ORGANIZATIONAL DESIGN AS A LEARNING ENABLER: A FUZZY-SET APPROACH

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ABSTRACT

In the literature on organizational learning, very few studies attempt to empirically show to what extent 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. Aswell is necessary that the qualified workers have autonomy to achieve the learning.

Key words. Organizational learning, organizational design, decision-making, autonomy, formalization, organizational complexity fzQCA.

1. INTRODUCTION

Despite the fact that the processes and outcomes of learning in organizations have received a great deal of attention from researchers, the study of organizational design as an enabler of learning remains relatively unexplored. Empirical studies that analyze the design variables whose aim is to engender learning are even rarer.

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 through the use of fuzzy set Qualitative Comparative Analysis (fsQCA).

Although the variety of statistical techniques used by researchers is broad, they can be classified into two main categories: those that use a large sample and those where the sample is much smaller, characterized either by using quantitative or qualitative methods respectively, while there are very few that use a mixed methodology. Fuzzy set Qualitative Comparative Analysis (fsQCA) is a relatively recent technique, which is particularly suitable for studies with a small to medium-sized sample due to the difficulties inherent in obtaining large samples of firms willing to share relevant internal information.

The paper contains the following sections: following the introduction, the first section provides a description of the variables for exploration, such as organizational learning, while the second section examines the causal conditions that make up the basic elements

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of organizational design. The third section describes the method used for the fuzzy-set analysis (fsQCA) and the study ends with an interpretation of the results of the study and the subsequent conclusions.

2. THE INFLUENCE OF ORGANIZATIONAL DESIGN ON LEARNING

An abundance of literature on learning has appeared in recent decades. 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 related to the acquisition and creation of competences that, to a greater or lesser extent, modify the way organizations manage situations, as well as the situations themselves (Koenig, 1994). Organizations must develop a capacity for learning in order to successfully compete in the market.

The capacity for organizational learning can represent a vital source of competitive advantage for the firm (De Geus, 1988; Stata, 1989), in the sense that it can represent the ability to do things better than competitors. Stalk, Evans and Shulman (1992) state that there are a wide variety of skills that can transform certain key processes in the firm with regard to strategic capabilities in terms of leading the firm towards competitiveness and a degree of success. This capability depends upon the firm's capacity to reduce the existing gap between knowledge accumulated in the past and knowledge in the future that will be necessary to adapt to or anticipate the future environment (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 it deploys and combines its resources (Amit & Schoemaker, 1993). It depends upon the confrontation between the organization and its environment, and on the transfer of knowledge, but also on the characteristics of the knowledge that affect how easily members of the organization learn. It is important to realize that the aspects that affect this capability are organizational, as it does not merely refer to the identification and assimilation of knowledge in organizations, but also the organization's ability to exploit it, as proposed by Cohen and Levinthal (1990).

Deep-rooted 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 are the result of knowledge transfer and learning can disappear when surrounded by a sterile organizational context. Although the structure in itself does not guarantee the existence of learning, one 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, this aspect is recognized in the literature (Fang, Li & Schilling, 2009; Liao, & To Chuang, 2011; Hao, Kasper & Muehlbacher, 2012; Steiger, Hammou & Galib, 2014).

Within the area of organizational design, some studies go further by suggesting that

certain organizational design variables act as enablers of learning. Widely cited research, such as the study by Kim (1993), point 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 proposed by Hedlund (1994). 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, while the other concerns the decentralization of decision-making related to acquired knowledge. Other authors state that, in order for a higher level of learning to take place, it is advisable for the organization to adopt an organic structure with reduced hierarchical echelons and hence lower organizational complexity (Hodge, Anthony & Gales, 2003), as well as an increase in decentralization and a reduction in formalization.

2.1. Organizational complexity

With regard to the *role of hierarchy*, the fundamental organizational issue lies in achieving fully coordinated action. A more participative management style that allows the organization to access and use individual knowledge located in the lower echelons of the organization (Wruch & Jensen, 1994); whilst the higher levels require greater intervention and participation from specialists.

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

The Firm size is one of the variables that has provoked the biggest discussion. For academics, it is, for the most part, a factor to bear in mind. According to Schumpeter (1934), large firms are more innovative than small ones. More 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 due to 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. It may be true that the concept of size itself has evolved. Firms with increasingly lower numbers of employees, though still not small, generate greater learning thanks to advances in information technology and increasingly automated processes. Firm age and the capacity for learning may have a positive relation due to the accumulative effect of learning (Dodgson, 1993; DiBella, Nevis & Gould, 1996, Benavides, 2007). Size and age are important variables for structure (Hall, 1996) and they may either directly or indirectly affect the capacity for learning.

Proposal 1a: A low level of complexity in organizational design enables learning in the organization.

