The climate of innovation in the UAE and its Construction Industry

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Abstract

Purpose

The ability to develop new products and services has motivated the government of the United Arab Emirates (UAE) to enter the global race for excellence and surprise the world with its iconic construction innovations. The key challenge for the UAE is how to encourage and enable organizations, public and private, to embrace innovation as the norm and create a positive environment for innovation. In this context, this study was carried out with the aim of examining the factors that can create innovation-conducive climate in construction and the measures that can be used to assess such a climate.

Design/methodology/approach

The paper reports research effort to develop and test a conceptual model that hypothesizes relationships among different constructs that make up the climate for innovation in UAE organizations, construction and non-construction. In verifying the conceptual model and testing the validity of the hypotheses, a quantitative study was conducted based on data collected via questionnaire survey. A total of 101 respondents participated in the study, majority of whom were employed in private international firms, semi-public firms and private local firms.

Findings

The findings showed that, overall, the climate of innovation in the UAE organizations is moderately strong where construction firms performed slightly better than non-construction firms in demonstrating an innovation-conducive atmosphere. In this context, the results found a need for senior management to provide tangible support in terms of providing more resources for the skill base to develop further and seek better ways of developing creative solutions. The main conclusion provided evidence that leadership has positively influenced the climate for innovation and as a result delivered an improved business performance.

Originality/value

The research developed a new conceptual model and the constructs that can be used to understand the climate for innovation and assist researchers in examining the complex dynamics of innovation in the local construction industry.

Keywords: Climate for innovation, UAE, leadership, organizational culture, construction performance.

1. Introduction

Innovation is a phenomenon that is as old as mankind itself as it incorporates the inherent tendency of humans to think about new and better ways of doing things, especially in the presence of necessity, and apply them in practice. It is those innovations, i.e. creative ideas implemented successfully in practice, which stand beyond the continuous advancement of civilization into higher levels. Research has linked the success of organisations to their ability to continuously develop offerings that perform better than their competitors on attributes that their customers consider to be of value (Wittmen, et al. 2009).

Innovation is a complex concept which encompasses other sub-concepts and various activities. It is an organizational phenomenon that involves teamwork and occurs in and between firms or other types of organizations. However, firms do not innovate in isolation as innovation activities involve extensive interactions with the firm's environment (Chesbrough and Bogers 2014). This interaction can be represented using the models of "networks" or "systems" that could be explain the flow of knowledge across organisational boundaries. Powell and Grodal (2005) argued that a network can represent the relationships of the firm with external parties such as partners, suppliers and clients. We can distinguish two types of links, namely, "strong ties", links to parties with whom interaction and communication is frequent, and "weak ties" (Powell and Grodal, 2005). This point is further elaborated by Arnett et al. (2018) in describing the links between changes at the organisation, industry and economy levels and their impact on the success of innovation. The increased interest in the concept of 'open innovation' (Chesbrough 2003) is an indication of increased interest of organisations in building such external networks to support their innovation effort.

Drucker (1985) defined innovation to be the effort to create purposeful, focused change in an enterprise economic and social potential. His definition linked the importance, in a business environment, of both concepts of invention and entrepreneurship. For a creative invention to be considered an innovation, it must be implemented and successfully commercialized, i.e. turned into a product that accesses the market (Dulaimi 1995). For this reason, invention can be an individual activity that can be carried out anywhere, whereas innovation is mostly perceived as a teamwork activity, referred to as social and collective activity (Guan and Liu, 2016), that takes place in organizations where a combination of different ingredients, such as knowledge, skills, and resources, do exist for a successful innovation.

Innovation is multi-dimensional concept that integrates the dimensions of *cognitive science*, since it involves activities of learning and production of knowledge, *the organization*, since it involves the different efforts required to transform the knowledge into artifacts, and the *economic dimension*, since the cycle of innovation is only completed by matching the produced artifact to market needs and demands. As a consequence of that there is no widely accepted theory of firm-level processes of innovation that integrates all its different dimensions.

Psychologists and cognitive scientists may be interested in examining the phenomenon of creativity and cognition, individual and organizational, in terms of the micro-level process of how organizations stimulate the development of new ideas and problem-solving mechanisms in relation to learning and collective knowledge generation, exploitation and management. Liao et al. (2017) argued that innovation drives organizations' performance and therefore requires the leadership to support and encourage learning and provide individuals with access to the needed resources. Anderson el al. (2014) interactionist perspective of organizational creativity can explain the complex interaction between individuals and their work situation at different levels of organization, From the view point of economists, studying innovation translates mainly into studying the economic incentives that can drive an innovation and its effect on economic growth and competitiveness. Micro-economists would pay more attention to the interaction

between market and organizational factors in influencing innovation. Economic sociology would trace the relationship between the internal structure of "networks" of different actors (i.e. social structure and processes of the enterprise) and innovation.

Organizational studies on the other hand tend to focus on the links between organizational components such as structural forms (including informal structures of culture and values), strategy, processes, and relationships and the propensity of an organization to innovate. The aim of such research would typically be to identify the structural characteristics of an innovative organization by unfolding the effects of the structure and strategy on the ability of the organization to innovate. Management specialists may focus on the practices and managerial qualities that can deliver successful innovations. It also needs to consider change management and the adaptation of the organization to change in terms of its capacity to respond to changes in the external environment. Research in this area would investigate the relationship between innovation activities and a range of factors that affects innovation activities, among them leadership and climate for innovation (Hoang and Wilson-Evered 2020). There is evidence to support the argument that employee's perception of a positive climate for innovation, and the availability of support and resources from their leaders, would enhance the employees' innovation performance (Scott and Bruce, 1994; Wikhamn and Selart, 2019).

The pressure on the construction industry to develop and adopt new technologies, tools and practices is immense and global (Jelodar et al. 2018). Many researchers have argued that one of the main reasons for the construction industry lagging other sectors is the nature of its one off and short-term projects (Lloyd-Walker et al., 2014, Walker, 2016, Jacquetta et al., 2016). The delivery of successful innovation may be argued to require clients to accept greater and long-term uncertainty regarding the long-term performance of the acquired facility (Holmen et al., 2017). This further demonstrates the need for all project stakeholders to contribute to creating a positive climate for innovation that is the manifestation of the complex and dynamic interactions of the different project team members. Panuwatwanich et al. (2008) argued that innovation is the outcome of the social relationships and complex systems of interactions in construction projects. Such social psychological process, in the context of the construction project, can manifest itself as the climate that determines the motivation and behaviour of the project team (Kozlowski and Doherty, 1989). This paper is, therefore, focused on understanding how the social psychological processes in projects teams, and specifically construction project teams, create the climate that would influence innovation.

Focusing on construction firms in the UAE goes in line with the purpose of the research that is meant to explore factors of innovativeness in organizations in the UAE. The iconic construction developments in the UAE, such as Burj Khalifa and MASDAR, are evidence of the dynamic, active and innovativeness of this sector. The most active Emirate in the UAE in terms of constructions, both projects and companies, is Dubai. Reflecting the perceptions of professionals from different managerial levels and backgrounds, the results of this research give an important insight into aspects of innovation with the focus on climate for innovation, by providing empirical evidence from the UAE construction and non-construction industries.

This research aim is to investigate innovation, with the focus on construction organizations, in the UAE where innovation and creating a knowledge-based economy is a national concern. The pressure for innovation was further fueled by the announcement of the UAE government that 2015 will be the 'year of innovation' and that within seven year the government aims to be the number one in the world in innovation (The National 2014). This would require transformational projects, especially, in the fields of strategic importance to the economy such as the construction industry. This drive and urgency have motivated this research to develop the knowledge that would enable organizations to deliver successful innovation.

2. Climate for Innovation

The conditions that are critical to promoting and facilitating innovation has attracted the attention of researchers for several decades. Dulaimi's (1995) research into the challenges facing innovation in construction have drew attention to the importance of psychological safety net and management willingness to support innovative champions to motivating individuals to innovate. The diversity of the concepts related to innovation had resulted in the emergence of many theories to formally relate innovation to its factors and determinants. From the level of organizational design comes the theory of the "innovative enterprise" that was developed by Lazonick and West (1998). This theory relates the competitive advantage of the business enterprise to its structure and strategy. The theory postulates that in order to sustain a competitive advantage, business enterprises that operate in advanced economies must achieve a higher degree of "organizational integration" (in terms of the social structure of the enterprise) over time. The theory of 'innovative firm' also necessitates that the strategic decision makers be able to mobilize committed finance to sustain investment in the skill base to deliver an efficient performance. In this theory, the means by which innovative firms can sustain competitiveness through its dynamic skill base are strategic control and financial commitment. Lazonick and West (1998) argued that innovative firms need to invest strategically in their skill base that is defined by the firm's functional and hierarchical division of labour. The way the division of labour is structured is related to the generation of collective and cumulative learning.

