

**DEVELOPMENT AND VALIDATION OF AN INSTRUMENT TO  
MEASURE ORGANISATIONAL LEARNING CAPABILITY**

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## **ABSTRACT**

The development of a valid, reliable instrument to measure organisational learning continues to present a major challenge in this field of literature. The present study proposes a measurement scale that aims to capture the organisational capability to learn, based on a comprehensive analysis of the facilitating factors for learning. The organisational learning capability (OLC) measurement instrument consists of 14 items grouped into 5 dimensions: experimentation, risk taking, interaction with the external environment, dialogue and participative decision making. This scale has been validated using confirmatory factor analysis through the responses of 157 workers from 8 companies in the Spanish ceramic tile sector.

**Keywords:** Organisational Learning, Organisational Learning Capability, The facilitating factors for Organisational Learning, Organisational Learning Measurement Scale.

## INTRODUCTION

The literature on the concept of organisational learning is one of the most prolific and popular in our field, and generates myriad academic publications both in specialised journals and those of a more general scope. However, despite this consolidation and importance, widespread controversy, confusion and theoretical disarray are still in evidence as a consequence of the natural evolutionary process of a complex dynamic concept, as is the case of organisational learning.

A range of studies (Easterby-Smith et al., 2000; Antal et al., 2001; Vince et al., 2002; Lyles and Easterby-Smith, 2003) points out these deficiencies and prioritises future research lines, amongst which the development of a valid reliable measurement instrument for organisational learning is given prominence.

Lyles and Easterby-Smith (2003, p. 650) affirm that the choice of an appropriate measure of organisational learning remains a debated topic. Several of the authors in their handbook lament the lack of agreement on appropriate measures for organisational learning.

As Bapuji et al. (2005; p. 538) state, some measures (Bontis et al. 2002, Tippins and Sohi, 2003) attempt to capture organisational learning that occurs as a psychosocial process at various levels (Crossan et al., 1999; Huber, 1991). These scales organise their items according to each one of the phases of the organisational learning process, in an attempt to determine the existence of these phases within the organisation.

Other measures (Goh and Richards, 1997; Hult and Ferrell, 1997, Jerez-Gómez et al., 2005) try to capture the organisational propensity to learn or determine the

organisational learning capability (OLC). These questionnaires organise their items according to the main facilitators of organisational learning. Their goal is to determine whether the organisation possesses the characteristics or dimensions (e.g., teamwork, experimentation etc.) that facilitate organisational learning. These scales have developed their dimensions on the basis of a single perspective or literature, mainly the learning organisation literature (Senge, 1990; Garvin, 1993; Tsang, 1997). However, the study of the facilitating factors for learning has not only been advocated and underlined by this literature, but also by the different perspectives put forward in the organisational learning literature (Brown and Duguid, 1991; Weick and Westley, 1996; Fiol and Lyles, 1985; Hedberg, 1981). Therefore, the development of a new measurement instrument that aims to capture the organisational capability or propensity to learn, and that takes into account all the theoretical perspectives and literatures involved in the facilitating factors for organisational learning may justify a re-examination of how the organisational learning construct is measured.

The aim of this paper is to propose a measurement scale of organisational learning capability, based on a comprehensive analysis of the facilitating factors for organisational learning, and to describe its development and validation.

The introduction is followed by a literature-guided framework, which includes a discussion of the instruments for its measurement and an analysis of the concept of organisational learning capability. The latter discussion concentrates on organisational learning facilitators, and determines the dimensions of OLC. Secondly, we explain the methodology followed in the development of the measurement instrument and detail the identification of the indicators (items), the design of the measurement scale and finally

the data-gathering process in eight organisations in the ceramic tile industry. We then expose the results, in this case the sociometric properties of the measurement scale, and close by outlining the implications of the measurement instrument for organisational learning capability, and proposals for future research.

## **THEORETICAL BACKGROUND**

### **Measurement of Organisational Learning**

Studying organisational phenomena usually involves some type or form of measurement (Lähtenmäki et al., 2001). Organisational learning is no exception. There seems to be a serious need for the development of a valid and reliable measurement instrument for organisational learning (Easterby-Smith et al., 2000).

Organisational learning empirical research (Bapuji and Crossan, 2004) has not only used scale measurements and survey-based methods. Much of this empirical research uses qualitative methods (Antonacopoulou, 1999, 2001; Finger and Bürgin, 1999), but also quantitative methods other than surveys, such as learning and experience curve analysis (Epple et al., 1991; Barkema et al., 1997). Nevertheless, the problem of learning and experience curves when applied to measuring organisational learning is that they focus on outputs, not on the learning process, sources or capability. Similarly, the Balanced Scorecard (Kaplan and Norton, 1996) focuses on results by tracking financial and non-financial drivers of performance as well as the impact of intangibles, such as organisational learning capability.

These objective measures contrast with judgmental/opinion measures. Unfortunately, organisational learning does not usually directly generate 'hard' numbers with which to

make comparisons (Luthans et al., 1995). The learning effects are most often difficult to measure quantitatively. Questionnaire surveys of and interviews with the participants, and/or those external to the organisation such as suppliers or customers, are the most likely sources of information with which to judge organisational learning (Luthans et al., 1995, p. 37). Stakeholder analysis might be an interesting research approach to explore organisational learning, as it would involve identifying stakeholders, or interested parties, and collecting data on their actions, perceptions, behaviours, experiences and thoughts in relation to organisational learning (Burgoyne, 1994; p. 187). However, stakeholder perceptions external to the firm can hardly determine the internal situation of an organisation. Nevertheless, their views could prove essential when evaluating the results (e.g. customer satisfaction measures). Questionnaire surveys or interviews with internal staff may be relevant when analysing the organisational capability to learn or the learning process.

The use of individual perceptions to measure organisational issues, such as organisational learning capability, is discussed by Bontis et al. (2002, p. 457). These authors argue that while most researchers appreciate the existence of groups and organisation-level structures, the measurement of these constructs still focuses on the single respondent. Furthermore, they affirm that their decision to use individual perceptual measures is based on the assumption that it is a shortcoming, as the alternative would have been to try to attain objective assessments of each of their constructs, which appears to be quite a complex task.

Two main perspectives appear to emerge in the development of an organisational learning scale. These perspectives are determined by their aims, which as they are

different, mean that their dimensions also differ. The first perspective attempts to determine whether a certain process of organisational learning is being accomplished. These questionnaires organise their items according to each of the phases of the organisational learning process, in an attempt to determine the existence of these phases within the organisation. Each of these phases is therefore taken as the dimensions of the scale. These scales are based on models such as that of Huber (1991) or Crossan et al. (1999). The studies of Bontis et al. (2002) or Tippins and Sohi (2003) are notable examples of this perspective of OL measurement.

