POSTCOVID COMPETITIVENESS BUSINESS RESILIENCE & ADAPTIVE SYSTEM

JOSÉ SÁNCHEZ-GUTIÉRREZ & TANIA GONZÁLEZ-ALVARADO (COORDINATORS)

UNIVERSIDAD DE GUADALAJARA

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Prologue

P ost-Covid Competitiveness: Business Resilience & Adaptive System is of interest to those who expect a critical but positive vision of the pandemic times we live. Experts explain the situation of the organizations, institutions and regions according to resilience, innovation and adaptation for the new ways and best practices according to the Sustainable Development Goals (SDGs). SDGs are the essential guidelines that facilitate the strategic consideration of the Post-covid competitiveness.

The authors are from Colombia, Spain, Poland and Mexico. All of them are experts in Economic and Business Sciences. The institutions that participate in this project are Fundación Universitaria Konrad Lorenz, Universidad Complutense de Madrid, Universidad Externado de Colombia, Pontificia Universidad Javeriana, Universidad Autónoma Metropolitana-X, Instituto Politécnico Nacional, Universidad Autónoma de Aguascalientes, Universidad Michoacana de San Nicolás de Hidalgo, Universidad Autónoma de Coahuila, Instituto Tecnológico y de Estudios Superiores de Monterrey, and Universidad de Guadalajara.

Each chapter of this book was based on empirical real-life evidence from enterprises, universities, governments and institutions. All of these studied organizations are part of the Post-Covid competitive environment.

The writers believe in economic progress in line with innovation, resilience, entrepreneurship and international cooperation between regions, countries and corporations.

This publication was created following the best practices of scientific edition. Turnitin was applied to favor the originality. The editorial team carefully analyzed the quality and originality of the contents. Every chapter was selected, evaluated, and modified with the support of international peers. Editors authors this will hope is that book contribute and to the advancement of theoretical and practical knowledge.

Dr. José Sánchez-Gutiérrez

Post-Covid Competitiveness: Business Resilience & Adaptive System

Business Resilience and Complex Adaptive Systems

Photo by Tomáš Malík on Unsplash

Chapter

Post-Covid Competitiveness: Business Resilience & Adaptive System

Business Resilience and Complex Adaptive Systems

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INTRODUCTION

he complex adaptive system has facilitated advances in artificial intelligence (Moon *et al.*, 2011; Padilla, 2012; Chandrasekaran, 2013; Yagüe & Balmaseda; 2020); but it is also a metaphor to understand the way in which the network of companies responds to changes.

In recent decades, the systemic approach has contributed to the advancement of knowledge in administrative, economic and organizational sciences (Mas, 2008; Jackson, 1994).

This approach has made possible a more thorough study of companies, their competitiveness and the way in which they contribute to the economy (Ackoff, 1999, 1971; Scott, 1988; Cooke, 2001; Johnson, Kast & Rosenzweig, 1964; Malmberg & Maskell, 2002; Bozeman & Bretschneider, 1986). The economic framework is seen as a complex system, constantly adapting to the environment. It facilitates the analysis of the achieved results, their impact and possible corrections in their dynamics.

As a global trend, companies constitute networks that intertwine and form more complex systems. Business activities involve various agents (public or private, local or international, with innumerable economic activities). Their heterogeneity and complexity contribute to a better adaptation to changes in the environment.

During 2020 the business system, international competitiveness and the ability of operational continuity of markets were tested in the face of the COVID 19 pandemic. This pandemic added to the global crisis that the capitalist system has experienced in recent decades and that lengthens and deepens each time (Argyriades, 2020; Alvarado, Kubus & Sánchez, 2020).

What is free of doubt is that the experience is essential for learning (Estrada & Dong, 2020; Mückschel *et al.*, 2020; Covas *et al.*, 2021; Argote & Miron-Spektor, 2011; Boud, Cohen & Walker, 1993; Boyd & Fales, 1983), but the way in which this learning is processed by each organization, territory or economic sector makes the difference, especially in what refers to the adaptation period and the achieved results. There are new and marked inequalities that generate profound changes in the business system.

