanning activity has to be used for orienting the organization toward its strategic goals. In this point is key to learn from successful and failure in a confirmative or corrective way.

The cumulated learning in each experience of adaptation is used for future improving; thus, the adaptive experience permits a best fitting to environment as the exhibit 1 indicates.

Final commentaries

For dealt with the turbulent time in the current business world adaptability is an important construct, but it has not received the attention required as is observed in the specific scare literature related. This subject is more needed because of in the last decades have arose special phenomena as critical episodes, catastrophic events and shocks (König, Graf-Vlachy & Schöberl, 2021) increasing the frequency of the biological, environmental, social, nuclear and economic risk.

In these situations, an evolutionary answer is insufficient because of its gradualism and incrementalism. Thus, new responses are demanded for confronting new uncertainties. As consequence, prevention, based in flexibility, in the ex-ante moment (exhibit 2) or allostasis is essential instead of promoting the direct action characterized by the action-moment.

On the other hand, the problems of researching in adaptability in complex term require intervention of different disciplines (interdisciplinarity) as psychology (emotional and relating issues), sociology (social risk and cooperative work), neurosciences (homeostasis, allostasis and plasticity) and education (learning).

Besides, adaptability is not only corporative but involves different organizational levels. In a divisionalized or decentralized organization exists adaptability in diverse business strategic units because each BSU has its specific environment and must respond itself to external change. Then, adaptability is a recursive phenomenon as complexity theory maintains.

In contrast to the initial phase of the development of adaptability theory, the last stage has accomplished the task to orient researching toward the disruptive environment and its impact as shock, crisis, and catastrophe. For future is necessary to advance in this research line for understanding the new facts arising in the contemporary reality.

Another problem appearing in the field is the contradiction spontaneity (emergence)- intentionality. Newly neurosciences play into the game. First, man is intentional and in addition, we can read the intention of other people (Mind theory), a point where the most of neuroscientists are agree, that serves of base for a planned collective behavior in an organizational milieu, and this justifies the management role.

In the development of organizational adaptability theory has dominated a cognitive approach with aspects as sensing, creating, reasoning and propection but confronting environment has emotional impact and responses that have been few studied requiring a future effort of research. In this route is worthy the input of neurosciences in homeostasis and allostasis studies related to stress and resilience.

Every that shows the importance to continue studying organizational adaptability for understanding the new business landscape and its challengers.

Ethical considerations

The authors declare that the approval of the ethical commission is not required for this research.

Authors' contributions

The authors declare that the main author contributed in the review of the bibliography, evaluation of the authors, construction of the models, writing of the document. The secondary author participated with the bibliographic review, evaluation of authors, writing of the document and verification of presentation rules.

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Notes

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