Advances in Research
4(2): 122-141, 2015, Article no.AIR.2015.068
ISSN: 2348-0394

SCIENCEDOMAIN *international*
www.sciencedomain.org

Measuring Innovation Culture: Development and Validation of a Multidimensional Questionnaire

Ana Muñoz-van den Eynde[1*], Maria Cornejo-Cañamares[1], Irene Diaz-Garcia[1] and Emilio Muñoz[1]

[1]Research Unit on Scientific Culture, Center for Research on Energy, Environment and Technology (CIEMAT), Spain.

Authors' contributions

This work was carried out in collaboration between all authors. Author AME performed the statistical analysis, and wrote the first draft of the manuscript. All authors contributed equally to the design and elaboration of the questionnaire. All authors read and approved the final manuscript.

Article Information

DOI:10.9734/AIR/2015/15533
Editor(s):
(1) Paulo Jorge Silveira Ferreira, Superior School of Agriculture of Elvas (Polytechnic Institute of Portalegre), Portugal.
Reviewers:
(1) Mohamed Tarek Chahid, Moroccan Institute for Training in Automotive Industry (IFMIAC), Casablanca, Morocco.
(2) Mojca Duh, University of Maribor, Slovenia.
(3) Anonymous, USA.
(4) Anonymous, USA.
(5) Marcel van Marrewijk, Research to Improve, Trusting Companies International and Virtu et Fortuna, Vlaardingen, Netherland.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=869&id=31&aid=7871

Original Research Article

Received 3rd December 2014
Accepted 10th January 2015
Published 26th January 2015

ABSTRACT

Aims: In this paper, we describe the design and validation of the Radiography of Innovation Culture-Multidimensional Questionnaire (RIC-MQ), aimed at studying innovation culture in organizations from the perspective of individuals in addition to taking context into account. It has been considered that innovation culture is essential to enhance the innovation capability of organizations, but studies of innovation culture adopting a holistic approach are scarce. Those identified in the literature tend to pay little attention to the influence of individuals within the organization or to social context.
Study Design: Cross-sectional study.
Place and Duration of Study: The questionnaire was sent to a sample of workers from three Spanish organizations (a public research organization, a public university and a private healthcare company) to gather data and analyse RIC-MQ psychometric properties. Data were collected between October 2011 and November 2011.
Methodology: Cronbach's alpha coefficients were used to assess reliability, and Structural

**Corresponding author: E-mail: ana.munoz@ciemat.es;*

Equation Modelling (SEM) to validate the RIC-MQ.
Results: The RIC-MQ includes three dimensions: general, organizational and individual. Reliability, construct validity and discriminant validity results are satisfactory. The three dimensions structure has been confirmed and 15 factors have been identified.
Conclusion: Results provide evidence supporting the adequacy of the questionnaire to measure innovation culture as a three dimensional construct from an individual perspective in a sample of Spanish workers.

Keywords: Organization; measure; questionnaire; social; individual.

1. INTRODUCTION

Since the final decades of the 20th century, a great deal of interest has been shown in the concept of innovation and the effects of innovation culture on organizational performance [1,2]. In fact, the STI Outlook 2012 [3] pointed out that it is increasingly recognized that innovation is influenced by certain social and cultural values, norms, attitudes and behaviors which may be described as innovation culture.

Although the literature on innovation culture is long-standing, it has been limited by the difficulties in reaching consensus on a number of different issues. In this paper we focus on three issues directly related to measuring innovation culture. First, the lack of validated measurement scales of innovation culture [2], necessary to enhance the understanding of innovation culture. Second, the difficulty in identifying the factors determining the tendency and ability of organizations to produce innovations [4], key for diagnostic purposes. Third, the excessive focus on organizations, neglecting the relevance of social factors and individuals.

The study and fostering of innovation has been mainly founded on the idea that the more resources there are available (tangible assets), the more innovative there will be. Another thesis is currently emerging, however, based on the power of culture and the relevance of intangible assets, according to which those who have learned that there is no competitiveness without innovation are the most innovative. Yet, the power of culture is not only relevant in the context of innovation producers; innovation only exists as such if it is socialized [5].

Innovation and culture are social constructs [6]. To say that something is socially constructed is to emphasize its dependence on society. Had we had different needs, values or interests, we might well have built a different kind of thing or built the same thing in a different way [7]. Innovation takes place within a context that is external to the organization. This extra-organizational context includes the cultural heritage and resources that society provides [8] and these also have to be taken into account [9]. The widespread emphasis on innovation is a result of our societies, which promote and accept its results. This is more than ever present in the current context of the global economic crisis. However, the social context tends to be ignored when measuring innovation culture.

Addressing this issue, it seems appropriate to talk about the social appropriation of innovation, a term from Science, Technology and Society (STS) studies. If this approach is to be accepted, it is necessary to include not only cognitive and economic elements in the concept of innovation, but also social, organizational and cultural aspects. Ultimately, all innovations generate changes due to their adoption or rejection by society [10].

Several authors have defined innovation culture as a multidimensional construct [4,9,11,12]. However, there is a lack of consensus on the issue and even regarding its dimensions or determinants. It has been postulated that innovation culture includes the intention to be innovative, the infrastructure to support innovation, the operational level of the behaviors needed to influence the market and value orientation, in addition to the environment to implement innovation [2]. However, we do not consider these factors to be elements of innovation culture, but rather determinants of innovation. Furthermore, we do not believe that these factors are dimensions of innovation culture. We are therefore interested in three dimensions via which these factors could contribute to fostering innovation: society, organization, and the individual.

Most innovation is the result of a conscious, purposeful search for innovation opportunities, which are found only in few situations. These

situations are a consequence of a fertile and supportive social context [13]. An appropriate context is a necessary condition for innovation [14]. Although the reference to context has mainly focused on organizations, society is fundamental for innovation, as already stated. Consequently, this dimension should not be neglected in a questionnaire aimed at measuring innovation culture.

The organizational dimension is the unit of analysis of most studies on innovation culture [15]. However, there are very few validated scales measuring the influence of this dimension on innovation [4]. Besides the available scales measuring innovation culture tend to focus on product innovativeness and ignore the organization's overall ability to innovate. These approaches pay little attention to relevant factors as such the behavior of members of the organization [4]. What is even more noteworthy, there seem to be no studies in which the point of view of the people directly involved on a day-to-day basis in the development of innovations is taken into account. We consider it fundamental to know workers' perceptions about the influence of this dimension on their ability to do their job. An organization's innovative capability depends, at least partly, on the innovative traits of its employees [2,11]. Thus, individual differences have to be taken into consideration [16-18]. Another relevant and neglected factor is trust. Trust may be broken down into two dimensions: trust among employees, and trust between personnel and leaders [19]. Therefore, it is also important to know which traits in workmates and leaders are valued by employees.

Because deciding to be innovative is not enough. Actions are also needed to promote an environment that fosters innovation. It is assumed that, as a result of these actions, the members of the organization are sufficiently at ease with innovation that they innovate [9]. However, a contradiction seems to exist between perceptions and actions [20-22]. When searching for the reasons behind these contradictions, it is necessary to inquire into the perceptions of the people involved in innovation. It has been found that managers and employees broadly agree about the organizational factors that promote innovation and about the importance of people and organizational culture. Nonetheless, while executives consider that they do not have people who are talented enough for the innovation projects they pursue, employees tend to believe that their organizations have the right talent to innovate, but that organizational culture means it is wasted [23]. Despite these discrepancies, to the best of our knowledge the available studies tend to consider only the perspective of managers or executives. Even when asking for the opinion of workers, studies focus on the organization. We have not found any study that considers the workers' values, beliefs, norms, and symbols regarding innovation. Consequently, our study has adopted a bottom-up approach and focuses on workers' perceptions. In fact, we are interested in individuals as members of an organization that innovates.