The second perspective on scales aims to determine the organisational propensity or capability to learn. These questionnaires organise their items according to the main facilitators of organisational learning. The main facilitators of organisational learning (experimentation, risk taking, etc.) are therefore taken as the dimensions. These measurement scales are mainly based on the learning organisation literature. However, some scales (Tannenbaum, 1997) have been also based on the individual view of organisational learning. Pedler et al. (1991), Goh and Richards (1997) and Jerez-Gómez (2005) are outstanding examples of this measurement perspective.

Items from both scales are statements about individual or social behaviours and organisational characteristics; however both kinds of scale seem to measure different concepts and therefore their theoretical dimensions are different. The first measures whether the organisational learning process is fluid or is being completed, and the second, whether the organisation has the capability to learn. Furthermore, conclusions obtained from both kinds of scale differ. As an example, Bontis et al. (2002) suggested that companies were over-investing in individual learning and under-investing in

mechanisms to facilitate the flow of learning between levels, individual-group-organisational. On the other hand, Goh and Richards (1997) determined that some companies scored high or low in certain characteristics such as “clarity of purpose” or “teamwork”.

Organisational learning is also measured by indicators such as experience (Luo and Peng, 1999), age and effort (Grewal et al., 2001), or exploration (McGrath, 2001). These indicators usually attempt to discover whether OL takes place or has taken place in an organisation. To measure some of these indicators, scales are also developed: diversity of experience (Luo and Peng, 1999), effort-based learning (Grewal et al., 2001) and exploration (McGrath, 2001).

Table 1 summarises some of the characteristics of the OL measurement instruments.

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The OLC measurement scale developed in this paper, which aims to determine the organisational propensity to learn, attempts to enrich the research on OL measurement scales by developing a questionnaire through a comprehensive analysis of OL facilitators. These facilitators or dimensions have been established by a review of the extant literature. All the organisational learning literatures and perspectives have been taken into account.



## **Organisational Learning Capability**

The concept of organisational learning capability (OLC) (Dibella et al., 1996; Goh and Richards, 1997; Hult and Ferrell, 1997; Yeung et al., 1999; Jérez-Gómez et al., 2005) seems to stress the importance of the facilitating factors for organisational learning or the organisational propensity to learn. Goh and Richards (1997, p. 577) define it as the organisational and managerial characteristics or factors that facilitate the organisational learning process or allow an organisation to learn.

The importance of the factors that facilitate organisational learning has traditionally been outlined by the learning organisation literature, which mainly focuses on the development of normative models for the creation of a learning organisation. This includes proposals of several facilitating factors of organisational learning (Tsang, 1997; Easterby-Smith and Araujo, 1999). Consequently, measures of organisational learning capability have traditionally looked to this literature to determine their dimensions or facilitating factors (Goh and Richards, 1997; Hult and Ferrell, 1997).

However, research from both the organisational learning and learning organisation literatures have suggested factors that facilitate the existence of learning, some of which are of a theoretical nature (Hedberg, 1981; Fiol and Lyles, 1985; Weick and Westley, 1996) while others are empirical (Ulrich et al., 1993; Nevis et al., 1995; Tannenbaum, 1997; Goh and Richards, 1997, Gherardi et al. 1998).

Thought on learning in organisations has unfolded over time, highlighting through the various perspectives that have dominated the debate, either the behavioural aspects (Cyert and March, 1963; Levitt and March, 1988), the cognitive issues (Duncan and

Weiss, 1979; March and Olsen, 1975), the socio-cultural dimensions (Cook and Yanow, 1993; Lave and Wenger, 1991) or more recently the practice-based view (Nicolini et al., 2003). However, two main explanations seem to be offered in relation to how organisations learn (Cook and Yanow, 1996; Easterby-Smith et al., 1998; Gherardi, 1999; Easterby-Smith and Araujo, 1999; Chiva and Alegre, 2005): the individual and the social view. The individual view considers learning as an individual phenomenon and consequently understands that organisations learn through individuals; and the social view considers learning as a social phenomenon and consequently understands that organisations learn through communities and groups. The studies that propose the factors that facilitate organisational learning do so from the learning organisation literature (Ulrich et al., 1993; Goh and Richards, 1997; Pedler et al., 1997), the social view (Brown and Duguid, 1991; Weick and Westley, 1996), and the individual view (Hedberg, 1981; Nevis et al., 1995; Tannenbaum, 1997; Zietsma et al., 2002).

The learning organisation literature (Ulrich et al., 1993; Goh and Richards, 1997; Pedler et al., 1997) describes a set of actions that ensure learning capability: work to generate ideas with impact by experimenting, continuous improvement, competence acquisition and observing what others do; teamwork and group problem-solving; participative policy making; boundary workers acting as environmental scanners; etc.

From the social view, organisational learning can only be achieved through active participation (Blackler, 1993), not based on the individual, but on the social practice of organisational life. Brown and Duguid (1992) stress the importance of social construction, dialogue, collaboration, and communication for organisational learning. Weick and Westley (1996) hold that organisational learning implies a juxtaposition of

exploration and exploitation, order and disorder, diversity. They also believe that humour, dialogue, teamwork experiences, improvisation, and experimentation are facilitators of organisational learning.

The individual view literature (Hedberg, 1981; Tannenbaum, 1997; Popper and Lipshitz, 2000) appears to stress the importance of several factors: workers that want to learn, experimentation, and mistake and risk acceptance as individual learning is the essence of this perspective.

Following an exhaustive and comprehensive literature review, we identified five essential facilitating factors of organisational learning. Figure 1 shows the conceptual model of organisational learning capability. The figure includes the dimensions of the model and definitions of each one of them.

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***Experimentation.*** Experimentation can be defined as the degree to which new ideas and suggestions are attended to and dealt with sympathetically. Experimentation is the most heavily supported dimension in the literature of OL (Hedberg, 1981; Nevis et al., 1995; Tannenbaum, 1997; Weick and Westley, 1996; Ulrich et al., 1993; Goh and Richards, 1997; Pedler et al., 1997). Nevis et al. (1995) consider that experimentation involves trying out new ideas, being curious about how things work, or carrying out changes in work processes. It includes the search for innovative solutions to problems, based on the possible use of distinct methods and procedures (Garvin, 1993). Weick and Westley

(1996) explain the importance to organisational learning of small rather than big changes or experiments.

