

THE ROLE OF TECHNOLOGY FOR BUILDING RESILIENCE THINKING IN CORPORATE GOVERNANCE

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Abstract

Nowadays, the growing complexity of social systems and the faster technological evolution makes central the concept of resilience, defined as the ability of an organization to bounce back in the face of disturbance, the ability to persist in facing a black swan.

In this regard, the Viable Systems Approach (VSA), with its conceptualization of information variety, highlights the importance of requalification of knowledge endowment owned by an organization, in order to adapt and absorb the variability of its internal and external environment.

In this scenario, the technology and, in particular, the application of ICT tools (e.g., Big Data Analytics), also in the area of corporate governance, could enrich the information variety of subjects involved, lending them resilient thinking.

The key to achieving resilience is not much in people or technology itself but in the capability to harmonically combine both in a coherent whole.

1. INTRODUCTION

In organizational contexts, resilience is defined as the ability to adapt and absorb variations, changes, and disturbances, being able to manage the variability of environments (Horne & Orr, 1998; Hamel &

Valikangas, 2003; McDonald, 2006; Hollnagel et al., 2006). In contemporary socio-economic contexts, in which organizations face an unexpected change, this organizational capacity is even more required and becomes increasingly linked to the availability of intangibles (Foray, 2006; Volpato & Stocchetti, 2007; Greco & Silvestrini, 2009; Grazzini, 2008; Paoli, 2009).

Starting from the above, after a review of the literature on the concept of resilience (Section 2), the paper underlines, through the methodological lens of the Viable Systems Approach (VSA) (Golinelli, 2000, 2011; Barile, 2009a), the need to foster the information variety endowment of an organization (Section 3), through the contribution of new information units or the use of different interpretative schemes, with the aim of lending a resilient thinking.

Therefore, it is important to facilitate the process of knowledge acquisition and expansion necessary to face emerging problems.

In this scenario, the application of ICT tools (e.g., Big Data Analytics), also in the area of corporate governance, could amplify the information variety of subjects involved, becoming effective support to the decision-making processes (Section 4).

This is a new organizational imperative for an unlocking competitive advantage and maximizing value (Tallon, 2013).

Finally, Section 5 sets out our main conclusions and discusses future implications for research and study limitations.

2. ORGANIZATIONAL RESILIENCE AND ITS PAIR WITH TECHNOLOGY: A CORPORATE GOVERNANCE VIEW

Organizational resilience literature emerged from the study of organizations that experience unexpected events such as natural disasters or accidents that have significant consequences in terms of recoverability (Bigley & Roberts, 2001). Therefore, resilience is defined as the ability of the organization to bounce back in the face of disturbance, the ability to persist in facing a black swan (Contu, 2002; Comfort, et al., 2010). In other words, an organization should not merely aim to survive but also be able to reshape its structure and its functions maintaining the same set of goals it had prior the event (Välikangas et al., 2010; Bhamra, 2011). Therefore, in corporate governance¹ terms, a resilient organization effectively aligns its strategy, operations, management systems, governance structure and decision-support capabilities so that it can uncover and adjust to continually changing risks, endure disruptions to its primary earnings drivers and create advantages over less adaptive competitors (John & Senbet, 1998; La Porta et al., 2000; Aguilera & Jackson, 2003).

¹ Corporate governance is a set of mechanisms through which outside investors protect themselves against expropriation by the insiders (La Porta, 2000). It is a means by which various stakeholders interact among each other and exert control over a corporation by exercising certain rights (John & Senbet, 1998).

A resilient organization establishes transparency and puts in place controls for CEOs and boards to address risks across the extended enterprise. It can withstand improper or fraudulent employee behaviour, IT infrastructure failures, disruptions of interdependent supply chains or customer channels, adverse economic conditions across markets and the myriad other discontinuities companies face today.

