Internet Journal of Society for Social Management Systems Vol.10 Issue 1 sms15-3292
ISSN: 2432-552X
ORIGINAL ARTICLE

An Investigation of the Relationship between Project Organizational Culture and Procurement Approach of Construction Project Organizations

Luong Hai NGUYEN*, Tsunemi WATANABE**, and Trong Tung LE***
* Graduate School of Engineering, Kochi University of Technology, Japan
** School of Management, Kochi University of Technology, Japan
*** University of Transport and Communications, Vietnam

Abstract: Culture topic recently has attracted much attention by researchers since it is recognized as influencing performance of an organization. As such, cultural attributes have been examined at various levels in terms of national culture, industry culture, and organizational culture. In construction industry, organizational culture within project level is not commonly addressed. This paper aims to figure out a framework of the project organizational culture in perspective of work-practice based, and to examine the hypothesis of the relationship between project organizational culture and procurement approach using project-specific data that were collected from 199 completed construction projects in Vietnam. A questionnaire survey was conducted to develop a conceptual framework for project organizational culture and to examine the correlation between culture and procurement approach. This paper has clarified a significant association between project organizational culture and procurement characteristics. The results may assist a possibility to improve culture, within project level, which is expected to enhance the project performance.

***Keywords*:** Project organizational culture, procurement, construction industry.

1. INTRODUCTION

Culture area has recently received much devotion by researchers (Zuo and Zillante, 2008). Culture is believed to be essential determinants of practical management and attributable to the conflicts among participants: "unsound" culture increases in difficulties with project management (Chan and Raymond, 2003; Fellows et al., 1994). Thus culture plays a vital role in enhancing quality of management practice and project performance.

In construction industry, project organization is often claimed that it has its own characteristics which are different in nature from conventional organizations: (1) the project organization is temporarily formed for the duration of the project delivery, (2) organizational members are gathered from diverse entities, and (3) the product is usually one-off. As such, it challenges project participants to understanding culture of project organization notwithstanding its importance.

According to General Statistical Office, annual investment in Vietnam's construction industry has increased sharply since the adoption of the reform and opening-up policy in Vietnam in 1986. Along with the increasing investment, the construction project performance has been reported to be confronting a number of critical issues, which has been plagued by problems including poor quality, cost overruns, time delays, unsafe execution, and client dissatisfaction (Nguyen and Watanabe, 2014). To determine the potential impacts, the project organizational culture deserves to further verify as a key factor influencing project performance. In addition, as principally of the uniqueness of the construction industry and project organization, project environment may significantly influence on participants' behaviors. It is thus necessary to study project organizational culture grounded on practices of the industry. However, there have been a limited number of researches on project organizational culture, particular with construction context, and no such research in Vietnam.

This study aims to explore the cultural artifacts at project level from the perspective of work-practice based, which is approached based up the literature and the field study of industry are adopted. The research hypothesis is the significant influence of project characteristics in terms of project related-factors and procurement approach on such cultural artifacts. The statistical analyses were thus employed to test the hypothesis, searching for the answers to the questions below that would be of help in determining the relationship and planning further strategies:

Received: 2015.09.15 / Accepted: 2016.05.20
Internet Journal of Society for Social Management Systems Published Date: 2016.12.20

(1) How do characteristics of project and procurement approach influence project culture?
(2) How can such knowledge be helpful to project management?

2. LITERATURE REVIEW

Concept of culture has been studied in a number of previous researches. According to Bodley (1994), there is a list of over 160 various definitions of culture. Fundamentally, culture is known as a set of learned mores, values, attitudes and meanings that are shared within group members (Duarte & Snyder 1999). In the last two decades, culture has been studied with various environments and levels; the studies are frequently conducted for national culture, industry culture, and organizational culture.

Under the project perspective, cultural concept was discussed in a few studies with its impact on business operations. In general, project culture is defined as the general attitude towards projects within the business (Widmen, 2004). As Korzilius (1988) & Mullins (1993) concluded that to form a unified, robust project culture is very crucial for successful projects; without such formations, the achievement of the overall project objectives could be difficult. Also the quality of interrelationships between project participants, studied by Soetanto et al. (1999), is eventually as a determinant of overall project performance and individual participant performance. Although these interrelationships were not considered within the cultural context, culture must be appropriately viewed as a significant aspect. It also has an impact on the propensity for litigation (Fenn et al., 1997; Phua and Rowlinson, 2003), and the attitudes and behaviors towards such aspects as health and safety (Cooper, 2000). According to Gareis and Huemann (2000), along with the scope of work, the project schedule, the project costs, the project organization, and the project context, project culture is as an objective of the project management process.

Particularly, in construction industry practice, which is structured by project-based industry (Fellows et al., 2002), culture issues at project level need to have more insight. Construction project culture is however similarly less studied area (Dainty et al., 2007). Among few attempts in determining construction project culture framework, these studies are pretty much divergent and have their own limitations. For example, the model developed by Kumaraswamy et al. (2001, 2002 cited Zuo and Zillante, 2005) is very complicate to understand due to its incorporated several components at various levels of culture. Zuo and Zillante (2008) proposed a model for construction project culture, which the cultural orientations dedicated to relationship contracts such as partnering and alliancing projects; while the traditional procurement is still dominated. Ankarh et al. (2008) proposed a framework consisting with organizational culture, which was essentially relevant to the drivers for change of UK construction industry reported by Egan (1998). Furthermore recently, Cheung et al. (2011) employed a set of literature of organizational culture artifacts to verify the construction industry of Hong Kong. Although these few studies have demonstrated on construction project perspective with some specific context, little attention has been paid on organizational culture from the perspective of work-practice based at project level.

