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Assessing Creativity and Innovation in Organizations: A Descriptive and Analytical Comparison of the Most Authentic Models

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ABSTRACT

Background: Evaluation and measurement of status quo of an organization may be useful and effective in regard to identification of relative rate and measurement of current status of organization work environment for suitable and appropriate manifestation and appearing of creativity and innovation therein. It may be performed through assessment of different activities of an organization and by determination of strengths, impediments and gaps inside and between its different departments. **Objective:** In this research, at the first stage, the literature related to "creativity and innovation in organization environment" has been reviewed and then the most authentic models designed for evaluating internal environment and social conditions of organizations, were identified from the "creativity and innovation" aspects. **Results:** Thereafter, four models including "Dr. Amabile's", "Anderson & West's", "Dr. Ekvall's", and "Siegel & Kaemmerer's" were selected in the framework of this research, and afterwards, theoretical factors of each model, measurement criteria for evaluation of creativity and innovation in organizational environment, and reliability and validity of each instrument related to the models, were described and analyzed within the available and accessible literature. **Conclusion:** Accordingly, the most appropriate model out of the aforesaid models from the researcher's view was determined and introduced discursively.

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INTRODUCTION

In the current world, the organizations require continuous revision and keeping the organization compatibility with the changing conditions and status of the current age, for continuity of their life and being survived in business. This research has been identified as an important factor for survival and long-term success of organizations for the purpose of increasing the organizational creativity and innovation in products, services, systems and processes (Ekvall, 1999; Soriano de Alencar & Bruno-Faria, 1997). Hence, finding strategies for growth and promotion of creativity and innovation in an organization and among its employees is deemed as a major and essential need for most of companies and institutions in the modern world.

The main objective of this comparison and analysis is to evaluate some factors of work environment by using the instruments designed and provided by scientists and experts, to measure them based on their models; particularly those aspects of work environment related to creativity and innovation.

According to the definitions, the concepts of innovation and creativity and attributes described for them, are so close to each other and have so strong and inseparable connection with each other that it is required to study and analyze the instruments designed for evaluation of organizational environments in terms of creativity and innovation, simultaneously.

In this research, the following items have been considered for comparison of the models and qualitative evaluation of each instrument:

1-Structure of different factors of model in the literature review;
2- Reliability and validity;
3- Theoretical and applied relationship between available factors in model;
4- Internal correlation among factors.

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It is notable that, social status of work environment are changed over time, hence, long-term reliability test related to instruments of each model has average value, whilst this test within a short-term period for reliability of each model seems to have high value.

In addition, upon advising of the advisor, the criteria considered in this study for comparison of different instruments, are as follows:

a. The studied model and its instrument must be printed in a valid and academic international journal and its aspects must be described.

b. The main objective of the measuring instrument should be qualitative evaluation of the internal environment (social) of an organization in connection with "creativity and innovation".

c. The studied instrument must have both research application and be available and operable in terms of application and commercial aspects so that any organization may provide and utilize it.

d. The studied instrument preferably must have users' guide and instructions for use.

In the analysis of various models in the literature review, only the following 4 models had most of the mentioned specifications:

1- Dr. Amabile's model (Amabile, 1988; Amabile *et al*., 1989, 1996)

2- Anderson and West's model (Anderson & West, 1994, 1996, 1997, 1998)

3- Dr. Ekvall's model (Ekvall, 1991, 1996)

4- Siegel and Kaemmerer's model (Siegel and Kaemmerer, 1978)

a. Creativity and innovation:

Amabile (Amabile *et al*., 1996, p. 1155) defines the creativity as "production of innovative and useful ideas in any environment" and the innovation as "successful execution of creative ideas in an organization".

Anderson and West have defined the innovation as consciously presenting and applying the ideas, processes, products or methods during execution of an individual, team or organizational duty which is new for their accepting unit and designed in such a way that provide meaningful profits for the performance of individual, team and organization or broader community. Necessarily, this element should not be completely new or uncommon for the members of that unit, but must include some identifiable changes or challenges to the status quo (West & Farr, 1989, p. 16).

b. Work environment/organization environment and innovative organization:

Amabile assumes the work environment as a combination of personalities, characteristics, policies and interaction of a lot of employees from senior manager to the common employees in workgroups (Amabile *et al*., 1996).

