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## Article

# How changing organizational culture can enhance innovation: Development of the innovative culture enhancement framework

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## MANAGEMENT | RESEARCH ARTICLE

# How changing organizational culture can enhance innovation: Development of the innovative culture enhancement framework

Salaheddine Bendak<sup>1\*</sup>, Amir Moued Shikhli<sup>1</sup> and Refaat H. Abdel-Razek<sup>1</sup>

**Abstract:** Innovation is considered one of the key factors that influence long-term success of any organization. The published literature indicates that establishing and enhancing the right culture that supports innovation in the organization is a precondition for innovation. The objective of this study is to propose and validate a framework, called the Innovative Culture Enhancement Framework (ICEF), which can be used to enhance innovation at any given organization based on its culture. First step in the framework involves using the Organizational Culture Assessment Instrument (OCAI) to determine the level of each culture type within the organization. Then, the Community Innovation Survey (CIS) is used to determine the level of each innovation type. The third step of ICEF involves doing multiple linear regression analyses of OCAI outcomes over CIS results to determine how each culture type contributes to each innovation type. The fourth step involves comparing existing level of each innovation type with the desired level as indicated by the management. The fifth and last step involves adjusting existing level of culture types in a way that enhances the desired innovation type. ICEF was validated by implementing it at three medium-size companies and was found to be workable and giving statistically significant outcomes. Then, the framework was further validated by interviewing a group of industry experts and seeking their opinion on ICEF dimensions. Statistical analysis of the interviews mainly gave high item-to-total correlations for the dimensions explored and a high Cronbach's alpha value leading

## ABOUT THE AUTHOR

Dr. Salaheddine Bendak holds BSc and MSc in Industrial Engineering from the Middle East Technical University (Turkey), Graduate Diploma of Education from Monash University (Australia), graduate certificate in the Global Burden of Injuries from Karolinska Institute (Sweden) and a PhD in Ergonomics from La Trobe University (Australia). He worked in five different countries as an industrial engineer, occupational/transportation safety consultant and university professor. He is currently working as an associate professor at the Department of Industrial Engineering and Engineering Management, University of Sharjah, UAE. His research interests include transportation safety, occupational safety, applied ergonomics, safety culture and organisational behaviour.

## PUBLIC INTEREST STATEMENT

Innovation is essential for the long-term success of any organization. The published literature indicates that establishing and enhancing the right culture that supports innovation in organizations is a precondition for innovation. The objective of this study is to propose a framework, called the Innovative Culture Enhancement Framework (ICEF), which can be used to enhance innovation at any given organization by determining and then changing its culture. ICEF was then validated by implementing it at three medium-size companies and was found to be workable and reliable. It is recommended that future research explores further how culture can be used as a driving force for innovation in organizations.

to conclude that the framework is reliable and delivers what it was developed for. It is recommended that future research explores further how culture can be used as a driving force for innovation in organizations.

**Subjects:** Development Studies, Environment, Social Work, Urban Studies; Development Studies; Economics, Finance, Business & Industry

**Keywords:** organizational culture; organizational innovation; framework; competitiveness

## 1. Introduction

Innovative and fast response to changes in the external environment is very important for any organization nowadays in order to avoid the risk of extinction. Innovation, defined as departure from existing knowledge, principles, products and/or practices to newly created or significantly improved ones, can keep the organization ahead of its competitors. Innovation also involves new ways of thinking on technological advances, marketing strategies and/or consumer behavior. Innovation can be generated internally from within organizations or adopted from external sources and can be radical or incremental. Radical innovation is harder to implement and involves, in general, greater risk because of the uncertainty but might be more suitable for long-term growth. On the other side, incremental innovation is easier to implement and suitable for making gradual improvements (Dewar & Dutton, 1986; Dosi, 1982; Giannopoulou, Barlatier, & Pénin, 2019; Hamel, 1999; Herkema, 2003; Hogan & Coote, 2014; OECD and Eurostat, 2005; Revilla & Rodríguez-Prado, 2018; Tidd & Bessant, 2009).

Studies on organizational innovation capability, started mainly by Burns and Stalker (1961), cover many areas of knowledge, without, however, converging on clear paths through which organizations would become more innovative (Raisch, Birkinshaw, Probst, & Tushman, 2009). Innovation management is also a very complicated process because of the several functional activities involved. Thus, the adoption of traditional formulas, such as high investment in research and development, may not yield reliable solutions (Hansen & Birkinshaw, 2007). Besides that, Tellis, Prabhu, and Chandy (2009) and Abdel Razek and Alsanad (2014) emphasized the importance of identifying and assessing factors that have the potential to affect innovation, like culture, and determining their inter-relationship.

