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Organizational design as a learning enabler: A fuzzy-set approach☆

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ABSTRACT

In the literature on organizational learning, very few empirical studies attempt to show how organizational design can enable or hinder learning in organizations. This study uses a fuzzy-set technique (fuzzy-set qualitative comparative analysis: fsQCA) as an initial approach to analyzing different design variables and how they affect organizational learning. The results prove that the mechanical structures are suitable for organizational learning, especially in large companies. Furthermore, qualified workers should have autonomy to learn.

1. Introduction

Even though the processes and outcomes of learning in organizations receive much attention from researchers, the study of organizational design as an enabler of learning requires further investigation. Empirical studies that analyze the design variables aiming to engender learning are uncommon. The objective of this study is to analyze whether the different elements of organizational design, such as complexity, centralization, and formalization influence or enable learning within the organizational environment by using fuzzy-set qualitative comparative analysis (fsQCA).

Although researchers use a broad variety of statistical techniques, those techniques correspond to two main categories: those using a large sample and those using a much smaller sample. Studies in each category use quantitative or qualitative methods, respectively, whereas few studies use a mixed methodology. Fuzzy-set qualitative comparative analysis (fsQCA) is a relatively recent technique, particularly suitable for studies comprising small to medium-sized sample because of the difficulties in obtaining large samples of firms willing to share relevant internal information.

The study contains the following sections: following the introduction, the first section provides a description of the variables for exploration such as organizational learning, whereas the second section examines the causal conditions that compose the basic elements of organizational design. The third section describes the method for the fuzzy-set analysis (fsQCA), and the study concludes with an interpretation of the results and the subsequent conclusions.

2. The influence of organizational design on learning

During the last decades, many studies focus on learning. The term "learning" from an organizational perspective refers to the development of the relationship between past events and the efficiency of current and future ones (Fiol & Lyles, 1985). These changes must be long lasting and, as Lyles (1988) highlights, learning is the result of actions and changes in the state of knowledge. Learning in organizations is a collective phenomenon that relates to the acquisition and creation of competences that, to a greater or lesser extent, modify the way organizations manage situations, as well as situations themselves (Koenig, 1994). Organizations must develop a capacity for learning in to compete successfully in the market.

The capacity for organizational learning can represent a source of competitive advantage for the firm (De Geus, 1988; Stata, 1989) because this learning can represent the ability to do things better than competitors. Stalk, Evans, and Shulman (1992) state that a wide variety of skills can transform certain key processes in the firm regarding strategic capabilities to lead the firm toward competitiveness and a degree of success. This capability depends upon the firm's capacity to reduce the gap between knowledge accumulated in the past and knowledge that will be necessary to adapt to or anticipate the future environment

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(Zack, 1999). The greater the degree of uncertainty, the greater the need for knowledge (Dodgson, 1993) and learning will be.

A firm's capabilities relate to how a firm deploys and combines its resources (Amit & Schoemaker, 1993). Those capabilities depend on the confrontation between the organization and its environment, and on the transfer of knowledge, and also on the characteristics of the knowledge that affect how easily members of the organization learn. The aspects that affect this capability are organizational, as that effect does not merely refer to the identification and assimilation of knowledge in organizations, but also the organization's ability to exploit that knowledge, as Cohen and Levinthal (1990) propose.

Deep changes in the relationships between organizations and their environments can entail a total restructuring of the organization. Organizations change by transforming and restructuring their resources and capabilities (Garud & Nayyar, 1994). One of these transformations involves deciding which type of organizational structure is the most propitious for achieving a competitive advantage. Some authors, such as Szulanski (1996), state that competitive advantages that result from knowledge transfer and learning can disappear when a sterile organizational context surrounds them. Although the structure itself does not guarantee the existence of learning, a wrong choice or decision can seriously hamper or endanger this process.

One of the first studies on the factors that influence the context of learning in organizations is that of Fiol and Lyles (1985). Revilla and Pérez (1998) distinguish between support tools that influence the process and the enablers of organizational learning, where organizational learning acts as a support for the interactions between individuals and groups within the organization. Bapuji and Crossan (2004) also consider structure as a learning enabler. Currently, the literature recognizes this aspect (Fang, Lee, & Schilling, 2009; Hao, Kasper, & Muehlbacher, 2012; Liao, Chuang & To, 2011; Ribeiro-Soriano & Urbano, 2010; Steiger, Hammou, & Galib, 2014).