On the level of organizational cognition and learning many theories of shared organizational learning, cognition and collective knowledge, also known as "corporate memory or collective mind" (Walsh and Ungson, 1991) have been introduced. Corporate mind is defined as the accumulated knowledge of the organization stored in its rules, procedures, routines and shared norms used to guide the patterns of interaction and activities of generating and utilizing knowledge. Marsh (2016) explains that "individuals learn from their experiences and organizations create an organizational memory". In such theories, activities of knowledge creation and discovery take place in a social context where knowledge transfer requires social interaction and shared understanding to and interaction with the corporate collective mind. From the same stream, stems the notion of "community of practice" (Lave and Wenger, 1991) that suggests members of an organization construct their shared identities and perspectives through shared practical work experiences and social activities. One central theory in this respect is Nonaka's theory of "knowledge creating company" and organizational knowledge (Nonaka 2008). Another critical study in this respect is the work of Nelson and Winter (1982) on the concept of "organizational routines". All such studies emphasize the role of social identity and relationships and shared cognition in generating knowledge necessary for sustainable innovations. A hybrid theory, from the stream of social psychology that combines factors from both levels of organizational design and organizational cognition is the four-factor theory of facet-specific "climate for innovation" within work groups at organizations (West, 1990). This theory assumes that innovation occurs within proximal work groups of collective learning, shared understanding and coordinated performance occur. The model suggests four factors of internal environmental stimulus, namely climate, are essential for team innovation to occur. These factors are: "vision", "participative safety", "task orientation", and "support for innovation". According to this model, for a team to be innovative, it must have a clearly defined and shared vision that transmits signals to stimulate the members' energy towards the expectations of the organization for innovation. Integrating team members into decision making is proposed as another important factor for team innovation. Furthermore, the working atmosphere should be perceived as safe to enable staff to offer and seek new ideas and solutions without fearing ridicule or other risks that would affect their positions and financial status. For innovative performance, it is assumed that team members reflect critically upon their outcomes according to their shared vision. Finally, the condition of enacted support for attempts to introduce new

and better ways of doing things is also assumed necessary for innovation to occur within the team. The review of the different aspects of innovation in this section emphasized the importance of management leadership pivotal role in shaping the organisation's approaches and team dynamics critical to effective innovation.

3. Aim and Objectives of the Study

The main question to answer in this study is *to what extent the phenomenon of innovation can exist and be sustained inside organizations in the UAE, especially construction firms*? To answer this question, a conceptual model was developed based on the review and analysis of existing relevant literature. The developed conceptual model presented a set of hypothesis that attempted to verify, through a quantitative study, via survey development and response analysis. The research objective is to investigate the construct of the climate of innovation in UAE business organizations and how the dynamics of such a climate is different in construction organizations compared to other sectors.

4. Theory and Conceptual Model

Research in construction has examined the influence of organisational and team dynamics on innovative behaviour (Zhang et al. 2018; Liu and Chan 2017). Zhang et al studied the links between the climate of innovation and leadership in construction projects and argued that innovation climate "reflected the individuals' cognition for the sense making of the working environment". They argued that individuals' perception of the working environment, physical and psychological, would influence their motivation and behaviour towards innovation. Park et al. (2004) investigation of the impact of construction project managers behaviour on innovation have defined the climate of innovation using *resource supply* and *support for innovation* dimensions. They argued that the climate for innovation represents the "cognitive interpretation of an organisational situation" where individual perception of team dynamics is key.

There is a significant interest in research into organisational climate over the last few decades (Ekvall 1996; Isaksen and Akkermans, 2011). Schneider et al. (2013, p. 362) defined organisational climate as "the shared perceptions of and the meaning attached to the policies, practices, and procedures employees experience and the behaviors they observe getting rewarded and that are supported and expected.". However, the climate for innovation is referred to as the "practices and norms supported by an organization that encourage employees to take initiatives, and explore and develop new ideas, processes, or products that benefit the organization" (Charbonnier-Voirin et al., 2010, p.701). Anderson and West have introduced the four-factor theory on the climate for innovation which has received wide support from researchers (Anderson et al. 2014). Hunter et al. (2005) study reported 40 different conceptualizations of the climate for innovation. However, research by Hoang and Wilson-Evered (2020) shows that while researchers have used different research methodologies the emerging conceptual models can be mapped very closely with the four-factor theory for the climate for innovation.

Researchers have for over a century focused on using mechanistic models to understand organisational behaviour and performance. More recently researchers have focused on understanding the social context that influences performance, creativity and innovation (Glisson 2015). This have given rise to studies that attempted to associate social context, such as organisational culture and climate, to innovation and organisational effectiveness. Research has consistently found that a positive climate for innovation is conducive to organisational level innovation (Jung et al. 2008; Patterson et al. 2005). Lewin et al. (1939) used 'climate' to capture the psychological impact of the work environment on behaviour and performance of team members.

The active intervention to create a psychologically safe working environment and a transparent working practices that would enable the workforce to develop new ideas that addresses the expectations of the client would create the values and norms that sustain such performance. Amabile et al. (1996) research found that employees' perception of structural support in their work environment forms the psychological context for creativity.

Ahmed (1998) study of the relationships between organisational climate and culture with that of innovation and explained that organisational culture reflects the organisation's climate but operates at a deeper level. Organisational culture is defined to be the behavioural norms, values and expectations (Handy 1976). Ahmed's research concluded that organisational culture appears "to stem from the interpretations that employees give to their experience of organisational reality (why things are the way they are and the how and why of organisational priorities)".

Research has provided ample evidence of how different leadership styles influence creativity and team innovativeness through their influence on the social context and psychological environment (Anderson et al 2014; George 2007). Research has also shown that leadership style (transformational vs transactional) and leadership behaviour (participative vs directive) stimulate team innovation (Wang and Rode 2010; Amabile et al 2004; Somech 2006). Villaluz and Hechanova (2019) suggested that leadership support for innovation influences the factors (strategy, climate, systems and structures, evaluation and rewards) that enable innovation and hypothesised that leadership support for innovation impacts innovation culture indirectly through mediating variables that included climate of work. The team leader innovation role is argued to provide and influence the working climate to positively impact the motivation and ability of the team to deliver successful and effective innovation. This role would include identifying innovation champions, motivating and enabling them to drive this innovation. Therefore, leadership will have to accept the uncertainty and risk associated with innovation and the need to create the safety net that would encourage the team to explore new ideas. Ahmed (1998) argues that innovative firms are the ones where senior management commits financial and emotional support for innovation; ensure closeness to customer/users to enable accurate assessment of potential demand; innovation is supported by all levels of the organisation; and set in have structured systems to guide innovation development.

Emerged from this review a theoretical framework that consists of three constructs. The three constructs represent the three levels of social psychological factors at organisation, leadership and team levels. The three components representing the research proposed *Constructs of Climate for Innovation* are:

- *Leadership for Innovation (LFI)* refers to the standpoint of the team supervisors towards encouraging and acknowledging creativity and engaging their teams in learning activities as well as in decision making.
- *Team Climate for Innovation (TCI)* emerged from the consideration of the social-psychological environment. It refers to the shared perception among proximal work groups regarding shared vision, perception of participative safety, support for innovation and the quality of task performance.
- *Organizational Culture for Innovation (OCI),* refers to the collective corporate mind and memory in terms of shared perception regarding practices, policies, and norms of the firm. It also refers to the efforts the firm puts in encouraging and stimulating creativity and other ingredients of innovation (such as resources, skills, and knowledge). Panuwatwanich et al. (2008) review of this topic concluded that organisational culture for innovation is dependent upon leadership and team climate for innovation

This theoretical framework defines the scope of this study through the following research questions (RQ):

- (RQ1) How do the three constructs (LFI, OCI, and TCI) relate to each other in constituting an innovation-driving climate within UAE organizations?

- (RQ2) What is the role of the organizational climate of innovation in influencing and predicting the business performance of organizations?

Insert Figure 1 here

In order to address the above research questions a conceptual model (Figure 2) was proposed and tested to confirm the underlying hypotheses using a quantitative analysis. The hypotheses in this study were:

- H1: Leadership for innovation positively influences organizational culture for innovation.
- H2: Leadership for innovation positively influences team climate for innovation.
- H3: Team climate for innovation positively influences organizational culture for innovation.
- H4: Leadership for innovation positively influences business performance.
- H5: Organizational culture for innovation positively influences business performance.
- H6: Team climate for innovation positively influences business performance.

Insert Figure 2 here

5. Research Methodology

After developing the conceptual framework and developing hypotheses, a quantitative study was conducted to investigate the proposed hypotheses. The survey approach was adopted not only to be able to use the quantitative measures adopted across most studies in this field (West 2012) but also to due to exploratory and comparative nature of the research. The research in its quantitative study part passed through the stages: (i) survey development, (ii) descriptive data analysis, (iii) measurement scale analysis, (iv) model assessment and refinement, and (v) conclusions.