3. MATERIALS AND METHODS

3.1 Research design and data collection

To collect the primary data, both structured and semi-structured survey approach was conducted. At the first stage, the interviews were conducted to 21 participants who were from clients (10 participants) and constructors (11 participants), and as the main role of project managers or senior engineers. The participants were required to clarify the problems of construction industry and to recommend the reasonable cultural artifacts which would be formed in the official questionnaire items. The interviews were carried out via face-to-face, taking approximately one hour for each, and were undertaken in a semi-structured manner. After interviewees gave a brief introduction of their experiences, primary questions were asked, and then supplementary questions were added as appropriate. During the interviews, the artifacts and their descriptions of project culture in the literature were also mentioned to help clarified.

Subsequently, the pilot study was undertaken; a tentative questionnaire model was distributed to those participants who were first required scanning the items to ensure the clarity of instructions and reasonable contents of questions. The questionnaire was then modified in order to generate the most precise answers. Finally, the questionnaire items were divided into three parts: (1) demographic characteristics of respondents; (2) the description of project characteristics and procurement approach, and (3) cultural artifacts.

Case-specific data were collected from construction practitioners in Vietnam, who are the role as project manager working for clients and constructors. A total of 416 sets of questionnaires

were distributed to participants between April 2015 and June 2015. The distribution was conducted by e-mail survey and personal survey via face-to-face interviews. Follow-up telephone calls were made to remind and urge the participants to respond to the survey. The participants were required to choose a last completed project that they were involved to answering the surveyed items. A total of 265 responses were received, in which 199 samples were valid enough for analysis, representing an effective rate of 47.8%. Among the valid questionnaires, 84.9% were from constructors and 15.1% from clients.

3.2 Analytical methods

Principal component factor analysis (PCFA) was undertaken to test the factor structure of the 29 culture artifacts and to establish the extent to which any underlying factors tally with the a priori item classification. In addition, the Varimax rotations were executed since the factor solution can be achieved simpler and more meaningful for interpretation, (Hair et al., 1998; Sharma, 1996). Factors having Eigenvalues greater than or equal to 1 are considered significant, and in contrast, factors are omitted with Eigenvalues less than 1. Employing the Eigenvalue for establishing a cutoff is most reliable when the number of artifacts is between 20 and 50 (Hair et al., 1998). As the number of artifacts is 29, it is applicable to using the Eigenvalue criterion. Furthermore, the reliability of data was verified for the factorize artifacts by using Cronbach's alpha (Sharma, 1996). The alpha value can range from 0 to 1. The higher the alpha value is, the more reliable the groupings of the artifacts are. A Cronbach's alpha value higher than 0.7 is regarded as 'good' and /or 'acceptable' in reliability testing (Sharma, 1996; Pallant, 2005). To further test the suitability of the data for the factor analysis, two measures – the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) and Bartlett test of sphericity were performed. The MSA varies between 0 and 1, with .60 suggested as a minimum (Kaiser and Rice, 1974). Factor loadings of 0.4 or greater were considered (Kline, 1994; Field, 2000). With the Bartlett test, a significant result is required (Hair et al., 1998).

Furthermore, nonparametric procedures such as the Kruskal-Wallis and its post hoc analysis tests were used to test for the significance of the differences between the mean ranks of the variables. To assess the existence of relationships between variables in the case as the data to be tested included ordinal or dichotomous nominal data, the Pearson's correlation coefficient was calculated.

4. RESULTS AND DISCUSSION

4.1. Development of project culture framework

Culture artifacts development:

To identify construction project-specific cultural dimensions, it is first of all necessary to examine the sources of dimensions. As dimensions of culture are rooted in the fundamental problems that groups of people have to deal with or find solutions to (Schein, 1985; Hofstede, 2001), it can be argued that a useful source of information when looking for dimensions of construction project culture is to examine the fundamental problems of construction project delivery.

In the case of the construction industry of Vietnam, according to the results the field survey conducted in April 2014 and April 2015 in Vietnam by the authors, the fundamental problems of construction project delivery were explored to cover the areas of: collusion, poor performance of constructors, low trust among participants, low accountability, unskilled people, unavailable information, poor executive management, changed orders and conflicts in execution, biased decision-making and un-fulfillment of commitments. These explorations are supported by studies in Nguyen and Watanabe (2014); Ling and Hoang (2010); Ling and Bui (2010); Ling et al (2009); Nguyen et al (2004a), Nguyen et al (2004b). Based on these issues, the appropriate culture artifacts indicated in the literature associating with these problems are underlined and then adopted to develop reasonably the cultural framework, as shown in the Table.4.1.

A questionnaire items were developed based upon the culture artifacts rooted. Each construct was measured using multiple items on a five-point scale of the agreed statement level.