Organizational culture has been attracting more attention in the last few decades due to its potential role in improving the organization's future prospects from the managerial perspective (Fisher & Wilmoth, 2018; Hutchison et al., 2019; Jaskyte & Kisieliene, 2006; Schein, 2004). Watson (2006) stated that culture was originally derived from a metaphor of the organization as "something cultivated." However, culture is more conventionally seen as a set of values, attitudes and behaviors that are shared by a group of people and communicated between generations (Matsumoto, 1996). Similarly, recent studies on organizational culture have focused more on intangible qualities such as values, behaviors and attitudes which help in the decision-making and development processes. Some researchers stress on the point that organizational culture is the climate and practices that support the development cycle within organizations by dealing with people (Schein, 2004).

Researchers stated also that there are two scenarios regarding culture variations within any given organization. First, a single uniform or homogeneous culture can exist across an entire organization (Martin, 2004; Wood et al., 2016). Second, organizations, especially larger and diverse ones, can have multiple cultures or subcultures. Therefore, cultural variations in such organizations are likely to occur across multiple departments. So the management can either focus on the entire organizational culture or can assess different subcultures to determine where commonalities exist (Cameron & Quinn, 2011; Rainey, 2009; Wood et al., 2016).

Many published studies have also provided evidence of the significant relation between organizational culture and innovation (Chang & Lee, 2007; Obenchain & Johnson, 2004; Tellis et al., 2009). Moreover, Tellis et al. (2009) evaluated the effects of corporate culture on radical innovation

by using survey and archival data from 759 firms across 17 countries. The authors found that corporate culture is the strongest driver of radical innovation across nations and firms.

Similarly, Jaskyte and Kisieliene (2006) and Schein (2004) stated that the effect of organizational culture on innovation depends on the contents of the culture. It is necessary, therefore, to improve the innovative culture in any given firm so that its members can search for new products, services or processes (Skerlavaj, Song, & Lee, 2010). Thus, innovation, as a process in any organization, requires a cultural climate and an innovative behavior that enhances creativity (Büschgens, Bausch, & Balkin, 2013; Jamrog, Vickers, & Bear, 2006; Jaskyte and Dressler, 2005; Tellis et al., 2009).

According to the literature review on the effects of culture on innovation, researchers defined four culture characteristics that have the potential to enhance innovation: creativity, freedom, teamwork and risk taking (Crossan & Apaydin, 2010; McLean, 2005). It is also reported in the literature that some organizations try to extend cultural characteristics that enhance innovation based on their existing culture and field of work such as availability of resources, customer orientation, employee participation, cooperation, continuous learning orientation and flexibility (Jamrog et al., 2006; McLean, 2005).

However, and to the best knowledge of the authors, no published study has tried to introduce a clear framework that helps organizations in enhancing their desired type of innovation by changing culture types in a specific way that enhances that type of innovation. Hartnell, Ou, and Kinicki (2011), for example, tried to assess the relationship between organizational culture and organizational effectiveness (but not specifically innovation). Although their results provided a broad-base support to the assertion that culture types affect organizational effectiveness, they did not sufficiently document the mechanism of how organizational culture can support aspired innovation (as was also postulated by Hogan & Coote, 2014). The aim of the current work is to develop a framework, called Innovative Culture Enhancement Framework (ICEF), that enhances the desired innovation type and then to validate it.

## 2. Framework development

As postulated earlier, this research aims to develop a framework that helps any given organization in enhancing its desired innovation type with the aim of improving its competitiveness in the market. Determining existing culture types and innovation types in the organization are the first and second steps of the framework, respectively.

The Competing Value Framework (CVF) model is a well-known model used to determine existing culture types in any organization (Hutchison et al., 2019). Quinn and Rohrbaugh (1983) initially developed this model based on four dimensions: human relations, open systems, rational goals and internal process. Since then, some empirical studies used CVF to identify culture types in organizations (Chad et al., 2011; Stock, McFadden, & Gowen, 2007). This model is used to check competing demands that determine cultures in organizations based on two dimensions: focus (internal or external environments) and organizational structure (emphasis on stability or flexibility) (Bradley & Parker, 2001). Cameron and Quinn (1999) later made some changes to the model by modifying culture types to adhocracy culture (AC) (creativity), market culture (MC) (competitive vision), hierarchy culture (HC) (controlled decision-making mechanism) and clan culture (CC) (collaboration vision). The same authors also developed an evaluation instrument called Organizational Culture Assessment Instrument (OCAI) to assess existing culture types in any organization.