We developed the Radiography of Innovation Culture-Multidimensional Questionnaire (RIC-MQ) taking all the above into account. The RIC-MQ is a measurement scale aimed at studying innovation culture in organizations from the perspective of individuals, those who are directly involved in the development of innovations. Assuming innovation culture as a multidimensional construct, the RIC-MQ includes questions on three dimensions: General (measuring individuals' perceptions of the social context), Organizational (measuring individuals' perceptions of the organization), and Individual (measuring individuals' traits and preferences related to innovation in the work context)(see Appendix).

An initial description of the development of the RIC-MQ was presented at the 2013 EU-SPRI Forum Conference [24]. In the present paper, we describe the process leading to the development of the RIC-MC and analyze its psychometric properties (reliability, construct validity, and discriminant validity) using data on a sample of workers from three Spanish organizations: a public research organization (CIEMAT), a public university (University of Oviedo), and a private health care company.

2. METHODOLOGY

2.1 Item Generation

A review of articles and entries on the Internet and the Web of Science including the key terms "measure", "questionnaire", and "innovation" was conducted. After reviewing the information gathered, two strategies were adopted. First, items from those identified in the literature as measuring the factors we are interested in were selected. Second, we completed the

questionnaire with self-generated items aimed at measuring general, organizational and individual innovation dimensions.

The items include two formats of a seven point Likert scale to obtain the responses of participants. The scales do not include a "neither agree nor disagree" option. Although this option supposedly reduces uninformed response, it has been found that including it does not improve the quality of responses [25]. In fact, it diminishes the valid answers as a result of a satisficing strategy [26]. The questionnaire includes the two formats of the Likert scale with the aim of reducing satisficing [27]. In one format, the most negative response option (totally disagree, totally unnecessary, etc.) corresponds to 1, and the most positive option (fully agree, totally necessary, etc.), to 7. In the other, the most negative response corresponds to -3, and the most positive, to +3 [28].

2.2 Data Collection

In a research environment, it is crucial to know how the members of the organization have internalized the core elements of innovation culture, entrepreneurial ability, tolerance to risk and uncertainty, the ability to adapt to a changing environment, creativity, etc. Therefore, the aim of this study is to measure the innovation culture of key actors in innovation, i.e., workers directly involved in its development. Furthermore, bearing in mind the possible differences due to organizational characteristics, the study has included workers from institutions belonging to the public sector (a public research organization and a public university) and the private sector (a healthcare company).

We considered these institutions to be representative of three key sectors for innovation. Although it has been reported that innovation in public-sector organizations is difficult to achieve [21], the public sector is far more dynamic and innovative than its reputation reflects and innovation has now become an essential target in the public sector [29]. Besides, linking research with innovation is one of the strategic goals of the research organization from the public sector included in our study, namely the institution to which the authors belong. The reason for including an organization from the healthcare sector is based on the proliferation of innovations in the healthcare industry and the need to convert validated research into best practices [30]. Finally, University is closely linked to research and innovation and the University of Oviedo has been accredited as an International Campus of Excellence for its involvement in enhancing research focusing on technological development and innovation.

A pilot sample of workers from the public research organization and the public university completed the questionnaire (N = 50) in June 2011. Comments regarding the difficulties encountered when answering the questionnaire were collected. The most frequent comment referred to the difficulty of using two different scales. This was intended, so the initial 115 items were kept unmodified.

Two versions of the initial questionnaire were prepared. The first version had the items arranged naturally, i.e., with the factors belonging to each dimension, one following the other. However, researchers have known for many decades now that changes in question order can deeply affect the results [31].The second version had the items arranged randomly. Both versions were randomly administered to the pilot sample. The analysis of the results did not provide statistically significant differences according to the version of the questionnaire. Consequently, the "natural" version was administered to the validation sample.

The questionnaire was electronically administered using software developed by CIEMAT programmers and implemented via the Internet. An email explaining the purpose of the study, asking for the cooperation of participants and containing the link to the survey application on the Internet was sent to all the workers at the three participating institutions. A reminder was sent one week after the first contact. Another mail was sent two weeks later warning about the imminent closure of the Internet application. Notifications were sent to 6338 workers (1356 from the public research organization, 2126 from the public university and 2856 from the healthcare company). The total validation sample consisted of 645 completed questionnaires (256, 222 and 167 respectively), representing a 10.18% response rate (18.9%, 10.4% and 5.85% respectively). Data were collected between October 3 and November 23, 2011.

2.3 Validation of the Questionnaire

All analyses were carried out with SPSS version 14.0 and AMOS 18.0.

Prior to the validation analysis, some data adjustments had to be made. In order to have all data on the same scale, the items with -3/+3 response options were transformed into the 1 to 7 scale. This change does not modify the subjects' answers, as a seven-point scale is being used in both cases. Some items have to be reversed to ensure that the lowest value on the scale corresponds with a worse outcome in terms of innovation culture, and vice versa. Once this has been done, the value 0 is assigned to the "Don't know" replies. This strategy allows avoiding the missing values without losing cases and without distorting the results. For the internal consistency assessment, a "Don't know" reply could be perfectly understood as an indication of poor innovation culture. For the construct validity, the items saturating in each factor are summed, so a 0 value does not have any influence.

2.3.1 Internal consistency

Internal consistency was assessed by means of Cronbach's alpha reliability coefficient. It was calculated for the 18 factors, the three dimensions, and the questionnaire as a whole. There are no clear standards regarding what level of Cronbach's alpha is considered acceptable [32]. However, 0.70 is considered the minimum acceptable, although this can be lowered to 0.60 in exploratory research [33]. These are the criteria guiding our analysis.

2.3.2 Validation

We carried out second-order confirmatory factor analysis by structural equation modeling to test the construct validity of the RIC-MQ. These analyses were aimed at testing the dimensional structure of the innovation culture construct.

Structural equation modeling (SEM) is a statistical technique adopting a confirmatory approach to analyze a structural theory about some phenomenon. The hypothesized model can be tested statistically in a simultaneous analysis of all variables to determine to what extent it is consistent with the data. The final conclusion depends on goodness-of-fit [34].

The most widely used index of goodness-of-fit is CMIN/DF. This index should be close to 1 for correct models [35]. However, this statistic has some problems: it depends to a major extent on sample size, and there is no clear consensus regarding how far from 1 it should be before concluding that a model is unsatisfactory. In relation with the latter problem, it has been suggested that a value from 1 to 3 reflects an acceptable fit [35]. In relation to the former limitation, researchers have developed other goodness-of-fit indices. There is considerable consensus regarding the convenience of choosing the RMSEA and CFI indices to assess SEM goodness-of-fit [36,37]. RMSEA values below 0.05 indicate a good fit, while those as high as 0.08 are considered reasonable [34]. The use of confidence intervals to assess the precision of RMSEA estimates is recommendable, and a test to value the closeness of fit of the RMSEA interval exists (PCLOSE)[38]. PCLOSE is a p value for testing the null hypothesis that the population RMSEA is no greater than 0.05; a value above 0.05 thus means that the null hypothesis may be maintained [35]. A value of CFI greater than 0.90 was originally considered representative of a well-fitting model [34]. However, it has now been proposed 0.95 as the CFI cutoff value [39].

In assessing the adequacy of a model, parsimony also has to be taken into account. There is agreement that the PCFI should be the parsimony index of choice [34]. A recommended criterion refers to PCFI values above 0.50 with goodness-of-fit indices around 0.90 [40].