Factor structure of culture and internal consistency:

From Table 4.2, it can be observed that the data is suitable for factor analysis (MSA value was 0.924). Result of the further analysis shows that five project culture factors initially extracted accounting for 62.488% of the total variance in the 29 dimensions of culture, which is considered sufficient to explain project culture using the extracted artifacts (Sharma, 1996). All of the Cronbach's alpha values range from 0.658 to 0.900. It suggested that all the factors have acceptable internal consistency reliability (Robinson et al., 1991). The results of exploratory factor analysis using a principal component with a Varimax rotation and an eigenvalue of one for the remaining items show a pattern of loadings consistent with our theoretical expectations.

Eleven artifacts are extracted as significant in project culture factor 1: (i) Objective understanding,

(ii) Roles and duties of Constructor, (iii) Roles and duties of Client, (iv) Mutual understanding, (v) Information sharing, (vi) Project manager's encouragement given (vii) Mutual trust, (viii) Importance of people's contribution, (ix) Opportunity given,(x) Supervision's commitment and,(xi) Leaders' leadership. Referring to the artifacts descriptions stated in Table 3.1, artifacts (i–iv) can be used to evaluate the effectiveness of goal setting for project delivery. The rest of the artifacts of project culture factor 1 can be used to assess the extent to which trust atmosphere among participants puts on committing to achieve good goal. This project culture factor is called as *Goal alignment & Trust*.

Project culture factor 2 consists of nine artifacts: (i) Look forward the project benefit, (ii) Effective working relationship, (iii) Open and respect to each other, (iv) Exchange idea and support, (v) Blame assignment and accountability,(vi) Pride and cerebration,(vii) Client's commitment on agreements,(viii) Leaders' instruction, and (ix) Decision-making involvement. The artifacts aligned in factor 2 are based upon the creation of cooperative working environment. Thus, project culture factor 2 is labeled as *Cooperative orientation.*

Three artifacts: (i) Constructor's commitment on quality, (ii) Constructor's commitment on schedule (iii) Constructor's commitment on budget are loaded highly in factor 3. These artifacts concern the extent to which constructor's emphasis is placed on project performance commitment. Thus, project culture factor 3 is labeled as *Constructor commitment*.

Project culture factor 4 is labeled as *Worker orientation* which consists of three artifacts that can be used to evaluate the extent of concern to worker and workforce: (i) Training sessions, (ii) Respect for workers, and (iii) Concerns for workers.

Three artifacts are extracted in taxonomy factor 5: (i) Empowerment assignment, (ii) Decision-making encouragement (iii) Leaders' direction. Project culture factor is labeled as *Leadership committed* as the extracted artifacts can be used to assess the level of leadership to achieve the project goals

Table 4.1 Cultural artifacts rooting in fundamental problems of project delivery

Core problems identified	**Practitioner's detail statements**	**Cultural artifacts rooted**	**Literature of organizational culture related**
Common goal concern	▪ Participant's responsibility ▪ Clear objective and Scope ▪ Commitment to project ▪ Individual benefit	▪ Objective understanding ▪ Roles and duties of Constructor ▪ Roles and duties of Client ▪ Mutual understanding ▪ Look forward the project benefit	Focusing upon the goal of project success (Walker 1994) Placing on working cooperatively toward common goals for which all employees feel mutually accountable. (Denison 2000) A clear set of goals and objectives can be linked to the mission, vision, and strategy. (Hansen and Wernerfelt 1989; Bettinger, 1989; Denison, 1990; Liu, 1999; Coffey, 2002) Ways of dealing with conflicts (Hofstede, 1997)
Working environment issues	▪ Information sharing ▪ Top management support ▪ Mutual trust sharing ▪ Respect to others ▪ Open environment ▪ Blame assignment.	▪ Effective working relationship ▪ Information sharing ▪ Encouragement of project manager ▪ Mutual trust sharing ▪ Open and respect to each other. ▪ Exchange idea and support ▪ Blame assignment and accountability	Encourage information sharing (Cameron and Quinn, 1999) Participants are able to and work together well to achieve common goals. (Denison 2000) A collection of committed people with specific skills, abilities and interdependent roles who work together in an environment of trust, openness and co-operation towards achieving common goals, Uher & Loosemore (2004) Trust atmosphere (Hofstede,1983; Bettinger, 1989) To enable the project team members to help each other overcome difficulties instead of maximising their advantage over others (Walker 1994). The extent to which the interest of individuals prevails over the interest of the group and vice versa i.e. power of the group Hofstede, 2001)