OCAI is used in ICEF to determine existing culture types. In OCAI, respondents are asked to indicate their agreement or disagreement with the following 24 statements:

- The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.

- The organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
- The organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented.
- The organization is a very controlled and structured place. Formal procedures generally govern what people do.
- The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.
- The leadership in the organization is generally considered to exemplify entrepreneurship, innovation or risk taking.
- The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.
- The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.
- The management style in the organization is characterized by teamwork, consensus, and participation.
- The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.
- The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.
- The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.
- The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.
- The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.
- The glue that holds the organization together is the emphasis on achievement and goal accomplishment.
- The glue that holds the organization together is formal rules and policies. Maintaining a smooth-running organization is important.
- The organization emphasizes human development. High trust, openness, and participation persist.
- The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.
- The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.
- The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.
- The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.
- The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.
- The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.
- The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.

In the second step of ICEF, English version of the Community Innovation Survey (CIS), developed by the European Union and administered in UK by the Department for Business Innovation and Skills (Department for Business Innovation and Skills, 2012), is used. CIS is a widely used instrument to determine existing innovation types in any organization based on 28 questions divided into 12 sections. CIS classifies innovation into four types: product (aims to innovate new products/services and/or enhance existing ones), process (aims to enhance the work process), marketing (aims to better compete in the market) and organizational innovation (aims to enhance business practices) (Bianchini, Llerena, & Martino, 2019; Bou & Satorra, 2018; Giannopoulou et al., 2019; Revilla & Rodríguez-Prado, 2018).

However, two problems were encountered with CIS which led the authors to do some modifications to the survey. The first problem was that most of the questions were of yes/no type. Since answers to such questions do not accurately capture the opinion of respondents in general, a wider 10-point Likert scale was deemed more appropriate (as was also stated by DeVellis (2003)) to capture respondents' opinion on some of the points. The second problem was that the original questionnaire was too long with some of the questions being either too general, repeated and/or not directly related to innovation. So some of the survey questions were either deleted or modified which made the survey shorter and easier to administer. The slightly modified CIS questionnaire extracted from DBIS (2012) (after dropping definitions) used in the current study asked participants to respond and/or to rate 12 points (rating is done on a Likert scale of 1–10, 1 representing very weak and 10 representing very strong). The full questionnaire is given in Appendix A.

The third step of the developed framework involves determining the interrelationship between culture types and innovation types by determining how each culture type contributes to the existence of each innovation type. This is done using multiple regression analysis. The fourth step of ICEF involves comparing existing levels with desired levels of innovation types (based on management preferences) while the fifth step involves altering existing culture types in a way that enhances the desired innovation type.

### 3. Methodology

Methodology implemented in this study is summarized as follows:

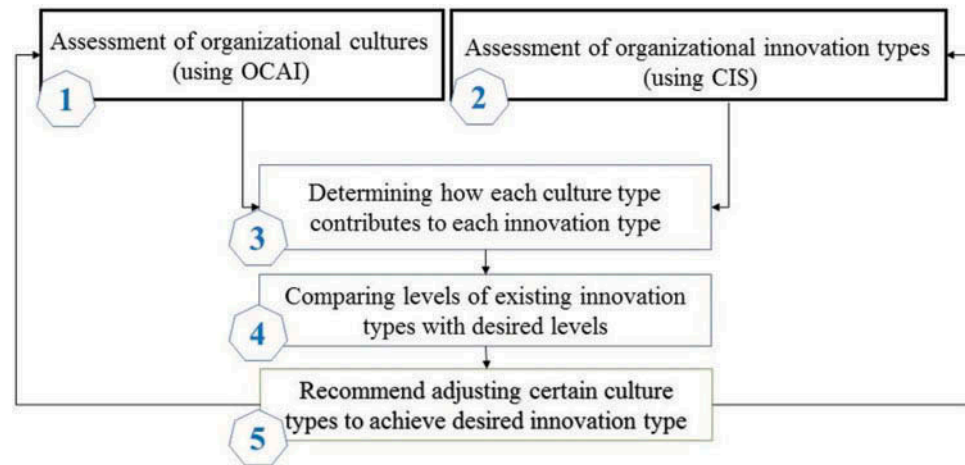
- (1) Developing a conceptual framework that consists of the following steps to enhance the desired organizational innovation type in any given organization:
  - (i) Assessing existing organizational culture types using OCAI.
  - (ii) Assessing existing innovation types within the organization using CIS.
  - (iii) Using multiple regression analysis and correlation matrix to find out how each culture type contribute to each innovation type.
  - (iv) Comparing levels of existing innovation types with desired levels as set by the management.
  - (v) Putting forward recommendations to adjust certain culture types to achieve the desired innovation type level.
- (2) Implementing and validating the framework in three companies.
- (3) Validating the framework by seeking expert opinion.