Finally, Hoelter's Critical N estimates the sample size that would be sufficient to yield an adequate model fit for a χ^2 test. Hoelter proposed a value above 200 as an indicator of model adequacy [41].

Prior to testing the validity of the model, the problem of its identification has to be addressed. Specifically, the identification status of the higher-order portion of the model, that reflecting the three dimensions and the innovation culture construct. We used the critical ratio difference (CRDIFF) method to identify the residual variances to which the parameter equality constraint should be imposed [34].

The approaches employed in SEM are based on the assumption that the variables included in the model are continuous and have a multivariate normal distribution. Examination of the skewness and kurtosis of the univariate distributions is not enough, as all the univariate distributions may be normal, yet the joint distribution may be multivariate non-normal [42]. The calculation of multivariate measures of skewness and kurtosis is thus required [43]. It has been suggested that values of this measure above 5 are indicative of lack of normality [44].

2.3.3 Discriminant validity

Discriminant validation is required to justify novel measures, validate test interpretation, and establish construct validity [45:81]. Discriminant validity ensures that a construct measure is empirically unique and represents phenomena of interest that other measures in the structural equation model do not capture [46]. There are different approaches for evaluating discriminant validity. However, it has been empirically demonstrated that the heterotrait-monotrait ratio (HTMT) of the correlations provides the best results. As a criterion, a value of HTMT lower than 0.85 has been accepted as being indicative of discriminant validity [46].

3. RESULTS

3.1 Item Generation

The literature and Internet searches provided several factors identified as playing a relevant role in the development of innovations in organizations. Innovativeness is considered the precursor of innovation and represents a firm's ability to innovate. This suggests that innovativeness should be viewed as the strategic and competitive orientation of an organization, and innovation as the vehicle which it uses to achieve its competitive advantage. Innovativeness is not an end in itself, but rather a means to an end [2,4,20,47]. The terms *organizational motivation to innovate* [48] and *innovation orientation* [49] have also been used in this context.

The most cited factor has been creativity [9,12,17-19,49-53]. In fact, the link between creativity and innovation is so close that both concepts have tended to be identified as the same, thereby confusing the analysis [19].

Risk is also intertwined with innovation. An innovative organization has to be risk tolerant [12,14,23,48,50]. Furthermore, individuals must be willing to take risks [17,47,49,50,54].

Another relevant factor is safety. When safety exists, workers feel that their new ideas, alternatives and solutions are valued and fostered by the organization. Safety reflects the organization's openness to the proposals made by individuals and the trust of its members in this fact [1,20,48,50,54,55].

Other factors influencing innovation are autonomy [9,14,17,48,50], attribution of resources [12,48,49], technological capacity [47], flexibility and cooperation [12,48], knowledge and communication [14], leadership style [18], and the personality or motivation of individuals [18,19,48,53].

The general dimension gathers most of the factors (10) and 62 items: meaning of innovation (7 items), features necessary for innovation (7 items), objectives achieved by innovation (3 items), elements contributing to innovation (6 items), determinants of innovation (9 items), the process of innovation (5 items), beliefs about innovation (12 items), reasons to innovate (4 items), judgments about innovation (5 items), and the importance of innovation (4 items) (see Appendix).

The organizational dimension is second in importance in terms of the number of factors measured and items included (5 and 32, respectively): innovativeness (4 items), factors fostering innovativeness (12 items), autonomy (9 items), organizational culture (4 items), and safety (3 items).

Finally, the individual dimension includes three factors and 21 items: worker qualities (8), work preferences (7), and personality traits (6 items).

Opinion, safety, and work preference factors have some items reversed to avoid satisficing [26]. In these items, the most positive statement about innovation corresponds to the most negative response option. These items have to be reversed in the calculations.

3.2 Validation

3.2.1 Internal consistency

Cronbach's alpha coefficients are good with respect to the cutoff values mentioned in the previous section, with the exception of the Judgments factor, which presents a coefficient of 0.40. It seems as if the items have not been well selected and do not reflect a coherent factor. They were thus deleted from the questionnaire and the subsequent analysis. Cronbach's alpha coefficients for the remaining factors, the three dimensions, and the items of the questionnaire as a whole are presented in Table 1.

The total Cronbach's alpha coefficient of the 110 items reflects very good internal consistency (0.95). Moreover, all factors are internally consistent, with alpha values between 0.71 and

0.95, with the exception of Work Preferences, equal to 0.62. However, this coefficient could be considered high enough [32], also bearing in mind that the individual dimension has not been sufficiently addressed in previous papers on innovation culture and is explored for the first time in this study. The three dimensions are internally consistent. Cronbach's alpha for the organizational dimension is 0.95, for the general dimension, 0.93, and for the individual dimension, 0.82.

The reliability assessment showed the good internal consistency of the RIC-MQ, both as a whole and in terms of its dimensions and factors. Therefore, the corresponding items of the RIC-MQ were summed to obtain the 17 composed factors included in Table 1. Table 2 shows the name of the factors, a brief description of each, and their mean and standard deviations.

The means and standard deviations of the 17 factors show that responses are distributed around the highest scores. In fact, after subtracting the standard deviation from the mean, the value remains above the midpoint of the range of scores in almost all factors. Things are somewhat different in the organizational dimension. SD values reflect more data variability. When subtracting the standard deviation from the mean, values of four out of five of its factors are situated below the midpoint. Process (in the general dimension) is the factor with a mean value nearest the maximum.

3.2.2 Validation

The aim of the second-order confirmatory factor analysis is to assess the RIC-MQ construct validity. Moreover, it allows us to check whether the RIC-MQ measures what it is intended to measure, i.e., the three dimensional innovation culture construct we propose in this paper. The first approximation to validation results is presented in Fig. 1. The model assumes that the second-order factor, Innovation Culture (I_C), accounts for the variance of the first-order factors: General Dimension (G_D), Organizational Dimension (O_D), and Individual Dimension (I_D). These dimensions are measured by the 17 observed factors. The reliability of each factor is influenced by random measurement error, as indicated by the corresponding error terms. Furthermore, it is assumed that the prediction of the three dimensions from the Innovative Culture factor includes some measurement error. A residual term is accordingly associated with them.

Table 1. Internal consistency of RIC-MQ factors and dimensions

Factors	Number of items	Cronbach's alpha
General dimension	**57**	**0.93**
Meaning	7	0.79
Features	7	0.79
Objectives	3	0.83
Elements	6	0.86
Determinants	9	0.83
Process	5	0.84
Beliefs	12	0.85
Reasons	4	0.83
Importance	4	0.85
Organizational dimension	**32**	**0.95**
Innovativeness	4	0.86
Factors	12	0.95
Autonomy	9	0.94
Organizational culture	4	0.84
Safety	3	0.78
Individual dimension	21	0.82
Worker qualities	8	0.83
Work preferences	7	0.62
Personality traits	6	0.71
Total	**110**	**0.95**