Therefore, given the evidence that each organization will face, during its life, unforeseen situations or risk to fail, resilience is a desirable property and also strategically advisable (Välikangas, 2010). However, it could be costly as well. To give an example, firms can protect themselves against supply chain disruptions by spreading their purchasing of inputs across multiple suppliers, but on the opposite, this implies higher costs. Moreover, to push resilience, firms can develop a variety of standby teams to deal with a variety of unexpected problems (e.g., quality failures, unusual customer requests, etc.), but this will also add to their overheads (Lampel et al., 2014). Thus, building resilience in organizations becomes a process of balancing costs against potential risks. In so-called high-reliability organizations (Weick & Sutcliffe, 2007) costs clearly take second place to achieve resilience. These organizations, as Weick and Sutcliffe (2015) point out, are preoccupied with failure. Therefore, structuring operations around resilience makes sense in spite of much higher costs. For business organizations that do not face the same type of risks, "achieving resilience for its own sake without regard to costs is clearly not a practical option" (Lampel et al., 2014). Instead, these organizations rely on the resilience of their structures and processes (that already exist) but primarily operate to meet the tasks of making products and serving customers. This resilience is latent by contrast to designed resilience which organizations develop specifically to address threats that can potentially damage their viability (Weick 1990, 1993). Researchers have focused on several organizational factors that contribute to latent resilience.

Structural flexibility is one cited driver of latent resilience (Bigley & Roberts, 2001; Lin et al., 2006). Organizations that are structurally flexible, in fact, are more effective to adjust when faced with unforeseen contingencies (e.g., rapid fall in demand by reallocating resources).

Another factor that improves resilience is the presence of slack resources, specifically cognitive slack (Barile et al., 2017a). Organizations often accumulate slack resources for reasons that are not directly linked to improving resilience. Nevertheless, this slack can be mobilized to meet urgent needs when adverse contingencies arise unexpectedly. Both structural flexibility and slack represent macro properties which positively correlate with resilience (Durodie, 2003).

Scholars have also examined micro properties that contribute to push organizational resilience. Marchington and Kynighou (2012), for example, underline the relevance of a high level of employee engagement that enables firms to successfully differentiate themselves from their competitors during a crisis. Gittell and Douglass (2012) argued that "relational reserves", that is interpersonal bonds among employees, are pivotal for dealing with crises. Moreover, Roberts et al. (1994) argued

that the locus where decisions are taken and the subject involved in this - the Governing Body (Barile, 2009b) – also has an essential impact on organizational resilience. Organizations in which top management centralizes decision-making process will be less resilient than organizations in which decision-making authority is spread and allowed to migrate closer to where decisions are made (Cox, 2012). Thus, the growing body of research on organizational resilience has firstly focused on exploring internal organizational factors that directly contribute to pushing resilience. Then, more recently, attention has turned to the relationship between resilience and external stakeholders. Specifically, researchers have begun to ask whether patterns of ownership and governance encourage or discourage the development of internal organizational processes and paths to increase resilience. In this direction, recent stream of research examined resilience in family firms (Chrisman et al., 2011). Kachaner et al. (2012), for example, argued that resilience is one of the main dimensions that distinguish family from non-family firms. Amann and Jaussaud (2012) investigated this issue by looking at the resilience of Japanese family vs. non-family firms during the Asian crisis of 1997 (it was used a sample of 98 firms of each type). They concluded that family firms "resist the downturn better, recover faster and continue exhibiting higher performance and stronger financial structures over time" (p. 203). Therefore, the corporate governance structure creates institutional foundations that allow for the growth of organizational factors that directly contribute to the emergence of resilience (Connelly et al., 2010).

3. FIRMS AS INFORMATION VARIETY ENDOWMENT

The proposed contribution is also based on some key conceptualizations of the Viable Systems Approach (VSA) (Golinelli, 2000, 2011; Barile, 2009a), a theoretical framework for investigating social phenomena.

Specifically, in accordance with the VSA: a) each individual or organization, as a viable system, is considered as an information variety, defined through the dimensions of information units, interpretative schemes (general and synthesis) and value categories; b) knowledge is considered both from a static point of view, as an endowment, and from a dynamic point of view, as an ongoing process.

Information units, interpretative schemes (general and synthesis) and value categories are expressive factors capable of conditioning the evolutionary dynamics of knowledge.

The work, in particular, is focused on the concepts of:

- Information units: a set of data that contribute to the formation of elements of completed thinking. The individual can process and transform them into information related to defined processes of knowledge;
- Interpretative scheme understood as a model of knowledge and representative of the organization of information within a viable system.