Anderson and West have defined the group as permanent or semi-permanent group that its members have interaction with each other under a particular system to carry out their duties (Anderson & West, 1998, p. 236). In addition, they have defined the environment as the shared perceptions in group level or "procedure of working with each other, developed by the group" (Ibid, p. 3).

Ekvall (Ekvall, 1996, 1991) in his model assumes the concept of "environmental conditions" as an organizational reality and beyond the individual perceptions and imaginations. As his belief, "organizational environment" conceptually assumed as "intervening variable" which affects on processes such as problem solving, decision-making, communication, coordination, monitoring (control), learning, creativity, motivation and commitment (Ekvall, 1996, p. 106).

The organizational environment as the viewpoint of Siegel and Kaemmerer has been formed based on the conclusion of Litwin and Stringer (Litwin and Stringer, 1968) that assume it as a collection of measureable characteristics of work environment which is felt by employees working in such environment and affects on their motivation and behavior (quoted by Siegel & Kaemmerer, 1978, p. 554).

"Siegel and Kaemmerer's" viewpoint about an "innovative organization" includes an organization which trains the creative performance of its members, whilst a "tradition oriented and non-innovative organization" specifically has no tendency to training and growth of its employees' creative performance (Ibid).

1- Dr. Amabile's model:

1-1 Review of the model features and its instrument:

Amabile *et al*. (Amabile *et al*., 1996; Amabile, 1988) in their model evaluated and assessed 10 factors, mentioned consistently in the literature review as stimulants and obstacles of creativity and innovation in the organization. These factors include organizational encouragements, supervisory encouragements, workgroup supports, sufficient resources, challenging work, independence and freedom at work, organizational impediments, workload pressure, creativity and innovation and productivity.

Previous version of this instrument was called Work Environment Scale (Amabile & Gryskiewicz, 1989) which revised several times and finally its newest version is called KEYS. She created an instrument (questionnaire) based on the said model, under the title of KEYS which evaluates the employees' perceptions

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and assumptions of the environment working therein, in several organizational levels, including organization, group and supervisory levels. This instrument measures those managerial actions that affect on the workplace and encourage the innovation. According to the model of Dr. Amabile, KEYS includes 10 criterion scales for assessment. The first 6 scales have been considered for "creativity encouragement", two scales called "organizational impediments" and "workload pressure" have negative relationship with creativity and innovation and two other scales evaluate the employees' general perceptions and assumptions of "creativity and innovation" and real "productivity" in an organization (criterion scales).

The correlation and internal fitness among factors of the model varied from 0.66 to 0.91by means of Cronbach's alpha which indicates acceptable reliability (Ibid). Short term reliability of test-retest within a 3-month period was varied from 0.71 to 0.94 with the mean of 0.84 (Amabile *et al*., 1996, p. 1169).

For making the convergent validity of the model and its instrument, "work environment scale" (Insel & Moos, 1975) which is a general measurement of work environments in organizations, was used (Amabile *et al*., 1996). Furthermore, in order to prove that the questionnaire designed so that answers to which is not merely a reflection of personal characteristics of employees; two scales including KAI which assesses the perceptional style related to problem-solving (Kirton, 1976) and WPI which evaluates the stable individual differences with regard to the status of intrinsic and extrinsic motivation, have been used (Amabile *et al*., 1994).

Questionnaire of Amabile's model has been designed based on 12 years of extensive research and different studies on 12525 executive managers and employees of 50 creditable international organizations, and its reliability and validity have been obtained accordingly (Ibid). A part of organizations participated in these researches are including electronic industries, high technologies, biotechnologies, chemical industries, pharmaceutical industries, hygienic productions, research & development, manufacturing industries, banking, and consumer products.