The developed framework is illustrated in Figure 1 and explained further in detail in the subsequent validation section.

It should be noted that organizational culture is a dynamic process that can vary over time. In order to ensure that the organization has the desired innovation type at the desired level after implementing changes pinpointed by ICEF, the organization can redo the process after a period of time (possibly two to 3 years).



**Figure 1. Developed ICEF framework.**



#### 4. ICEF implementation and validation

As a way of validating the framework, it was implemented in three different medium size companies in Abu Dhabi city, capital of the United Arab Emirates. The companies were an information technology (IT) company, a construction/design company and a media company. The framework was implemented in all three companies according to the following plan:

- (1) Employees were approached and invited to participate in the study on a department by department basis.
- (2) Implementation phase: Willing employees were given online access to OCAI and then CIS questionnaires and were asked to assess organizational culture and innovation types on different dates with at least a fortnight in between.
- (3) Statistical (linear regression) analysis phase: Results of the questionnaires were assessed while taking organizational culture types as input and innovation types as output factors as shown later. The output of this phase showed how each culture type contributed to each innovation type.
- (4) Comparison phase: Company management evaluated existing level of the desired innovation type and decided to enhance it.
- (5) Adjustment phase: The company adjusted its existing organizational culture by adopting strategies that aimed to strengthen culture types which help in achieving the desired innovation type.

In order to avoid repetition, framework implementation details in the first company are presented here while only implementation outcome in the second and third companies is given. The first (IT) company, which had 781 employees, consisted of the following main departments:

- (a) Sales and marketing
- (b) Finance
- (c) Services
- (d) Delivery
- (e) Human resources
- (f) Miscellaneous (mainly drivers, maintenance workers, security officers and procurement employees).

In the current study, human resources and miscellaneous employees were excluded as the nature of their work is not directly related to the core business of the company. So a total of 489



**Table 1. Distribution of employees among the four departments in the first company**

Department	No. of employees	No. of responses	Percentage
Sales and marketing	7	7	100
Finance	41	41	100
Services	108	96	88.9
Delivery	333	228	68.5
Total	489	372	76.07

employees of the company, who worked in the first four departments and were directly related to the core business of the company, were invited to participate in the current study. Out of those, 372 employees accepted the invitation with a response rate of 76.1%. Table 1 shows their distribution among the different departments.

OCAI questionnaire has six dimensions with a total of 24 questions. In each dimension, there is a question that asks the respondent to give a percentage value for each culture type (CC, AC, MC, HC) where the total of all of the four values is 100%. Then, the mean value of each culture type is calculated as the average of the six responses. Same procedure is then repeated by asking the employees to answer the same questions but for how they prefer the culture to be in the future in their organization. Results representing existing and preferred levels of each of the four organizational culture types are shown in Table 2. Results given in Table 2 show that the existing culture in the organization is a combination of 26% CC, 20% AC, 25% MC and 29% HC. At the same time, results show that employees expressed their opinion that the culture in their organization should be a combination of 28% CC, 21% AC, 24% MC and 27% HC in the future.

Results of CIS questionnaire, which was distributed more than 2 weeks after distributing OCAI, showed that employees of the company gave organizational innovation a weight of 26.98%, marketing innovation 25.6%, product innovation 25.55% and process innovation 21.95%.