Table 2. Factors of innovation culture

Name	Description	Min	Max	Mean	SD
Meaning	Meaning of the term innovation	0	49	37.25	7.88
Features	Characteristics necessary for innovation	0	49	39.98	6.97
Objectives	Objectives that innovation could contribute to achieving	0	21	18.26	3.63
Elements	Elements contributing to innovation	0	42	36.43	5.86
Determinants	Factors generating innovation	0	63	48.28	9.44
Process	Elements used to describe the innovation process	0	28	24.02	4.32
Beliefs	Agreement with statements about innovation	0	63	47.75	8.87
Reasons	Reasons justifying the need to innovate	0	28	23.52	4.89
Importance	Importance of innovation in different areas	0	28	25.41	3.75
Innovativeness	Innovation orientation in the working environment	0	32	19.42	7.18
Factors	Features contributing to innovation present in the organization	0	84	49.53	19.66
Autonomy	Possibilities offered by organizations for workers to organize their daily work	0	63	42.49	13.87
Org_Cult	Characteristics of organizational culture	0	28	15.70	6.43
Safety	Ways of working in organizations	0	21	12.17	5.14
Qualities	Workers' qualities valued	0	56	39.63	8.37
Preferences	Preferences about work and how to work	0	46	30.42	6.71
Traits	Traits describing respondent personality	0	42	28.86	6.79

** Min: minimum; Max: Maximum; SD: Standard Deviation*

Prior to testing a SEM, it is critical to assure the identification status of the measurement model, including the relationships between observed and unobserved variables (G_D, O_D, and I_D, and the 17 factors) and the structural model, which includes the unobserved variables (I_C, G_D, O_D, and I_D). In the measurement model, this requisite is satisfied by constraining one factor loading parameter for each set of loadings. In Fig. 1, this implies making one of the factor loadings from each dimension (G_D, O_D, and I_D) to the corresponding 17 factors equal to 1. In the structural model, CRDIFF values allow us to identify the residual variances that should be made equal in order to solve the problem of identification. In the proposed model, these are the variances of G_D residual and I_D residual (CRDIFF = 1.885, <1.96).

As can be seen in Fig. 1, neither Safety factor loading nor the goodness-of-fit indices are good enough. Factor loading from the organizational dimension to Safety equals 0.37, the CMIN/DF value is greater than 3, RMSEA is above 0.05, PCLOSE equals 0, and the CFI value is below 0.90. However, the PCFI and Hoelter's Critical N values are indicative of acceptable goodness-of-fit, while the coefficients of the other indices are not far from the cutoff criteria.

A new model was tested after deleting the Safety factor. There is some gain in goodness-of-fit, but it still remains below minimum criteria (CMIN/DF=3.764; RMSEA=0.065; PCLOSE=0; CFI=0.904; PCFI=0.768; Hoelter's Critical N=216).

In our search for model misspecification, we focused on I_D for a number of different reasons: it is the dimension in which the worst internal consistency results were found; it is the least explored dimension in the literature; and we found it difficult to differentiate between Work Preferences and Personality Traits when we reviewed the questionnaire. Therefore, we looked for a correlation between these two factors and found a significant and moderate one, equal to 0.44. When this correlation is included in the model, there is a significant improvement in the goodness-of-fit indices (CMIN/DF=2.703, RMSEA=0.51, PCLOSE= 0.400, CFI=0.941 and PCFI=0.792). However, the factor loading of Traits decreases to 0.20 and its explained variance is almost negligible, equal to 0.04. We subsequently tested a new model after combining Traits and Preferences in the same factor. Cronbach's alpha for this newly created factor is good (0.76). Results are presented in Fig. 2. Model adjustment is correct in terms of the goodness-of-fit indices, but some problems still remain with the I_D. Factor loading of Pref_Trait is 0.36, which is quite low. However, bearing in mind the improvement in model adjustment and the percentage of explained variance in I_D after this modification, we found

the result acceptable and decided to keep Qualities and Pref_Trait.

The innovation culture construct significantly contributes to explaining the three proposed dimensions. The regression weights (factor loadings) are 0.65 for G_D, 0.51 for O_D, and 0.78 for I_D. Therefore, I_D is the best explained dimension, with 62% of its variance accounted for by innovation culture. The dimensions correctly explain the scores in the 16 factors. Factor loadings range from 0.36 to 0.87. Both worst and best results are present in I_D. As previously mentioned, the regression weight from I_D to Pref_Trait is only 0.36, but from I_D to Qualities, it is 0.87. There is also a high regression weight from O_D to Autonomy.

The percentage of variance in the factors accounted for by the three dimensions ranges between 13% and 76%. Yet again, extreme results correspond to I_D. The results in the other two dimensions are more homogeneous, being better in O_D (from 33% to 68%) than in G_D (from 28% to 44%).

Finally, Mardia's normalized estimate of multivariate kurtosis (value of 156.909) shows a clear violation of the normality assumption.

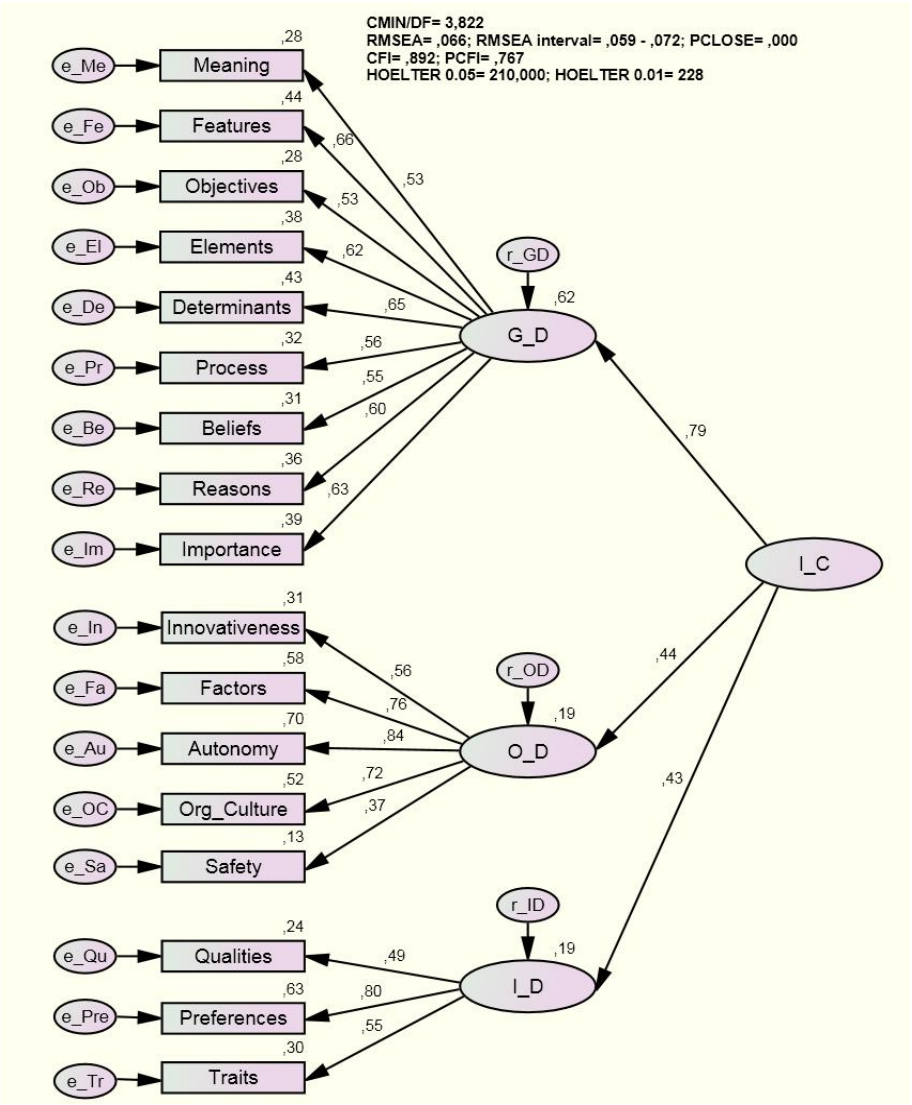

Fig. 1. RIC-MQ second-order confirmatory factor analysis. All initial factors included. Standardized coefficients and goodness-of-fit indices

3.2.3 Discriminant validity

Although there is no established criterion for discriminant validity, a result lower than 0.85 is considered an indicator of the absence of overlap between constructs. On the other hand, a result higher than 0.85 reflects major overlap between constructs and therefore means that the items do not discriminate. Results from the RIC-MQ Questionnaire are shown in Table 3, highlighting the good discriminant validity of its 110 items. None of the coefficients exceeds the value of 0.70. As expected, values tend to be higher when comparing factors belonging to the same dimension, and lower when comparing factors loading on different dimensions. That is to say, items correctly discriminate between factors, and factors between dimensions.