Within the area of organizational design, some studies suggest that certain organizational design variables act as enablers of learning. Relevant research, such as Kim's study (Kim, 1993), points to autonomy as one of the necessary characteristics for organizational learning to occur. Hedlund (1994) also examines flexibility and autonomy in this context, claiming that design is an essential element for achieving flexibility, along with possessing highly skilled human resources.

Other authors propose specific structures for knowledge transmission. The best known of these is the hypertext model of Nonaka and Takeuchi (1995) and the N-form corporation, which Hedlund (1994) proposes. Swieringa and Wierdsma (1992)) identify different types of structure in firms that facilitate different kinds of learning. According to Grant (1996), the integration of strategic knowledge into the organization entails two different aspects. On the one hand, the firm must establish flatter (low complexity) structures based on teamwork, where the emphasis lies on the role of employees in a more effective articulation of knowledge. On the other hand, the firm concerns the decentralization of decision making that relate to knowledge acquisition. Other authors state that for a higher level of learning to take place, the organization should adopt an organic structure with few hierarchical echelons and hence lower organizational complexity (Hodge et al., 2003), increasing decentralization and reducing formalization.

2.1. Organizational complexity

Regarding the role of hierarchy, the fundamental organizational issue lies in achieving full coordination of the action. A more participative management style allows the organization to access and use individual knowledge appearing in the lower echelons of the organization (Wruch & Jensen, 1994), whereas the higher levels require greater intervention and participation from specialists.

Many organizations seek to increase cooperation among individuals, redesigning their structures to be flatter, based principally on team work, with decentralized authority to reinforce the role of low-level employees (Jones & George, 1998).

Firm size is one of the variables that provokes the biggest discussion. For most academics, firm size is a factor to bear in mind. According to Schumpeter (1934), large firms are more innovative than small ones. Recently, authors such as Tsang (1997) or Lei, Slocum, and Pitts (1999) associate larger size with a greater capacity for learning. Conversely, other authors such as McCann (1991) or Damanpour (1992) claim that small organizations may be more innovative given their higher flexibility and their greater capacity for adaptation and improvement. Recent trends among organizations indicate that a reduction in size is the most popular option. The concept of size may be evolving. Firms with increasingly lower number of employees, although not small, generate greater learning because of the advances in information technology and increasingly automated processes. Firm age and the capacity for learning may have a positive relation because of the accumulative effect of learning (Benavides, 2007; DiBella, Nevis, & Gould, 1996; Dodgson, 1993; Guzmán-Cuevas, Cáceres-Carrasco, & Soriano, 2009). Size and age are important variables for structure (Hall, 1996) and affect learning capacity either directly or indirectly.

H1a. : A low level of complexity in organizational design enables learning in the organization.

H1b. : Large size enables greater levels of learning in the organization.

2.2. Decision making

The locus of decision making, from the perspective of organizational learning, has two major implications: the organization needs to decentralize decisions building on idiosyncratic or specialized knowledge, while centralizing those decisions that require more general knowledge. Decentralization reduces the burden and responsibility for high-level management so that the organization becomes more sensitive to changing conditions, thereby reducing the number of managers necessary to direct the firm.

Autonomy or freedom guarantees the necessary flexibility to acquire, relate, and interpret information in the search for new knowledge (Davenport, Jarvenpaa, & Beers, 1996), although autonomy involves a certain amount of risk as employees can use resources less efficiently if those resources are not their own. As the creation of new organizational knowledge building on sharing knowledge becomes more widespread in the organization, the firm must endow its members and teams with greater autonomy, otherwise running the risk of generating only low-level knowledge (Wruch & Jensen, 1994). Autonomy drives personal commitment and the organization must, in turn, manage this commitment (Nonaka, 1994), with a view creating a spirit of achievement and improvement, where employees see themselves as colleagues rather than competitors.

Organizations must allow their members to act with the greatest degree of freedom possible to increase the likelihood of new opportunities. Those organizations that foster learning tend to *decentralization* (s & Chang, 2012). In cases where decentralization exists, employees must have the capability to judge and take decisions to solve complex, specific problems. This proviso means that workers need to possess enough knowledge and experience to incorporate successfully the use of new technologies into their daily work, to participate in developing innovative products, to improve the current ones, and to solve any problem that might arise after establishing new procedures. Workers with adequate training can make the most suitable decisions for their tasks because their training provides them with specific knowledge and qualification to make judgments and decisions on complex issues.

H2a. A high level of employee autonomy enables organizational learning.

H2b. A high level of decentralization in organizational design enables organizational learning.

H2c. A high level of training among employees enables organizational learning.