Proposal 1b: 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 based on idiosyncratic/specialized knowledge, while centralizing those that require more generalized knowledge. Decentralization reduces the burden and responsibility for high level management in such a way that the organization becomes more sensitive to changing conditions, thereby reducing the number of managers needed 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), despite the fact that 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 based on knowledge-sharing becomes more widespread in the organization, the firm must endow its members and teams with greater autonomy, otherwise it runs the risk of generating only low level knowledge (Wruck & Jensen, 1994). Autonomy drives personal commitment and the organization must, in turn, manage this commitment (Nonaka, 1994), with a view to creating a spirit of achievement and improvement, where employees see themselves more as colleagues than competitors.

Organizations must allow their individuals to act with the greatest degree of freedom possible in order to increase the likelihood of new opportunities. Those organizations that foster learning show a tendency towards *decentralization* (Chen & Chang, 2012).

In cases where decentralization exists, employees must have the capability to make judgments and take decisions to solve complex, specific problems. This proviso means that workers need to possess enough knowledge and experience to successfully incorporate the use of new technologies into their daily work, become involved in developing innovative products, improving current ones and solving any problems that might arise from establishing new procedures. Trained workers can make the most suitable decisions for their tasks, as they are trained to acquire specific knowledge and are qualified to make judgments and decisions on complex issues.

Proposal 2a: A high level of employee autonomy enables organizational learning.

Proposal 2b: A high level of decentralization in organizational design enables organizational learning.

Proposal 2c: A high level of training among employees enables organizational learning.

2.3. Formalization

Formalization is a means of ensuring that the people and departments that carry out highly differentiated tasks coordinate their activities through the creation of formal rules, policies and procedures. Once the management understands that the organization's employees have secured 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 due to the uncertainty that these changes provoke, managers are unable to foresee all the possible situations and conditions. If at times there is an excess of formalization, managers must seek to fight against too many rules and regulations (Daft, 2007).

Organizations that wish to acquire and learn knowledge should allow their staff to act with the greatest amount of freedom possible, with the least number of rules that might restrict their chances of improvement or the possibility of generating new knowledge, and the creation of new opportunities, innovations and products, that is to

say, a higher level of learning.

Proposal 3: A low level of formalization enables organizational learning.

3. EMPIRICAL ANALYSIS

Researchers began using Qualitative Comparative Analysis (QCA) at the end of the 1980's and the start of the 1990s (Berg-Schlosser et al, 2009). It represents a particularly interesting technique for management analysis where sample sizes are small. This type of technique allows a detailed analysis of how causal conditions contribute to a particular result, and is based on a configurational understanding of how a combination of causes leads to the same series of results and, more importantly, it is suitable for analyzing high levels of causal complexity.

All of the above can be summarized in the following axioms, as Lieberson (1991) points out in his study:

(a) generally, a particular "outcome" is the result of a combination of different relevant causal conditions and not of the presence of one or several conditions considered individually,

(b) different combinations of causal conditions may lead to a same end result and

(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 has recently led to the development of fuzzy-set Qualitative Comparative Analysis (fsQCA). The book entitled fsQCA, introduced by Ragin (2000), describes a case using the combination of "causal conditions" and the "outcome". It allows researchers to overcome the limitations of conventional QCA by enabling the classification of cases and conditons by identifying the intervals or categories of pertinence (Ragin, 2008, 2009). These intervals allow for the classification of excessively complex phenomena in order to describe them in quantitative terms. fsQCA is an alternative tool to traditional quantitative methods.

This type of technique is ideal for this study for two fundamental reasons: on the one hand, in order 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. The other aspect regards the size of the sample. The advantage of this method is it allows researchers to work with medium-sized samples without being having to obtain a large number of individual cases (Ragin et al., 2003, Ragin & Rihoux, 2004). This study uses the statistical software package fsQCA 2.5 for its analysis (Ragin & Davey, 2014).

3.1. Sample & calibration

The data of our work is drawn from the ZEPHYR international database, containing 1.837 firms listed from around the world who comply with the characteristics required by our study. We were unable to contact 231 firms and, despite forming a part of the consulted database, 356 organizations declared that learning did not take place in their organizations. The total number of firms to whom we directed our study was 1.210 & the final sample consisted of 74 firms (51spanish firms and 23 from the rest of the world), that have said they´ve learned, after discarding those that had not.

The outcome variable (fs_rdo) for analysis in this study is the achievement of organizational learning as a consequence of having a particular type of structure. We measure this outcome via two questions: firstly, to what extent has learning itself been an

objective and secondly, has learning improved the competitive position of the firm. Respondents use a five point Likert scale to answer this set of questions.

We carry out the calibration using “the direct method” that appears in Ragin (2008), which implies transforming the interval, using a crossover point as an anchor to calculate the deviation scores, taking the values of pertinence as the upper or lower boundaries. In order to calibrate these observations, we transform them into two different measures, whose values are between 0 and 1. These values do not represent probabilities but rather transformations of the quantitative scale in degrees of integration within the category (Ragin, 2000; Schneider, et al. 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), with 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, this These variables are called fs_r1 and fs_r2. Additionally, given the operator "and" we obtain a single dependent variable fs_rdo.