Then, multiple linear regression analysis was used to find out the interrelationship between organizational culture types and innovation types. Independent variables in this relation were culture types represented by  $x_j$  ( $j = 1, 2, 3, 4$ ) and dependent variables were innovation types represented by  $y_i$  ( $i = 1, 2, 3, 4$ ) in the following regression equation:

$$y_i = \beta_0 + \sum \beta_j x_j + \epsilon$$

where  $\beta_0$  represents the intercept,  $\beta_j$  represents the coefficient of  $x_j$  and  $\epsilon$  represents regression error.

The hypotheses for each innovation type relationship with culture types are as follows:

$H_0$ :  $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$  meaning that there no relation between culture types and innovation type.

$H_1$ : at least one  $\beta_j \neq 0$ , meaning that at least one of the culture types is useful in predicting or explaining this innovation type.

**Table 2. OCAI questionnaire results in the first company**

Dimension	Existing %	Preferred %
CC	26	28
AC	20	21
MC	25	24
HC	29	27
Total	100	100

Regression analysis of all four innovation types gave statistically significant ( $p < 0.05$ ) results which meant that  $H_0$  was rejected in all four cases. This means that at least one of the four culture types is useful in explaining the given innovation type. Regression analysis for each of the four innovation types gave the following equations and adjusted  $R^2$  values:

$$\text{Product innovation} = 6.108 + 0.280\text{CC} + 1.627\text{AC} - 2.816\text{MC} + 1.085\text{HC} \text{ (adjusted } R^2 = 0.717)$$

$$\text{Process innovation} = 7.554 - 0.078\text{CC} + 1.212\text{AC} - 2.496\text{MC} + 0.988\text{HC} \text{ (adjusted } R^2 = 0.827)$$

$$\text{Organizational innovation} = -2.890 + 0.496\text{CC} + 2.190\text{AC} - 0.698\text{MC} + 1.458\text{HC} \text{ (adjusted } R^2 = 0.695)$$

$$\text{Marketing innovation} = -0.156 + 0.552\text{CC} + 2.083\text{AC} - 0.879\text{MC} + 0.776\text{HC} \text{ (adjusted } R^2 = 0.532)$$

These four equations have four unknown variables that represent culture types (CC, AC, MC and HC). So assigning values to the dependent variables (i.e. innovation types) in a way that gives one of them priority (based on the preferences of the management) will give the desired culture types combination for that innovation type. In a subsequent short meeting with the most senior three managers of the company in concern, they were briefed on the progress of the framework implementation and were asked for their preferred weight to be given to each of the four innovation types. They agreed that the company aims specifically to enhance product innovation and that this type of innovation should be allocated double the priority given to other innovation types. Accordingly and in percentage terms, product innovation was assigned a value of 40% while all other innovation types were assigned a value of 20% (meaning that product innovation had twice the importance of other innovation types). Other organizations, however, can assign other percentages to each culture type based on the importance they give to each innovation type.

Solving the four equations (with four unknowns) gives  $\text{CC} = -8$ ,  $\text{AC} = 2.24$ ,  $\text{MC} = -3.40$  and  $\text{HC} = -4.11$ . Then, the absolute values of  $X_i$  are converted to percentage terms representing desired culture types combination for the desired innovation type as follows:

$$\text{CC} = \frac{8}{8 + 2.24 + 3.40 + 4.11} \times 100 = 45\%$$

$$\text{AC} = \frac{2.40}{8 + 2.24 + 3.40 + 4.11} \times 100 = 13\%$$

$$\text{MC} = \frac{3.40}{8 + 2.24 + 3.40 + 4.11} \times 100 = 19\%$$

$$\text{HC} = \frac{4.11}{8 + 2.24 + 3.40 + 4.11} \times 100 = 23\%$$

Existing and desired levels of all culture types are given in Table 3. As can be concluded from this table, the management of the company is recommended to implement strategies that would lead to

**Table 3. Existing and desired levels of each culture type**

Culture type	Existing level (from OCAI)	Desired level (from multiple linear regression analysis)	Dif.
CC	26%	45%	+19
AC	20%	13%	-7
MC	25%	19%	-6
HC	29%	23%	-6

the desired levels of culture types (i.e. CC = 45%, AC = 13%, MC = 19%, HC = 23%) if they want to prepare a suitable climate to enhance product innovation. In other words, and based on ICEF outcome, the company is recommended to adopt strategies that would enhance the clan culture from 26% to 45% level and weaken the other three culture types to the indicated desired levels in order to achieve the strong product innovation outcome sought. When presented with those results and recommendations, the same three managers of the company expressed their acceptance of framework results. They consequently reported forming a committee to formulate a company-wide strategy that would enhance their clan culture and ease the other three types of culture so that their product innovation would be ultimately enhanced.

