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Project Organizational Culture Framework in Construction Industry

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Abstract

Project organizational culture (POC) has been recognized as a significant influencing factor of the success or failure of a project. Although numerous studies on this topic have been conducted to develop organizational culture models, these have mainly been for generic business settings, and one has not yet been developed for construction organizations at the project level. The aim of this chapter was to perform this task in Vietnam. A case study shows that cultural artifacts were arranged into a five-factor project organizational culture framework: "Project goal setting," "Contractor assurance," "Cooperative emphasis," "Empowerment assignment," and "Workforce emphasis." The chapter's findings suggest that the construction contracting organizations are more focused on the culture of mission and adaptability, with a relatively higher emphasis on clear project goals and contractor assurance. They favored a culture of involvement less, with a relatively lower emphasis on empowerment and workforce.

Keywords: project organizational culture, project culture framework, organizational culture, project management, construction project organization

1. Introduction

Over the years, numerous studies have been conducted on the concept of culture, offering a list of over 160 various definitions of culture [1]. Essentially, culture is acknowledged as a set of learned mores, values, attitudes, and meanings that are shared within a group of people. In the last decades, culture has been examined either in various environments or under various levels; the studies are frequently conducted for national culture, industry culture, and organizational culture. Particularly, renowned organizational culture models have been proposed within consideration of an organization's effectiveness.

In the context of construction project organizations (CPOs), among the critical success factors (CSFs) of a CPO, culture factors arguably play a vital role in the success or failure of project management [2–8]. Cultural factors are essential determinants of management practices; thus, culture has recently been examined in the study as a CSF of construction projects [9–11]. To ensure the success of a CPO, management should pay significant attention on understanding of culture aspect and explain how culture's impacts can contribute to the CPO' effectiveness. Although cultural form and its influences are widely recognized in generic businesses, it is still the least studied area in the study of construction management. Thus, studies exploring project culture framework that have intended to provide a useful tool for assisting project management have been focused on less than others (e.g., procurement approaches, project characteristics, or management mechanisms). Among the few studies attempting to explain the form of organizational culture within the project level, Kumaraswamy et al. [12] defined a project culture model within four overlapping groups of sub-cultures: organizational sub-cultures, operational sub-cultures, professional sub-cultures, and individualistic sub-cultures. Thomas et al. [13] employed the Competing Values Framework model, which is based on four basic organizational forms (Market, Clan, Hierarchy, and Adhocracy) to identify the project culture orientation on 13 Australian construction projects. Zou et al. [14] proposed a project culture model based on the study of organizational models, which focuses more on the partnering contract procurement in China, including the five dimensions of integrative, cooperative, goal-oriented, flexible, and people-oriented. More recently, Stare [15] suggested a project organizational culture model that emphasizes the attitudes of top and line management in various Slovenian business enterprises related to IT, product development, and civil engineering, which was then used to examine the influence of the model on project performance.

Summarizing the above review, although multiple studies have addressed the formulation of organizational culture, such research has been disparate, and the culture dimensions have been analyzed based on the concepts of organizational culture that are built under the valued-based approach for generic business settings. This approach has been criticized because organizations differ more in work practices than in values [16]. In addition, CPOs are known as temporary settings to which multiple individuals with diverse backgrounds and professionals contribute to the construction project organization, which results in different human behavior and different expectations for a project. Hence, the individuals involved who present complicated behaviors and/or attitudes significantly influence the success of a project. Cultural differences are also believed to be capable of generating conflicts related to individual communication, which decreases the capacity of construction organizations to achieve project objectives [17, 18]. Hence, these studies, to some extent, do not address issues of definition and identification of POC with respect to work-based practices, particularly emphasizing the construction project organizations setting. Nevertheless, questions regarding POC remain unanswered in the context of the construction industry and deserve further investigation. Therefore, this chapter aimed to fill this research gap.

The purpose of this chapter is to define project organizational culture within the perspective of work-based practices. This approach is significant for project management practices, providing a useful tool for supporting the project participants in decision making to archive project objectives as well as the stakeholders' own benefits. After the introduction, we structure our work in six

sections. First, the theoretical framework is presented. Next, a case study POC is introduced. Then, the discussions of the results and background of our findings are presented. The conclusions are consequently drawn. In the last section, the limitations and future research are made.