Experimentation, the constant flow of ideas, or proposals that challenge the established order are dimensions included in studies on the creative environment (Amabile et al., 1996; Isaksen et al., 1999). They consider experimentation as a manifestation of the creative environment. Other aspects linked to this environment are sense of humour (Weick and Westley, 1996), level of autonomy, and involvement of individuals, those who wish to learn and improve, in improving processes (Hedberg, 1981; Popper and Lipshitz, 2000), which Tannenbaum (1997) associates with quality training that fosters learning.

**Risk taking.** Risk taking can be understood as the tolerance of ambiguity, uncertainty, and errors. March's concept of exploration (1991), regularly associated with organisational learning, includes activities and characteristics such as searching, variety, experimentation, flexibility, discovery, innovation and risk taking. Hedberg (1981) proposes a range of activities to facilitate organisational learning, amongst which is stressed the design of environments that assume risk-taking and accept mistakes. Accepting or taking risks involves the possibility of mistakes and failures occurring. Kouzes and Posner (1987) stress that the key to opening up business opportunities lies in learning from the successes and mistakes that arise from risk-taking.

Sitkin (1996, p. 541) goes as far as to state that failure is an essential requirement for effective organisational learning, and to this end, examines the advantages and disadvantages of success and errors. If the organisation aims to promote short-term stability and performance, then success is recommended, since it tends to encourage

maintenance of the status quo. According to Sitkin (1996, p. 547), the benefits brought about by error are risk tolerance, prompting of attention to problems and the search for solutions, ease of problem recognition and interpretation, and variety in organisational responses. Since the appearance of this work, many authors have underlined the importance of risk-taking and accepting mistakes in order for organisations to learn (Popper and Lipshitz, 2000; Ulrich et al., 1993).

***Interaction with the external environment.*** We define this dimension as the scope of relationships with the external environment. The external environment of an organisation is defined as factors that are beyond the organisation's direct control of influence. It consists of competitors, and the economic, social, monetary and political/legal systems, among others.

Environmental characteristics play an important role in learning, and their influence on organisational learning has been studied by a number of researchers (Bapuji and Crossan, 2004, p. 407). Relations and connections with the environment are very important, since the organisation attempts to evolve simultaneously with its changing environment. Hedberg (1981) considers the environment as the prime mover behind organisational learning. More turbulent environments generate organisations with greater needs and desires to learn (Popper and Lipshitz, 2000). According to Nevis et al. (1995), in recent years researchers have stressed the importance of observing, opening up to and interacting with the environment (e.g. Ulrich et al., 1993; Goh and Richards, 1997).

Both this dimension and the following, dialogue, stress the importance of connections for organisational learning. Interactions are not simply the way in which individual

knowledge is shared, as understood by Huber (1991) or Kim (1993). Following the ideas put forward by Oswick et al. (2000), interactions lead to constant evolution and change in knowledge, and individuals interact precisely in order to improve and develop their knowledge.

*Dialogue.* In particular, authors from the social perspective (Brown and Duguid, 1992; Weick and Westley, 1996) highlight the importance of dialogue and communication for organisational learning. Dialogue is defined as a sustained collective inquiry into the processes, assumptions, and certainties that make up everyday experience (Isaacs, 1993, p. 25). Schein (1993, p. 47) considers dialogue as a basic process for building common understanding, in that it allows one to see the hidden meanings of words, first by revealing these hidden meanings in our own communication.

Some authors (Isaacs, 1993; Schein, 1993; Dixon, 1997) understand dialogue to be vitally important to organisational learning. Although dialogue is often seen as the process by which individual and organisational learning are linked, Oswick et al. (2000) show that dialogue is what generates both individual and organisational learning, thus creating meaning and comprehension.

The vision of organisational learning as a social construction implies the development of a common understanding, starting from a social base and relationships between individuals (Brown and Duguid, 1991, p. 47). Nevis et al. (1995) argue that learning is a function of the spontaneous daily interactions between individuals. The chance to meet people from other areas and groups increases learning. Similarly, Goh and Richards (1997) advocate teamwork and problem solving in groups, with particular emphasis on

multi-functional teams. By working in a team, knowledge can be shared and developed amongst its members (Senge, 1990; Garvin, 1993).

Easterby-Smith et al. (2000, p. 792) hold that the recent literature is moving away from a vision of an integrating dialogue in which consensus is sought, towards one that seeks pluralism and even conflict. Oswick et al. (2000) claim that authentic dialogue fosters organisational learning because it creates, rather than suppresses, plural perceptions. Individuals or groups with different visions who meet to solve a problem or work together create a dialogic community. Schein (1993, p. 47) argues that by making space for disagreement, meanings become clearer and the group gradually builds a shared set of meanings that enable much higher levels of mutual understanding and creative thinking to be achieved.

Pluralism, heterogeneity and variety are aspects that have not traditionally been considered in the organisational learning literature. However, according to Easterby-Smith et al. (2000), these aspects are increasingly attracting the attention of academics in this field (Weick and Westley, 1996; Pedler et al., 1997; Nevis et al., 1995), although certain classic works have already mentioned them (Hedberg, 1981; March, 1991).

***Participative Decision Making.*** Participative decision making refers to the level of influence employees have in the decision-making process (Cotton et al., 1988). Organisations implement participative decision making to benefit from the motivational effects of increased employee involvement, job satisfaction and organisational commitment (Daniels and Bailey, 1999; Latham et al., 1994; and Witt et al., 2000; Scott-Ladd and Chan, 2004).

Scott-Ladd and Chan (2004) provide evidence to suggest that participative decision making gives better access to information and improves the quality and ownership of decision outcomes. Parnell and Crandall (2000) also maintain that divulging information is a requirement for participative decision making. Subordinates are assumed to be informed in order to participate efficiently.

Bapuji and Crossan (2004), Nevis et al. (1995), Goh and Richards (1997), Pedler et al. (1997) or Scott-Ladd and Chan (2004) consider participative decision making as one of the aspects that can facilitate learning.

## **METHODOLOGY**

### **Development of the OLC measurement scale**

In all areas of research, the development of reliable and valid measurement instruments is a task of paramount importance. There is a broad consensus in the literature that the measuring process in scientific empirical research must be based on theoretical foundations (Bagozzi, 1982; DeVellis, 1991). Blalock (1982) conceives the overall process of operationalisation, in other words, the process of assigning measurements to concepts, by differentiating two fundamental notions: conceptualisation and measurement. The former refers to the theoretical process through which the ideas or theoretical concepts are clarified and given a working definition. The latter consists of the general process that links the physical measuring operations with mathematical operations that assign numbers to objects.