5.1. Survey design

With the concern of designing a survey suitable for assessing the relationships in the research's conceptual the research has adapted the measures used in Panuwatwanich study (2008). The final measures used in the survey had to reflect the research conceptual model and the UAE context. The survey consists of three parts. The first part (Part A, 12 items) collects background information about the respondent and his/her organization. The second part (Part B, 58 items) is dedicated for rating the climate of innovation in the organization. This part is further subdivided into three subsections. Section B1 (13 items) represents the construct of leadership for innovation, whereas section B2 (34) represents the construct of team climate for innovation, and the last subsection, B3, (11 items) is for measuring the construct of organizational culture for innovation. The last part (Part C, 9 items) is for rating the elements of the indirect result of innovation, i.e. business performance.

5.2. Sampling Design and Data Collection

In general, sample design addresses two basic issues: (1) how elements of the population will be selected and (2) how many elements will be selected. For the first question, the sampling decision was based on the following considerations:

- Geographic area: The survey needs to target organisations located in UAE only.
- For-profit vs. nonprofit organizations: The survey needs to exclude nonprofit organizations so that the outcomes of innovation, i.e. business performance, are measurable.
- Eligibility of respondents: Only respondents who belong to teams of size more than 3 are eligible. This is a necessary requirement for credible testing of TCI.

For the second concern regarding the sampling size, the sampling strategy was based upon availability sampling which is a nonprobability (or nonrandom) sampling strategy (Heckathorn, 2002) which has shown to provide dependable sampling behavior (Salganik and Heckathorn, 2004). In this technique, elements of population are selected because of their accessibility to the researchers. At best, nonrandom

sampling strategies can yield a sample that is representative of the population. However, it is very likely that such strategies result in biased samples. Purposive sampling is another nonrandom sampling technique that is based on the research's knowledge of the population eligible to serve the research goals (Czaja and Blair 2015).

In this research nonrandom sampling techniques of availability, purposive and snowball were merged by: (1) employing the contact directory of the University that contains mailing lists for current and alumni students and the contacts of some corporate, (2) concentrating on firms with the business sector of construction in Dubai and (3) by asking students to invite their colleagues at work to take the questionnaire. Focusing on construction firms in Dubai, but not excluding other emirates, is in line with the purpose of the research that is meant to explore factors of innovativeness in organizations in the UAE. It is evident that in UAE, the most dynamic, active and profit-making sector is the constructions sector, if we exclude the oil and gas sector. The most active Emirate in the UAE in terms of constructions, both projects and companies, is Dubai as it counts for the largest development programmes in the country.

Three formats of the survey were created, word document, PDF file and online survey. Word documents can be filled and sent back by email, whereas the PDF versions can be returned by fax or scanned and sent by e-mail. Most of the responses received were submitted online. The survey was distributed mainly by sending emails to the contacts as in the university's contact database. We also asked postgraduate students undertaking construction related programmes to forward the survey to their colleagues at work. Also, online social network was employed by posting links to the online survey on the researchers' page on Facebook, the number one social networking site on the Internet.

Around 542 emails were sent using the University's contact directory. 104 responses were returned (19.19%), out of which 3 records were omitted because they violate the requirements, we considered in the sample design. As a result, 101 valid records remained. Researchers have debated the issue of sample size and it is widely understood that larger sample provide more valid results. However, MacCallum et al (1999) argued that there is evidence that questions regarding the sample size and its impact on the results of the analysis. For example, Gorsuch (1983) and Kline (1979) recommended a sample of at least 100 for a factor analysis studies. Further research recommended the use of sample to variables ratio of 3 to 6 Cattell (1978), Gorsuch (1983) 5 and Everitt (1975) recommended a ratio of at least 10. The sample to variable ratio of this study is, therefore, 100 to 4, i.e. 25 (for total sample) and 43 to 4, i.e. over 10 (for the construction sample). The research hence concludes that the sample of 101 will provide valid results.

5.3. Data Analysis

After correcting the data-entry errors, the respondent's answers were coded to the categorical questions of ratings the different variables used to measure the climate of innovation. A Likert scale of 1 to 5 were used to code ratings from "Strongly Disagree" to "Strongly Agree" respectively, which make it more straightforward to identify patterns and perform specific analysis procedures. The data was also screened, using scatter plot, to detect outliers and found no outliers that can cause a problem of bias when calculating statistics. Cases with missing data were identified using frequencies.

Missing data can seriously affect the validity and significance of the analysis results. Three cases were removed because they have entire sections left blank. To handle missing data, the expectation maximization (EM) algorithm in SPSS was used to apply the method of estimating the missing values by imputing the data. EM is a popular approach due to its simplicity and stability (Magni et al. 2014). In brief, the EM algorithm functions by running a two-step iterative process, the estimation (*E) step* and the maximization (*M) step*. In the *E* step, a series of regression equations were applied in the data to predict and replace missing values. In the *M* step, maximum likelihood (ML) estimates were calculated as if the data were complete. The E-M steps were repeated until convergence meaning that the covariance matrices were extremely similar. As a result, a new complete set was generated so that further analysis could be carried out. Imputing data is said to be a more recommended strategy for handling missing data than listwise deletion, pairwise deletion and mean substitution.

5.4. Sample characteristics

Majority of the respondents in the sample were employed in private international firms (29.8%), semi-public firms (24.5%) and private local firms (20.2%). Most firms belong to the constructions (48.9%) and services (22.8%) sectors. This comes as a natural consequence since the survey covered firms mostly in Dubai (69.1%) and Abu Dhabi (29.8%) where these two sectors were explicitly considered of the two emirates' mission towards their vision. Most respondents were employed in large companies with more than 1000 employees (43.6%). More than half the respondents (57.4%) were employed in companies with more than 500 employees. The majority of respondents (around 53%) work in teams of 3-15 members. Most respondents have high positions with 44.7% work as managers and 17% as senior executives. This can explain that most respondents have influence on the decision making in their firms (67.74%).

Although the maximum percentage of respondents' years of experience goes to employees with less than 5 years of experience (35.1%), but a large portion goes to employees with 6-11 years (26.6%) and 11-20 years of experience (19.1%). Most respondents hold a master's degree (48.9%) with no one respondent having an educational level less than a diploma/certificate. The percentage of respondents with a bachelor's degree as their highest level of education is 40.4%. The most common age range of respondents was 26-30 (38.3%), followed by the range of 31-40 (27.7%).

Based on the descriptive analysis of the respondent profiles we can conclude that the questionnaires returned by the respondents provided reliable information since most respondents hold high educational degrees and occupy high positions as managers in international large firms where they influence the decision-making process. Therefore, we may conclude that the climate of innovation in the respondents' firms was fairly rated.

5.5. Reliability

In order to check the internal consistency and reliability of the variables that measure each construct in the conceptual model, the variables that were proposed to measure a single construct were verified whether they produce similar scores by measuring the Cronbach's alpha coefficient, the most common measure of a scale reliability that is used to measure how well a set of variables measure a single construct by estimating their correlation. A commonly accepted rule of thumb is that the range of 0.6-0.7 is the lower limit of acceptability, whereas a value of 0.8 or higher indicates a good reliability (Gorsuch, 2015). Table 1 presents the Cronbach's alpha coefficients of the different constructs' measurement scales. The result of the test provides a very good empirical evidence that responses to the surveyed scales are reliable (all alphas are greater than 0.9).

Insert Table 1 here

6. Findings and Discussion

The mean values of the thirteen 'Leadership for Innovation' variables were greater than 3.00, ranging from 3.22 to 3.66 (the appendix provides the details of the analysis in this section). This can be interpreted by saying that overall, supervisors/managers in the surveyed firms displayed strong innovation conducive behaviors. More specifically, supervisors were perceived as promoting new technologies and ideas, confident, powerful and persistent when facing obstacles, as indicated by the means with the highest values of variables (A1, A2 and A3). Despite exhibiting a sense of encouraging new ideas and solutions, but supervisors had relatively poor rankings on the time they dedicate to coach their staff as this variable had the least mean value (A10; 3.22). Evidently, putting serious efforts in making the vision clearly understood and in understanding job problems were not of the main characteristics of the supervisors. This can be explained by managers tendency to be more reactive and responsive to changes and creative initiatives rather than being the force that drives and leads such initiatives.

The 'Team Climate of Innovation' mean analysis showed quite strong level with mean values ranging from 3.21 to 3.96. Teams seem to be clear about their objectives and believe that they are highly

achievable. This was indicated by the corresponding variables having highest values among the 34 variables that were designated to measuring the TCI. Equally important, team members expressed strongly cooperative atmosphere as team members tended to strongly agree that their teams were meeting and interacting frequently (A25: mean: 3.95, ranked second in terms of highest mean values; A26: mean: 3.90, ranked third). However, teams seems to be emphasize less on building on each other ideas (A42), monitoring (A41) and critically appraising (A38) each other's performance and potential weaknesses for the sake of maintaining excellence. More importantly, team members seem to have insufficient time to seek and develop new ideas as the corresponding variable (A31) had the least mean value.