			Amicable opinions and ideas exchange (Fulmer, 1988; Cameron and Quinn, 1999; Liu, 1999)
Employee concerns	▪ Working condition for worker ▪ Employee encouraged to participate in decision-making ▪ Training session ▪ Respect to worker.	▪ Importance of people's contribution ▪ Opportunity given ▪ Empowerment assignment ▪ Pride and cerebration to achievement ▪ Training sessions ▪ Respect for workers ▪ Concerns for workers	The individual is the central point ,Harrison (1972);Handy (1985) People felt that their personal problems were taken into account that the organization took a responsibility for employee welfare, and that important decisions were made by groups or committees. (Hofstede, 2001) Providing organisation learning and development opportunities for project team members (Bryde and Robinson, 2005) The level of importance placed by organisation on its people (Deal & Kennedy, 1982). Empowering the employees and create change during the operation(Denison 2000) People issues are given higher priority, decision-making is pushed down. Opportunities are given to develop capabilities during the project process APCC report (1997). Investment in the development of the employee's skills. (Denison 2000) The amount of concern and interest the welfare and happiness of workers (Taylor and Bowers,1972) The amount of effort put into ensuring that the health and safety of the workforce (Cooper, 2000)
Contract commitment concerns	▪ Constructor's responsibility on project performance ▪ Client commits with agreement ▪ Supervision's accountability	▪ Constructor's commitment on quality ▪ Constructor's commitment on schedule ▪ Constructor's commitment on budget ▪ Supervision's commitment on work ▪ Client's commitment on agreements	Concern to satisfy the customers, (Denison 2000). The priority given to clients (Thompson, 1993) The attitudes and effort put into delivering construction products on time (Egan, 1998) Attitudes towards costs and cost reduction (Thompson, 1993) The attitudes and effort put into ensuring that mistakes are avoided (Egan, 1998)
Hierarchy and management issue	▪ Competent of project manager ▪ Communication ▪ Decision-making involvement.	▪ Leaders' leadership ▪ Decision-making encouragement ▪ Leaders' direction ▪ Leaders' instruction ▪ Decision-making involvement	Individuals have the authority, initiative, and ability to manage their own work. (Denison 2000) The level of empowerment (Kashiwagi et al., 2004). Providing everyone with a clear direction in their work, (Denison 2000) Willingness to talk to subordinates to let them know what is going on and to find out what is going on at their level (Low & Shi, 2001) The extent of planning and goal-setting. The extent to which problems are defined, objectives established, roles and tasks defined, and instructions are given by leaders (Quinn, 1988). Employees 'participation in decision-making process (Cameron and Quinn, 1999)

In summary, the five project organizational culture factors in construction derived from the factor analysis are: (i) *Goal alignment & trust*, (ii) *Cooperative orientation*, (iii) *Constructor commitment*, (iv) *Worker orientation*,(v) *Leadership committed*. Collectively, this forms a structural framework of project culture in construction.

The project culture factor score is the average of the mean score of its artifacts, then ranked and arranged in descending order as shown in Table 4.3

Table 4.2 Results of factor analysis on culture artifacts

Culture artifacts		Component				
		1	2	3	4	5
Objective understanding	CG1	.716				
Roles and duties of Constructor	CG2	.520		.507		
Roles and duties of Client	CG3	.644				
Mutual understanding	CG4	.724				
Look forward the project benefit	CG5		.478			
Effective working relationship	CW1	.444	.479			
Information sharing	CW2	.577				
Project manager's encouragement given	CW3	.498		.414		
Mutual trust sharing	CW4	.535				
Open and respect to each other.	CW5	.466	.592			
Exchange idea and support	CW6	.421	.569		.400	
Blame assignment and accountability	CW7		.645			
Importance of people's contribution	CP1	.537				
Opportunity given	CP2	.525			.413	.401
Empowerment assignment	CP3					.581
Pride and cerebration	CP4		.412			
Training sessions	CP5				.739	
Respect for workers	CP6				.787	
Concerns for workers	CP7				.779	
Constructor's commitment on quality	CCM1			.743		
Constructor's commitment on schedule	CCM2			.839		
Constructor's commitment on budget	CCM3			.789		
Supervision's commitment	CCM4	.512				
Client's commitment on agreements	CCM5	.404	.441			
Leaders' leadership	CH1	.466	.411			
Decision-making encouraged	CH2					.770
Leaders' direction	CH3		.408			.613
Leaders' instruction	CH4		.697			
Decision-making involvement	CH5		.624			
Eigenvalue		12.471	1.856	1.493	1.233	1.069
Variance (%)		43.003	6.399	5.149	4.252	3.686
Internal consistency reliability (Cronbach's alpha)		0.900	0.887	0.873	0.882	0.658
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.924					
Bartlett's Test of Sphericity						
Approx. Chi-Square	3.130E3					
dif.	406					
sig.	.000					

4.2. Description project type

Table 4.4 summaries the types of projects captured in the questionnaire survey. The projects were fundamentally classified by type of facility constructed, type of client, and scale. Each category is presented in the number of case and the percentage equivalent, and the total volume of output for each category as expressed in percentage terms. In terms of the number of projects captured in the survey, state/public sector funding category constituted the biggest proportion of the investment. Majority of the projects were either Transportation

infrastructure or building with medium scale based budget invested.

4.2.2. Procurement method

In terms of procurement routes adopted on the 199 projects representing the sample, the traditional route (DBB) dominated as the most popular procurement approach with 75% of the projects procured this way. Following this with 11% is the EPC approach. BOT, BT, and BOO were the approach for procuring 8%, 5%, and 1% of the projects surveyed, respectively. There is no other procurement approaches such as Management Contracting, Construction Management, and Private Finance Initiative (PFI) of all projects assessed.