As a last point that should be mentioned on implementation, the direction of change in culture types derived from the framework matched that of the OCAI outcome. As can be seen in Table 2, employees indicated that they would prefer the clan culture to be slightly enhanced and other types of culture to be slightly weakened. Although the extent to which they wanted the change in culture types is different from the framework outcome, the direction of change is the same. This is also considered as an indirect way of confirming the outcome of ICEF implementation in the company.

Implementing the framework in the two other companies gave somehow similar meaningful results to those of the IT company with all adjusted  $R^2$  values being between 0.5 and 0.8. Management of both companies also expressed their desire to implement the outcome of the framework in order to try to enhance their desired innovation types.

## 5. Validating ICEF through expert opinion

It is essential in any research similar to the current one to do face and content validation, on top of implementing the framework, to ensure that it is comprehensive, meaningful and consistent. Content validity is defined as the degree to which items are representative of the construct of interest (Haynes, Richard, & Kubany, 1995). Face validity is defined as an item that appears to be valid, in addition to being valid (Nevo, 1995). Netemeyer, Bearden, and Sharma (2003) recommended seeking opinion of experts in the field of study to evaluate the content and face validity. The same authors also suggested that all parts of any survey, including concepts, items, response formats, scale points and directions are to be reviewed for representativeness by experts in the area of concern.

In developing similar models, the number of experts whose opinion is sought might range, according to their scarcity, between one and nine or more (see Cheaitou, Larbi, and Al Housani (2018) and Li, Shen, Xu, and Lev (2015) for example). In the current study, the opinion of seven experts was sought. Those seven were managers and senior engineers who were involved with the

**Table 4. Background information of the seven experts**

No.	Position	Qualification	Experience
1	CEO	BSc in Computer Science, MBA	10
2	Sales and marketing director	BSc in Marketing	12
3	Data center manager	BSc and MSc in Computer Science	10
4	Service manager	BSc in Computer Engineering, MSc in Engineering Management	8
5	Senior networking engineer	BSc in Internet Technology	15
6	Head of project management office	BSc in Computer Engineering, PMI certified	10
7	Head of R&D department	PhD in Computer Science	14

strategic decision-making process in various manufacturing and service industries. Detailed background information on the seven experts are given in Table 4.

They were interviewed face-to-face on an individual basis and asked to examine the taxonomy of concepts (dimensions) that form the basis for those both OCAI and CIS. OCAI concepts asked to the experts were its five major dimensions as determined by Cameron and Quinn (2011). These dimensions were employee-workplace environment relation, leadership style, reasons that keep employees together and organization strategies and success keys. In CIS case, the concepts examined were the four innovation types and the experts were asked about the ability of CIS questionnaire to demonstrate the level of each of these four types.

Specifically, the seven experts were asked to express their opinion on the adequacy and representativeness of questions used, response format and responses within each concept by rating it on a 10-point Likert scale. Likert scale was deemed appropriate in this case as it gives a good opportunity to capture opinions, beliefs and attitudes of respondents (DeVellis, 2003).

Assessing reliability is important within the validation process. Reliability of ICEF was checked using two methods, Cronbach's alpha value (Cronbach, 1951) and item-to-total correlations. Nunnally and Bernstein (1994) and DeVellis (2003) suggested that Cronbach's alpha value should be 0.7 or greater in order for the framework to be considered valid. As there is no single agreed-upon method to judge the strength of item-to-total correlations, it was decided to consider item-to-total correlations greater than 0.6 to be strong.

In Table 5, opinion of the seven experts interviewed on the adequacy of the two questionnaires in assessing dimensions in concern, is presented. As can be seen in the table, item-to-total correlations of the dimensions explored are mainly strong. Moreover, Cronbach's alpha value was found to be 0.928. Both results indicate that the framework is valid.

## 6. Discussion

Existing culture at any organization has a potential to affect creativity and innovation at that organization. Some earlier studies tried to assess the relationship between organizational culture and innovation. For example, Naranjo-Valencia, Jiménez-Jimén and Sanz-Valle (2016) studied organizational culture types in Spanish companies and linked them to innovation in general. In another study, Hogan and Coote (2014) did the same but using a different organizational culture model. Although those studies were partially successful in assessing this relationship, they mainly described the relation between organizational culture and innovation as positive or negative only without putting forward any clear recommendations on how to adjust organizational culture to achieve the desired innovation. In addition, they only considered one dominant culture type within the organization and ignored all other types, while, in reality, there are multiple cultures that exist within any given organization at different levels.