Whereas this instrument is formed based on the said researches, thus we must be ensured of its "reliability and validity" and the fact that it evaluates the environmental conditions of an organization for creativity and innovation properly (Amabile, 1996). One of the features of the instrument is that it shares everyone in the development process of the studied organization. Therefore, some individuals may feel that this is the first time their ideas and views are valued. The model focuses on the individual assumptions and perceptions of work environments which affect on the creativity and innovation of organization. In relation to commercial use, KEYS is managed by a company that produced the said instrument based on Dr. Amabile's model and upon her cooperation (Amabile *et al*., 1999; Amabile 1995).

1-2 Summary of the model analysis:

Confirmatory factor analysis has been performed by a sample of 3708 individuals from 26 institutions (Amabile *et al*., 1996). In general, measurement of conformity and fitness indicates an appropriate consistency among different factors of a model. The designed and compiled instrument of Amabile's model (KEYS) includes 78 questions related to those factors described as "stimulants and obstacles of creativity and innovation" in different levels of an organization. The said instrument also contains questions for evaluation of viewpoints and perceptions of employees in regard to "creativity and innovation" as well as real "productivity" in an organization. Therefore, using the instrument may cause an organization to carry out a comprehensive assessment of its employees' viewpoints regarding work environment and the relationship between these viewpoints and judgment about the status of actual "creativity and innovation" and "productivity" in the organization.

Moreover, a comprehensive guide for quality of using the questionnaire from the organizational training and development aspects is available. The criteria are relied on large samples (hundreds and thousands) of a lot of different types of organizations and institutions with various activities (Amabile *et al*., 1996).

As a whole, the studies carried out so far on the model and its instrument, indicating that KEYS is an appropriate instrument for evaluation of organization environment in terms of "creativity and innovation", which is most probable to be utilized more comprehensively in the future.

2- Anderson & West's model:

2-1 Review of the model features and its instrument:

The said model has been extended based on the four-factor model of West regarding innovation in workgroups (West, 1990). This model has been hypothesized for four major environmental factors, predicting the "innovativeness of a workgroup" including vision, participative safety, task orientation, and support for innovation. In "Anderson & West's" model, sub-criteria also made for each criterion (Anderson & West, 1996).

The said model has been designed with the intention of evaluating the proximal environmental conditions of a workgroup, for achieving innovation.

The main version of instrument of the model includes 61 questions. The short form of this questionnaire with 38 questions is also available (Anderson & West, 1994). The said version provided by extracting questions

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from the main version (61-item), has high correlation with their scale and low correlation with other scales (Anderson & West, 1998).

Furthermore, the 38-item questionnaire is also available in several languages, including Swedish (Agrell & Gustafson, 1994) and Finnish (Kivimaki *et al*., 1997). Another summarized version including only 14 questions also provided several years ago out of the main questionnaire (Kivimaki & Elovainio, 1999).

Most of the information have been gathered from health services teams with total sample size of 247 persons (N=247) in one study (Anderson & West, 1998;1996) and two samples with 435 and 281 individuals in another study, within two time intervals (Bunce & West, 1995).

Nonetheless, other studies have been performed on samples of university professors (West *et al*., 1998; ns=522 & 573), social service organizations and community mental health organizations (West & Poulton, 1997; N=720), oil companies (Burningham & West, 1995; N=59) and TV production groups (Carter & West, 1998; N=119).

Another evaluation carried out on Finnish version of the questionnaire on a sample of hygienic cares and social service departments (N=2265). Factor analysis indicated that both 4-factor and 5-factor models are acceptable with internal goodness of fit (alphas range from 0.83 to 0.94, Kivimaki *et al*., 1997).

Another analysis using LISREL software indicated that 5-fatcor model has better fitness than 4-factor model.

Another research analysis has been accomplished by means of data obtained from Swedish version using a sample including 17 teams from different organizations (N=124). Results obtained from individual answers recommended a 4-factor structure. The questionnaire items were fitted and consistent to the main structure of factors (Agrell & Gustafson, 1994).