Table 4.3 Significance scores of project culture artifacts

No.	Project culture factors	Culture artifacts	Score (ranking)
1	*Goal alignment & Trust (C1)*	• Objective understanding, • Roles and duties of Constructor, • Roles and duties of Client • Mutual understanding • Information sharing • Project manager's encouragement given • Mutual trust sharing • Importance of people's contribution • Opportunity given • Supervision's commitment • Leaders' leadership	3.75 (1)
2	*Constructor commitment (C2)*	• Constructor's commitment on quality • Constructor's commitment on schedule • Constructor's commitment on budget	3.53 (2)
3	*Cooperative orientation (C3)*	• Look forward the project benefit • Effective working relationship • Open and respect to each other • Exchange idea and support • Blame assignment and accountability • Pride and cerebration • Client's commitment on agreements • Leaders' instruction • Decision-making involvement	3.40 (3)
4	*Leadership committed (C4)*	• Empowerment assignment • Decision-making encouraged • Leaders' direction.	3.30 (4)
5	*Worker orientation (C5)*	• Training sessions • Respect for workers • Concerns for workers.	3.03 (5)

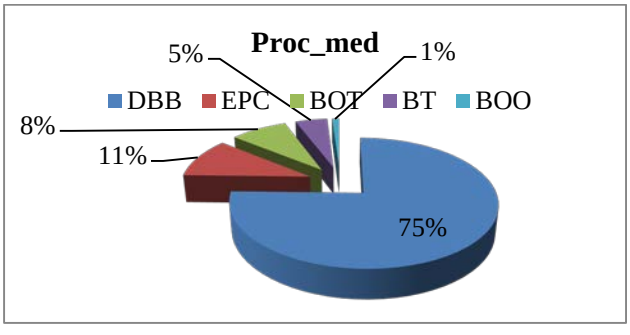

Fig.4.1 Procurement method distribution

The chi-square ($\chi 2$) test was conducted on these procurement types to test the null hypothesis that they are equally distributed in the population. The output shown clearly that the differences suggested by Fig 4.1 are highly significant and not due to chance ($\chi 2$= 371.225, df =4, p-value < 2.2e-16). This implies that there is very strong evidence to show that the traditional procurement approach is still the

most popular among others. Similarly, this profile shows somewhat similar to survey findings reported for the year 2004 in an RICS report (RICS, 2006), the general trend of the traditional lump sum procurement approaches and the Design and Build routes were still the most popular in UK construction industry.

4.2.3. Bid method

Among three bid methods implemented in the 199 projects representing the sample, it indicates that the Competition route dominated as the most popular bid approach with 62% of the projects conducted this way. Following this with 24% and 14% are shared for the Designated/Negotiated and Limited approach respectively of the projects surveyed. The chi-square ($\chi 2$) test was conducted on these bid types to test the null hypothesis that they are equally distributed in the population.

Table 4.4 Project type descriptions

Project type		Projects surveyed (N)	Projects surveyed (%)
Proj_type1			
Transport infrastructure (T)		107	54.00
Building (B)		78	39.50
Industry (I)		6	3.00
Factory (F)		4	2.00
Water system (W)		3	1.50
	Total	198	100
Proj_type2			
State funded		107	54.00
Private funded		48	24.30
Over sea funded		43	21.70
	Total	198	100
Proj_type3			
Big scale (National level)		49	25.60
Medium scale (Budget >15 bil. VND)		113	59.20
Small scale (Budget <=15 bil. VND)		29	15.20
	Total	191	100

The output presents that the differences suggested by Fig 4.2 are highly significant and not due to chance ($\chi 2$= 75.8477, df = 2, p-value < 2.2e-16). This implies that there is very strong evidence to show that the Competition approach is still the most popular among others. The dominance of the competitive bid approach is actually justifiable since the regular project is absolutely required to bid under this way by tender law of Vietnam.

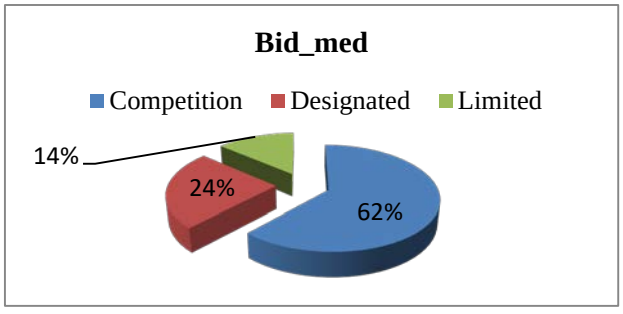

Fig.4.2 Bid method distribution

3.2.4. Bid evaluation method

To examine the bid evaluation on the 199 projects surveyed, four principles representing as the existing concerns of the tendering evaluation adopted from Nguyen and Watanabe (2014) were measured including (i) f*air and transparent competition (Bid_f.t1), (ii) no intervention to bid process (Bid_intl2), (iii) trust on past performance (Bid_past3), and (iv) reasonable capability of constructor on site (Bid_cap4).* The respondents were also asked to what extent of their agreement on the four criteria indicated by using the five point-scale format item. The mean scores show that all these criteria were rated in the range of neural to closed high level (from 3.0-4.0). It implied that there is a possibility to improve these principles/criteria to achieve a better biding evaluation.

In terms of testing for significant differences in these various bid evaluation criteria found, the hypothesis put forward to the testing was that: There are no differences in the bid evaluation principles regardless of either their project characteristics or procurement approach. By testing of the Kruskal_Wallis method, each of four principles/criteria of bid evaluation was tested. The results are presented in the Table 4.5. The results show that there was no evidence to suggest that the project characteristics and procurement approach have an effect on the bid evaluation criteria except for the significant effects of the bid method (Bid_med) on the *no bid intervention criterion* (Bid_intl2). The Kruskal_Wallis *post hoc* analysis was thus employed to figure out this specific difference (Table 4.6). The data indicates that there is a significant difference in the *no bidding intervention criterion* (Bid_intl2) between the Competition and Limited method. The level of the bid intervention of the Limited route is significantly higher (mean =2.56) than that of the Competition route (mean=3.19). The revelation may well explain that the competitive measure is typically considered as the productive instrument to archive the transparent bid; while the limited manner could be attributable to collusive phenomenon of bidding players.