The theoretical review is therefore a necessary stage to be carried out prior to formulating the scales to measure the phenomena under study. Hence, the greater the



knowledge of the phenomena and of the abstract relations between the various elements that make it up, the better chances the researcher will have of creating reliable, valid and useful scales. DeVellis (1991: 8) defines these measurement scales as “measurement instruments made up of sets of items that attempt to reveal different levels or dimensions of theoretical variables or concepts that are not directly observable”.

From the concept of organisational learning capability adopted in our theoretical review, we proceed to the development of a measurement instrument comprising a set of scales that represent theoretical dimensions or latent variables through their items. There is broad agreement in the literature on the steps to be followed in the creation of a measurement scale (Churchill, 1979; Lazarsfeld, 1985; DeVellis, 1991; Spector, 1992): (1) Theoretical representation of the concept in such a way as to reflect its defining features; (2) Specification of the concept, by breaking it down into the various dimensions or relevant aspects it covers; (3) Choice of indicators; (4) Synthesis of the indicators through the elaboration of a weighted index for each of the conceptual dimensions.

According to our literature review, we understand organisational learning capability (OLC) to consist of the organisational and managerial characteristics that foster the organisational propensity to learn or facilitate the organisational learning process. We propose five dimensions that represent the essential factors that determine organisational learning capability: experimentation, risk taking, interaction with the external environment, dialogue and participative decision making.

Spector (1992) argues that the content of other scales may help in the development of a new scale. He proposes the use of items from existing scales to develop a new one. Our

scale makes use of items from OL and creative climate measurement instruments (Pedler et al., 1991; Hult and Ferrell, 1997; Goh and Richards, 1997; Templeton et al., 2002, Isaksen et al., 1999; Amabile et al., 1996). The latter include dimensions that coincide with those of organisational learning: creativity, diversity, risk taking, communication, etc. Our scale, which takes into account all theoretical perspectives and literatures, aims to determine the organisational capability to learn. The OLC measurement instrument was applied using a 7-point Likert scale, where 1 represented total disagreement and 7, total agreement. A pre-test was administered to four technicians from ALICER (Centre for Innovation and Technology in Ceramic Industrial Design), to assure that the translation into Spanish was fully understandable. Table 2 presents the questionnaire.

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### **Data gathering**

We test our OLC measurement scale in 8 companies from the Spanish ceramic tile sector. Most of the firms from this sector are considered to be SMEs, as they do not exceed an average of 250 workers. Ceramic tile production is a globalised industry whose features belong to the scale-intensive and to the science-based trajectories of Pavitt's taxonomy (Alegre et al., 2004). In the production of ceramic tiles, technological accumulation is mainly generated by (1) the design, building and operation of complex production systems (scale-intensive trajectory) and (2) knowledge, skills and techniques emerging from academic chemistry research (science-based trajectory). Spanish ceramic

tile production in 2002 represented almost the half of EU production. The world's biggest ceramic tile producer is China, followed by Spain, Italy, Brazil and Turkey.

The field work was carried out from January to April 2004. With the help of ALICER technicians, eight ceramic tile manufacturers were selected. The questionnaire was addressed to the workers in each organisation. We excluded managers in order to obtain a homogeneous set of respondents expressing their perception about OLC in their organisation.

Spector (1992) states that between 100 and 200 subjects are initially required to develop a scale. We received a total of 157 valid questionnaires. The sample obtained represents 61% of the population under study (see Table 3). Both the number of responses and the response rate can be considered satisfactory (Janssen and Van Yperen, 2004).

Much of the validation process is based on a Confirmatory Factor Analysis, which is a particular case of structural equations modelling (SEM). Maximum likelihood is an asymptotic estimator, which means large samples are required for stable, consistent estimates. One common rule-of-thumb on the minimum threshold for implementing SEM is that it should be based on 100 subjects (Williams et al., 2004). Our sample also satisfies this threshold.

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We asked workers to answer the OLC questionnaire with reference to their organisation. The set of responses for a particular organisation would allow us to determine its OLC.

To test whether pertaining to a particular organisation systematically implied a specific OLC, we conducted an analysis of variance (ANOVA). The results of the ANOVA demonstrated significant differences between the means of the different organisations, and also showed that there is less variance between responses within firms than among firms (Table 4).

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Through its quantitative results, the OLC measurement scale could be used as a diagnostic tool by practitioners and researchers. As the OLC measurement instrument is formed of 5 dimensions, global results should be obtained through the average score of each dimension. As the OLC measurement instrument was applied using a 7-point Likert scale, the maximum score on each dimension would be 7 and the minimum 1. Each dimension's results will be obtained from the average score of the averages of the items from that dimension (e.g. items 1 and 2 come from the 'experimentation' dimension). Consequently, it will be possible to find out strengths and weaknesses in each of the OLC dimensions. We now present the results of the 8 firms in Table 5, from which it would appear that firms 1 and 8 have the highest OLC.

## **RESULTS: SOCIOMETRIC PROPERTIES OF THE MEASUREMENT SCALE**

The sociometric properties of the measurement scale were evaluated by following accepted practice in the literature (Anderson and Gerbing, 1982). Specifically, this evaluation included the scale's dimensionality, reliability, content validity, convergent validity, and discriminant validity (Tippins and Sohi, 2003). By verifying the

dimensionality of the scale, the researcher ensures that the factorial structure used to conceive the latent variable is correct. Reliability is an indication of the degree to which a measure is free from random error, and therefore yields consistent results. Finally, verification of validity guarantees that the scale satisfactorily measures what it sets out to measure.

### **Dimensionality**

Structural equation modelling can be employed to evaluate the dimensionality of measurement scales through confirmatory factor analysis (Mueller, 1996; p. 125). Such analysis allows the researcher, based on theory, to establish *a priori* the number of latent variables and the relations between them and the observable variables (Hair et al., 1998). This represents a major advantage over exploratory factor analysis, in which measurement error is not evaluated, nor is the number of factors determined prior to the analysis (Long, 1991, p. 12).

The organisational learning capability (OLC) concept is understood as a second order factor made up of five dimensions: experimentation (*exp*), risk taking (*risk*), interaction with the external environment (*env*), dialogue (*dialog*), and participative decision making (*particip*). The path diagram in Figure 2 shows a representation of the dimensionality of the OLC concept.