On the other hand, some other articles studied the effect of innovation types on organizational performance (e.g. Hassan, 2013; Karabulut, 2015). Yet, those studies did not consider the organizational culture role in this context that made their findings uncomprehensive.

The ICEF framework incorporates those gaps that existed in previous studies. It takes into consideration existing level of each culture type within the organization and determines the desired level that would lead to enhance the desired innovation type. This framework constitutes the first suggested mechanism published in the literature, to the best knowledge of the authors, that helps organizations in enhancing their desired type of innovation by recommending the alteration of existing culture types within the organization. Moreover, applying the framework in three companies and seeking expert opinion gave encouraging results on the applicability and reliability of the framework.

Table 5. Mean, standard deviation and item-to-total correlation of items				
Questions	Item	Mean	SD	Item-to-total correlations
Does OCAI describe employee's relation with the workplace?	Demonstrates relation between employees and workplace environment	4.8571	1.34519	0.899
Does OCAI describe the employee's emotions during the work?				
Does OCAI consider workplace rules?				
Does OCAI describe leadership style within the organization?	Demonstrates relation between employees and organization leadership	5.0000	0.81650	0.626
Does OCAI consider the relation between employees and their leaders?				
Does OCAI consider the appropriateness of management styles applied in the organization?	Finds out the reason that keeps organization employees together	5.5714	1.27242	0.921
Does OCAI describe most important management styles applied in the organization?				
Does OCAI consider the organization strategy and objectives of the business?	Examines organization strategy in general	4.5714	0.97590	0.869
Does OCAI consider the criteria needed by the management to succeed?	Examines success keys of the organization	5.7143	1.11270	0.850
Does CIS cover the most important points of product innovation?	Demonstrates product innovation in the organization	4.2857	0.75593	0.671
Does CIS demonstrate the services offered by your organization?				
Does CIS consider the most important processes within the organization and how to develop them?	Demonstrates process innovation in the organization	4.4286	1.39728	0.949

(Continued)

**Table 5. (Continued)**

Questions	Item	Mean	SD	Item-to-total correlations
Does CIS describe the most important methods and practices that will improve performance of the organization?	Demonstrates organizational innovation in the organization	5.4286	0.97590	0.271
Does CIS consider marketing strategies and concepts?	Demonstrates marketing innovation in the organization	5.0000	0.81650	0.626

## 7. Conclusions

The purpose of the current study is to develop a framework, called Innovative Culture Enhancement Framework, which helps organizations adjust their existing culture in a way that would enhance their desired innovation type. First, OCAI is used to evaluate existing culture. Then, an adjusted version of CIS is used to assess existing innovation types and their level of existence. Then, the framework determines the degree to which each culture type contributes to the existence level of each innovation type. Based on those results, the organization can then alter their existing culture in a way that enhances the level of their desired innovation type.

The framework was then applied at three medium-size firms to check its implementability and as a way to validate it. Implementing the framework in all three firms revealed positive outcome leading to the conclusion that the framework is workable and implementable in general. Then, the reliability of the framework was checked by seeking the opinion of a group of experts who were asked to rate the adequacy of the tools and concepts of the framework. Statistical analysis of responses gave high item-total correlations of all dimensions explored and a Cronbach's alpha value of 0.928 which is considered high. This leads to conclude that the framework is valid and delivers what it was developed for.

All of the above-mentioned lead to conclude that altering culture at any given organization in a systematic way and as described in the framework can help in enhancing the desired innovation type among its employees. Although this proposed process of change might take a long time that spans over several months if not a couple of years, enhancing the level of the desired innovation type in any organization is essential for their long-time survival.

It should be noted at the end that the framework developed in the current study and its implementation should be taken with caution. As this framework is the first of its kind in this area, more work is needed to enhance and further validate the framework. Adding other components or doing some adjustments to the framework should also be considered. Finally, prospective validation of the framework is needed where implementation-adjustment-reimplementation over a long period of time (e.g. 3 years) is necessary. This was beyond the scope of the current study but is recommended for future research.

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### Correction

This article has been republished with minor changes. These changes do not impact the academic content of the article.