4. DISCUSSION

The literature on innovation, organizations, and culture is broad, extensive and thorough. Nevertheless, attempts at measuring innovation culture have not been very systematic, with certain exceptions [2,4]. There are still less studies which adopt a holistic approach, with a great deal of papers focusing on a single factor, such as creativity. Furthermore, the role of the individual within the organization, as a party involved in innovation development, has been neglected. This is clear evidence of the extreme complexity of the innovation process. This complexity may be better addressed by a multidisciplinary team, such as that of the authors. This seems to us one of the mainstays of this study.

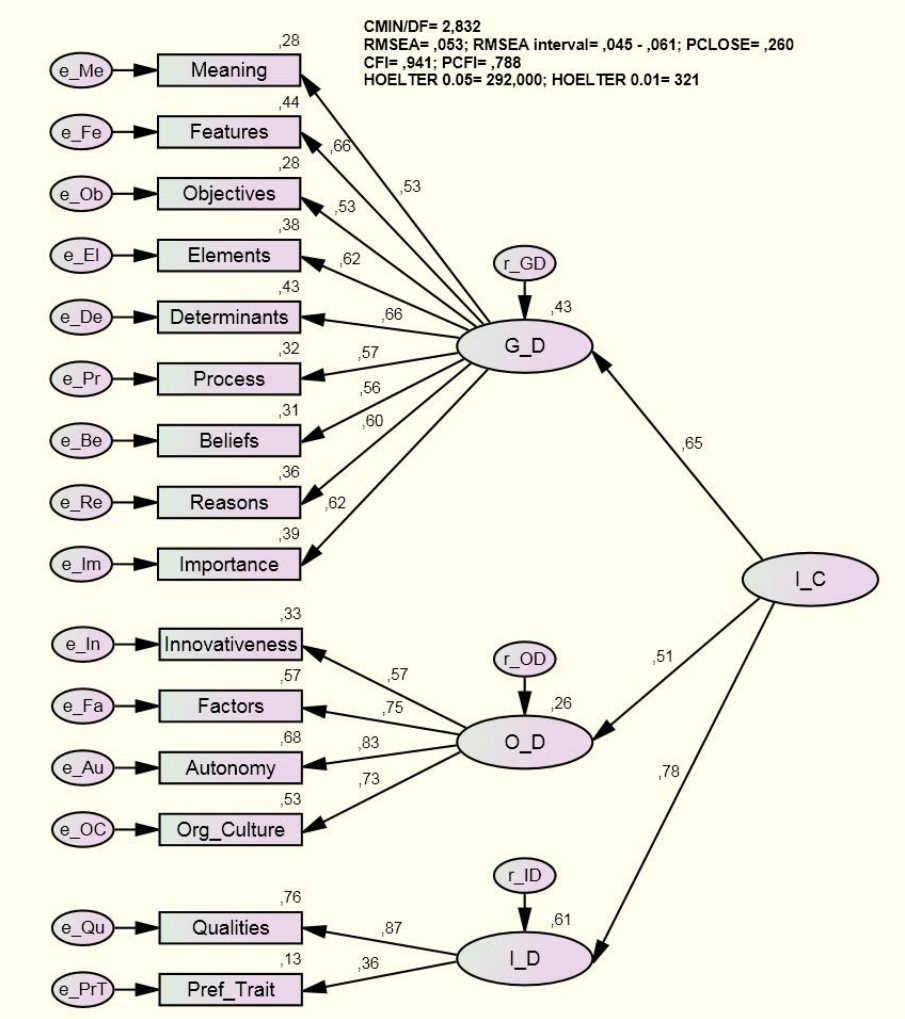

Fig. 2. RIC-MQ second-order confirmatory factor analysis. Final result. Standardized coefficients and goodness-of-fit indices

Table 3. Discriminant validity

	Fea	Obj	Ele	Det	Pro	Bel	Rea	Imp	Inn	Fac	Aut	O_C	Qua	Pre_Tra
Mea	.613	.360	.441	.552	.338	.285	.329	.309	.207	.189	.226	.265	.321	.161
Fea		.427	.503	.615	.519	.479	.435	.453	.117	.149	.137	.169	.385	.196
Obj			.363	.443	.303	.351	.412	.444	.069	.163	.188	.113	.260	.098
Ele				.602	.458	.432	.387	.446	.138	.205	.237	.166	.308	.056
Det					.530	.542	.456	.483	.188	.195	.155	.200	.238	.160
Pro						.581	.449	.394	.161	.141	.193	.173	.337	.219
Bel							.443	.448	.129	.162	.232	.206	.336	.221
Rea								.584	.197	.216	.263	.238	.274	.108
Imp									.193	.204	.212	.195	.340	.286
Inn										.518	.488	.517	.223	.135
Fac											.667	.587	.255	.120
Aut												.685	.343	.113
O_C													.327	.152
Qua														.481

Mea: Meaning; Fea: Features; Obj: Objectives; Ele: Elements; Det: Determinants; Pro: Process; Bel_ Beliefs; Rea: Reasons; Imp: Importance; Inn: Innovativeness; Fac: Factors; Aut: Autonomy; O_C: Organizational Culture; Qua: Qualities; Pre_Tra: Preferences and Traits

In this paper, we present a questionnaire designed to deal with some of the aforementioned limitations. However, in order to accurately develop a questionnaire, it has to be made clear what it is intended to measure. A three-dimensional innovation culture construct has accordingly been proposed. A factor analytic model is concerned with the extent to which the observed variables are generated by the underlying latent constructs. A structural model allows for the specification of regression structure among latent variables. A full latent variable model comprises both a measurement model and a structural model [34]. The model presented in this paper is a full latent variable model: it includes the link between the three postulated dimensions of innovation culture (general, organizational, and individual), the 15 observed factors finally retained, and the influence of innovation culture on the three dimensions.

Although the individual dimension is the least represented in the RIC-MQ in terms of the number of factors and items, it is the dimension best accounted for by the innovation culture construct. This result reflects the significant contribution of individuals when it comes to innovation. The organizational dimension is the worst explained. Possibly, our focus on the dimensions that have been addressed less in the available literature has pervaded the RIC-MC to the point of making the organizational dimension secondary. The general dimension was included with the aim of capturing the influence of social factors and context. Its significant contribution to the model supports our idea regarding the relevance of context for innovation.

The percentages of variance in the dimensions explained by innovation culture constitute very good results in terms of Cohen's criteria [56]. However, it is obvious that residual terms still explain a significant amount of variance, especially in the organizational dimension. This is a clear indication of the absence of relevant variables in the model. Nevertheless, a questionnaire measuring every relevant factor both extensively and accurately would not be feasible. We think that the RIC-MQ correctly achieves the compromise of measuring innovation culture in both a practical and parsimonious way.