To have a more detailed evaluation on the 'Team Climate of Innovation', we interpreted the statistics of the corresponding variables as grouped in the four factors of TCI which are: 'Vision', 'Participative Safety', 'Support for Innovation' and 'Task Orientation'. Evidently, the items of 'Vision' had the highest mean values, and then came the items of 'Participative Safety'. We can conclude that teams tend to be responsive and reactive rather than driving innovative initiatives. This was similar to what we concluded regarding the attitude of management on this aspect. More specifically, we can argue that while teams exhibit good understanding and agreement with the vision, and while they perceive the overall atmosphere as being safe and encouraging for creative participations, but they seem to need more task orientation and practical and tangible support for innovation.

With a similar outcome, the overall level of 'Organizational Culture for Innovation' was perceived to be reasonably innovation–conducive with mean values higher than 3.0, ranging from 3.02 to 3.53. Firms were described as highly flexible, adaptive to change and adoptive of new technologies with the corresponding variables having highest values of mean. Unfortunately, despite seeming to foster a good atmosphere of openness and collaboration, firms were expected to dedicate more resources (time, money, and training) as the least mean values were scored for variables assessing whether firms `provide sufficient funding to investigate creative ideas', whether firms 'provide adequate training for new technologies', and whether 'adequate time is given to pursue creative ideas'.

Generally, it can be concluded that the overall climate for innovation among the firms in the UAE, as represented by the surveyed sample, was moderately strong. However, its strength seems to be more in voicing the desire for innovation rather than practical where management are expected to give more attention to coaching staff and making the vision prevalent. Also, while team members enjoy the secure and cohesive atmosphere they operate in, but they seem to require their tasks to be more innovation-oriented with practical support. This also applies to the culture of the organizations that despite providing freedom and openness was required to provide more resources to pursue and develop creative solutions.

Firms were described as performing moderately good in terms of economic success as all the nine variables associated with this construct were relatively high (all values were greater than 3.0). In general, firms seem to have better reputation as they seem to attract more new clients. However, organizations seem to perform less in acquiring public recognition and achieving higher numbers of products than their competitors. Overall, it can be concluded that the average level of business performance among the sampled firms was moderately strong.

6.1. Construction context

The sample used in this study targeted individuals employed in different sectors. However, the research focused on the constructions sector, which constituted the majority of the survey population. Such a comparative analysis would facilitate the identification of good practices across sectorial boundaries and identify current gaps in the industry practices. We performed a comparative analysis by calculating and comparing the mean values of all variables in both groups of constructions (n=43) and non-constructions firms (n= 49, mainly in the services sector). The results are presented in table 2 with accompanying radar charts.

Insert Table 2

Although the results show that there are small differences in the scores, for both construction and no-construction, for all the measured constructs ('Leadership for Innovation', 'Team Climate for Innovation', 'Organizational Culture for Innovation' and 'Innovation and Business Performance') the construction sector scored higher mean values than firms in the non-constructions sector.

As can be seen in figure 3, the mean values for almost all the variables of 'Leadership for Innovation' were slightly higher in the construction firms. Similarly, for 'Team Climate for Innovation' (Figure 4), the constructions firms were perceived as having slightly better climate for innovation on average than the non-constructions firms as indicated by the mean values of all the variables, except for one variable (A20: team objectives worthwhile to the society) which has higher mean value for non-construction firms. This can be reasonably justified as the non-construction firms include different firms in the sectors of services, banking, IT, oil and gas and other sectors with products of more direct value to the wider society rather than specific clients. Although the overall average mean score of the 'Organizational Culture of Innovation' (Figure 5) was slightly higher for construction firms, but many individual variables had higher mean values in the non-construction firms. These variables are: A52: firm adopt new technologies (3.55 non-construction vs. 3.51 construction), A54: firm enable sense of one's control over ideas (3.24 vs. 3.23), A56: firm provide funding to investigate creative ideas (3.06 vs. 2.98), and A58: firm provide adequate training for new technologies (3.10 vs. 3.07). This observation may suggest that on the overall, the construction sector offered slightly less resources for seeking innovation than firms mainly in the services sector.

Insert Figure 3 here

Insert Figure 4 here

Insert Figure 5 here

For 'the Business Performance' scale (Figure 6), firms in the constructions sector had slightly higher average mean score than firms in other sectors. Except for one variable (B2: higher number of new products than competitors) all the variables had slightly higher mean values in construction firms. However, this variable has a significant indication as it explicitly measures the innovation diffusion outcomes, whereas other variables (except for B1: public recognition that can also be looked as an indication to the innovation diffusion outcomes) in this scale measure the general business performance. This may indicate greater emphasize of the constructions business on delivering projects on target than whether they have new products. This would reflect the focus of the construction industry on delivering products and services to satisfy clients in the absence of an innovation strategy framework.

Insert Figure 6 here

In summary, the level of the constructs of 'Leadership for Innovation', 'Team Climate for Innovation', 'Organizational Culture for Innovation' and 'Business Performance' as perceived by respondents from the construction firm sample did not remarkably differ from respondents in the other the non-construction sample. This has allowed the research to use the entire set of data as a single sample rather than splitting it based on the business sector while highlighting the differences between the different variables in a more systematic manner as shown in the next section.

Finally, the data was checked for any significant difference between the means of the variables in the two groups (construction and non-construction). Having significant differences between the means of the two groups would require splitting the sample into two separate samples before carrying out the analysis of the measurement scales devised for the study. For this purpose, we applied the two-sided t-test for equal means in which the null hypothesis (H0) states that that the means of the two groups are equal (data is

from the same sample). The null hypothesis is rejected if the absolute value of the test statistic is greater than the upper critical value (0.025).

The results revealed that H0 can be rejected for only 5 variables based on the significance column (A27, A28, A34, A45, and A46), raising the possibility that the data set needs to be partitioned as the two groups have significant difference between the means. However, when checking the mean difference, it has been found that the values are not significant (maximum mean difference for these variables was 0.7 < 1). Thus, it has been concluded that the entire sample can be used for the analysis as a single data set.

To further confirm this conclusion, the t-test was repeated for comparing the means of the two groups of small-medium sized firms (where the firm's size is <1000) and large firms (size is over 1000). We reached the same conclusion, that the analysis can be performed on the entire sample as a single data set.

Structural Model Assessment

The last step after establishing the validity of the measurement model is to assess the structural model in order to examine the relationships between the model constructs. To construct the structural model, we replaced the double-headed arrows between the constructs which represent correlations/covariance with single-headed arrows which represent causal relationship to test the hypotheses we developed in the conceptual model. The full structural model with the hypothesized relationships between the factors is illustrated in figure 7. In this model, we consider LFI an independent construct, whereas all the remaining constructs are dependent.

Insert Figure 7 here

To evaluate the model, we consider assessment criteria similar to the one we used in assessing the measurement model. The resulting model is presented in figure 8 with standardized path coefficients associated with their significance rates. For the hypothesized relationship to be supported, the standardized path coefficients needed to be significant at $p < 0.05$, and greater than 0.30 to be considered meaningful (Bryne, 2001). Table 3 details the results of model assessment and hypothesis testing.

Overall, all the model indices conformed to the assessment criteria except for RMSEA which slightly diverted from the threshold. The model concludes that four out of the six hypotheses are supported. Although one of the supported hypotheses (H3) was suggested not meaningful (path coefficient = 0.29 < 0.3), but we found that, following Bryne (2001) rational stated above, its deviation from the proposed threshold is very slight and can be ignored. Table 3 shows that H4 and H6 are not supported.

These results suggest that the developed conceptual model is only partially supported by the data we collected via the questionnaires we distributed. Based on our data, hypotheses H1, H2, H3, and H5 are supported and the final resulting model is depicted in figure 9 with path coefficients shown along their significance levels.

Insert Figure 8 here

Insert Table 3 here

This final model confirms the significance of the following hypotheses and suggests they are all meaningful:

- H1: Leadership for innovation positively influences organizational culture for innovation.
- H2: Leadership for innovation positively influences team climate for innovation.

- H3: Team climate for innovation positively influences organizational culture for innovation.
- H5: Organizational culture for innovation positively influences business performance.

Insert Figure 9

7. Conclusion

In this study we aimed to investigating the components of the climate for innovation that would be conducive to successful and recurring innovations in the UAE. Three constructs were derived from the three theories of the literature. The three constructs are: *"Leadership for Innovation"* (LFI), *"Organizational Culture for Innovation"* (OCI), and *"Team Climate for Innovation"* (TCI). The factor analysis techniques, exploratory and confirmatory, enabled the research to group the variables, in each construct, into representative components. We labeled these components as follows: components of LFI were *"innovation championing"* and *"transformational leadership"*, components of TCI were *"Insured support for innovation", "Vision", "Task orientation" and "Interaction frequency",* components of OCI were *"Tactic for innovation" and "Strategy for innovation",* and components of BPM were *"Economic growth" and "Outstanding performance"*. The factor analysis confirmed the validity and reliability of the model constructs.