2.3. Formalization

Formalization is a way to ensure that the people and departments that carry out highly different tasks coordinate their activities through the creation of formal rules, policies, and procedures. Once the management understands that the organization's employees secure a sufficient amount of knowledge and capabilities and possess suitable judgment and self-control, the organization is likely to relinquish a high degree of formalization (Hodge et al., 2003). The world is changing rapidly, and because of the uncertainty these changes provoke, managers are unable to foresee all the possible situations and conditions. In situations with an excess of formalization, managers must seek to fight against the excess of rules and regulations (Daft, 2007).

Organizations willing to acquire and learn knowledge should allow their staff to act as freely as possible, with the least number of rules, which might restrict their chances of improvement or the possibility of generating new knowledge, and the creation of new opportunities, innovations, and products, that is, a higher level of learning.

H3: A low level of formalization enables organizational learning.

3. Empirical analysis

Researchers start using qualitative comparative analysis (QCA) at the end of the 1980s and the start of the 1990s (Berg-Schlosser, De Meur, Rihoux, & Ragin, 2009). QCA is a particularly interesting technique for management analysis where sample sizes are small. This type of technique allows an in-depth analysis of how causal conditions contribute to a particular result and builds on a configurational understanding of how a combination of causes leads to the same series of results, and more importantly, QCA is suitable for analyzing high levels of causal complexity.

In sum, in the following axioms, as Lieberson (1991) points out:

(a) Generally, a particular "outcome" results from a combination of different relevant causal conditions and not from the presence of one or several individual conditions.
(b) Different combinations of causal conditions may lead to a same result.
(c) Depending on the context and potential combination with other conditions, an identical result can derive from the presence of a particular causal condition or from its absence.

The combination of QCA with the premises of fuzzy-set theory yields the development of fuzzy-set qualitative comparative analysis (fsQCA). Ragin's (2000) book *fsQCA* describes a case using the combination of "causal conditions" and the "outcome." fsQCA allows researchers to overcome the limitations of conventional QCA by enabling the classification of cases and conditions through the identification of the intervals or categories of membership (Ragin, 2008, 2009). These intervals allow for the classification of excessively complex phenomena to describe them in quantitative terms. FsQCA is an alternative tool to traditional quantitative methods.

FsQCA is adequate for this study because of two fundamental reasons. On the one hand, to analyze whether organizational design enables learning "in" organizations or not, fsQCA does not solely analyze the isolated effect of two or more variables on the result of interest but also explores all the possible (intensifying or moderating) interactions between these variables. On the other hand, this method allows researchers to work with medium-sized samples without having to obtain a large number of individual cases (Ragin & Rihoux, 2004; Ragin, Shulman, Weinberg, & Gran, 2003). This study uses the statistical software package fsQCA 2.5 for its analysis (Ragin & Davey, 2014).

3.1. Sample and calibration

The data for the analysis come from the ZEPHYR international database, containing 1837 firms from around the world that comply with the characteristics that this study requires. A total of 231 firms were unreachable, and despite forming a part of the consulted database, 356 organizations declared that learning did not take place in their organizations. The study initially comprised the 1210 firms; the final sample consisted of 74 firms (51 Spanish firms and 23 from the rest of the world), which said they had learned.

The outcome variable (fs_rdo) for analysis in this study is the achievement of organizational learning resulting from a particular type of structure. Two questions measure this outcome. First, to what extent has learning itself been an objective? Second, has learning improved the competitive position of the firm? Respondents use a five-point Likert scale to answer this set of questions.

The calibration using "the direct method" that appears in Ragin (2008) implies transforming the interval, using a crossover point as an anchor to calculate the deviation scores, and taking the values of pertinence as the upper or lower boundaries. To calibrate these observations, transforming them into two measures, whose values are between 0 and 1, is necessary. These values do not represent probabilities but rather transformations of the quantitative scale in degrees of integration within the category (Ragin, 2000; Schneider, Schulze-Bentrop, & Paunescu, 2010).

In this case, applying the direct method of calibration requires establishing three values. The threshold for complete inclusion within a category or full membership (where learning takes place) has a score of 4, the threshold that indicates full exclusion from the category or full non-membership is 2, and the crossover point or anchor, indicating the maximum point of ambiguity, is 3. These variables' names are (fs_r1) and (fs_r2). Applying the operator "and" to these two variables, the variable fs_rdo appears.

Now, considering the causal conditions, that is, the conditions that form a part of organizational design, these conditions are complexity, decision making, and formalization. The questions for this block also correspond to values on a five-point Likert scale.