The internal consistency and discriminant validity analysis results indicate that what is being measured has been measured well. On the other hand, the factor analysis results show that what is being measured represents a very small fraction of the constructs of interest, both the three dimensions and innovative culture. That is to say, the RIC-MQ is able to capture a small fraction of innovation culture, a very complex construct. Nonetheless, the RIC-MQ adequately identifies the point of view of individuals regarding innovation culture. Through the RIC-MQ, workers are able to rate the influence of the social and organizational context and the role of individuals in relation to innovation.

This study has certain limitations. The descriptive statistics clearly show that responses are distributed around the highest scores. This is an indication that the respondents have innovative culture, at least as measured by the RIC-MQ. However, it is also an indication of a ceiling effect. Besides being valid and reliable, a questionnaire has to be able to discriminate

between individuals. This is not possible if a ceiling effect exists. However, it could be due to the selected sample. There is more evidence pointing to a response bias associated with participants who are highly involved with innovation. The RIC-MQ was sent to all the workers belonging to the three organizations taking part in the study. However, the vast majority of respondents seemed to be the ones more linked to innovation: researchers in the public research organization, professors and assistants carrying out research activities at the public university, and healthcare and administrative staff in the private company. This could be also an explanation for the obtained response rates. Therefore, further studies and different samples are needed.

The data used to test the questionnaire and its underlying construct do not meet the assumption of normality. It has been found that whereas skewness tends to influence tests of means, kurtosis severely affects tests of variances and covariances [57]. Given that SEM is based on the analysis of covariance structures, evidence of kurtosis is a matter of concern [34]. Multivariate kurtosis in our model shows a clear departure from normality. However, as has previously been pointed out [42], the departure from normality may contribute to the rejection of accurate models, not to the confirmation of inaccurate ones. Furthermore, the results of this study lead to the validation of the proposed model. We may conclude therefore that the RIC-MQ suitably captures a fraction of the very broad context of innovation culture and does so from the perspective of people directly involved in innovation development. Bearing in mind the differences in perspective of managers and workers regarding the organization and its needs when it comes to innovation [23], organizations would presumably benefit from knowing its workers' values, beliefs, and perspectives regarding innovation and thereby improve their results in this respect. The RIC-MQ could be a useful tool to achieve this aim.

5. CONCLUSION

We have developed and tested a questionnaire to measure innovative culture. It has been assumed that innovation culture is a multidimensional construct including a general, an organizational, and an individual dimension, each one comprising several factors. The questionnaire has been tested in a Spanish sample of workers from a public research organization, a public university and a private healthcare company. Results provide evidence in favor of the adequacy of the questionnaire, and the need to consider social context and individual perspectives when measuring innovation culture in organizations. Nevertheless, further studies to explore the possibilities offered by the RIC-MQ are needed, and validating the questionnaire in other samples is necessary to better address it usefulness. Anyway, the RIC-MQ seems to be a useful diagnostic tool for academics and practitioners interested in knowing how individuals perceive innovation culture in organizations, in a practical and parsimonious manner.

ACKNOWLEDGEMENTS

The work presented in this paper was carried out as part of the research project "Politics of scientific culture: Analysis of the politic and social dimensions of scientific culture" (FF12011-24582) funded by the Spanish Ministry of Economy and Competitiveness.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anderson NR, West MA. Measuring climate for work group innovation: development and validation of the team climate inventory. J. Organ. Behav. 1998; 19:235-58.
2. Dobni CB. Measuring innovation culture in organizations. The development of a generalized innovation culture construct using exploratory factor analysis. Eur. J. Innov. Manag. 2008;11(4):539-59.
3. Organisation for Economic Co-operation and Development. OECD Science, Technology and Industry Outlook 2012. Paris: OECD; 2012.
4. Wang CL, Ahmed PK. The development and validation of the organizational innovativeness construct using confirmatory factor analysis. Eur. J. Innov. Manag. 2004;7(4):303:13.
5. Carbonell E. Evolución, innovación y resocialización. RevistaI+D+i. 2008;20:14-20. Spanish.
6. Cornejo M, Muñoz E. Percepción de la innovación: cultura de la innovación y capacidad innovadora. In: Pérez Sedeño

E., Cimoli M, coordinators. Innovación y Conocimiento. Pensamiento Iberoamericano. 2012;5:2ª.n época. Spanish.
7. Boghossian PA. What is social construction; 2001. Accessed 21 November 2014. Available:http://as.nyu.edu/docs/IO/1153/socialconstruction.pdf.
8. Van De Ven A.H. Central problems in the management of innovation. Manag. Sci. 1986;32(5):590-607.
9. Ahmed PK. Culture and climate for innovation. Eur. J. Innov. Manag. 1998; 1(1):30-43.
10. Rogers EM. Diffusion of innovations. 5th ed. New York: Free Press; 2003.
11. Tang HK. An inventory of organizational innovativeness. Technovation. 1999;19: 41-51.
12. Martins EC, Terblanche F. Building organizational culture that stimulates creativity and innovation. Eur. J. Innov. Manag. 2003;6(1):64:74.
13. Drucker PF. Innovation and Entrepreneurship: practice and principles. New York: Harper & Row; 1985.
14. Camelo-Ordaz C, Fernández-Alles ML, Martínez-Fierro S. Influence of top management team vision and work team characteristics on innovation. The Spanish case. Eur. J. Innov. Manag. 2006;9(2): 179-201.
15. Salavou H. The concept of innovativeness: should we need to focus? Eur. J. Innov. Manag. 2004;7(1):33-44.
16. Dewett T. Employee creativity and the role of risk. Eur. J. Innov. Manag. 2004;7(4): 257-266.
17. Williams SD. Personality, attitude and leader influences on divergent thinking and creativity in organizations. Eur. J. Innov. Manag. 2004;7(3):187-204.
18. McLean LD. Organizational culture's influence on creativity and innovation: A review of the literature and implications for human resource development. Adv. Dev. Hum. Resour. 2005;7(2):226-246.
19. Ellonen R, Blomqvist K, Puumalainen K. The role of trust in organizational innovativeness. Eur. J. Innov. Manag. 2008;11(2):160-181.
20. Tan BS. The consequences of innovation. The Innov. J. 2004;9(3):1-42.
21. Macpherson M. Performance excellence principles – drivers of innovation in public sector organisations. Paper presented at the National Conference on New Zealand Organisation for Quality, Christchurch, New Zealand; 2001. Accessed 21 November 2014. Available:http://www.macpherson.co.nz/public_sector_innovation.pdf.
22. Kirchgeorg V, Achtert M, Groeschmidt H. Pathways to innovation excellence. Results of a global study by Arthur D. Little. Accessed 21 November 2011. Available:http://www.adlittle.com/downloads/tx_adlreports/ADL_InnoEx_Report_2010.pdf
23. Barsh, M. Capozzi, J. Davidson, Leadership and innovation. McKinsey & Company. Accessed 21 November 2014. Available: http://changellenge.com/wp-content/uploads/2014/04/Leadership_and_innovation.pdf
24. Muñoz-van den Eynde A, Cornejo M, Díaz-García I, Muñoz E. Innovative culture: radiography through a multidimensional questionnaire. Proceedings of the 2013 EU-SPRI Forum Conference; 2013. ISBN 978-84-695-7408-9.
25. Sturgis P, Roberts C, Smith P. Middle alternatives revisited: how the neither/nor response act as a 'face-saving' way of saying 'I don't know'. Sociol. Methods Res; 2012. DOI: 10.1177/0049124112452527.
26. Krosnick JA, Holbrook AL, Berent MK, Carson RT, Hanemann WM, Kopp RJ et al. The impact of 'no opinion' response options on data quality. Public Opin. Q. 2002;66:371-403.
27. Krosnik JA. Response strategies for coping with the cognitive demands of attitude measures in surveys. Appl. Cogn. Psychol. 1991;5:213-236.
28. Fishbein M, Ajzen I. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading: Adrian-Wesley; 1975.
29. Sørensen E., Torfing J. Introduction: Collaborative innovation in the public sector. The Innov. J. 2012;17(1):article 1.
30. Omachonu VK, Einspruch NG. Innovation in healthcare delivery systems: A conceptual framework. The Innov. J. 2010; 15(1):article 2.
31. Schwarz N. Attitude measurement. In: Crano WD, Prislin R, editors. Attitudes and attitude change. New York: Psychology Press; 2008.
32. Clark LA, Watson D. Constructing validity: Basic issues in objective scale