In this phase of COVID 19 scenario, the theory of complex adaptive systems is the basis for analysing and understanding competitiveness, international business and marketing in the companies (Ma, Xue, & Huang, 2020; Basile & Dominici, 2016; Langdon & Sikora, 2006; Haataja & Okkonen, 2004; Etemad, 2004; Rullani, 2002). The reality of this last year, renewed the importance of the study regarding complex adaptive systems in business while facing the need for resilience (Yaroson *et al.*, 2021; Liu, Tong & Sinfield, 2020; Korhonen, 2020).

THE METAPHOR OF COMPLEX ADAPTIVE SYSTEMS AND RESILIENCE IN BUSINESS

Complex adaptive systems are made up of agents that perform actions from which they learn to adapt, while interacting with others. Thus, the company is an agent. At the same time, the company is made up of individuals who learn. Individual learning depends on the environment (it encourages learning or not); the availability to learn (the person must be interested in constant learning); and the individual's ability to study (skills, aptitudes, and attitudes that lead to critical thinking) (Tejedor & Aguirre, 1998; Peña, Gómez & Rubio, 1999; Esteban, 2002; Pérez, 2002; Prot, 2004; González, 2006; de Medrano & de Paz Higuera, 2010; Morgado, 2014; Bruner, 2018).

The contribution of individual to business learning leads to endless ways and possibilities. Because of that, a company can take months or years to change and adapt to the environment. The bottom line is that the same process is responsible for each of these changes (Holland, 1992).

In case where the company is analysed as an agent of an adaptive system, it is necessary to divide the system into three subsystems: execution one (what the system can do without adapting), credit allocation (decision between the rules that work and those that do not), and identification of rules (Holland, 1992).

"An agent in such a system is adaptive if it satisfies two additional criteria: the actions of the agent in its environment can be assigned to a value (performance, utility, payoff, fitness, development of a general mathematical theory or similar); and the agent behaves with the aim of increasing this value over time". (Holland & Miller, 1991)

The company (economic unit) is represented as a one hundred percent rational agent. However, the same does not happen with the individuals that constitute it. The person is not one hundred percent rational, but the role acquired within the company usually adjusts both the decision-making and the actions of the individual in such a way that the possibility of acting according to the organizational objectives exceeds the individual impulses and interests (Simon, 1990).

On the other hand, Artificial Intelligence (AI) has provided companies with electronic tools and processes that support analysis for decision-making, fully adjusted to what the theory of complex adaptive systems exposes (Yu *et al.*, 2016; Melnychenko, 2020; Anagnoste, 2018; Schoemaker & Tetlock, 2017; Dhingra, Jain & Jadon, 2016; Impedovo & Pirlo, 2020; Kerzel, 2021). Nonetheless, decisions and actions are taken by people with limited rational ability.



Figure 1. Complex Adaptive System Model

Source: McElroy (2000).

In complex adaptive systems, rules are used for hierarchical decision making. The hierarchy between the rules is obtained by experience (Holland, 1992). The difficulties increase because the agents' rules are continually changing (Holland, 2006). In companies, policies, norms and rules are derived from previous experiences and allow the reduction of errors and/or waste.

In some areas of the company, the rules are closely followed because the decrease in costs in the production chain depends on them. Notwithstanding,

this is not the case of the entire company. In an adaptive system, focusing the mechanisms to interact on the rules of the company would decrease its ability to learn and to adapt.

Based on experience and the search for better results, employees in senior and middle management and in strategic positions have the individual freedom to rank the rules, to modify and to replace them. These same strategic employees contribute to changes in rules not only of the company, but of the system, transposing them into the political, legal or social environment. However, this has not always been used to benefit the company or the system. There are cases where this ability was used to adapt the environment for individual interest, affecting the system in general (Stiglitz, 2004).