2. Theoretical framework: understanding of project organizational culture

Although culture has been examined widely at different levels of analysis from national culture to organization-level culture, there is still no agreement on the definition of organizational culture. Schneider [19] described organizational culture as things that have been existing in the way people do things around here to succeed. In a more formal manner, Schein [20] defined organizational culture as a pattern of shared basic assumptions that is learned by a group within an organizational setting, to which organization members share the way of feeling, perceiving, and thinking to devote great efforts to solve or explain its problems of external adaptation and internal integration. In the comparable ways, organizational culture refers to the norms, values, and beliefs that form expected behaviors of employees [21, 22], or organizational culture reflects the unique pattern of norms, values, beliefs, and ways of behaving within groups to which it characterize the manner that members combine to get things done [23]. In the work of McNamara [24], organizational culture is also argued as the assumptions, values, norms, and tangible signs (artifacts) of organization members and their behaviors, in which new members consciously or unconsciously are coming to engage with the particular organizational culture for becoming another person. Hofstede [25] and Hofstede et al. [26] defined organizational culture as the collective mental programming that differentiates an organization's members from another.

Furthermore, organizational culture is agreed with as the way of behaving, identity, pattern of dynamic relationships, "reality," or genetic code within an organization [19]. It is regularly grounded in the philosophies related to the organization's members and is learned by new members through a process of socialization [27]. Organizational culture can also be viewed as the set of elements of an organization that regulates its manner of operating, being, decision making, communicating, and others [28]. In addition, it is argued that organizational culture is rooted in the basic and universally shared problems [20, 29], dilemmas [30], or contradictions [31] which all members of an organization have to deal with. Efforts made by the members to resolve and/or explain these problems and reconcile dilemmas or contradictions regularly yield solutions that are reliable and repeatable, and reflect the organizations' underlying cultural paradigm [20]. Groups of people may encounter the comparable fundamental problems, but each those groups might find their own unique solutions for these problems that set them apart from each other; as a result, this systematic effort is perceived as their culture [29].

In addition, multitude models have been proposed for evaluating organizational culture in the study. Among those models, the following well-known ones have been commonly utilized for years. The typology culture model was firstly proposed by Harrison [32] and then modified by Handy [33], who suggested that four main types of culture exist in organizations: "power

orientation," "role orientation," "task orientation," and "person orientation." This model emphasized on how processes are conducted and decisions are made within a culture. Deal and Kennedy [34] proposed a model of corporate culture that emphasizes on what kinds of decisions have to be made—are the stakes high and how quickly does the decision maker know if the decision was right. The model encompasses four types of culture: "Work Hard/ Play Hard," "Touch- Guy/Macho/Star," "Process," and "Bet-Your-Company," which are based on two dimensions: the risk level of the company's businesses and the speed of feedback on decisions and/or strategies are made. Hofstede et al. [35] defined an organizational culture model founded on six dimensions: internally driven versus externally driven; easygoing work discipline versus strict work discipline; local versus professional; open system versus closed system; employee-oriented versus work-oriented, which is defined as perceived common practices (i.e., symbols, heroes, and rituals) that carry a specific meaning within the organizational unit; means-oriented versus goal-oriented. Denison and Mishra [36] identified four different cultural traits that reflect diverse dimensions of an organization's effectiveness: adaptability, mission, involvement, and consistency. Schneider [19] defines a four-square-matrix culture model that emphasizes more on the way of thinking in the decision-making process, including four dimensions: "Collaboration," "Control," "Cultivation," and "Competency." The Competing Values Framework proposed by Cameron and Quinn [37] recognizes four types of culture in organizations: Clan, Adhocracy, Hierarchy, and Market, to which the values held by the organization are emphasized.