Table 4.5 Kruskal_Wallis test results

	Statistics	Bid_f.t1	Bid_intl2	Bid_past3	Bid_cap4
Proj_type1	chi-squared	4.5243	6.971	9.1802	3.2797
	p-value	0.3397	0.1374	0.05675	0.5122
Proj_type2	chi-squared	1.271	1.7257	0.847	2.8142
	p-value	0.5297	0.422	0.6548	0.2449
Proj_type3	chi-squared	0.3122	0.2443	4.337	3.2814
	p-value	0.8555	0.885	0.1143	0.1938
Proc_med	chi-squared	0.3882	0.8093	3.1865	1.1868
	p-value	0.8236	0.6672	0.2033	0.5524
Bid_med	chi-squared	2.235	9.1919	0.0575	4.3743
	p-value	0.3271	**0.01009**	0.9716	0.1122

Table 4.6 Kruskal_Wallis post hoc analysis results

Test	Comparisions	obs.dif	critical.dif	difference
Bid_intl2 vs Bid_med	Competition-Designated	3.619031	23.37604	FALSE
	Competition-Limited	34.651639	28.73469	**TRUE**
	Designated -Limited	31.032609	32.75487	FALSE

4.3. Influence of project characteristics and procurement characteristics on project culture

To verify the relations, some of them were put to the test using the Kruskal-Wallis and the post hoc analysis where the variables involved were nominal; while the Spearman's correlation was employed where the variables involved were treated as ordinal or scale. Each of the five dimensions of culture was tested and the results are presented in Table 4.7 and Table 4.9.

It could be observed from Table 4.7 that there was no evidence to suggest that the project characteristics such as participant type who were 169 constructors and 30 clients of the respondents surveyed (Type_Par), nature of fund (Proj-type2), and project size (Proj_type3) as well as procurement aspects regard of procurement route (Proc_med) and bid method (Bid_med) have an effect on the project culture.

However, the significant differences were found on two culture dimensions of the cooperative orientation (C3) and the worker orientation (C5) for the project type (Proj_type1).The Kruskal_Wallis post hoc analysis was thus employed to figure out these specific differences. The results reveal no difference in the culture of cooperative orientation

regard of the project type. In contrast, from the Table 4.8, the data indicates that there is a significant difference in the worker orientation between transportation infrastructure (T) and building facility (B). It further means that the level of worker orientation of the transport infrastructure facility (mean =3.24) is significantly higher than that of the building facility (mean=2.47). This revelation may well be supported by the reality that the employees in the constructor involved building facility are under widely temporary contract status in contrast to those with the long-run contracted of long-standing state-owner corporations.

Table 4.7 Kruskal-Wallis test results

	Statistics	C1	C2	C3	C4	C5
Type_Par	chi-squared	0.4944	1.7481	1.2685	0.9829	0.2934
	p-value	0.482	0.1861	0.26	0.3215	0.588
Proj_type1	chi-squared	9.2226	4.4433	9.6427	8.7356	15.4782
	p-value	0.05577	0.3493	**0.0469**	0.06806	**0.003806**
Proj_type2	chi-squared	0.4979	2.0259	2.311	2.1263	1.4264
	p-value	0.7796	0.3632	0.3149	0.3454	0.4901
Proj_type3	chi-squared	0.5633	2.916	0.2309	0.2449	1.1995
	p-value	0.7545	0.2327	0.891	0.8847	0.549
Proc_med	chi-squared	0.325	4.4425	4.2979	2.4069	6.0084
	p-value	0.9881	0.3494	0.3672	0.6614	0.1985
Bid_med	chi-squared	2.9462	1.8715	1.2579	0.5925	1.8721
	p-value	0.2292	0.3923	0.5331	0.7436	0.3922

Table 4.8 Kruskal_Wallis post hoc analysis results of worker orientation (C5)

Comparisons	obs.dif	critical.dif	difference
B-F	33.5608974	82.46046	FALSE
B-I	21.4358974	68.14482	FALSE
B-T	32.8120657	23.94765	**TRUE**
B-W	8.3525641	94.63477	FALSE
F-I	12.1250000	103.82705	FALSE
F-T	0.7488318	81.91355	FALSE
F-W	25.2083333	122.84983	FALSE
I – T	11.3761682	67.48199	FALSE
I – W	13.0833333	113.73684	FALSE
T-W	24.4595016	94.15860	FALSE

Table 4.9 Correlation coefficient between bid evaluation and project culture

		C1	C2	C3	C4	C5
Bid_f.t1	Pearson Correlation	.539**	.480**	.514**	.437**	.566**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _intl2	Pearson Correlation	.463**	.419**	.457**	.448**	.522**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _past3	Pearson Correlation	.398**	.498**	.353**	.303**	.369**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
Bid _cap4	Pearson Correlation	.538**	.640**	.481**	.379**	.424**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

***. Correlation is significant at the 0.01 level (2-tailed).*

Furthermore, from the Table 4.9, it could be observed that there is a positive correlation between bid evaluation principles and the project culture dimension (correlation coefficient above 0.35), which means that when one variable changes, the other variable also changes in accordance with it in a positive direction. This statistical revelation indicates that the bid evaluation could therefore be the significant factor motivating participants to enhance productively the interactive working environment.