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Table 5 shows the parameters of the OLC measurement model obtained with the statistical programme EQS 5.7 using Maximum Likelihood estimators. The variance-covariance matrix is presented in the Appendix. All the estimated parameters are statistically significant; the factor loadings are high, falling above the minimum recommended values (Hair et al., 1998, Tippins and Sohi, 2003).

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Insert Table 5 about here

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Table 6 supports the proposed dimensionality of OLC through the correct fit of the second order factor model. The fit, in absolute terms, is satisfactory as shown by its indicators. The chi-squared statistic is not significant at the 0.05 level, which means that the null hypothesis of perfect fit cannot be rejected; the RMR (Root Mean Squared Residual) is close to 0, while the GFI (Goodness of Fit Index) falls above the recommended minimum of 0.9. The fit in incremental terms is also good: the CFI (Comparative Fit Index) is close to 1; the BBNFI (Bentler-Bonett Nonnormed Fit Index) exceeds the recommended acceptance threshold of 0.9. Finally, the Normed Chi Squared (NC) falls between 1 and 2, which indicates an excellent parsimonious fit (Anderson and Gerbing, 1988; Gatignon et al., 2002).

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## **Reliability**

Reliability is the ratio of the true score's variance to the observed variable's variance. Traditionally, scale reliability has been evaluated by means of the Cronbach's alpha coefficient. However, a high alpha does not guarantee that all the values obtained in the items are derived from the existence of a single latent variable (DeVellis, 1991: 92). The problem with this coefficient, which is a direct function of the number of items and the magnitude of their intercorrelation, is that it does not indicate what the factorial structure is, and consequently, gives no indication of either the number of latent variables or the dimensions that influence the scale items. In this way, the mean inter-item correlations may be high, and consequently the alpha coefficient may also be high, even when the factorial structure is not correct. Hence, it is not advisable to use the Cronbach's alpha coefficient in isolation to evaluate the reliability of a measurement scale.

Accordingly, we use both the composite reliability and the Cronbach's alpha coefficient. Table 7 shows the reliability evaluation for each dimension. The composite reliability values and the Cronbach's alpha coefficients are highly satisfactory, all above 0.7 (Hair et al., 1998; Nunnally, 1978). Our analysis therefore confirms the reliability of the measurement scales for each dimension of the OLC concept.

Furthermore, the ANOVA analysis we carried out to test whether pertaining to a particular organisation systematically implied a specific OLC showed that there is less variance between responses within firms than among them, which gives some additional evidence of the OLC reliability.

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## **Validity**

### *Content validity*

A measurement scale is considered to have content validity if two conditions are met. The first is that the generation of the dimensions and the items that make them up is grounded in the literature, in other words, in theoretical arguments, scales and previous empirical research. The second condition is that the scale was constructed in accordance with procedures accepted by the literature.

The OLC scale we propose meets both requirements. The dimensions and items were taken from the organisational learning literature, as described in the theory section. Moreover, the construction of the scale followed the widely accepted proposals of Churchill (1979), Lazarsfeld (1985) and DeVellis (1991).

### *Discriminant and convergent validity*

The convergent validity of a concept implies that the measure being used has a high correlation with other measures that evaluate the same concept (Churchill, 1979, p. 70). Confirmatory factor analysis was used to establish convergent validity by confirming that all scale items loaded significantly on their hypothesised construct factors (Anderson and Gerbing, 1988).



Discriminant validity verifies that one construct's dimensions are different from each other (Gatignon et al., 2002). In this way, we are able to confirm that the scale measures the concept under evaluation, and not other closely connected concepts. The discriminant validity of two constructs can be assessed by demonstrating that the correlation between a pair of constructs is significantly different from unity (McEvily and Zaheer, 1999). Pairwise correlations in Table 7 support the discriminant validity of the OLC measurement scale.

Additionally, discriminant and convergent validity was also assessed through confirmatory pairwise analyses. The discriminant validity of the OLC dimensions was ascertained by comparing measurement models where the correlation between the constructs was estimated with a model in which the correlation was constrained to 1 (thereby assuming a single-factor structure). The discriminant validity was examined for each pair of constructs at a time (Table 8). Results show that the model where the correlation is not equal to 1 improves the fit for all pairs of constructs, confirming that the two constructs are distinct from each other, although they can possibly be significantly correlated (Bagozzi et al., 1991).

Convergent validity of the OLC dimensions was assessed by comparing a measurement model where the correlation between the two constructs was estimated with a model where the correlation was constrained to be equal to 0. Results show significant improvements in the pairwise fits, indicating that the two constructs are indeed related and confirming convergence validity (Table 8). Combining the two tests demonstrates that the two constructs are different, thus evidencing discriminant validity, although they may be related, evidencing convergent validity (Gatignon et al., 2002).

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Insert Table 8 about here  
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## **CONCLUSION**

The research carried out in this study describes the development and validation of an instrument to measure organisational learning capability. The OLC measurement instrument, which aims to capture the organisational propensity to learn, is based on a comprehensive analysis of the facilitating factors for organisational learning. The facilitators were obtained from the learning organisation and organisational learning literature in an attempt to develop a comprehensive instrument.

From a thorough bibliographical review of these facilitating factors, we posit five dimensions of organisational learning capability: experimentation, risk taking, interaction with the external environment, dialogue and participative decision making. These dimensions represent an important contribution to the literature on OL, as they are based on an exhaustive literature review, and they have also been statistically validated by the research presented here.

These dimensions were operationalised in a 14-item questionnaire, to which 157 workers from 8 firms responded correctly. All the firms belonged to the Spanish ceramic tile sector. The items or indicators chosen were taken from measurement scales available in the organisational learning literature or other scales that include the same dimensions, following the suggestions of Spector (1992).

This paper also presents a review and categorisation of OL measurement instruments (Table 1), which allows us to present our contribution to the OL literature more clearly. Although other measurement scales that try to capture the organisational propensity to learn have been developed, none of them seems to have determined the conceptual dimensions through a comprehensive theoretical review. Most theoretical frameworks for these measures were based on a single perspective or literature, mainly the learning organisation literature.

The OLC measurement scale may prove most useful to practitioners. Metrics must provide key business drivers for decision makers to examine the outcomes of various measured processes and strategies and track the results to guide the company. The OLC measurement scale may be used as a diagnostic tool, a device for a survey-feedback procedure towards organisational development.