Complex adaptive systems can anticipate or forecast, and this is not limited to those which are like humans and that can change their activity in the future, even if that forecast can be wrong (Holland, 1992). Agents rarely reach equilibrium, and the combination of conditional action, regular innovation, and perpetual novelty, disrupts the formation of attractors (Holland, 2006).

This exercise of anticipating, predicting and making mistakes is essential to develop the ability to learn (Peña, Gómez & Rubio, 1999; De la Torre, 1993; Rodríguez, 2006; Salas & Salas, 2014). The possibility of reducing errors, making better decisions and leading to actions more congruent with reality is ensured to the extent that they are exercised. For the person, the company and the economic system, mistakes and failures are essential for learning and adaptation.

The properties of the adaptive system are: 1) aggregation, as companies contribute to the Gross Domestic Product; 2) flows, feedback from production, and the multiplier effect; 3) non-linearity, as there are catalysts; and 4) the diversity (Holland, 1992).

Models based on natural (not artificial) systems become incomplete because reality is more complex. Thus, it is impossible to reach their thorough representation (Holland, 1962). The economy indeed is a complex system (Holland, 1988).

Emerging models for reality forecasting and explanation are incomplete. This characteristic poses clear boundaries for their study and conception. However, the theory of complex adaptive systems allows the understanding of how companies learn and how this learning leads to a better adaptation to change. This adaptation of the company has been determined through the concept of "competitiveness". Nonetheless, adaptation must be assessed on the basis of its contribution to a greater resilience.

RESILIENCE AS A CHARACTERISTIC AND THE COMPETITIVENESS-ORIENTED PRACTICE OF MANAGEMENT

Additionally, resilience is a quality or characteristic that may or may not be present. Business resilience by itself is not an implied process, and the studies that address it as a process, actually present an administrative practice with its proceedings, principles and tools that have been classified as "good business practices".

Coupa's case exemplifies this. Its web page suggests to companies the generation of resilience in times of commercial uncertainty. It is to be achieved by different means: by enhancing the visibility and by controlling the cost of their business, as well as by revealing the strategic areas of cost containment; by implementation of essential steps to immediately reduce supplier risk, or by supporting the state of business today while generating agility for the future (Coupa, 2021). These actions are general and closely related to risk management. There is neither an indication of focusing attention on learning environments in and for the company, nor of the learning based on experience.

Another case is PMK Digital Learning (2021). They consider that business planning, leadership and management, complemented with metric measures, contribute to resilience. They do not consider learning from experience as a key element; while even promoting the "idea that adversity will pass, and the situation will improve."

They consider that the change in the environment is due to an isolated event and that the normality will return soon. However, experience of the last year teaches us that unexpected changes can last for years and there is no return to what was normal before. Instead of that, inside the same dynamics a new normal is built.

The idea that "adversity will pass" does not contribute to resilience. In the long run, it fosters self-deception and the anxiety of those who make up the organization. The latter, is due to the reality that sends the constant message that "adversity does not pass and the situation may not improve in the short term." A more consistent option is to encourage continuous learning and adaptation to reality.

PMK Digital Learning (2021) explains resilience more clearly but it does not link resilience theory to managerial practice. However, to entrepreneurs and senior management the approach this company makes about resilience is interesting. It urges them to see the firm as "a living and dynamic system that can continually learn, build stable relationships, and focus on a greater purpose". It is perhaps at this last point that this entity would establish the link to resilience by adopting the metaphor of complex adaptive systems, considering their limits and scope.

A third and final example of the confusion between resilience and management can be found in the Practical Handbook on Business Resilience (U.S. Chamber of Commerce Foundation, 2017). The manual focuses on risk management. It is interesting that it mentions the reasons why companies display "failure to understand the post-event environment" and "reluctance or inability to act in response to the new environment". However, it forgets these two key elements of resilience and it focuses on describing tools for risk management.

This manual uses the term "catastrophic" to justify resilience. It is a term or word that conveys the idea of resignation and victimization in the face of a change in the environment. Those who are victimized can hardly learn from reality or act rationally and innovate. Furthermore, the person that qualifies a phenomenon as catastrophic is the human being. Avoiding the classification as a catastrophe makes it easier to understand and learn from reality, as well as speeds an adaptation to the environment.