development, Psychol. Assess. 1995;7(3): 309-319.
33. Hair JF, Anderson RE, Tatham RL, Black WC. Multivariate Data Analysis. 5th ed. Hillsdale: Lawrence Erlbaum Associates; 1998.
34. Byrne BM. Structural equation modeling with AMOS. Basic concepts, applications, and programming. New York: Routledge; 2010.
35. ArbuckleL. Amos 17.0 user's guide. Chicago: SPSS Inc.; 2008.
36. MacCallum RC, Austin JT. Applications of structural equation modeling in psychological research. Annu. Rev. Psychol. 2000;51:201-226.
37. Bentler PM. Comparative fit indexes in structural models. Psychol. Bull. 1990; 107:238-246.
38. Steiger JH. Structural model evaluation and modification: An interval estimation approach. Multivar. Behav. Res. 1990;25: 173-180.
39. HuL-T, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equ. Modeling. 1999; 6:1-55.
40. Mulaik SA, James LR, Van Altine J, Bennett N, Lind S, Stilwell CD. Evaluation of goodness-of-fit indices for structural equation models, Psychol. Bull. 1989;105: 430-445.
41. Hoelter JW. The analysis of covariance structures: Goodness-of-fit indices, Soc. Methods Res. 1983;11:325-344.
42. West SG, Finch JF, Curran PJ. Structural equation models with nonnormal variables: problems and remedies.in: Hoyle RH, editor. Structural equation modeling: concepts, issues, and applications. New York: SAGE Publications; 1995.
43. Mardia KV. Applications of some measures of multivariate skewness and kurtosis in testing normality and robustness studies. Sankhya. 1970;B36: 115-128.
44. Bentler PM. EQS 6 Structural equations program manual Encino: Multivariate Software; 2005.
45. Campbell DT, Fiske DW. Convergent and discriminant validation by the Multitrait-Multimethod Matrix. Psychol. Bull. 1959; 56(2):81-105.
46. Hensler J, Ringle CM, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. J. of the Acad. Mark. Sci.; 2014. DOI 10.1007/s11747-014-0403-8.
47. Lynch P, Walsh MM, Harrington D. Defining and dimensionalizing organizational innovativeness, paper presented at International CHRIE Conference-Refereed Track. 2010;18. Accessed 21 November 2014. Available:http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1468&context=refereed
48. Amabile T, Conti R, Coon H, Lazenby J, Herron M. Assessing the work environment for creativity. Acad. Manag. J. 1996;39(5):1154-1184.
49. Siguaw JA, Simpson PM, Enz CA. Conceptualizing innovation orientation: a framework for study integration of innovation research, J. Product Innov. Manag. 2006;23:556-574.
50. Ekvall G. Organizational climate for creativity and innovation. Eur. J. Work Organ. Psychol. 1996;5(1):105-123.
51. Roberts R. Managing innovation: the pursuit of competitive advantage and the design of innovation intense environments. Res. Policy. 1998;27:159-175.
52. Isaksen SG, Akkermans HJ. Creative climate: a leadership lever for innovation. J. Creat. Behav. 2011;45(3):161-187.
53. Lin CY, Liu F. A cross-level analysis of organizational creativity climate and perceived innovation. Eur. J. Innov. Manag. 2012;15(1):55-76.
54. Baer M, Frese M. Innovation is not enough: climates for initiative and psychological safety, process innovations, and firm performance. J. Organ. Behav. 2003;24:45-68.
55. Jaruzelsky B, Loher J, Holman R. The Global Innovation 1000: why culture is key? strategy+business. 2001;65.
56. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale: Lawrence Erlbaum Associates; 1988.
57. DeCarlo LT. On the meaning and use of kurtosis. Psychol. Methods. 1997;2:292-307.

APPENDIX – RCI-MQ QUESTIONNAIRE

1. In this first question, we would like to know what "innovation" means for you.Please rate to what extent you think that the issues mentioned below define the concept, bearing in mind that 1 means *nothing to do with innovation* and 7 means *a great deal to do with innovation*.

Innovation is:

	1	2	3	4	5	6	7
a) Ideas							
b) Solutions							
c) Contributing technological value							
d) Contributing organizational value							
e) Contributing economic value							
f) Contributing social change							
g) Doing something different							

2. We now present a number of features. We would like you to let us know to what extent you consider them necessary for innovation to exist. Bear in mind that 1 means that they are not needed at all and 7 means that they are absolutely necessary.

	1	2	3	4	5	6	7
a) Scientific knowledge							
b) Technological knowledge							
c) Productivity							
d) Creativity							
e) Ability to solve problems							
f) Entrepreneurship							
g) Competitiveness							

3. We would now like to know your opinion on the goals that innovation can contribute to achieving. Please rate the following goals from 1 to 7, where 1 means that innovation *contributes nothing* and 7 that it is *key to achieving the goal*.

	1	2	3	4	5	6	7
a) Growth							
b) Economic development							
c) Social development							

4. We now present a number of elements that may contribute to innovation. On a scale of 1 to 7, we would like you to rate the importance of each of these elements for innovation, where 1 means it is *not at all necessary* and 7 means it is *very necessary*.

	1	2	3	4	5	6	7
a) Resources (economic, material, etc.)							
b) Attitudes (predisposition)							
c) Research work							
d) Knowledge sharing							
e) Cooperation							
f) Risk taking							

5. We now present a number of factors that might contribute to innovation. We would like you to give your opinion regarding the contribution of these factors using a scale of 1 to 7, where 1 means that it *contributes nothing* and 7 means that it *contributes fully*.

	1	2	3	4	5	6	7
a) Improving processes							
b) Overcoming barriers							
c) Getting funding							
d) Making important investments							
e) Designing short-term strategies							
f) Designing long-term strategies							
g) Improving the functioning of the public system							
h) Facilitating collaboration between the public and private sectors							

6. We now present a number of issues that may be used to describe the process of innovation. On a scale of 1 to 7, we would like you to rate the importance of each issue in describing the process, where 1 means it is *not at all important* and 7 means it is *very important*.

	1	2	3	4	5	6	7
a) Identifying a need							
b) Doing research							
c) Coming up with a solution							
d) Placing on the market							
e) Disseminating and adopting							

7. We now present a number of statements. We would like you to give us your opinion on each one using a scale of 1 to 7, where 1 means you *totally disagree* and 7 means you *fully agree*.

	1	2	3	4	5	6	7
a) Those who have more resources innovate more							
b) To innovate, it is essential to be willing to do so							
c) If you do not innovate, you cannot be competitive							
d) To innovate, you have to take risks							
e) Creativity is needed to innovate							
f) Innovation is the result of scientific research							
g) There is a lot of talk about innovation, but little innovation is actually carried out							
h) Innovating is expensive							
i) It is easier be innovative if society in general is also innovative							
j) To innovate, you have to work as a team							
k) Innovation and creativity are related to the idea of progress. They are positive values that should be fostered							
l) Innovation contributes to transforming society							

8. In this case, we present a number of reasons justifying the need to innovate. We would like you to tell us whether you consider them good reasons for innovating or not, rating them on a scale of 1 to 7, where 1 means it is *not at all important* and 7 means it is *very important*. If you think it is not necessary to innovate, mark 1 in all the options.