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## Community Innovation Survey

Please respond to the following questions based on the situation in your company:

1. During the three years 2015 to 2017, did your enterprise introduce these points (rate them)?
  - Goods innovations: New or significantly improved goods (exclude the simple resale of new goods and changes of a solely aesthetic nature)
  - Service innovations: New or significantly improved services
2. Who developed these product innovations?
  - Your enterprise by itself
  - Your enterprise together with other enterprises or organisations
  - Your enterprise by adapting or modifying goods or services originally developed by other enterprises or organisations
  - Other enterprises or organisations
3. Were any of your product innovations (goods or services) during the three years 2015 to 2017 (rate them):
  - New to your market? Your enterprise introduced a new or significantly improved product onto your market before your competitors (it may have already been available in other markets)
  - Only new to your enterprise? Your enterprise introduced a new or significantly improved product that was already available from your competitors in your market
4. During the three years 2015 to 2017, did your enterprise introduce:
  - New or significantly improved methods of manufacturing for producing goods or services?
  - New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services?
  - New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing?
5. Who developed these process innovations?
  - Your enterprise by itself
  - Your enterprise together with other enterprises or organisations
  - Your enterprise by adapting or modifying processes originally developed by other enterprises or organisations
  - Other enterprises or organisations
6. Were any of your process innovations introduced during the three years 2015 to 2017 new to your market? ( ) Yes ( ) No ( ) Don't know
7. During the three years 2015 to 2017, did your enterprise have any innovation activities that did not result in a product or process innovation because the activities were (rate them):
  - Abandoned or suspended before completion

- Still ongoing at the end of the 2017
- Activities and expenditures for product and process innovations:

8. During the three years 2015 to 2017, did your enterprise engage in the following innovation activities?

- Acquisition of machinery, equipment, software & buildings: Acquisition of advanced machinery, equipment, software and buildings to be used for new or significantly improved products or processes.
- Acquisition of existing knowledge from other enterprises or organizations:
- Acquisition of existing know-how, copyrighted works, patented and non-patented inventions, etc., from other enterprises or organizations for the development of new or significantly improved products and processes
- Training for innovative activities: In-house or contracted out training for your personnel specifically for the development and/or introduction of new or significantly improved products and processes
- Market introduction of innovations: In-house or contracted out activities for the market introduction of your new or significantly improved goods or services, including market research and launch advertising
- Design: In-house or contracted out activities to alter the shape, appearance or usability of goods or services
- Other in-house or contracted out activities to implement new or significantly improved products and processes such as feasibility studies, testing, tooling up, industrial engineering, etc.

9. How much did your enterprise spend on each of the following innovation activities in 2017 only (rate them)?

- In-house R&D (Include current expenditures including labor costs and capital expenditures on buildings and equipment specifically for R&D)
- External R&D
- Acquisition of machinery, equipment, software & buildings (Exclude expenditures on these items that are for R&D)
- Acquisition of existing knowledge from other enterprises or organizations
- All other innovation activities including design, training, marketing, and other relevant activities

10. Please indicate the type of innovation co-operation partner your firm has:

- Other enterprises within your enterprise group
- Suppliers of equipment, materials, components, or software
- Clients or customers from the private sector
- Clients or customers from the public sector
- Competitors or other enterprises in your sector
- Consultants or commercial labs
- Universities or other higher education institutes
- Government, public or private research institutes

11. During the three years 2015 to 2017, did your enterprise introduce (rate them):

- New business practices for organizing procedures (i.e. first-time use of supply chain management, business re-engineering, knowledge management, lean production, quality management, etc.)
- New methods of organizing work responsibilities and decision-making (i.e. first-time use of a new system of employee responsibilities, teamwork, decentralization, integration or deintegration of departments, education/training systems, etc.)
- New methods of organizing external relations with other enterprises or public organizations (i.e. first-time use of alliances, partnerships, outsourcing or subcontracting, etc.)

12. During the three years 2015 to 2017, did your enterprise introduce (rate the selected activity):

- Significant changes to the aesthetic design or packaging of a good or service (exclude changes that alter the product's functional or user characteristics—these are product innovations)
- New media or techniques for product promotion (i.e. first-time use of a new advertising media, a new brand image, introduction of loyalty cards, etc.)
- New methods for product placement or sales channels (i.e. first-time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc.)
- New methods of pricing goods or services (i.e. first-time use of variable pricing by demand, discount systems, etc.)



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