In order to assess the validity of model and its instrument, Anderson and West performed a study on teams of senior managers (N=243), evaluating their viewpoints on group innovation as well (Anderson & West, 1996). Furthermore, general managers of some hospitals described the level of achieved or rejected innovations. The innovations were registered monthly and within 6 months.

Burningham and West (1995) applied studies on 13 workgroups of an oil company (N=59). The members of these groups answered the questionnaire, evaluating four factors of the model, but the name of this questionnaire has not been reported. However, this study has been mentioned as one of the studies relevant to validity, in the questionnaire guide.

2-2 Summary of the model analysis:

In the model literature, procedure of using the model instrument (questionnaire) and its application in workgroups has been described (Anderson *et al*., 1997). The 38-item version of the questionnaire used much more, in terms of simplicity. Hence, the said instrument seems to be suitable for applied and commercial utilizations. In addition, the results and data obtained from the studies totally show an acceptable "factor structure" and "reliability".

One of the ambiguous points in the model analysis is related to the fifth factor. In the literature review, it is not specified that whether it is necessary to add the fifth factor, namely "number of interaction frequencies" (interaction of group members with each other), to the model and its instrument, or not.

No logical justification has been presented to use the different groupings for answering the questions, such as selecting 7-choice scales for some questions and 5-choice scales for some other, which may cause the responders to be confused.

Furthermore, considering the theoretical fundamentals of the model, that is evaluation of the environmental conditions from the perspective of workgroups, the designed instrument must also study more the environment among groups. In other words, individual answers to the questionnaire must be combined with the ideas of other members in group level collectively. However, contrary to the theoretical aspect of the model, in the studies and surveys as well as all the analyses carried out, substantially attention is paid to the individual level, and no report of the results of their aggregating and combination in workgroup presented.

Confirmation of "reliability" and "validity" of a model requires study and analysis of large and diverse samples, while in this model, both number and variety of organizations as well as size of samples have been very often small, thus the results related to reliability and validity of the model, are not reliable.

In addition, as mentioned in the model literature review, most of the studies have been performed in health services groups and for this reason, quality of the model and its instrument application is not clear, when using in other work and organizational environments.

Anderson and West (1998) reported the acceptable internal fitness among groups for all the factors and indicated that combined answers in group level are acceptable. However, summary of other studies undermines the significance of the "collective climate" concept. For instance, Patterson *et al*. (1996) concluded that collective climates have no basis in the official workgroups and there is no relation between collective climates and factors such as gender, age, position, or even membership in group, which is the reflection of organization social structure. Therefore, it seems that group and collective climates have no clear socio-psychological concept; because studies indicated that plenty of individuals constituted these collections, have no tendency to

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interaction with each other. Gonzales *et al*. (1999) applied studies on relationship between the role of membership in organization departments, organizational hierarchy level, work shifts, job location, and organization tenure, and "collective climate". Summary of the results indicated that merely organizational hierarchy level has relation with collective climate. Therefore, further research must be applied about the comparison of relationship between total scores obtained in groups (from questionnaire) and other probable factors which can predict the environmental scores.

3- Dr. Ekvall's model:

3-1 Review of the model features and its instrument:

Ekvall (1996, 1991) assumes the concept of "environmental conditions" in his model, as an organizational fact beyond the individual perceptions and conceptions. "Organizational environment" conceptually has been assumed as the "intervening variable" that affects on processes such as problem-solving, decision-making, communication, coordination, monitoring (control), learning, creativity, motivation and commitment (Ekvall, 1996, p. 106).

Hypothesizing for the said environment and processes is required because whether or not they affect on quality, productivity, innovation, job satisfaction, welfare and profitability in an organization (Ekvall, 1996, 1999). On the other hand, he believes that resources available in an organization namely the employees, buildings, machineries, know-how, patents, financial resources, materials, products and concepts which are applied in processes and operations, affect on the organization environment (Ekvall, 1996, 1999). At the beginning, he was interested in those environments encouraging the creativity of employees and consequently increasing their innovation in organization. Nevertheless, this researcher (H. Yazdani) concluded that Ekvall has presented no clear definition for concepts of "creativity" and "innovation".