Our empirical findings have also shown that there is less variance between responses within firms than among them, which gives some evidence of the OLC reliability as a measure to attribute characteristics to the organisation. The diagnostic tool might be related to a dynamic trait theory approach applied to organisations, as some dimensions or traits determine the organisational behaviour concerning learning. However, the OLC measurement scale might itself be a mechanism for facilitating such learning, as OLC dimensions are accessible to change through learning and could represent a useful target for organisational change initiatives.

Although the OLC measurement scale is designed to be answered by individuals within organisations, its results will lead to conclusions at organisational level. The use of individual questionnaire responses to impute attributes to the organisations, previously

discussed by Bontis et al. (2002), might be considered as a shortcoming, considering the difficulties of obtaining objective assessments of the five dimensions. However, this opinion-based instrument is considered adequate as we are evaluating environmental conditions, which can only be properly assessed by people working within that context. Furthermore, prior studies have demonstrated the high correlations of perceived measures with objective measures (Gatignon et al., 2002).

We administered the questionnaire only to workers, as an employee based survey, in order to obtain a homogeneous set of respondents. This may constitute a limitation as we do not take into account other stakeholders. While it is true that the questionnaires were completed by the internal staff from a single industry, to control for potential industry effects across organisations, the instrument was designed so that its application could be generalised to any sector or country. In addition, particular attention was given to its versatility so that people from all different educational and training backgrounds would be able to respond to it, and it could be eventually used by all types of workers and managers.

This research tests the internal validity of the OLC scale. Future research could investigate the link between OLC and other organisational learning instruments and performance. The development of a valid OL measurement scale was one area of critical importance in the OL academic field. However, our aim was not only to devise the scale itself, but also to put it to use in the analysis of the relationships between OL and other organisational issues, such as performance, strategic posture, or innovation management. While linking learning to performance appears to be very important (Lyles and Easterby-Smith, 2003), the operationalisation of the co-alignment between a

firm's business strategy and its OLC is also vital (Vera and Crossan, 2003). Further research should also analyse the relationships between OL and issues concerning employees, such as job satisfaction, emotional intelligence or organisational commitment. These are several directions in which this research might be extended.

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TABLE 1: Summary of OL measurement instruments

	<b>OL MEASUREMENT INSTRUMENT</b>	<b>AIM</b>	<b>Conceptual background</b>
<b>Goh and Richards (1997)</b>	Organisational Learning Survey Scale: administered to 632 people from 4 organisations.	Capability	The Learning Organisation
<b>Hult and Ferrell (1997)</b>	The Organisational Learning Capacity Scale (OLC) (23 items): administered to 179 SBUs + 167 SBUs. Emphasis on purchasing.	Capability	The Learning Organisation
<b>Pedler, Burgoyne and Boydell (1997)</b>	Learning company questionnaire: Destined for audits.	Capability	The Learning Organisation
<b>Tannenbaum (1997)</b>	Learning Environment Survey: administered to 500 people in 7 organisations.	Capability	Individual view
<b>Hult (1998)</b>	The Organisational Learning Capacity Scale (OLC) (17 items): administered to 179 SBUs + 167 SBUs. Emphasis on sourcing process.	Capability	The Learning Organisation
<b>Hurley and Hult (1998)</b>	Learning and development: administered to 9648 employees from 56 organisations.	Capability	Individual view
<b>Edmonson (1999)</b>	Team Learning Behaviour: administered to 51 work teams in one company.	Capability	Individual view
<b>Ramus and Steger (2000)</b>	Behaviourally anchored rating scale of supervisory behaviour based on "the learning organisation" behaviours.	Capability	The Learning Organisation
<b>Hult, Hurley, Giunipero and Nichols (2000)</b>	The Organisational Learning Capacity Scale (OLC) (17 items): administered to 355 SBUs + 200 SBUs. Emphasis on purchasing.	Capability	The Learning Organisation
<b>Watkins and Marsick (1993, 2003)</b>	Dimensions of the Learning Organisation Questionnaire (DLOQ): administered to 191 managers and human resource developers from different organisations.	Capability	The Learning Organisation
<b>Jerez-Gómez, Céspedes-Lorente and Valle-Cabrera (2005)</b>	Organisational Learning Scale (16 items): administered to 111 Spanish firms from the Chemical Industry.	Capability	The Learning Organisation
<b>Bontis, Crossan and Hlland (2002)</b>	Strategic Learning Assessment Map (SLAM): administered to 480 individuals from 32 organisations.	Process	Crossan et al. (1999): 4I framework.
<b>Templeton, Lewis and Snyder (2002)</b>	Measure for the OL construct: administered to 119 firms. Emphasis on IT.	Process	Huber (1991)
<b>Tippins and Sohi (2003)</b>	OL: administered to 271 firms. Emphasis on IT and customers.	Process	Slater and Narver (1995); Huber (1991)
<b>Luo and Peng (1999)</b>	OL as measured by experience (intensity and diversity). Experience diversity measured through a scale: administered to 108 companies.	Indicators	Individual view
<b>Grewal, Comer and Mehta (2001)</b>	OL as measured by age and effort. Effort based learning: scale administered to 306 companies.	Indicators	Individual view. Huber (1991)
<b>McGrath (2001)</b>	Learning effectiveness and exploration: administered to 56 business development projects.	Indicators	Duncan and Weiss (1979); Nelson and Winter (1982)

FIGURE 1: The conceptual model of Organisational Learning Capability (OLC)