Regarding organizational complexity (com), the measurement of vertical differentiation considers the number of hierarchical echelons in the organization, taking into account the longest line between the CEO and the lowest ranked employee and horizontal differentiation through the number of departments that exist in the firm so that the total differentiation is the sum of the two (Fiss, 2011; Singh, 1986). For the fuzzy set of firms with a high degree of administrative complexity, firms in the 1st percentile (three or more levels and three functions) are fully out, and firms in the 99th percentile (seven or more hierarchical echelons and more than 17 functions) are fully in. The crossover point is the product of the 50th percentile values of each of the individual measures (five hierarchical echelons with 9 functions), which is largely consistent with the mean score of prior studies using this complexity measure (Fiss, 2011). The new causal condition resulting from the calibration process is (fs_com).

In terms of size, the classification of the firms according to European Union regulations is (1–9, 10–49, 50–249, and over 250). This means that the classification of firms of over 250 employees have a code as fully in the set of large firms. Those with less than 10 employees have the fully out code; the midpoint is 50 employees, in a similar vein to Fiss (2011). The new causal condition subsequent to calibration is fs_size.

Three questions measure decision making: first, whether those that run the different units in the firm enjoy sufficient autonomy to make decisions that pertain to that unit (aut). Second, whether a tendency

exists in the firm to make decisions at the lowest possible level of hierarchy; in other words, if decentralization exists (des). Third, whether the firm employs trained workers with a considerable degree of autonomy (tra).

Respondents answer the three questions with either 0 or 1; 1 when the employee has autonomy and 0 when the reverse is true. Regarding decentralization, 1 means total decentralization in the firm, whereas a 0 means no decentralization. For the third question concerning trained workers, 1 means that they belong entirely to the group of skilled workers and a 0 indicates that they do not belong to this group at all.

In this case, applying the direct method of calibration requires the establishment of three values: first, the threshold for complete inclusion within a category (with a score of 4); second, the threshold that indicates full exclusion from the category (2); and third, the crossover point or anchor, indicating the maximum point of ambiguity (3), which gives the new causal conditions (fs_aut), (fs_des), and (fs_tra).

Three items measure formalization: (a) whether detailed job descriptions exist (for1), (b) whether the firm requires strict compliance with established rules and standards (for2), and (c) whether workers have scant freedom to deviate from established norms in their work (for3). This study applies a direct method for calibration, which requires establishing three values: first, the threshold for complete inclusion within a category (with a score of 4); second, the threshold that indicates full exclusion from the category (2); and third, the crossover point or anchor, indicating the maximum point of ambiguity (3), which gives the new causal conditions (fs_for1), (fs_for2), and (fs_for3). Applying the operator "or" yields one causal condition (fs_for).

4. Results

4.1. Necessary conditions and functional equivalents

This section shows whether any of the causal conditions is a necessary condition for the outcome. A condition is necessary when the outcome constitutes a subset of the cases of that causal condition (Ragin, 2006; Schneider et al., 2010). To gauge the degree to which observations comply with the strict rule the use of consistency measures is necessary in fsQCA. A consistency score of "1" indicates that the combination of causal conditions complies with the rule in all cases. Conventionally, a condition or a combination of conditions is necessary or almost necessary if the consistency score is over the 0.9 threshold (Table 1).

In this study, the principal argument is that for learning to take place in a firm, creativity is an essential element, and along with creativity, the autonomy of the trained worker because creative workers can create new things and improve and innovate. In addition, taking into account Schumpeter's argument that large firms are more innovative than small ones, this study establishes the relationships among these causal conditions. Technically, establishing the existence of such relationships implies testing whether two or more conditions united by an "or" logic are a necessary condition for the outcome. Table 1 contains the results for the replaceable necessary conditions for two expressions (fs_tra + fs_size) and (fs_aut + fs_size). These expressions give a consistency score of 0.95 and 0.96, respectively, indicating they are necessary.

Table 1
Analysis of necessary conditions.

Condition	Consistency	Coverage
fs_com	0.74	0.86
fs_size	0.81	0.82
fs_aut	0.82	0.87
fs_des	0.37	0.90
fs_tra	0.86	0.85
fs_for	0.84	0.84
fs_tra + fs_size	0.95	0.80
fs_aut + fs_size	0.96	0.80

Presence of either condition or of both conditions

The measurement that indicates whether a necessary condition is trivial or not is the coverage ratio, which in all cases exceeds 0.80, a long way from the 0 score, which implies that these expressions are not at all trivial for the outcome (Ragin, 2006; Schneider & Wagemann, 2007).