The examination of the relationships between the constructs suggested that only support 4 out of the 6 hypotheses can be supported. Consequently, both hypotheses of TCI →BPM and LFI →BPM were eliminated and the other hypotheses of LFI → TCI, LFI → OCI, TCI → OCI and OCI → BPM were retained.

One justification we could form for the unsupported hypotheses is that since the majority of the organizations in our sample data are very large (≈ 44%, company size: 1000+) international (≈40%) firms, it is not easy to directly relate one team's climate or a single leadership's attitude to the business performance, whereas these two factors can be easily linked to the organizational culture. On the other hand, it is justifiably more reasonable to establish a direct link between the business performance and the organizational culture which is constantly influenced by the leadership for innovation and the team climate for innovation.

The findings showed that, overall, the climate of innovation in the UAE organizations is moderately strong with construction firms performing slightly better in demonstrating an innovation-conducive atmosphere. However, the results suggest that project-based industry such as construction needs to address the perceived paradox of investing extra resources for innovation against the need to deliver outcomes limited by time, cost and specification. The results of the study have shown that corporate goals, influenced by government innovation strategy, have led to greater emphasis from management on innovation. However, failure to provide resources and training are limiting the opportunity to enhance the climate for innovation.

The strength of the climate for innovation can be attributed to the overall business environment that is reinforced by government desire for more innovation. However, the evidence suggest that such organizations have not yet been able to translate that, through effective leadership, into tangible support for innovation. Organisations are failing to provide more resources for the skill base to further develop and seek better ways of developing innovative solutions through effective leadership. This may be understandable as the UAE went through a phase where the emphasis was on fast delivery of facilities and infrastructure to build this young nation which would have been instrumental in shaping the working culture. The country has now embarked on a new phase in its development with greater focus on

innovation. The drive for innovation championed by the government has seen public and private organizations embracing the innovation agenda at every level and quickly giving innovation a dominant position in its vision and goals. However, such organizations would need more time and effort to root innovation at every level of the organization and develop the innovation culture. Long established practices, processes, organizational structure and attitudes as well as its recruitment and procurement strategies need to be aligned with the new organizational vision. The results of this study indicate that ignoring this need for change would increase the frustration of teams in their effort to deliver on innovation goals.

The research findings should be considered in its context of being conducted in the UAE where the intensity of cultural diversity may have influenced the conclusions. In an environment where the majority of the workforce is expatriate, even more so in the construction sector, it is expected that the temporary nature of employment of such respondents may have impacted the results. The research findings provided significant evidence how project managers' leadership role can influence the climate of innovation. Project managers' power, competence and skills have a positive influence on the project team in seeking new ideas. The intensity of cultural diversity of the team as likely moderating factors in this research framework and a great factor in influencing the project manager role in inspiring and supporting innovation. Future studies could further support research in this area by exerting a greater effort to generate larger sample and, therefore, enhance the validity of the findings.

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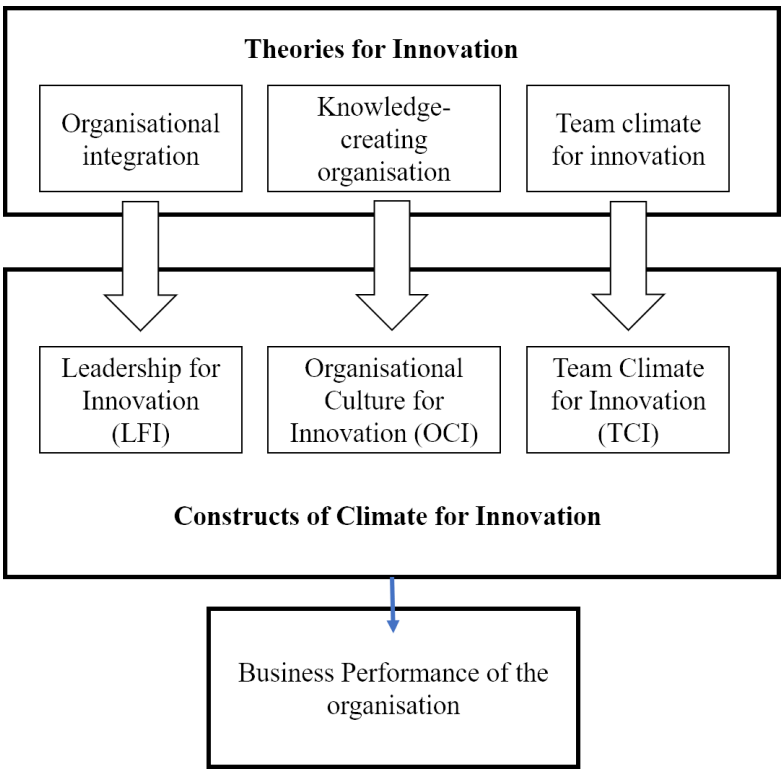