The study on this issue has shown that definitions of organizational culture commonly pertain to basic assumptions [20], values and norms [23], beliefs [23], and mental programs [26]. Furthermore, organizational culture is defined as manners of behaving [6, 23] and work practices [16]. The divergence of the standard definition of organizational culture is understandable since the concept of organizational culture was derived from anthropology, where there was no consensus on culture's meaning [38]. Hence, there is no surprise of a multiplicity in culture definitions and its applications within organizational studies, making cultural appearances contextually diverse. Culture manifestations are either the large invisibilities that pertain to values, beliefs, and underlying assumptions [20, 29], or the visibilities, including artifacts, creations, and behavioral norms [20], which were referred to as "practices" by Hofstede et al. [26]. Thus, it could be argued that values and practices are two-side reflections of culture. Values reflect the preferences of people in work and life-related issues, whereas practices reflect the employees' descriptive perceptions of aspects of the work environment or actual work situation [26]. Hence, culture will become more readily readable when approaching from the two-side descriptions of culture, values, and practices.

Although traditional approaches have largely analyzed organizational culture based on the concept of values and basic assumptions, which are known critical aspects of organizational culture, the study has argued that organizations are more recognized in work practices than in values [16, 26]. It has also been argued that because significant aspects of values are often observable through organizational practices, there is also undoubtedly a capacity for measurement of values from work practices [26, 39]. This approach is also in line with the argument that the traditional approach of culture based on notions of shared values, beliefs, and basic assumptions is inadequate; instead, organizational culture should be argued from a strongly

operational perspective—"as embodied in the organization's structures, mechanisms and practices" [40]. In this form, culture is reflected in concern actions that characterize the interactions between individuals and working life rather than statements of values and beliefs; this may be a poor starting point for understanding culture and is out of step with culture as implemented in actions. Culture should thus be understood in a way that reflects the decisions, choices, options, and explanations related to norms of behavior and practice [40]. Taken together, these arguments support the view that consistent and widespread practices reflect organizational culture [41]. It is justifiable to approach culture from its reflections, the organizational practices, which are more readily observable and measurable and can thus be compared across organizations and directly related to individual and organizational performance.

Organizational practices are described as "particular ways of conducting organizational functions that evolved over time… [These] practices reflect the shared knowledge and competence of the organization" [42]. Based on these concepts of organizational practices, organizational culture is specifically defined as "a shared perception of organizational work practices within organizational units that may differ from other organizational units" [39]. Specifically, the construction project organization is performed as a temporary organization, where diverse contracting organizations gather and set the pattern of interrelationships, authority, and responsibility to accomplish the project's goals and objectives within the project life cycle. In the domain of project management, the CSFs in terms of managerial support, communication, relationships, participant involvement, and decision making [4, 43, 44] have been explored, which may be viewed as the "cultural" manifestations at the project level that assess the patterns of project participants' regular work behaviors and/or attitudes over the course of the project.

This study therefore proposes that project organizational culture can be identified by examining relevant project participants' work behaviors that reflect the methods of explanation or resolution for problems encountered over the course of a project. To develop each project's organizational culture, it was therefore necessary to examine the sources of practice problems that project participants must address or for which they must find solutions. Building upon this perspective of cultural identification, examining project participants' work behaviors is pivotal to determining culture within project organizations. Measuring cultural artifacts is thus expected to involve examining the level of project participants' work behaviors. Thus, when examining the dimensions of the organizational culture of a construction project, one could argue that a useful source of information should be obtained in consultation with key practitioners involved in the project delivery process.

3. Project organizational culture framework: a case of construction industry in Vietnam

This section presents findings derived from our contemporary studies on POC. It shows the POC approach, how the research methodologies were conducted, and research results were interpreted.

3.1. Identifying project organizational culture artifacts

To approach organizational culture from perspective of work-based practices, literature review focus group studies (FGSs), face-to-face interviews, and field observations were the key tools used to develop culture artifacts. Cultural artifacts identified from the literature reviews were further verified and adapted by the interviews, FGSs, and field observation before they were adopted as the measures in the survey. In the first stage of cultural artifact development, the FGSs, which are considered a good approach for investigating the cultural differences [45], were conducted within construction practitioners in Vietnam. In total, six FGSs were conducted in the six largest metropolitan cities in diverse areas in Vietnam: Ha Noi (the capital), Hai Phong (the largest economic city in the eastern North), Ho Chi Minh (the largest economic city in the South), Vinh (the largest economic city in northern midland), Da Nang (the midland capital city), and Can Tho (the main city of the Mekong Delta in the south), with one FGS in each city. The participants invited in each FGS were well-experienced construction professionals working for clients, contractors, and consultant businesses in the cities, with nine participants in each FGS. The selected participants' backgrounds included architects, designers, surveyors, project managers, and supervisory officers. In the second stage, face-to-face interviews were conducted with key experts. This stage covered the customization of the preliminary list of identified cultural artifacts in stage 1. Targeted interviewees included professionals with adequate experience in managing construction projects. In addition, field observations were conducted within on-going and complete construction projects in Vietnam to obtain a clear view of practices related to the study data collection.