The instrument made based on Dr. Ekvall's model, has been designed for assessment of those organizational conditions, which could stimulate or inhibit creativity and innovation (Ekvall, 1996; Ekvall *et al*., 1983). In fact, the instrument known as "Creative Climate Questionnaire" specifically is a questionnaire that measures the internal environmental status and conditions of an organization in terms of creativity and innovation.

Development and extension of Dr. Ekvall's model was commenced by reviewing the literature justified that organizational innovation was in connection with the four extensive contexts (Ekvall *et al*., 1983, p. 2-3) as follows:

- Mutual openness and trust, idea support, open and free relations (freedom);
- Challenge and motivation, commitment to organization goals and operations;
- Freedom for information searching and presenting innovation;
- Pluralism in viewpoints, knowledge, experience, exchange of ideas and opinions.

Therefore, for fitness and coordination among these four contexts, fifty questions complied. These questions included the terms and sentences about the socio-psychological status of an organization.

Initially, draft of the questionnaire was sent for 192 engineers and factor analysis was performed on answers. According to the data gathered, 12 questions were eliminated and 6 new questions were added to the previous questions. Again, after resending the new questionnaire for 234 researchers and engineers and based on the receiving answers, a new analysis was carried out on the modified version, caused adding 6 other questions to the questionnaire (Ekvall, 1983); hence, the final version of the questionnaire includes 50 questions.

This questionnaire also translated into English and is called "Situational Outlook Questionnaire" (Isaksen *et al*., 1999). "Dynamism/liveliness" criterion has been omitted from the English version and therefore it includes 9 criteria consisting of challenge, freedom, idea support, trust/openness, dynamism/liveliness, playfulness/humor, debates, conflicts and risk taking. Therefore, some questions related to the tenth criterion that is "dynamism and liveliness" were eliminated and some new questions were added to sub-criterion known as "challenge". Nonetheless, the English version includes 50 questions however, contrary to the original version (Swedish), which includes constantly 5 questions for each aspect, this number is not equal in the English version.

3-2 Summary of the model analysis:

Dr. Ekvall's model has an appropriate and simple questionnaire, particularly for employees in an organization. This questionnaire has been developed based on a comprehensive model therein the concept of "environment" plays a significant role in productivity of organizations. The questionnaire has completely an organized structure, consisting of the 10 environmental factors of the model, each of which includes five questions. Furthermore, in the theoretical as well as in the applied literature, most of the questions related to 10 aspects of the model described in the creativity and innovation context.

Notwithstanding, Ekvall has defined the environment as one of the important organizational feature for the productivity (Ekvall, 1996, 1983) and the instrument of the model measures the employees' individual perceptions of organizational environment, some of the studies have not been carried out in organization level,

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but mostly in departments or small sections. Therefore, it seems that there are some inconsistencies between theoretical aspect of the model and its real usage and applied aspect thereof.

In several studies, lack of sufficient data in regard to size of samples and statistical analysis, observed. Likewise, it is not clear that which aspects of the questionnaire formed based on the former findings and which aspects are extracted from the model itself and its relevant theory. For instance, 10-factor version of Ekvall's model has not yet been documented, excluding its English version (Isaksen *et al*., 1999), previously explained in this section. Furthermore, the result achieved from studies on the model validity indicates that despite there is no sufficient report on the 10-factor model, it seems totally that the model has relatively an acceptable validity.

One of the weaknesses in relation to the model validity is that variables relating to the model criteria have been described poorly. Therefore, if theoretically look at the questionnaire, it is an interesting instrument, however, prior to recommend it as a usable applied instrument with acceptable reliability and validity, it seems that the questionnaire requires further tests and better and more appropriate documentation.

4- Siegel and Kaemmerer's model:

4-1 Review of the model features and its instrument:

This model has been developed and presented for introducing those environmental factors, assumed to be found in innovative organizations (Siegel & Kaemmerer, 1978).

In this model, contrary to objective and tangible variables, the employees' perception of organizational environmental conditions working therein, considered as the basis for measurement and assessment of organization environment.