	1	2	3	4	5	6	7
a) Innovation makes us better prepared for the future							
b) Innovation makes us more competitive							
c) Innovation contributes to saving resources							
d) Innovation makes us more efficient							

9. Being innovation oriented represents the intention and commitment to create the conditions and foster the capacity to generate innovation in the broadest sense of the word (it is not just about creating new products, but also about developing new ways of solving situations or problems, new procedures, etc.).With this definition in mind, do you think there is a focus on innovation at the different levels in your workplace? Please answer this question on a scale of 1 to 7, where 1 means that there is *no focus on innovation* and 7 means there is a *total commitment to innovation*. If any of the levels does not apply to the work structure you belong to, please mark option 8.

	1	2	3	4	5	6	7	8
a) Organization (company, institution)								
b) Department								
c) Unit or group								
d) Work team								

10. Different features have been identified that seem to foster an innovation-oriented approach. Here are some of them. Using a scale of 1 to 7, we would like you to let us know if you think that these features are present in the institution/organization you work for, where 1 means they are *totally absent* and 7 means they are *fully present*.

	1	2	3	4	5	6	7
a) Risk taking							
b) Accepting failure							
c) Rewarding a job well done							
d) Identifying obstacles							
e) Making the most of the experience, skills and abilities of employees							
f) Knowledge sharing							
g) Searching for, detecting, obtaining and disseminating information at an in-house level							
h) Exchanging and coming up with ideas							
i) Fostering creativity							
j) Fostering team work							

11. Next, we present a number of statements about the possibilities offered (or accepted) by institutions/organizations to enable their employees to organize their daily work. We would like to know if, in your opinion, these statements represent possibilities offered to you by the organization you work for. Once again we ask you to use a scale of 1 to 7, where 1 means that there is *no possibility* for you to do so, and 7 that there are *all kinds of possibilities* for you to do so.

	1	2	3	4	5	6	7
a) Get trained (broaden your know-how)							
b) Apply your know-how							
c) Seek solutions to the problems that arise							
d) Contribute solutions to the problems that arise							
e) Propose new initiatives							
f) Develop new initiatives							
g) Freedom to organize your work							
h) Take on responsibilities							
i) Cooperate with other departments and/or teams at work who have different functions							

12. Organizational structure refers to what is important for the institution/organization, what it considers of value and hence what defines its structure, standards of practice and the activities of the people that form part of it. It is also important because it helps distinguish some institutions/organizations from others. With this in mind, we'd like you to tell us whether, in your opinion, the following features form part of the culture of the institution/organization you work for. You once again have a scale of 1 to 7 to do so, where 1 means it is *totally absent* from your organization's culture and 7 means it is *fully present*.

	1	2	3	4	5	6	7
a) There is a system of structured, well-defined information that enables what is done in different departments to be known							
b) There is a formal organizational structure: a set of rules, established functions and procedures; everyone knows what they can and should do							
c) The institution/organization is outward looking: it works with other organizations and professionals, knowledge and ideas are obtained from outside							
d) There is a focus on innovation: new opportunities are sought, creativity is fostered in employees and in learning							

13. We now present scales of -3 to +3 with two statements at each end regarding ways of working in institutions/organizations. We would like you to use the scale to let us know which statement best reflects what occurs in the organization you work for, with -3 indicating you *fully agree with one of the statements*, while +3 reflects you *fully agree with the other*.

	-3	-2	-1	0	1	2	3	
a)It is understood that employees must sometimes take risks to try to improve at work, even though the result is not fully satisfactory								a) It is understood that employees do not have to take risks to try to improve at work, even though by doing so, they might obtain better results
b)It is understood that it may be positive for employees to make mistakes, because it is a way to learn								b) It is understood that it is not positive for employees to make mistakes, even though it is a way to learn
c) A positive view is taken of employees taking the initiative when faced with new situations								c) A negative view is taken of employees taking the initiative when faced with new situations

14. In this question, we briefly outline some of the qualities that contribute to describing what we are like. If you were the person in charge of selecting the other members of your team or workgroup, what qualities would you like the people who are to work with you to have? To answer this question, we would like you to rate the importance of each of the characteristics we present on a scale of 1 to 7, where 1 means it is *not at all important* and 7 means it is *very important*.

	1	2	3	4	5	6	7
a) Creativity, having new ideas							
b) Autonomy, doing things your own way							
c) Seeking out and taking risks							
d) Looking out for workmates, taking care of their welfare							
e) Pursuing success, getting others to recognize your achievements							
f) Behaving correctly, avoiding doing something that others may consider wrong							
g) Sticking to customs, doing what is usually done							

15. We would now like to know your preferences or point of view regarding several issues related to work and ways of working. To do so, we once again provide scales of -3 to +3 with two statements at each end. We would like you to use the scale to let us know which statement best reflects your preference, what you consider best when working, with -3 indicating you *fully agree with one of the statements*, +3 reflects that you *fully agree with the other* and 0 indicates that *both statements equally reflect your opinion*.

At work:

	-3	-2	-1	0	1	2	3	
a) It is important to receive training and broaden one's know-how, but it is more important to fulfil the obligations of the job								a) It is important to fulfil the obligations of the job, but it is more important to receive training and broaden one's know-how
b) Keeping up-to-date with respect to the latest novelties is simply a waste of time								b) Keeping up-to-date with the latest novelties helps improve
c) I find it difficult to make important decisions, I have doubts								c) I find it easy to make important decisions, it motivates me
d) It is better to take other peoples' opinions into account								d) It is better to be independent and act autonomously
e)Changes (workmates, jobs, bosses, etc.) are stimulating								e) Changes (workmates, jobs, bosses, etc.) are stressing
f)It is better to have a guaranteed job, even though the wage is not very high								f) It is better to have a high wage, even though the job is not guaranteed
g) It is better to take on difficult, important tasks, even though one makes mistakes								g) It is better to do what one knows how to do well, although it might not be very important, and not make mistakes
h) I like the chance to explore and try out new ideas								h) I like it to be clear what has to be done, what the procedures are
i) I prefer to be independent								i) I prefer to work in a team
j) I prefer to be in charge of the job without having to be told what to do								j) I prefer to be told what to do, knowing what I am expected to do
k) When I start something, I don't like to leave it unfinished, even though it is hard to do								k) When I start something, I prefer to leave it unfinished rather than do it badly
l) I prefer to try new things, though I have to recognize I have made a mistake when I do something wrong								l) I prefer not to try new things, so as not to have to recognize that I have made a mistake if I do something wrong
m) The opinion of my workmates is important, but I think it is better follow my own judgment								m) My opinion is important, but I think it is better to follow the judgement of my workmates

16. It is becoming more and more commonplace to hear talk of innovation. To conclude this survey, we would like you to rate the importance of innovation in different settings using a scale of 1 to 7, where 1 means it is *not at all important* and 7 means it is *very important*. If you believe that innovation is not as important as it is made out to be and that it is *overrated*, mark 1 in all the options.

	1	2	3	4	5	6	7
a) Innovation is important for the country							
b) Innovation is important for companies							
c) Innovation is important for society							
d) Innovation is important for oneself							

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=869&id=31&aid=7871