Figure 1: Theoretical Framework for Innovation

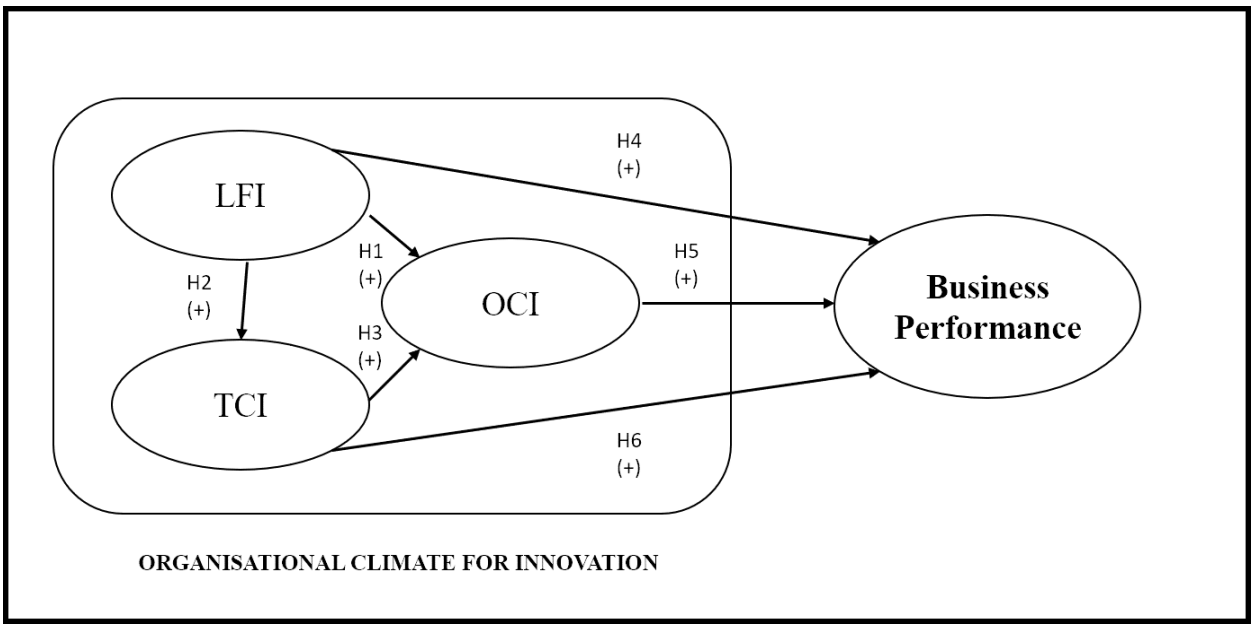

Figure 2: Conceptual Model for Organisational Climate for Innovation

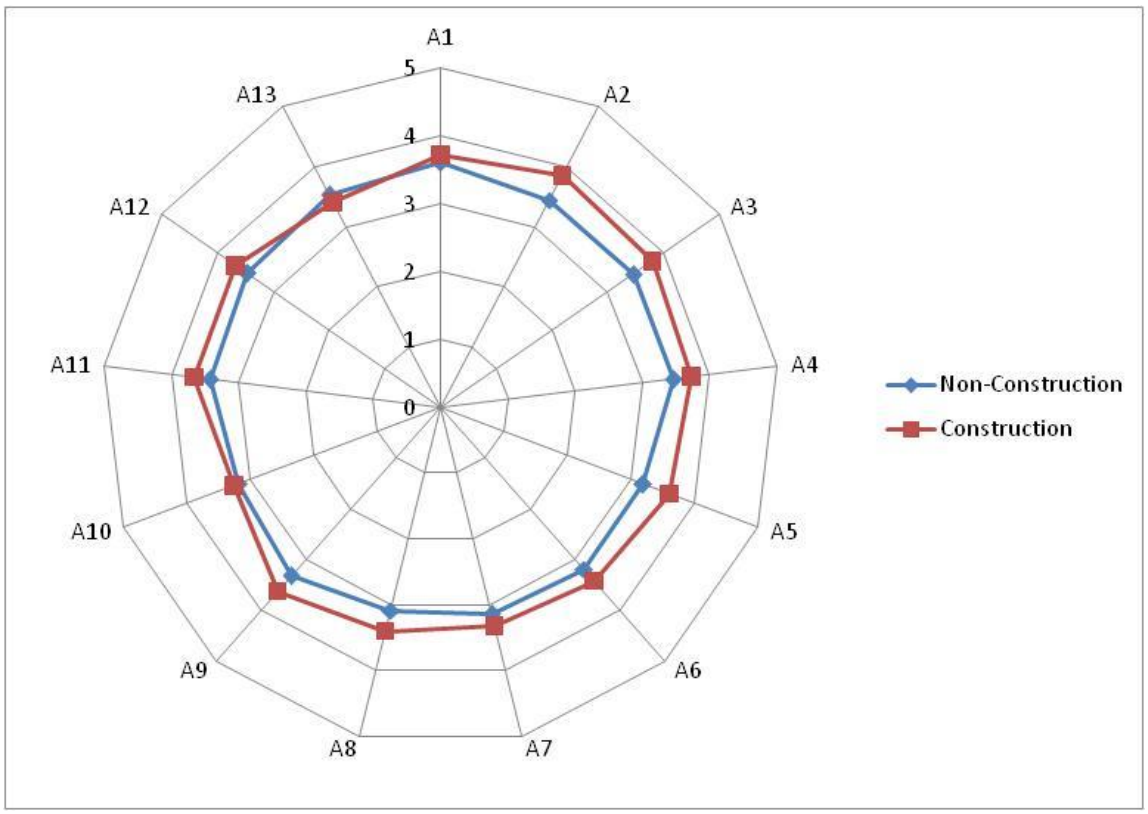

Figure 3: Leadership for Innovation' comparison

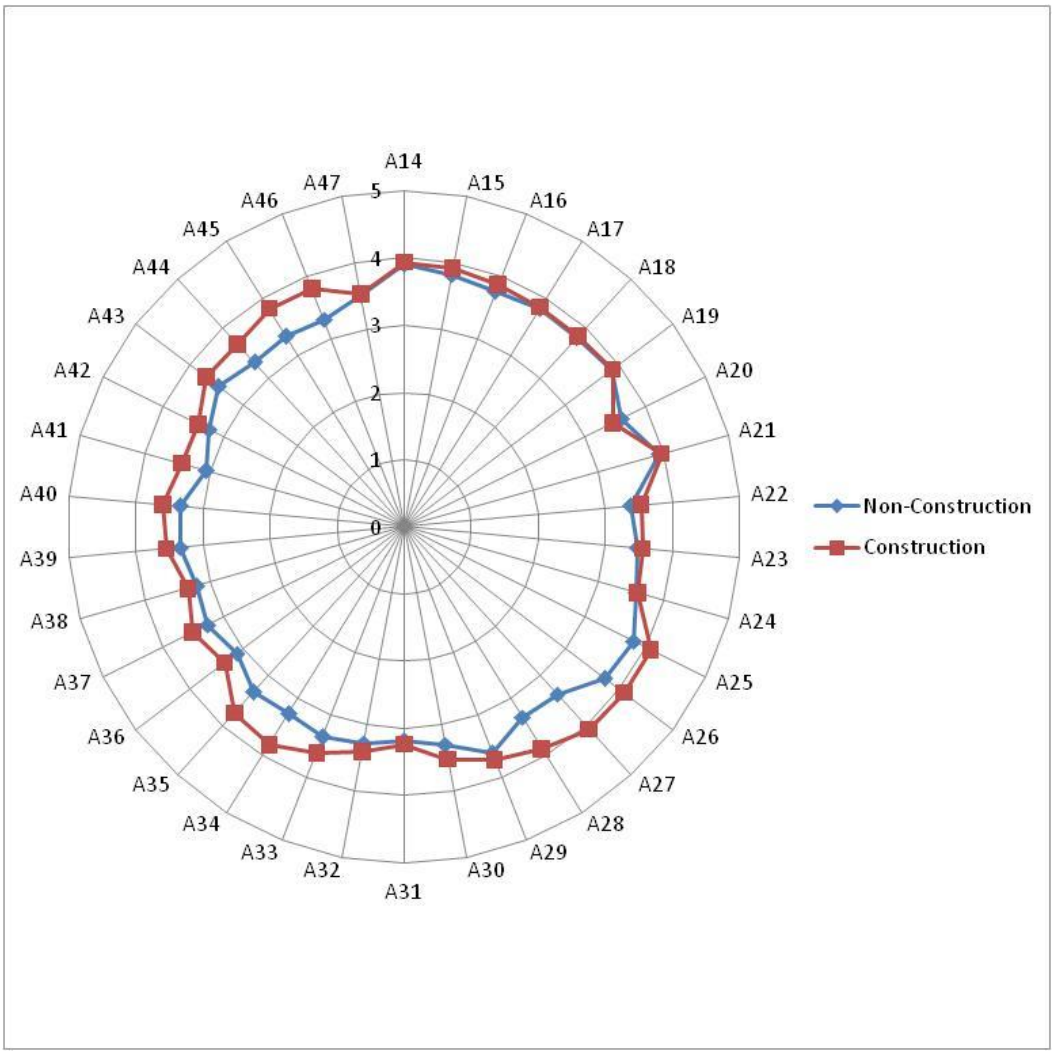

Figure 4: Team Climate for Innovation' comparison

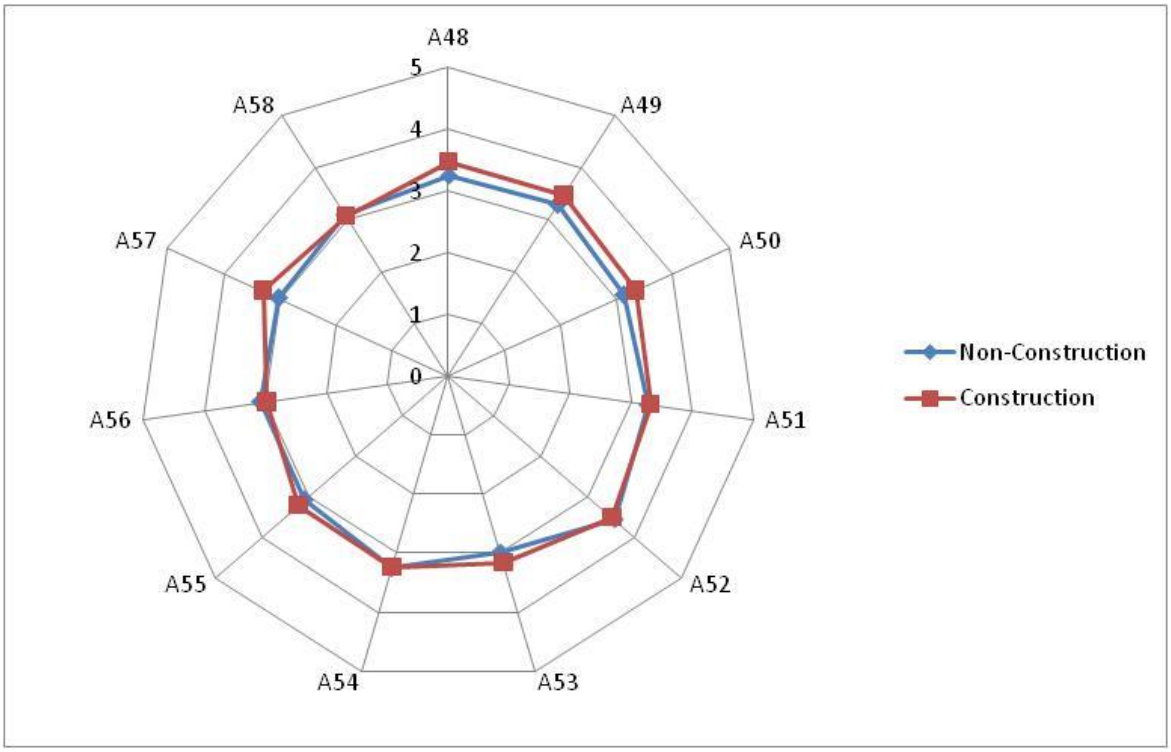

Figure 5: : Organizational Culture for Innovation' comparison

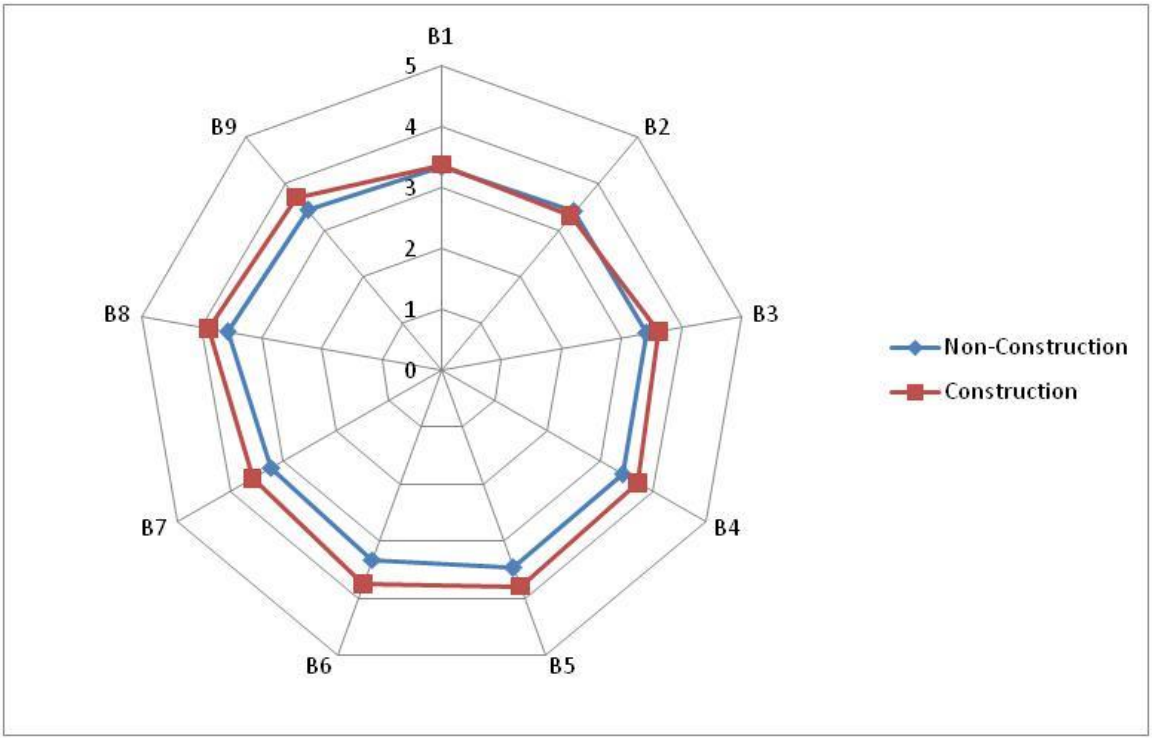

Figure 6: Innovation and Business Performance' comparison

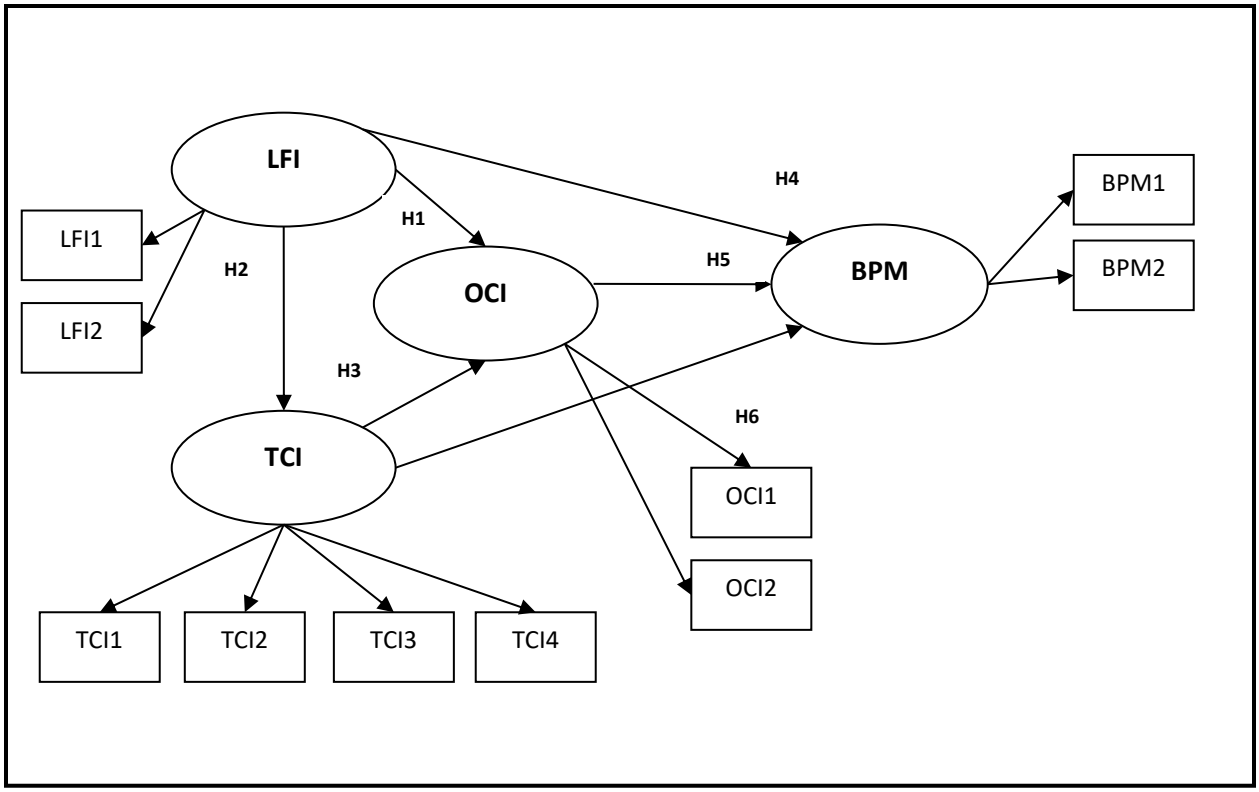

Figure 7: Structural model

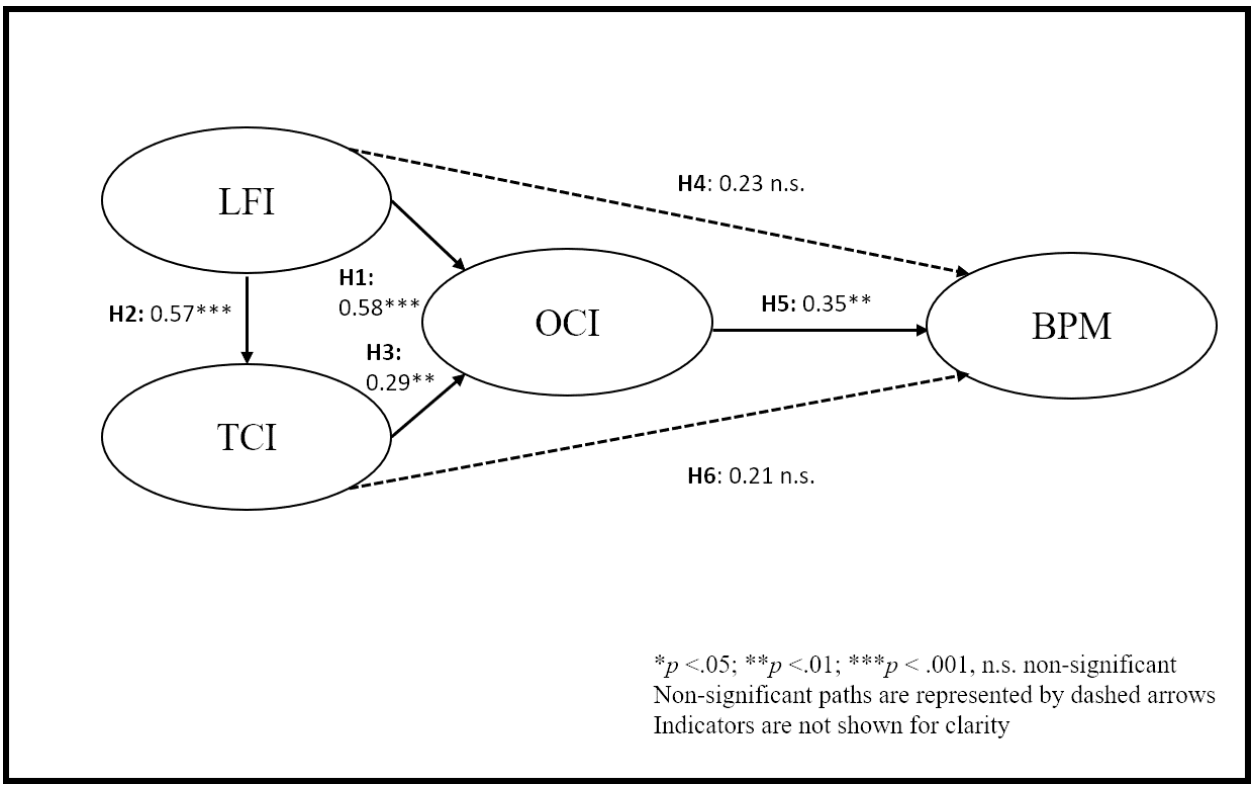

Figure 8: Structural Model after SEM analysis

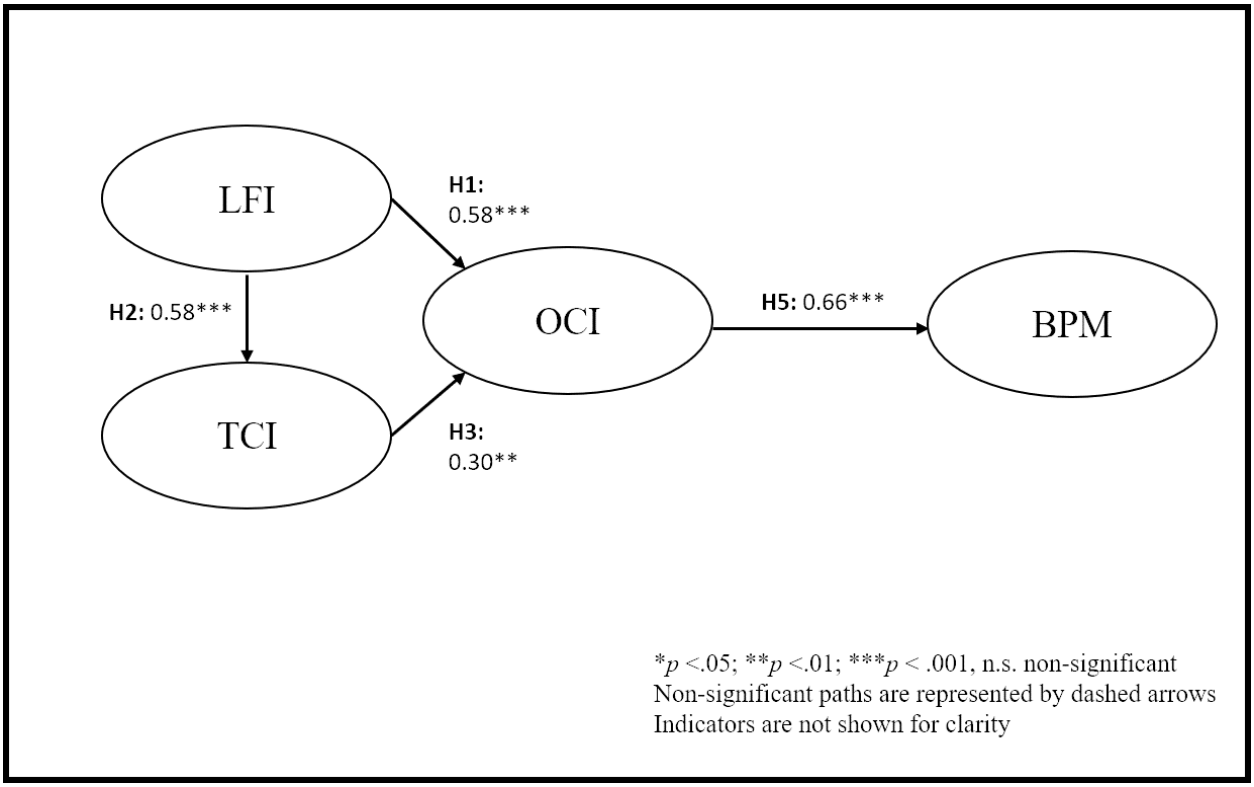

Figure 9: Final Model with standardised path coefficients

Table 1. Cronbach's alphas of measurement scales

Construct's Measurement Scale	Number of Items	Cronbach's Alpha
Leadership for Innovation (LFI)	13	0.953
Team Climate for Innovation (TCI)	34	0.973
Organisational Culture for Innovation (OCI)	11	0.942
Innovation Outcomes and Business Performance	9	0.917

Table 2: Comparative summary of the scales

Variable: Description	Construction Mean Value	Non-Construction Mean Value
Leadership for Innovation	**3.57**	3.35
Team Climate for Innovation	**3.68**	3.47
Organizational Culture for Innovation	**3.27**	3.18
Innovation for business performance	**3.64**	3.40

Note: Higher mean values underlined.

Table 3: Results of hypotheses testing as per the final structural model

Path (Hypothesis)	Path coefficient	P	Hypothesis testing result
H2: TCI ← LFI	.574	***	*Supported, meaningful*
H3: OCI ← TCI	.291	**	*Supported, not meaningful*
H1: OCI ← LFI	.580	***	*Supported, meaningful*
H4: BPM ← LFI	.231	.172	*Not supported, not meaningful*
H5: BPM ← OCI	.346	**	*Supported, meaningful*
H6: BPM ← TCI	.209	.111	*Not supported, not meaningful*

** p < 0.001, ** p < 0.01

Model fit indices: X^2/df = 2.36 (<3.0), RMR=0.039 (<0.05), CFI=0.943 (>0.90), RMSEA= 0.117 (not <0.080)

Appendix: List of Variables

Note: Higher mean values underlined.