The said model formed with the intention of establishing organizations intending to foster the creative performance of their employees, as well as based on the analyses arising out of two projects. The performed analyses altogether recognized five environmental factors cause deployment of creativity and innovation. These factors include leadership, ownership, norms for diversity (viewpoints), continuous development, and consistency between respective processes and products.

The model instrument at the beginning included 225 questions and introduced all the aforesaid five factors. These questions after two times filtering, diminished to 142 questions at first stage and then the same version was distributed and managed among 17 students and teachers of a high school, as innovative group and 93 students and teachers of another high school, as traditional or ordinary group (non-innovative). In the next stage, upon eliminating and adding some questions in the said process, the number of questions reached to 149 questions. Afterwards, new analyses on the factors performed and first of all number of questions reduced to 100 and eventually to 61. By the way, each question of 61-item questionnaire has 6 choices in Lickert scale from "completely agree" to "completely disagree" (Siegel & Kaemmerer, 1978).

4-2 Summary of the model analysis:

Results from analyzing "validity" indicated that the said model and its related instrument seems to be a useful instrument for measuring the environmental conditions of an organization to the extent that whether the organization supports the creativity and innovation or not. However, since there is limited information about validity of the model and using its instrument in work environments, and also there is merely one study by means of the initial version, thus it may be difficult to conclude that the model and its instrument has acceptable and appropriate validity on all the factors.

Development of the model and its instrument mainly performed based on the studies at schools and upon collaboration of students and some teachers. In the main study on the model validity, the relevant sample only was included the students and a few teachers. Therefore, if we intend to use the instrument of the model for evaluation of organizational environment of commercial companies and institutions, it is likely that we may achieve no accurate and suitable results. The reason is that the nature of schools and educational environments is quite different from work environments. In other words, students and teachers deal with some elements of environment which are not necessarily similar to those of work environments and what employees of an organization would face.

Other serious weaknesses of the model and the instrument developed out of it are the small size of samples and small number of organizations studied. Another deficiency observed in the model and its instrument is the inconsistency between factors of the model (5 factors) and questions of the questionnaire. Only one factor, namely "support of creativity" known as the best and most prominent factor of the model, could exclusively respond 66% of variance, and the other factors at most could obtain 12.6% of variance (Orpen, 1990; Siegel & Kaemmerer, 1978).

Moreover, despite the model and its instrument presented around 28 years and explained in the academic and applied literature, few documents thereof are available. According to the investigations made by this researcher through the internet, the model has not yet been updated.

Expression of the most important convergence and divergence points of the models:

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1- All the models focus more on stimulants than obstacles. The inhibitors of creativity and innovation have been raised only in two models namely in Dr. Amabile's (organizational impediments and workload pressure) and Dr. Ekvall's (conflicts). Nonetheless, the stimulants and obstacles have been studied in the literature review related to creativity and innovation concepts. Furthermore, presence of inhibitors in a model and evaluation of effect of the said factors on a work environment may result in finding solutions for improvement and promotion of the quality of creativity and innovation within an organization.
2- In evaluation of the said models on creativity and innovation analysis in organizations, it was observed that various beliefs and ideas are raised around the level of organizational environment evaluation. For instance, "Anderson & West's" model was formed based on assessing environment in group, whereas Dr. Ekvall and Siegel and Kaemmerer believe in assessment of work environment in organizational or departmental level. Among the four studied models, Dr. Amabile's model is the only one which evaluates the work environment in organizational, group and individual levels simultaneously. In other words, the questionnaire or the instrument provided through the theoretical aspects of the model includes questions in all the three mentioned levels.
3- As it is observed in table 1 (comparison of the models), factor or criterion of "idea support, valuing and appreciation thereof" has the maximum contribution among criteria and sub-criteria of the 4 models and reflected in the literature of all of them. Moreover, most of the studies indicated that this criterion properly predicts the creativity and innovation in groups and organizations (Amabile *et al*., 1996; Burningham & West, 1995; Ekvall, 1983, 1989, 1996; Ekvall *et al*., 1987; Siegel & Kaemmerer, 1978; West & Anderson, 1996; West *et al*., 1998).