Avoiding the idea of "catastrophe" makes it easier to understand its temporary nature. There are short events with long-lasting effects, long-lasting events with short effects, and long-term events with difficulties in definition of the restraints in the maximization of their effects. It is important to know that unforeseen events can happen, and that the constant transformation of the environment is the norm. For example, a fire is something that happens in a short time, but its effects can last in the long term; a virus (COVID 19) is a prolonged event with short effects under system adaptation; climate change is a protracted event for which the moment of maximization effects countering is still unknown.

Business resilience has become important in recent decades due to climate change and the search for competitiveness (Lew *et al.*, 2016; Winnard *et al.*, 2014; Mclellan *et al.*, 2012; Avery & Bergsteiner, 2011; Lele, 1998; Ludwig, Walker & Holling, 1997).

The emergence of COVID 19 is seen as a part of climate change (Cole & Doods, 2021). From this perspective, the Practical Manual on Business Resilience (U.S. Chamber of Commerce Foundation, 2017) is useful to promote risk management but at the same limited in what refers to the support the company resilience.

It is however true that in times of constant change and uncertainty, a company whose management has increased its competitiveness, is classified as highly resilient. This is justified because at times when job losses, company closures and the fall of markets normalize (Argyriades, 2020), the existing companies with opposite results are mostly highly resilient companies as well.

There are scenarios in which an increase in competitiveness is obtained through the resilience of the individuals that constitute the company and therefore contribute to the entity resilience itself.

Note that this kind of company would be rated as resilient; but it would rather be the result of the complex conjunction of human actions, decisionmaking and activities that correspond to both the administration and the response of the individuals who make it up or interact with the company. The result is classified as resilient, only after such outcomes are reached.

The resulting process that can serve as an explanatory model of how resilience was achieved is the adaptive complex system framework, not the resilience one. This adaptive system represents administrative practice in its entirety. However, it is oriented towards constant change, error and failure, as well as continuous learning.

Due to the complex nature of reality, the multidimensional heterogeneity of each company and the high uncertainty regarding the future, in each case there would be a specific and unrepeatable model, even for the same company with previous successful experience.

Currently, the exercise of creating a descriptive-explanatory model of the reality of a company has too many limitations due to historical determinism. Thus, it is misguided to later derive it in a prescriptive model that leads other companies to achieve better results.

If the environment is constantly changing, for the same actions, in the same sequence of events and with the same perspective it is difficult to obtain favourable results under all circumstances. In other words, a resilient business process as the one prescribed in the business literature presents strong internal contradictions.

A process establishes routines, and changing reality requires their overcoming. Improvisation and learning from mistakes are key for quick adaptation. Thus, descriptive-explanatory models are important instruments to learn from experience. Nonetheless, there is no certainty that they can serve to prescribe future actions because they should be learned from the predominant environment. An exercise of the human capacity of anticipation without fears of error and failure is required.

This leads to the transformation of theoretical construction in the field of administrative sciences, so that they can better contribute to practice. More evidence and analysis regarding the understanding of mistakes and failure is needed and not so much on successes and successes in order to overcome availability bias (Kahneman 2017).

This forces a cultural and ideological change, because for individuals the failure is not so compelling as success. Perhaps this justifies the fact that

commercial literature is inundated with titles such as "positive impact", "benefits", "boosted competitiveness", "success". This can be as well an indication of this positivity bias in recent cultural mindset (Ehrenreich 2009).

In the business area there are many consulting firms that promote strategic planning, good administrative practices and other tools common to the enterprise under the label "increase resilience"; however, it is important to remember the difference between metaphor, tool, practice, and characteristic.