Comparative summary of the 'Leadership for Innovation' scale

Variable: Description	Construction Mean Value	Non-Construction Mean Value
A1: supervisor seek out and promote ideas	3.72	3.61
A2: supervisor powerful and confident	3.86	3.45
A3: supervisor persist in the face of adversity	3.79	3.45
A4: supervisor encourage people to develop own ideas	3.72	3.45
A5: supervisor appreciate creativity	3.60	3.18
A6: supervisor express vision	3.42	3.18
A7: supervisor inspire	3.33	3.14
A8: supervisor make vision understood	3.40	3.08
A9: supervisor understand job problems	3.63	3.33
A10: supervisor coach	3.26	3.18
A11:supervisor recognize contributions	3.65	3.43
A12: supervisor encourage sharing resources	3.67	3.47
A13: supervisor consult members when making decisions	3.42	3.53
Average Mean Score	**3.57**	**3.35**

Comparison summary of the 'Team Climate for Innovation' scale

Variable: Description	Construction Mean Value	Non-Constructio Mean Value
A14: clear about team objectives	3.93	3.90
A15: agree with team objectives	3.91	3.82
A16: team objectives are realistic	3.86	3.76
A17: team objectives are useful	3.84	3.82
A18: team objectives worthwhile to me	3.84	3.80
A19: team objectives worthwhile to the organization	3.88	3.86
A20: team objectives worthwhile to the society	3.47	3.61
A21: team objectives are achievable	3.98	3.94
A22: team objectives are clear to team members	3.53	3.39

A23: team members agree with team objectives	3.56	3.49
A24: team members are committed to team team's objectives	3.60	3.59
A25: team members interact frequently	4.09	3.82
A26: team members meet frequently	4.09	3.73
A27: team members keep each others informed about work-related issues	4.07	3.37
A28: team members share information	3.88	3.33
A29: team members influence each other	3.72	3.61
A30: team members search for new ways of looking at problems	3.51	3.29
A31: team take the time needed to develop new ideas	3.23	3.18
A32: team move toward new answers	3.40	3.27
A33: team cooperate for developing new ideas	3.60	3.35
A34: team is open	3.81	3.27