5. CONCLUSION

This research was conducted to empirically identify a project organizational culture framework from the perspective of work-based practice that is grounded in the difficulties experienced across the construction industry. Using statistical analysis, we also studied the influence of project characteristics and procurement approach on cultural dimensions. The findings show that the characteristics of project such as type of participant, project size, and fund of project do not influence on project organizational culture. However, we have demonstrated that worker

orientation is significant different in project type regard of transport infrastructure and building facility. The study also clarifies that the bid evaluation principles in respect fair and transparent competition, no intervention of bid process, trust on past performance of bidder, reasonable capability of constructor on site were positively correlated with cultural dimensions. The authors expect that bid evaluation principles would be a key factor motivating the culture change. For further assessing the effectiveness of culture change, the impacts of project organizational culture into project outcomes are deserved to verify.

REFERENCES

Abeysekera, V. (2002). Understanding "Culture" in an International Construction Context, In Fellows, R. & Seymour, D. E. (eds.), *Perspectives on culture in construction, CIB report*, Vol. 275, 39-51.

APCC (1997) Construct Australia: Building a better construction industry in Australia, Australian Procurement and Construction Council.

Ankrah, N. A., Proverbs, D. & Debrah, Y. (2008). "Towards a model for diagnosing the culture of a construction project organization.", *International Journal of Construction Management*, 8(2), 17-31.

Bettinger, C., 1989. "Use corporate culture to trigger high performance." *J.Bus. Strat*., 10(2), 38–42.

Bodley, J. H. (1994). *An Anthropological Perspective, Cultural Anthropology: Tribes, States, and the Global System*, AltaMira Press.

Bryde, D. J. & Robinson, L. (2005). "Client versus contractor perspectives on project success criteria.", *International Journal of Project Management*, 23 (8), 622-629.

Cameron, K.S., Quinn, R.E., (1999). *Diagnosing and Changing Organizational Culture*. Prentice-Hall, Upper Saddle River, NJ.

Chan, E.H.W., Raymond, Y. (2003). "Cultural considerations in international construction contracts,". J. *Constr. Eng. Manag*. 129, 375–381.

Cheung,S.O.,Wong,P.S.P., and Wu,A.W.W. (2011). "Towards an organizational culture framework in construction.", *International Journal of Project Management*,29 (1),33-44.

Coffey, W.V. (2002). *Assessing organizational culture? Value management to the rescue*. A Paper Presented to the Institute of Value Management of Australia Conference, Tasmania, Australia.

Cooper, M. D. (2000). "Towards a model of safety culture.", *Safety Science*, 36(2), 111-136.

Dainty, A., Bagilhole, B. & Green, S. (2007) People and Culture in Construction: A Reader, Routledge.

Davidson, Prof. Colin H., and Dr. Tarek Abdel Meguid .(1997). *Procurement – a key to innovation/La maîtrise d'ouvrage – clé de l'innovation* Montreal, IF research Corporation and Rotterdam, CIB, xxii+850 pp.

Deal, T. E. & Kennedy, A. A. (1982). *Corporate cultures: the rites and rituals of corporate life, Reading, Mass.*, Addison-Wesley Pub. Co.

Denison, D.R. (1990). *Corporate Culture and Organizational Effectiveness*. Wiley, New York.

Denison, D.R. (2000). *Organizational culture: can it be a key lever for driving organizational change?* In: Cartwright, S., Cooper, C.L. (Eds.), The Handbook of Organizational Culture. John Wiley and Sons,London, UK.

Duarte, DL & Snyder, ND. (1999). *Mastering virtual teams: strategies, tools, and techniques that succeed*, 1st edn, Jossey-Bass, San Francisco.

Egan, J. (1998). *Rethinking Construction*. Department of the Environment, Transport and the Region HMSO, London.

Field, A. P. (2000). *Discovering statistics using SPSS for Windows: advanced techniques for the beginner*, London; Thousand Oaks, Sage Publications.

Fellows, R.F. Seymour, D. and Hancock, M.R. (1994). Conflict Resulting From Cultural Differentiation: An Investigation of the New Engineering Contract. Construction Conflict: Management and Resolution (edited by P. Fenn), 259-268. CIB Publication 171, Netherlands.

Fellows, R., Langford, D., Newcombe, R. and Urry, S. (2002). *Construction management in practice*, Oxford, Blackwell Science.

Fenn, P., Lowe, D. & Speck, C. (1997) Conflict and dispute in construction, *Construction Management and Economics*, 15,513-518.

Fulmer, R.M., (1988). The New Management. Collier Macmillan, London.

Gordon, G.G., DiTomaso, N. (1992). Predicting corporate performance from organizational culture. *J. Manage. Stud.* 29(6), 783–798

Gareis, R. and Huemann, M. (2000) 'Project management competences in the project-based organization', in Turner J.R., Simister S.J. and Lock, D. (eds), *The Gower Handbook of Project Management* (3rd edition), Aldershot: Gower.

Handy, C.B. (1985). *Understanding organizations* (3rd edition), Penguin.

Hansen, G. S. and Wernerfelt, B. (1989). Determinants of firm performance: The relative importance of economic and organizational factors. *Strategic Management Journal*, 10 (5), 399–411.

Harrison, R. (1972) 'Understanding your organization's character, *Harvard Business Review*, 50(3), 119.