The purpose of the FGSs and face-to-face interviews was to discuss the common problems in regard to the project delivery process and to clarify the traits of project organizational culture. Discussions and interviews were performed based on a semi-structured manner. A selection of primary questions is listed as follows: (1) what common problems occur over the course of a project? (2) Can you describe those problems in detail? (3) Have you ever heard of culture as a general concept or from the perspective of project management? (4) What do you understand about culture within CPOs? (5) How would you describe project organizational culture? (6) What should cultural artifacts measure in terms of project participants' behaviors/attitudes? (7) In your experience, who is appropriate for assessing these behaviors or attitudes?

The face-to-face interviews and FGSs with stakeholders suggested that the cultural artifacts should measure behaviors that reflect practices over the course of a project. Particularly, these practices should concern with (1) how project participants are expected to clarify the pursuit of project goals, which relates to participant responsibility for project goals, clear objectives for participants, participant commitment to achieve project goals, and conflicts of interest; (2) the work environment that assists project participants in interacting with and supporting each other over the course of a project, which relates to information sharing, the openness of the environment, support from top management, mutual trust among participants, mutual respect among participants, and assignment of blame in the event of disruptions; (3) emphasis on workforce, which should pertain to work conditions, employee participation in decision making, work training, and the respectful treatment of workers; (4) the extent to which project participants commit to project goals in the context of balancing them with other potentially competing goals,

which relates to contractor commitment to project performance, client commitment to the agreement, and the accountability of supervisors, and (5) how project managers or project leaders transfer his/her roles over the course of a project, which includes the competency of the project managers and project team leaders, communication between the project manager and subordinates and participant involvement in decision-making processes. As a result, 29 artifacts were enlisted and suggested for the measurement of project organizational culture (**Table 1**).

3.2. Data collection and measures

Based on the studies and discussions with key project's stakeholders, case-specific data were collected by practitioners involved in construction projects in Vietnam who served as project managers for clients and contractors. This approach was also validated by consultations for a pilot study to determine that clients and contractors with positions of project leaders, managing directors, and senior engineers were mostly the appropriate respondents to the survey. In the pilot study, scholars and professionals were invited to review and comment. Those participants included five professors who were affiliated with universities in the field of project management, 15 expert professionals who were five senior managers from contractors, six project managers from clients, and five senior engineers from consultant companies. Having 21 interviewees was well qualified in a qualitative study, which is above the 15 threshold suggested by Bertaux [46]. Meanwhile, all of 21 interviews were in agreement with the verification.

As a result, official questionnaires were distributed to 419 randomly targeted participants who were asked to answer the specific survey questions based on the most recently completed project in which they participated. A final sample of 199 valid responses was obtained for investigation. Among the final set of valid samples, 169 of the respondents were from contractors and the remaining 30 were from clients. Regarding respondents' backgrounds, 100% of the respondents played roles as project managers during the project delivery, and 79% of them had more than 5 years of experience in construction project management. Regarding the types of projects, 110 of the projects were infrastructure systems, including roads, bridges, and water supply systems; 78 of the projects were residential and/or commercials buildings; and 11 of the projects were industrial facilities. Regarding the scale of the projects, 49 were large investments (national level), 113 were mid-range investments (budget >VND 15 billion), and 37 were small-scale investments.

The respondents were asked to indicate their experience in a recently completed construction project on a five-point Likert scale of one (strongly disagree/not at all satisfied) to five (strongly agree/extremely satisfied). Principal component analysis (PCA) was conducted to examine the factor structure of the cultural artifacts as collected. PCA is an effective tool for demonstrating convergent and discriminant validity and for principally diminishing the number of variable factors [47] and avoiding multicollinearity [48]. The eigenvalue is reliably used to establish a cutoff when the number of artifacts is between 20 and 50 [47]. Hence, using the eigenvalue criterion is appropriate for this study, which was performed with 29 artifacts. Factors with eigenvalues greater than or equal to 1 were considered significant. In addition, Cronbach's alpha was used to verify the reliability of the factorized artifacts [49]. The alpha value ranged from 0 to 1; the higher the alpha value, the more reliable the groupings of artifacts. Cronbach's alpha value greater than 0.7 is considered "good" and/or "acceptable" in reliability testing [49, 50].