A35: team members provide support for new ideas	3.74	3.33
A36: assistance in developing new ideas is available	3.35	3.12
A37: team members share resources	3.51	3.27
A38: team critically appraise weaknesses	3.35	3.20
A39: team members can question the basis of what the team is doing	3.56	3.35
A40: team has clear criteria for excellence	3.60	3.35
A41: team members monitor each other to maintain higher standards	3.44	3.06
A42: team members build on each other 's ideas	3.42	3.24
A43: team members provide ideas and help to each other	3.70	3.47
A44: team has we-are-together attitude	3.67	3.31
A45: team members feel understood and accepted	3.81	3.33
A46: everyone's view is listened to	3.79	3.31
A47: there is a lot to give and take	3.51	3.51
Average Mean Score	**3.68**	**3.47**

Comparative summary of the 'Organizational Culture for Innovation' scale

Variable: Description	Construction Mean Value	Non-Construction Value
A48: firm flexible and adaptive to change	3.47	3.24
A49: firm take chances on good ideas	3.47	3.29
A50: firm encourage creativity	3.33	3.12
A51: cooperative atmosphere in firm	3.30	3.27
A52: firm adopt new technologies	3.51	3.55
A53: firm recognize creative employees	3.16	2.98
A54: firm enable sense of one's control over ideas	3.23	3.24
A55: adequate time is given to pursue creative ideas	3.21	3.08
A56: firm provide funding to investigate creative ideas	2.98	3.06
A57: enough manpower to support innovative activities	3.30	3.02
A58: firm provide adequate training for new technologies	3.07	3.10
Average Mean Score	**3.27**	**3.18**

Comparison summary of the 'Innovation and Business Performance' scale

Variable: Description	Construction Mean Value	Non-Construction Value
B1: public recognition	3.37	3.33
B2: higher number of new products than competitors	3.30	3.39
B3: profit has grown	3.63	3.43
B4: turnover has grown	3.72	3.43
B5: attracted new clients	3.79	3.47
B6: increased market shares	3.74	3.33
B7: increased customer satisfaction	3.58	3.22
B8: enhanced national reputation	3.88	3.57
B9: enhanced international reputation	3.70	3.43
Average Mean Score	**3.64**	**3.40**