Interpretative schemes attribute intentionality to thinking, transforming data from simple signs to meaningful information. The interpretative schemes recover a context, a perspective in which data acquire meaning and become information (Barile, 2009b).

Moreover, according to the Ashby's Law (1957, 1958), the understanding of a complex system (requisite variety) depends on the Information Variety endowment owned by the observer.

The higher the complexity of a system (expressed in terms of its variety), the higher the level of the information variety (i.e. richness and diversity of the information endowment) needed.

Through the interpretative scheme, generic data is transformed into contextualized information. In particular, this process takes place through the activation of general schemes which, by abstracting from the specific context, seek new solution paths, activating different synthesis schemes from time to time.

The relationship between general schemes and synthesis schemes found an antecedent into the Resource-Based View (RBV), specifically in the relationship between capabilities and competencies (Wernerfelt, 1984; Barney, 1991).

In this direction, Spencer and Spencer define competencies as a set of intrinsic characteristics possessed by an individual, causally related to performance (Spencer & Spencer, 1993); on the other side, capabilities are the abilities which allow individuals, groups, organizations and societies to be resilient over time, creating new skills, new knowledge, new way to do things. In their pioneering works, Teece, Pisano and Shuen (1997, 2000) define these capabilities as "dynamic", abilities which allow an organization "to reconfigure, redirect, transform, and appropriately shape and integrate existing core competencies with external resources and strategic and complementary assets to meet the challenges of a time-pressured, rapidly changing Schumpeterian world."

Therefore, the interplay between competencies (i.e. vertical and specialized knowledge) and capabilities (i.e. horizontal knowledge) is central in new general schemes creation and in the management of complexity (Pralhad & Hamel, 1990; Nonaka & Takeuchi, 1995; Teece et al., 1997; Saviano & Caputo, 2013).

The development of dynamic capabilities, descriptive of the "breadth" of knowledge, is fundamental for adaptation within a constantly evolving context (Nonaka & Takeuchi, 1995).

Therefore, general schemes represent the ability to interact with other realities, to exchange, share and transfer knowledge, creating the right conditions to originate or maintain competitive advantages.

On the other hand, synthesis schemes constitute the knowledge already possessed and consists of technical skills.

Present technological and social development requires competencies, but above all capabilities that can guide and dominate this dynamics, favouring adaptation and anti-fragility to different situations (Taleb, 2012).

Often, the error is in hyper-specialization: "the relationship between capabilities and competencies takes the form of the relationship between

power and act, emphasizing the relevance of the former for the purposes of the latter" (Barile et al., 2013).

We can conclude that competencies refer to specific schemes as the capabilities refer to general schemes. Therefore, simple problems will be solved through manual knowledge, with no change in competencies; complicated problems will be solved focusing on hyper-specialization of competencies; complex problems will be faced focusing on capabilities (general scheme), competencies reformulation and construction of new specific schemes (Barile et al., 2015): it is a virtuous vortex.

In other words, we are faced with a process of endless learning that leads to a progressive refinement of competencies and capability building (Barile et al., 2013; Barile et al., 2015; Simone & Calabrese, 2017). Aiming to shed light on the role of innovative technology in building resilience, in the next paragraph the paper will focus on the Big Data Analytics in facing corporate governance issues.

4. FOSTERING THE INFORMATION VARIETY IN CORPORATE GOVERNANCE VIA INNOVATION TECHNOLOGY

Innovation is not absolute new knowledge. Innovation (of products, processes, managerial practices, and strategic vision) often springs from a new way of linking and recombining extant knowledge. Inventing and innovating involve the capability of coupling fragments of 'old' knowledge in different, original, new ways - knowledge that is stored in the collective memory and in the enormous, fascinating knowledge endowment accumulated throughout human history (scientific knowledge, traditional knowledge, natural language). For these characteristics, capabilities are critical in order to increase the survival of an organization in conditions of complexity. They enrich organizations with the necessary variety (Barile et al., 2012b) and they expand the space of possible alternatives (competitive or cooperative; strategic or organizational; short- or long-term perspectives). They allow individuals, groups, and organizations to generate connections and to explore and exploit additional knowledge. Thus, capabilities enrich the number of options available to an organization, maintaining or improving its ability to survive (Golinelli, 2010).