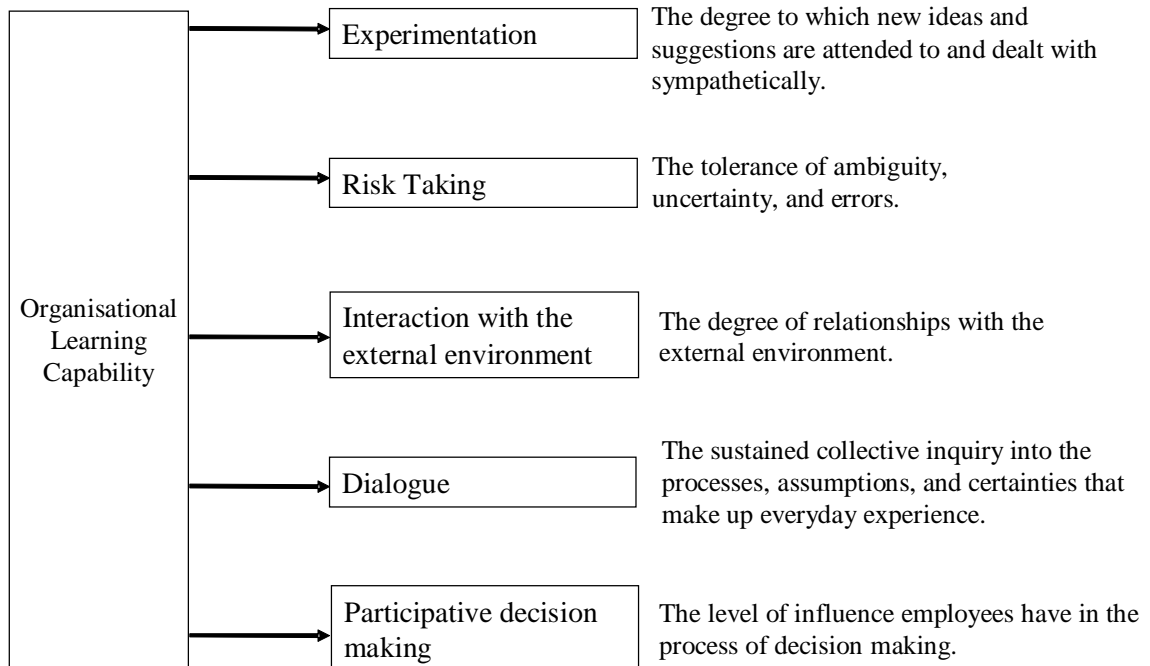


TABLE 2: Items composing the OLC scale

Dimension	Item	Literature source
Experimentation	1. People here receive support and encouragement when presenting new ideas	Isaksen et al. (1999)
	2. Initiative often receives a favourable response here so people feel encouraged to generate new ideas	Isaksen et al. (1999)
Risk taking	3. People are encouraged to take risks in this organisation	Amabile et al. (1996)
	4. People here often venture into unknown territory.	Isaksen et al. (1999)
Interaction with the external environment	5. It is part of the work of all staff to collect, bring back, and report information about what is going on outside the company.	Pedler et al. (1997)
	6. There are systems and procedures for receiving, collating and sharing information from outside the company.	Pedler et al. (1997)
	7. People are encouraged to interact with the environment: competitors, customers, technological institutes, universities, suppliers etc.	Pedler et al. (1997)
Dialogue	8. Employees are encouraged to communicate.	Templeton (2002)
	9. There is a free and open communication within my work group	Amabile et al. (1996)
	10. Managers facilitate communication	Pedler et al. (1997)
	11. Cross-functional teamwork is a common practice here.	Hult and Ferrell (1997)
Participative decision making	12. Managers in this organisation frequently involve employees in important decisions	Goh and Richards (1997)
	13. Policies are significantly influenced by the view of employees	Pedler et al. (1997)
	14. People feel involved in main company decisions	Pedler et al. (1997)

TABLE 3: Response rates

	FIRM 1	FIRM 2	FIRM 3	FIRM 4	FIRM 5	FIRM 6	FIRM 7	FIRM 8	TOTAL
Total number of workers	25	50	40	20	20	30	35	35	255
Total number of cases	25	35	19	14	11	20	15	18	157
Response rate	100%	70%	47%	70%	55%	66%	42%	51%	61%



TABLE 4: Descriptive statistics and ANOVA

	Firm	Mean	S.D.	ANOVA Significance level
<b>Experimentation</b>	1	4.88	1.08	0.000
	2	3.54	1.15	
	3	3.00	1.08	
	4	2.86	0.97	
	5	3.05	1.12	
	6	3.63	1.09	
	7	3.73	1.03	
	8	4.14	1.03	
	Total	3.69	1.54	
<b>Risk taking</b>	1	4.18	0.79	0.001
	2	3.33	0.94	
	3	2.37	1.10	
	4	2.61	1.16	
	5	2.73	1.04	
	6	3.78	1.14	
	7	2.93	0.84	
	8	3.39	1.01	
	Total	3.26	1.47	
<b>Interaction with the external environment</b>	1	4.56	1.05	0.000
	2	2.56	1.16	
	3	2.00	1.00	
	4	2.19	1.02	
	5	2.88	1.06	
	6	3.18	1.09	
	7	3.73	1.04	
	8	4.35	0.92	
	Total	3.20	1.49	
<b>Dialogue</b>	1	4.05	1.14	0.022
	2	3.56	1.17	
	3	3.45	1.00	
	4	3.80	1.09	
	5	4.16	1.07	
	6	3.59	1.05	
	7	3.62	0.99	
	8	5.03	1.01	
	Total	3.87	1.48	
<b>Participative decision making</b>	1	3.19	1.11	0.005
	2	2.37	1.06	
	3	2.25	1.01	
	4	1.98	0.82	
	5	2.55	1.05	
	6	2.82	1.13	
	7	2.58	1.07	
	8	3.72	1.10	
	Total	2.69	1.64	
<b>Organisational Learning Capability</b>	1	4.11	0.93	0.000
	2	3.06	1.07	
	3	2.66	0.96	
	4	2.76	0.67	
	5	3.18	1.05	
	6	3.37	1.04	
	7	3.34	0.89	
	8	4.24	0.84	
	Total	3.36	1.32	

Calculations based on the means of the items from each construct.

FIGURE 2: Representation of the dimensionality of the OLC concept

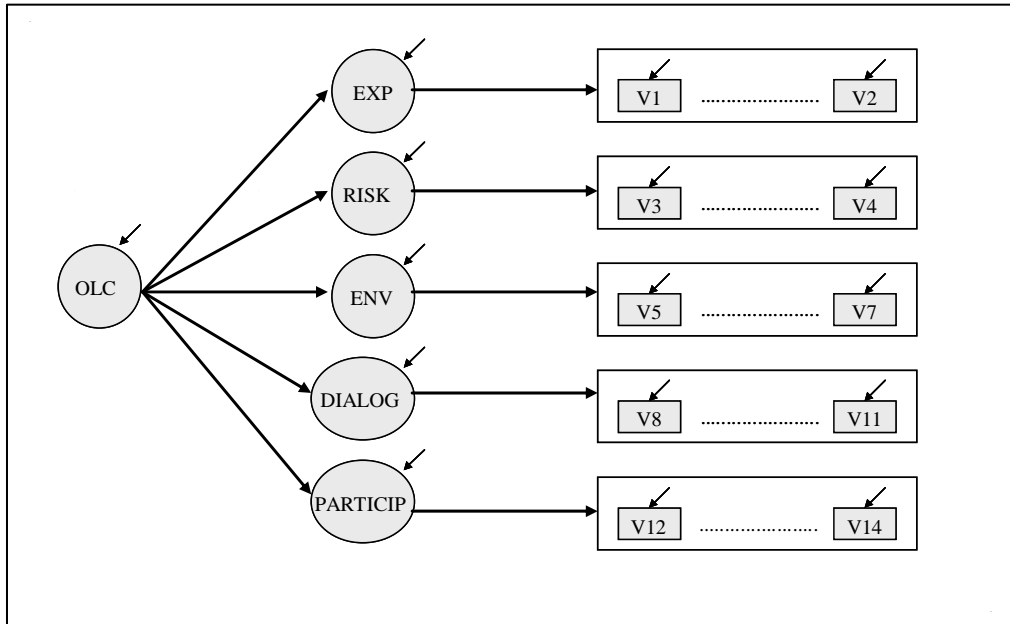


TABLE 5: OLC measurement model: standardised factor loadings, measurement errors and random perturbations