4.2. Sufficient conditions and solution analysis

After establishing the necessary conditions, the next step is to verify the conditions of sufficiency. This process requires creating the most suitable types by converting the set of values of pertinence for the causal conditions "into fuzzy-set values." A causal condition is sufficient to lead to the outcome if, for each case, the fuzzy membership value of the causal condition X does not exceed the fuzzy membership value of the outcome Y (Ragin, 2000; Schneider et al., 2010). This consideration also applies to the conditions brought about by the logic "and," for example, (fs_size*fs_aut).

The results show the causal paths, which are in fact combinations of these causal conditions. Three of these causal paths are empirically important. Empirical importance stems from the degree to which the causal condition or combination of conditions explains the result. Ragin (2006) suggests that two scores, the raw coverage and the unique coverage assess empirical importance. Raw coverage refers to the size of the overlap between the size of the causal combination set and the outcome relative to the size of the outcome set (Ragin, 2006). When the unique covariance differs from 0, more than one path exists. In this case, the overall solution consistency is 0.86; and the overall solution coverage is 0.78, indicating that the three causal paths cover most of the outcome. The raw coverage for single causal paths ranges from 0.66 to 0.23 (Table 2).

Regarding the first configuration, learning is easier in large firms because of the greater variety in procedures, tasks, and specific knowledge despite the existence of a high level of formalization. However, members need to be creative employees or teams with a high level of autonomy to establish the necessary changes and improvements in all firms, even modifying rules and regulations that the organization establishes in its routines. For this scenario, these workers need the adequate qualification to make their own decisions at the right time, regardless the degree of complexity and decentralization in decision making that may exist.

In the second configuration, size appears as an extremely important causal condition for organizational learning in comparison to the other conditions, aside from being a necessary condition. In other words, large firms have a greater likelihood of learning than smaller ones, although having a certain degree of autonomy among skilled employees is also important in firms of a certain complexity and formalization.

In the final configuration, size also appears as a clearly relevant causal condition. Large firms learn more easily, although these firms inherently

Table 2
Combinations of conditions of sufficiency.[a]

	Solution		
Configuration	1	2	3
Complexity	∅	x	x
Size	xx	xx	xx
Autonomy	xx	x	xx
Decentralization	∅	∅	∅
Trained workers	xx	x	xx
Formalization	x	x	∅
Consistency	0.87	0.89	0.96
Raw coverage	0.66	0.23	0.53
Unique coverage	0.17	0.07	0.04
Overall solution consistency	0.86		
Overall solution coverage	0.78		

[a] x indicates the presence of a causal condition, ∅ indicates absence, and xx indicates core conditions.

possess a certain organizational complexity, whereas trained employees must enjoy a degree of autonomy.

Therefore, with regard to Proposals 1a and 1b, the conclusion is that the existence of differentiation is not highly important for learning to take place unless the firm in question is large.

Regarding the second set of proposals (2a, 2b, and 2c), autonomy and qualification are necessary for learning to take place, whereas decentralization is not.

Lastly, regarding the third proposal, formalization does not hinder learning and indeed, as long as formalization is not excessive, formalization can actually enable learning.

5. Discussion

Learning in organizations occurs more easily in larger-sized firms because of the greater variety of knowledge, procedures, tasks, technologies, and even products or business transactions from which firms can learn. In addition, the typology of problems the organization must solve is much larger, which creates more opportunities for learning. Large firms are often extremely complex, which does not discard the introduction of more transversal coordination mechanisms that can eliminate hierarchical echelons.

Some of the more relevant results lie in the role of autonomy in comparison with the relatively small importance of decentralization in decision making, along with the fact that this autonomy must go with a high level of training on the part of employees, regardless of the position these employees occupy in terms of hierarchical level.

Theoretically, formalization is an obstacle to bringing about learning, whereas the results of this study lead to the conclusion that both are compatible.

The idea that organic structures are more suitable than mechanical structures for learning to occur in firms is not so clear because mechanical structures with sizeable coordination mechanisms for learning, such as teams or liaison roles, that can enable knowledge transmission may be structures that are just as suitable as organic ones. Hao et al. (2012) also rise this duality.

One of the limitations of this study is the creation of self-made scales because no prior empirical studies exist with validated scales.

Future research should attempt to obtain broader samples to apply quantitative techniques and verify to what extent other methods can confirm the results of this study and methodology.

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