In a complex landscape, organizations compete with other systemic entities by building competitive advantage, not through the control of resources but through the development of new combinations of competencies that are firm-specific and then inimitable. In rapidly changing contexts, the mechanisms of the formation of competitive advantage are reinterpreted on the basis of the development of new competencies through a structured process of combining and recombining basic capabilities. This process is embedded in the operative structure of the firm and guided by decision-makers endowed with appropriate dynamic capabilities (Teece et al., 1997).

Moreover, new levers are assuming a pivotal role in fostering resilience technology is one of those. ICTs have the potential to support the Governing Body in addressing the challenges of a turbulent

environment and maintaining resilience (Donnellan et al., 2006). In this direction, Big Data Analytics represents a new era in data exploration and utilization (Chen et al., 2012).

Big Data Analytics are tools to analyze Big Data (huge amount of data of different types – structured/not structured, text, numbers, images, etc. – coming from different digital devices and services) to extract useful organizational knowledge (sentiment on a product, performance or rules of a process, preferences on a service, forecast of the demand, etc.). According to Martinez et al. (2017), they can imply apparent or real (and effective) changes of organizational processes due to the type of changes they determine on the organizational structure (Barile, 2009a). Big Data Analytics have been seen not just as a way to produce organizational knowledge but to integrate it (Kaivo-oja et al., 2015). Moreover, several authors advocated them as a tool to build resilience (Data-Pop Alliance, 2015). In other studies, Big Data Analytics have been investigated for their inner resilience which can impact the disaster recovery and business continuity of an organization depending on the expertise of the employees involved in their usage (Rodger et al., 2015).

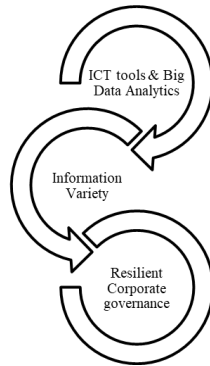
Furthermore, regarding decision-making processes, decisions will increasingly be based on data and algorithms rather than on experience and intuition (McAfee & Brynjolfsson, 2012) and for this scope several techniques, technologies, practices and methodologies have already been used in sub-processes related to data-driven application that comprehends transmission, storage, analysis, visualization and interpretation (LaValle et al., 2010; Chen & Zhang, 2014). In this direction, data mining techniques permit to extract useful information from large datasets or streams of data (Fan & Bifet, 2013) and can reveal insights, supporting decision-making. Indeed, from the data mining perspective, the data-driven model involves demand-driven aggregation of information sources, mining and analysis, user interest modeling, and security and privacy considerations (Wu et al., 2018). Consequently, through data mining techniques, it is possible to analyse structured and unstructured data and create information, a strategic activity for creating knowledge and value for companies (Rowley, 2007; Cricelli & Grimaldi, 2008). All these actions flow from a value chain framework that enables to manage data holistically from capturing to supporting decision-making and the variety of stakeholders' interests (Miller & Mork, 2013). In particular, big data application can help in finding models of corporate governance that maintain a balance between value creation and risk exposure, unlocking competitive advantage and maximizing value (Tallon, 2013). Therefore, big data carry significant promise for improving governance issues, especially because it provides decision-makers – such as corporate executives – experimentation, structured feedback processes (e.g., "crowdsourcing") and hypothesis-driven inquiry. By transforming data into information, the decision process may be significantly improved. More research in the field of management is necessary to discern which processes are effective for supporting better decision making (Tihanyi et al., 2014). Eventually,

regarding the problem of manipulation of the financial reports, considering the normal audit as procedures too expensive for a huge volume of data, the analytical procedures based on big data definitely can improve the analysing process (Sadasivam et al., 2016).

In this way, it is possible to overcome the process usually adopted by decision-makers and based on uncompleted data and improve organizations resilience by amplifying the information variety of its Governing Body and building the capacity to better read the context (Barile, 2009b).

Specifically, as mentioned in the previous paragraph, we highlight the importance of knowledge characterized by both functional/disciplinary skills and the ability to adapt knowledge (Barile et al., 2012a). Decision-makers have to constantly rework competencies, acquiring new specific knowledge to be exploited in a complex and constantly changing context. Therefore, as depicted in Figure 1. for corporate governance ICT tools and big data techniques can be central in facilitating the process of knowledge acquisition and expansion and, therefore, enriching the variety of information. In this way, the governing body is able to acquire a resilient thinking and is able to adapt to changes in the internal and external environment of the organization.