Project organizational culture artifacts	Descriptions
• Project objectives clarification • Obligation clarification by contractors • Obligation clarification by clients • Mutual understanding • Commitment of project benefits	• Objectives and values of the project are clearly understood by project participants. • The contractors clearly understand their required roles and duties. • The client clearly understands their required roles and duties. • All project participants concern each other's objectives, expectations, and values. • When disputes or conflicts occur, the participants first look at how the project would benefit rather than how they would benefit.
• Effective interactions at work • Information exchange • Roles of project manager • Trust-sharing atmosphere • Mutual respect and openness • Idea exchange and support • Assignment of blame and accountability	• Effective working relationships among the participants are promoted in terms of exploring innovative solutions and reducing costs and time spent. • Information is shared, transparent, and available to participants over the course of the project. • Project managers assist, support, and clearly communicate with their subordinates, ensuring accomplishment of project objectives. • There is an atmosphere of mutual trust generated by project participants. • The project participants are open and respectful of one another. • The project participants are encouraged to exchange ideas and to help one another. • Assignment of blame and accountability issues is (not) emphasized when things go wrong over the course of a project.
• Value project participants' contributions • Available opportunities • Promote empowerment • Recognize achievements • Emphasize training works • Encouragement of respectful attitudes toward workers • Emphasize good conditions for workers	• All project participants are valued as important contributors to the success of the project. • All project participants are encouraged to develop their capabilities over the course of the project. • Project participants are empowered to make decisions by themselves at any level. • Project participants take pride in or celebrate achievements when they achieve production milestones. • Workers are scheduled to attend any training sessions regarding skills and safety. • Workers are really being treated with respect over the course of project. • Workers are concerned about health and welfare.
• Contractor's assurance to project quality • Contractor's assurance to project schedule • Contractor's assurance to project budget • Supervisor's obligation to work • Client's obligation to agreements	• The contractors emphasize committing to the project's success with regard to quality. • The contractors emphasize committing to the project's success with regard to the schedule. • The contractors emphasize committing to the project's success with regard to contract costs. • The supervisor emphasizes obligation to making the project successful. • The *client* emphasizes obligation *to the contract agreements.*
• Emphasize leadership • Encouragement in decision making • Direction by project leaders • Instruction by project leaders • Participation in decision making	• Project leaders are encouraged to show their strong leadership. • Decision making is liberally encouraged at every level. • Project leaders always ensure that their subordinates know what is expected of them. • Project leaders always ensure that individual accountability is clear. • All project members are encouraged to participate in the decision-making process over the course of the project.

Table 1. Artifacts of project organizational culture.

3.3. Exploratory factor analysis on project organizational culture artifacts

PCA was employed to investigate the underlying factors of 29 cultural artifacts. The results of the PCA (**Table 2**) using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which is relatively higher than the suggested threshold of 0.60 [51], and Bartlett's test were highly significant (p > 0.000) [47], showing that the data were suitable for factor analysis. Factor loadings above the 0.40 threshold were considered [52, 53]. The final results of the exploratory factor analysis showed that the five cultural components that were initially extracted accounted for 62.49% of the total variance in the 29 cultural artifacts with an eigenvalue greater than one, indicating five project organizational culture factors. Cronbach's alpha values ranged from 0.66 to 0.90, which indicates that the internal consistency reliability of all extracted factors was acceptable [52].