MEASURE	EXP	RISK	ENV	DIALOG	PARTICIP	OLC	ERRORS & PERTURB.
V1	0.886 (1)						0.464
V2	0.907						0.422
V3		0.840 (1)					0.543
V4		0.697					0.717
V5			0.744 (1)				0.668
V6			0.783				0.622
V7			0.875				0.485
V8				0.870 (1)			0.493
V9				0.723			0.691
V10				0.827			0.562
V11				0.702			0.712
V12					0.801 (1)		0.599
V13					0.898		0.440
V14					0.750		0.662
EXP						0.787 (1)	0.617
RISK						0.715	0.699
ENV						0.816	0.579
DIALOG						0.716	0.698
PARTICIP						0.832	0.555

(1) The parameter was equalled to 1 in order to fix the scale of the latent variable.  
All estimated parameters are statistically significant at 95% ( $t \geq 1.96$ ).

TABLE 6: Fit indexes of the OLC second order factor model

Model	Satorra-Bentler $\chi^2$	d.f.	p	BBNFI	CFI	GFI	RMR	NC (= $\chi^2 / g.l.$ )
OLC	82.45	72	0.19	0.917	0.969	0.913	0.045	1.145

TABLE 7: Means, standard deviations, composite reliabilities, Cronbach's alphas, and correlation between the dimensions of the OLC second order factor model

	Mean	Standard deviation	Composite reliability	EXP	RISK	ENV	DIALOG	PARTICIP
EXP	3.69	1.54	0.78	(0.89)				
RISK	3.27	1.31	0.65	0.488**	(0.74)			
ENV	3.20	1.57	0.76	0.561**	0.480**	(0.84)		
DIALOG	3.87	1.30	0.80	0.505**	0.344**	0.470**	(0.86)	
PARTICIP	2.69	1.40	0.78	0.533**	0.481**	0.593**	0.541**	(0.85)

All correlation coefficients are statistically significant (\*\*p<0.01).

Cronbach's alphas are shown on the diagonal.

The correlation coefficients were calculated using the means of the items from each dimension.

TABLE 8: Pairwise Confirmatory Analyses: Estimates of Correlations

	EXPERIMENTATION					RISK TAKING					INTERACTION WITH EXTERNAL ENVIRONMENT					DIALOGUE				
	$\phi$	d.f.	$\chi^2$	$\Delta\chi^2$	p	$\phi$	d.f.	$\chi^2$	$\Delta\chi^2$	p	$\phi$	d.f.	$\chi^2$	$\Delta\chi^2$	p	$\phi$	d.f.	$\chi^2$	$\Delta\chi^2$	p
RISK	0.60	1	0.73		0.39															
	1	2	11.18	10.45	0.00															
	0	2	7.29	6.56	0.02															
ENV	0.64	4	0.82		0.93	0.60	4	10.22		0.04										
	1	5	10.71	9.89	0.05	1	5	15.82	5.60	0.00										
	0	5	25.69	24.87	0.00	0	5	41.18	30.96	0.00										
DIALOG	0.60	8	13.44		0.10	0.41	8	6.18		0.63	0.56	13	16.30		0.23					
	1	9	21.24	7.80	0.01	1	9	15.54	9.36	0.07	1	14	22.91	6.61	0.06					
	0	9	42.41	28.97	0.00	0	9	19.62	13.44	0.02	0	14	51.29	34.99	0.00					
PARTICIP	0.62	4	4.83		0.30	0.60	4	3.63		0.46	0.68	8	9.44		0.30	0.63	13	13.39		0.42
	1	5	13.32	8.49	0.02	1	5	7.11	3.48	0.21	1	9	14.59	5.12	0.10	1	14	25.99	12.60	0.02
	0	5	24.97	20.14	0.00	0	5	27.34	23.71	0.00	0	9	76.27	66.83	0.00	0	14	60.85	47.46	0.00

## APPENDIX

### Variance – Covariance Matrix (N = 157)

	<b>V1</b>	<b>V2</b>	<b>V3</b>	<b>V4</b>	<b>V5</b>	<b>V6</b>	<b>V7</b>	<b>V8</b>	<b>V9</b>	<b>V10</b>	<b>V11</b>	<b>V12</b>	<b>V13</b>	<b>V14</b>
<b>V1</b>	2.681													
<b>V2</b>	2.123	2.605												
<b>V3</b>	1.079	1.230	2.870											
<b>V4</b>	1.056	1.077	1.603	2.610										
<b>V5</b>	1.375	1.420	1.579	0.900	3.722									
<b>V6</b>	1.304	1.371	1.031	0.852	2.077	3.344								
<b>V7</b>	1.390	1.387	1.332	1.051	2.091	2.184	2.934							
<b>V8</b>	1.460	1.331	1.048	0.581	1.361	1.265	1.409	3.341						
<b>V9</b>	0.905	0.906	0.683	0.580	0.697	0.588	0.988	1.992	2.905					
<b>V10</b>	1.325	1.427	0.872	0.604	1.006	0.868	1.152	2.176	1.837	2.871				
<b>V11</b>	1.117	0.779	0.893	0.753	1.489	1.083	1.388	2.100	1.458	1.781	3.381			
<b>V12</b>	1.375	1.182	1.208	1.014	1.547	1.377	1.475	1.444	1.089	1.200	1.378	3.433		
<b>V13</b>	1.252	1.295	1.122	0.959	1.303	1.230	1.372	1.367	0.857	1.321	1.219	2.033	2.290	
<b>V14</b>	0.978	1.052	1.169	0.675	1.505	1.259	1.179	1.263	0.794	1.051	0.945	1.735	1.562	2.412