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., (1998). *Multivariate Data Analysis*. Prentice-Hall, Englewood Cliffs, NJ.

Hofstede, G. (1983). The cultural relativity of organizational practices and theories. *J. Int. Bus. Stud.*, 14(2),75-89.

Hofstede, G. H. (1997). *Cultures and organizations: software of the mind*, Rev., McGraw-Hill, New York.

Hofstede, G. (2001). *Culture's consequences: comparing values, behaviors, institutions, and organizations across nations*, London; Thousand Oaks, California, Sage Publications.

Kaiser, H.F., Rice, J. (1974). Little jiffy mark IV. Educ. Psychol. Meas. 34(1), 111–117.

Kashiwagi,D; Parmar,D; Savicky,J. (2004). Traditional low bid procurement system versus performance information procurement system (PIPS) in construction industry. In: Khosrowshahi, F (Ed.), 20th *Annual ARCOM Conference*, 1-3 September 2004, Heriot Watt University. Association of Researchers in Construction Management, Vol. 1, 703-9.

Kline, P. (1994). *An Easy Guide to Factor Analysis*, London: Routledge.

Korzilius, L.P. (1988). A system and contingency analysis applied to construction projects of exceptional architectural design (available from http://www.lesterkorzilius.com/pubs/msc/MSC-0.htm).

Ling, F.Y.Y. and Bui, T.T.D. (2010). "Factors affecting construction project outcomes: case study of Vietnam",*Journal of Professional Issues in Engineering Education and Practice*, 136(3), 148-55.

Ling, F.Y.Y. and Hoang, V.T.P. (2010), "Political, economic, and legal risks faced in international projects: case study of Vietnam",*Journal of Professional Issues in Engineering Education and Practice*, 136(3), 156-64.

Ling, Y.Y., Pham, V.M.C. and Hoang, T.P. (2009), "Strengths, weaknesses, opportunities, and threats for architectural, engineering, and construction firms: case study of Vietnam",*Journal of Construction Engineering and Management*, 135 (10), 1105-13.

Liu, A.M. (1999). Culture in the Hong Kong real-estate profession: a trait approach. *Habitat Int.* 23 (3), 413-425

Low, S. P. & Shi, Y. (2001). *Cultural influences on organizational processes in international projects: two case studies*, Work Study, 50 (7), 276-285.

Mullins, L. J. (1993) *Management and Organisational Behaviour*, Pitman Publishing, London.

Nguyen, L.H., & Watanabe, T. (2014). "The Status Quo and Perspective for Improvement of Public Works Procurement Performance in Vietnam." *J. Adv. Perform. Informat. Value*, 6(1), 22-39.

Nguyen, L. D., Ogunlana, S., Truong, Q., and Lam, K. C.(2004a). "Large construction projects in developing countries: A case study from Vietnam."*Int. J. Proj. Manage*.,22(7), 553–561.

Nguyen, L. D., Ogunlana, S. O., and Lan, D. T. X.(2004b). "A study onproject success factors in large construction projects in Vietnam." *Eng., Constr., Archit. Manage.*,11(6), 404–413

Pallant, J. (2005). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows (Version 12)*. Allen & Unwin, Australia.

Phua, F. T. T. & Rowlinson, S. (2003). Cultural differences as an explanatory variable for adversarial attitudes in the construction industry: the case of Hong Kong, *Construction Management and Economics*, 21(7),777-785.

Quinn, R. E. (1988). *Beyond rational management: mastering the paradoxes and competing demands of high performance*, Jossey-Bass, San Francisco.

Robinson, J.P., Shaver, P.R., Wrightsman, L.S. (1991). *Criteria for Scale Selection and Evaluation in Measurers of Personality and Social Psychological Attitudes*. Academic Press, San Diego, Calif.

Schein, E. (1985). *Organizatonal Culture and leadership*, San Francisco, Washington, London, Jossey-Bass Publishers.

Sharma, S. (1996). *Applied Multivariate Techniques*. John Wiley and Sons, USA.

Soetanto, R., Proverbs, D. & Cooper, P. (1999). A conceptual model of performance and satisfaction for main participants of construction project coalitions, *Proceedings of ARCOM 15th Annual Conference*. John Moores University, Liverpool, ARCOM.

Taylor, J. C. & Bowers, D. G. (1972). Survey of organizations; a machine scored standardized questionnaire instrument, Center for Research on Utilization of Scientific Knowledge, Ann Arbor, Michigan.

Thompson, J. L. (1993). *Strategic management: awareness and change*, London; New York, Chapman & Hall, University and Professional Division.

Uher, T & Loosemore M. (2004). *Essentials of Construction Project Management*, UNSW Press.

Walker, D.H.T. (1994), 'An investigation into factors that determine construction time performance', PhD thesis, Department of Building and Construction Economics RMIT, Melbourne Australia.

Widmen, M. (2004). Wideman Comparative Glossary of Project Management Terms v3.1 (available from http://www.maxwideman.com/pmglossary/PMG_P11.htm).

Zuo, J., and Zillante, G. (2005). Project culture within construction projects: a literature review. In *Proceedings of IGLC13*, (pp. 353 -361).

Zuo, J., Zillante,G., and Coffey,V. (2008). Project culture in the chinese construction industry: Perceptions of constructors. *The Australasian Journal of Construction Economics and Building*, 9(2), 17-28.