Resilience is a characteristic that not necessarily can be reached through certain administrative tools and practices. The metaphor of complex adaptive systems allows us to identify the limits that the companies' prescriptive models have in reality. What is sold in the consulting market as an engine for change may be more than anything just an anchor to the past. Especially, if the points outlined in this chapter are not considered. The costs to the company, the business sector and the economic system can be high.

In the same way, measuring resilience in companies (Kativhu, Mwale & Francis, 2018; Ayala & Manzano, 2014) leads to confusion; at best, with organizational performance (financial and market behaviour); and in most of the cases, with organizational development (planned change of the organization using behavioural science knowledge) (Austin & Bartunek, 2003; Worley & Feyerherm, 2003; Burke & Litwin, 1992; Porras & Robertson, 1986; Staw, McKechnie & Puffer, 1983).

Both organizational performance and change are tools that facilitate the analysis of the company's situation vis-à-vis the environment and contribute to improving its situation vis-à-vis reality. Resilience may or may not be an emerging business characteristic. Because it is a characteristic, it is expected to be found in a certain reality, which makes it even more subjective and difficult to measure.

Resilience is not the first attribute that is confused in the exercise of measuring it; especially when a measure is not always a prerequisite to comprehension and not everything that is measured is understood. It is probably so because of the reigning (wrongly attributed to Drucker) assumption that what gets measured gets managed. Nonetheless, hereby it is considered that it is more important to understand resilience than to measure it. If not, it is the company that ends up being measured. In companies, the understanding of resilience as an emerging characteristic and a quality of the people that make it up, facilitates the adaptation to the environment.

Resilience is the capacity of a dynamic system to adapt successfully to disturbances that threaten its function, viability, or development (Masten & Reed, 2002; Zolli & Healy 2012). Thus, complex adaptive systems make possible the

explanation of how and to what degree companies manage to adapt successfully under challenging circumstances.

"Resilience" has its origin in Latin, in the term *resilio* which means to go back, jump back, highlight or bounce (Kotliarenco, Cáceres & Fontecilla, 1997). Physically, resilience is synonymous with elasticity or buoyancy and expresses the ability of a body to recover its original state or position once those forces that tend to deform, displace or submerge it cease their action (Oriol, 2012).

It is also used to refer to the ability to have a successful development despite very adverse circumstances (Iglesias, 2006) and reflects the dynamic confluence of external and internal factors that promote positive adaptation (Truffino, 2010).

Resilience from an organization perspective is the result of administrative dynamics combined with uncertainty. An entity operates within a complex adaptive system. The resilience of an organization is related to the resilience of other economic agents with which it is linked (Medina, 2012).

In general, most of the studies that address organizational, or company resilience tend to include it or to link it closely with administrative functions or with strategic planning. This kind of research hardly considers resilience as a characteristic of a much more complex business phenomenon. Resilience is more an emerging characteristic that qualifies it. Additionally, it is attributed to an organization when it has overcome unforeseeable adverse circumstances.

In fact, the circumstances that lead to the qualification of a company as resilient are different. There are at least three situations of an entity: 1) it has a better position than before; 2) it has a better position compared to other companies; 3) its situation is better than what could be expected under certain circumstances, even though it is less advantageous than in the past.

CONCLUSIONS

It is worrying that resilience is confused with planning and other administrative practices. Indeed, there is a certain promotion of the idea that anticipation is the key to resilience. Meanwhile, when faced with the complexity of reality, the greatest negative impacts are associated with the least predictable challenges. Under this last perspective, the theory of complex adaptive systems is considered important. This theory leads to the understanding of the underlying principles or fundamental characteristics which are necessary for a better system adaptation.

This study offers a more convenient theoretical perspective than the prescription of scenarios that can be infinite given the many challenges that can arise. An adaptive system, even if it can learn from past experiences in order to improve its future results, requires that the agents that constitute it have a long-term vision and a capacity of analysis of what happens in the short term. The

non-linearity of complex adaptive systems encourages constant learning and an increasingly dynamic system, capable of responding quickly and efficiently to unexpected changes. Adaptive learning focuses on experience with an emphasis on mistakes and failures rather than successes.

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