As mentioned in the table, "independence and freedom at work" and "trust and openness" are observed in 3 models out of 4 studied models, have the next priorities.

Another criteria that are common in each of the 4 models, include challenge, participation in decision making, support for creativity and innovation and valuing them, risk taking, caring employees' individual development, ownership (feeling of possession to work), shared vision and goals.
4- Another subject that considered in most of the models is feeling of participation in setting goals or vision and feeling of ownership of ideas and having commitment to projects which again, taken into account as factors predicting creativity and innovation (Agrell & Gustafsen, 1994; Burningham & West, 1995; Orpen, 1990; Siegel & Kaemmerer, 1978).
5- Most of these factors shown the value and feature of predicting creativity and innovation (Agrell & Gustafsen, 1994; Amabile *et al*., 1996; Burningham & West, 1995; Ekvall, 1983, 1989, 1996; Ekvall *et al*., 1983; Ekvall *et al*., 1987).
6- Except in the questionnaire of "Anderson & West's" model, in all other questionnaires, "even choices" (for example 4 or 6 choices) used for answering the questions. The discussable point here is that generally in "odd choices" (5 or 7), due to different reasons, the middle choice may be selected. One of the important reasons for superiority of even choices to odd ones, as mentioned by Dr. Amabile, is avoiding a neutral or uncertain choice (Amabile *et al*., 1999, p. 14). People may naturally tend to provide similar, "middle-of-the-road" responses or ratings for multiple items, unless they already hold very strong opinions one way or the other toward the question topics. Thus, they usually prefer to select the middle option which has half-way effect – something like "the error of central tendency" – and the even choices prevent to some extent such selection. On the other hand, if a responder is allowed to select a middle choice or does not understand the concept of a question, he/she may select the middle option to relieve or hide his/her uncertainty and lack of knowledge (Schuman & Presser, 1981) and avoid answering the related questions and may choose the middle choice as an easy escape mechanism. Therefore, in the questionnaire of Dr. Amabile for example, "four-choice" measurement used to avoid the neutral choice.

Considering all the different ideas and beliefs available in the literature related to the subject, we may not certainly declare that number of even choices in a questionnaire preferred to odd ones or vice versa. I hope that the Iranian researchers and other interested researchers in the issue all over the world perform more studies in this relation and discursively clarify the hidden aspects of the subject for the future researchers.
7- A lot of studies performed in different organizations in relation to Dr. Amabile's and "Anderson & West's" models (particularly in Dr. Amabile's model). In addition, the instruments of the two models (questionnaires) have users' guide and instructions for use. Moreover, with respect to quality, both models have acceptable theoretical and applied fundamentals.
8- No considerable researches published in regard to the questionnaire of Siegel & Kaemmerer's model. Furthermore, results of factor analysis indicated that the said questionnaire has no significant consistency with the theoretical aspects of the model. In addition, the studies carried out on this model have been performed mainly at schools, and therefore we may not be ensured the quality and degree of responding of the questionnaire when using in other work environments.
9- The literature related to Dr. Ekvall's model to some extent may cause confusion. Furthermore, heterogeneity observed in several cases regarding the explanations of structure of factors. Likewise, description of the studies

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often was insufficient and has lack of precise statistical details. Therefore, prior to recommend the said model and its instrument for use in the different organizations, further information is required.

10- There is a significant internal correlation among factors of Dr. Amabile's model, however in Dr. Ekvall's, no information and document obtained concerning the internal correlation among factors. In "Anderson & West's" and "Siegel & Kaemmerer's", it was specified that a specific factor in each of the models responds the major part of variance.

11- If attention paid to the definitions of organization environment in literature review, it will be observed that two general approaches have been under consideration:

a. Cognitive schema approach, and

b. Shared perception approach.