We now consider the causal conditions, that is to say, the conditions that form a part of organizational design, which are: complexity, decision-making and formalization. The questions for this block also correspond to values on a five point Likert scale.

With regard to organizational complexity (com), we measure vertical differentiation by 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, in such a way that the total differentiation is the sum of the two (Singh, 1986; Fiss, 2011). 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) were fully out, and firms in the 99th percentile (seven or more hierarchical echelons and more than 17 functions) were fully in. As a crossover point, we chose 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 (e.g., Fiss, 2011). We call the new causal condition resulting from the calibration process (fs_com).

In terms of size, we classify the firms according to European Union regulations (1-9, 10-49, 50-249, over 250), meaning that we classify firms of over 250 employees were coded as fully in the set of large firms and those with less than 10 employees were coded as fully out; the midpoint was set at 50 employees, in a similar vein to Fiss (2011). We call the new causal condition subsequent to calibration is fs_size.

We measure decision-making via three questions: whether those that run the different units in the firm enjoy sufficient autonomy to make decisions that pertain to that unit (aut), whether there is a tendency in the firm to make decisions at the lowest possible level of hierarchy, in other words, if decentralization exists (des), and 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 that there is total decentralization in the firm, while a 0 means that there is none. 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 at all to this group. .

In this case, applying the direct method of calibration requires the establishment of three values: the threshold for complete inclusion within a category (with a score of 4), the threshold that indicates full exclusion from the category (2) and 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).

Lastly, formalization, which we also measure using three items: 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). I also apply a direct method for calibration in this study, which necessitates the establishment of three different values: the threshold for complete inclusion within a category (with a score of 4), the threshold that indicates full exclusion from the category (2) and the crossover point or anchor, indicating the maximum point of ambiguity (3), which gives the new causal conditions (fs_for1), (fs_for2) y (fs_for3). We create a one causal condition by applying the operator "or" thereby obtaining (fs_for).

4. RESULTS

4.1. Necessary conditions and functional equivalents

In this section, we verify whether we can consider any of the causal conditions as a necessary condition of 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). We use consistency measures in the fsQCA in order to gauge the degree to which observations comply with the strict rule. 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. 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		

In this study, we principally argue that, in order for learning to take place in a firm, creativity is an essential element, and along with it, the autonomy of the trained worker, as this figure is capable of creating new things, as well as being able to improve and innovate. If, in addition, we pay heed to Schumpeter's argument that large firms are more innovative than small ones, it makes sense to establish 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, which indicates that they are necessary.

The measurement that indicates whether a necessary condition is a trivial one 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

Having established the necessary conditions, the next step is to verify the conditions of sufficiency. We must hence create the most suitable types by converting the set of values of pertinence for the causal conditions "into fuzzy-set values". A causal condition can be considered 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. We can consider three of these causal paths to be empirically important. Empirical importance stems from the degree to which the causal condition or combination of conditions explains the result. Two scores, the raw coverage and the unique coverage, are suggested by Ragin (2006) to 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, it means that there is more than one path. In our case, the overall solution consistency is 0.86; and the overall solution coverage is 0.78, indicating that most of the outcome is covered by the three causal paths. The raw coverage for single causal paths ranges from 0.66 to 0.23.

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** indicate the presence of a causal condition, and ∅ indicate absence. **xx** indicate core conditions.

With regard to the first configuration, learning is easier in large firms due to the greater variety in procedures, tasks and specific knowledge despite the existence of a high level of formalization, though it is necessary for there to be creative employees or teams with a high level of autonomy in order to establish the changes and improvements that are necessary in all firms, even by modifying the rules and regulations that the organization has already established in its routines. For this scenario to be possible, it is necessary for these workers to possess the necessary qualification to make their own decisions at the

right time, regardless of the degree of complexity and decentralization in decision-making that may exist.

In the second configuration, size shows up 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, though a certain degree of autonomy amongst 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 find it easier to learn, although they inherently possess a certain organizational complexity, while trained employees must enjoy a degree of autonomy.

Therefore, with regard to proposals 1a and 1b, we can conclude 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, while decentralization is not.

Lastly, in relation to the third proposal, we can state that formalization does not hinder learning and indeed, as long as formalization is not excessive, it can actually enable learning.

5. DISCUSSION

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

Another of the more relevant results lies 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 be accompanied by a high level of training on the part of employees, regardless of the position they occupy in terms of hierarchical level.

Theoretically, formalization is an obstacle to bringing about learning, whilst the results of this study lead to the conclusion that the two are not incompatible.

The idea that organic structures are more suitable than mechanical structures for learning to occur in firms is not so clear, as mechanical structures with sizeable coordination mechanisms for learning, such as teams, liaison roles or others that can enable knowledge transmission may be structures that are just as suitable as organic ones. This duality is also raised in the work of Hao, Kasper and Muehlbacher, (2012).

One of the limitations of this study is that we have created our own scales, as no prior empirical studies exist with validated scales.

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

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