Figure 1. The interplay between ICT tools, Big Data Analytics and information variety in fostering resilience



Source: Authors' elaboration

5. FINAL REMARKS, LIMITATIONS AND FUTURE RESEARCH

Nowadays, new levers are assuming a pivotal role in fostering resilience. Technology is one of those. In fact, technological innovations are becoming more refined by using software that allows them to evolve with a predictable consistency (Arthur, 2009), being able to develop in the context of sudden and unexpected changes of direction. Such technologies allow new recombinations of resources (Schumpeter, 1934) and new vicar ways to achieve the multifaceted institutional goals of a firm (Berthoz,

2013). However, this same process could also produce economic and organizational diseconomies (Barile et al., 2017a; Simone et al., 2017a, 2017b). For example, technology could provoke an unpredictable deviation from codified firms' procedures. Procedures and protocols, in fact, act as firms' genetic memory (Hayek, 1979; North, 2006) and allow greater predictability and uncertainty reduction in the interaction of the firm with its internal and external stakeholders (Myers, 1967; Sutton & Dobbin, 1996). They build an implicit, pervasive order which sustains the design of a more consistent decision making framework (Simon, 1947; March, 1994).

Thus, if technology potentially amplifies firms capabilities both at individual and organizational level by providing new tools and techniques (Barile et al., 2017b) and building the infrastructure which makes individuals/organizations able to absorb change and disturbance and still maintain a positive relationship with their environment (Weick & Sutcliffe, 2007; Arthur, 2009), its effect finds a counterbalance in firms command-control mechanisms, demanding an effort to be led (Barnard, 1938; Gouldner, 1954; Crozier, 1963, 1971; Barile et al., 2017a; Simone et al., 2017a). This tension is a further central dimension to foster corporate resilience.

An example of this evidence relies on the concept of Big Data Analytics. Big Data Analytics has been seen as a way not just to produce organizational knowledge but better to integrate it (Kaivo-oja et al., 2015), and several authors advocated them as a tool to build resilience (Data-Pop Alliance, 2015). Big Data Analytics has also been investigated for their inner resilience which can impact the disaster recovery and business continuity of and organization depending on the expertise of the employees involved in their usage (Rodger et al., 2015).

This interpretation has also several managerial implications which open multiple future research paths. One relevant implication is that the use of Big Data Analytics may equip the organization with the cognitive variety to effectively survive in conditions of complexity. The principle of requisite variety, originally formulated by Ashby, affirms that the internal variety of self-regulating systems should match the external variety if the system is expected to adequately respond to external challenges. The principle of requisite variety is not an abstract concept. Rather it is a concrete managerial principle: if an organization is not capable to change by adapting itself in response to both internal and external changes, it will not be able to survive. Moreover, slack is an additional capability which can create opportunities for growth and innovation. The horizontal bar of the "T" is a true cognitive slack resource that generates a virtuous redundancy in the organizational system, as it multiplies its cognitive frames (general schemes). By promoting T-shaped managerial profiles, for example, the information acquired via Big Data increases their variety (Barile et al., 2015). These characteristics are crucial in the knowledge economy. Single loop learning can be a trap: creativity, lateral and wishful thinking are essential engines of the double loop learning and the reconfiguration of general schemes that allow the organization to rethink and reinvent

itself (Senge, 1990). The key practical issue, however, remains how to develop the horizontal bar of the T. In fact, "Companies can accumulate a large stock of valuable technology assets and still not have many useful capabilities" (Teece et al., 1997, p. 515). Here is a call for researchers: to direct the development of business models which could really 'serve' current but also future needs of society, economy and environment. A shift to a more flexible and responsible view of organizations, less focused on the 'certainty' of their formal structures and open to unpredictable outcomes. A view which is capable of welcoming complexity as a source of opportunities instead of threats. Through the exploration of the unknown and the pursuit of innovation in a creative manner, the potential of resources, especially of people but also of technology and information, can be more successfully exploited in a sustainable manner. Therefore, the key to achieve resilience is not much in people or technology in themselves but in the capability to harmonically combine them within a coherent whole, i.e. in the dynamic capabilities.

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