In the first approach, the evaluated environment is assumed mostly as an individual perception and reflection of individual's perception of his/her work environment (individual, group, organizational or all the three levels). Therefore, the environmental evaluations must be accomplished considering individual's view. In this relation, the questionnaire of Dr. Amabile's model, prepared based on the first approach and "cognitive schema"; because it assesses the perception and inference of each employee with regard to the environmental factors in all the three mentioned levels.

In the second approach, the evaluated environment is mostly assumed as a group shared perception and is the reflection of a shared understanding of a group of employees from their work environment. According to the theoretical criteria, "Anderson & West's" model must evaluate environment in group level, however, the questionnaire of the model is answered individually and no evidence observed proving a consensus of employees in a department or members of a group after answering the said questionnaire.

Table 1: Comparison of criteria and sub-criteria of the four models.

Factors (criteria and sub-criteria)	*Models*			
	A	*A & W*	*E*	*S & K*
■ a. Stimulants				
♦ Challenge	✓		✓	
♦ Independence and freedom at work	✓		✓	✓
♦ Trust/openness	✓	✓	✓	
♦ Debates			✓	
♦ Organizational encouragements	✓			
♦ Supervisory encouragements	✓			
♦ Participation in decision making	✓	✓		
♦ Dynamism/Liveliness			✓	
♦ Playfulness/Humor			✓	
♦ Risk taking	✓		✓	
♦ Time for idea presentation			✓	
♦ Sufficient resources	✓			
♦ Creativity & productivity	✓			
♦ Leadership				✓
♦ Caring employees' individual development	✓			✓
♦ Ownership (feeling of possession to work)	✓			✓
♦ Support for creativity & innovation and valuing them	✓	✓		
Factors (criteria and sub-criteria)	*Models*			
	A	*A & W*	*E*	*S & K*
♦ Idea support	✓	✓	✓	✓
♦ Shared vision and goals	✓			✓
♦ Norms for diversity				✓
♦ Continuous development				✓
♦ Consistency between processes and products				✓
■ b. Inhibitors (negetive relation with Creativity and Innovation)				
◆ Conflicts			✓	
◆ Organization internal struggles	✓			
◆ Workload pressure	✓			
◆ Conservatism	✓			
◆ Formal Structure	✓			
A = Amabile; A & W = Anderson & West; E = Ekvall; S & K = Siegel & Kaemmerer				

Note: This researcher (H. Yazdani) has formulated, drafted and drawn the above table by means of the information on criteria and sub-criteria of the 4 models and therefore (excluding the present study), there is no reference available in this relation.

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Furthermore on one side, despite meaningful correlation between employees' interaction and their answers to those questions relevant to evaluation of work environment in the questionnaire, no meaningful correlation found between membership in a department or group and the answers to questions of the questionnaire. On the other side, it is likely that for keeping the group cohesion, group members be influenced by one or several members of the group and refrain from expressing their real belief to avoid confronting the group idea.

Taking into consideration all the foregoing descriptions and analyses of the theoretical and applied factors of the four models in this study, the superiority of Dr. Amabile's model to the other three models is attained.

Table 2 shows the summary of comparisons of the four models in terms of evaluation level from theoretical and applied aspects in work environment.

Table 2: Comparison of the four models in terms of evaluation level from theoretical and applied aspects in work environment.

Models	*Filling out the Questionnaire (Applied level)*		*Evaluation of Work environment (Theoretical level)*			*Conclusion*
	Individual	*Group*	*Individual*	*Group/department*	*Organizational*	
A	✓	-	✓	✓	✓	Conformity between theoretical and applied aspects of the model
A & W	✓	-	-	✓	-	Nonconformity between theoretical and applied aspects of the model (i.e. there is no integration of the individuals' view in a group)
E	✓	-	-	✓	✓	Nonconformity between theoretical and applied aspects of the model (i.e. there is no integration of the individuals' view in a group)
S & K	✓	-	-	✓	✓	Nonconformity between theoretical and applied aspects of the model (i.e. there is no integration of the individuals' view in a group)

Note: This researcher (H. Yazdani) has formulated, drafted and drawn the above table, based on the explanations achieved from the literature review and therefore (excluding the present study), there is no reference available in this relation.

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