Eleven artifacts were extracted as significant in cultural factor 1 (C1): (AG1) project's objectives clarification, (AG2) obligations clarification by contractor, (AG3) obligations clarification by client, (AG4) mutual understanding, (AC2) information exchange, (AC3) roles of project manager, (AC4) trust-sharing atmosphere, (AP1) value project participants' contributions, (AP2) available opportunities, (ASA4) supervisor's obligation to work, and (AH1) leadership. Considering the artifact descriptions provided in **Table 1**, artifacts (AG1, AG2, and AG3) can reflect the effectiveness of project goal clarification over the course of a project. The remaining items in cultural factor 1 could be used to assess the degree to which people are reliable and motivated in terms of achieving project goals. This culture factor is called *project goal setting*. Cultural factor 2 (C2) comprised nine items: (AG5) commitment of project benefits, (AC1) effective interactions at work, (AC5) openness and mutual respect, (AC6) idea exchange and support, (AC7) assignment of blame and accountability, (AP4) recognize achievements, (ACA5) client's obligation to agreements, (AH4) instruction by project leaders, and (AH5) participation in decision making. The conceptualization of the artifacts extracted in factor 2 contributes to cooperation in the work environment. Thus, cultural factor 2 is called *cooperative emphasis*. Three items were significantly organized in cultural factor 3 (C3): (ACA1) the contractor's assurance of project quality, (ACA2) the contractor's assurance of the project schedule, and (ACA3) the contractor's assurance of the project budget. These artifacts reflect the degree to which the contractor is committed to project outcomes. Thus, this cultural factor is called *contractor assurance*. Cultural factor 4 (C4) is labeled *workforce emphasis*, which consists of three artifacts that are associated with the extent to which the workforce is concerned: (AP5) emphasize training works, (AP6) encouragement of respectful attitudes to workers, and (AP7) emphasize good conditions for workers. The taxonomy of factor 5 (C5) includes three items: (AP3) promote empowerment, (AH2) encouragement in decision making, and (AH3) the direction by project leaders. This cultural factor is called *empowerment assignment* because the extracted items reflect the level at which empowered individuals are involved in making decisions regarding the achievement of the project goals. In summary, the PCA identified the following five factors of project organizational culture for the construction industry: (C1) project goal setting, (C2) cooperative emphasis, (C3) contractor assurance, (C4) workforce emphasis, and (C5) empowerment assignment. These factors are suggested as the formulation of a construction project organizational culture framework in industry.

Project organizational culture artifacts	Code	Project organizational culture components				
		1 (C1)	2 (C2)	3 (C3)	4 (C4)	5 (C5)
Project objectives clarification	AG1	0.72				
Obligation clarification by contractor	AG2	0.52				
Obligation clarification by client	AG3	0.64				
Mutual understanding	AG4	0.72				
Information exchange	AC2	0.58				
Roles of project manager	AC3	0.50				
Trust-sharing atmosphere	AC4	0.54				
Value project participants' contributions	AP1	0.54				
Available opportunities	AP2	0.53				
Supervisor's obligation to work	ASA4	0.51				
Emphasize leadership	AH1	0.47				
Commitment of project benefits	AG5		0.48			
Effective interactions at work	AC1		0.48			
Openness and mutual respect	AC5		0.60			
Idea exchange and support	AC6		0.57			
Assignment of blame and accountability	AC7		0.65			
Recognize achievements	AP4		0.41			
Client's obligation to agreements	ACA5		0.44			
Instruction by project leaders	AH4		0.70			
Participation in decision making	AH5		0.64			
Contractor assurance to project quality	ACA1			0.74		
Contractor assurance to project schedule	ACA2			0.84		
Contractor assurance to project budget	ACA3			0.79		
Emphasize training works	AP5				0.74	
Encouragement of respectful attitudes to workers	AP6				0.79	
Emphasize good conditions for workers	AP7				0.78	
Promote empowerment	AP3					0.58
Encouragement in decision making	AH2					0.77
Direction by project leaders	AH3					0.61
Eigenvalue		12.47	1.86	1.49	1.23	1.07
Variance (%)		43.00	6.40	5.15	4.25	3.69
Internal consistency reliability (Cronbach's alpha)		0.90	0.89	0.87	0.88	0.66

Kaiser-Meyer-Olkin measure of sampling adequacy	0.92
Bartlett's test of sphericity	3.130E3
Approx. chi-square	406
dif.	0.000
sig.	

Table 2. Results of factor analysis on project organizational cultural artifacts.

4. Result interpretations and discussions

To examine the higher explanatory power of cultural dimensions for project performance, the statistical characteristics of all components are discussed. **Table 3** shows the mean value (MCV) and standard deviation (SDCV) of the CV of the artifacts categorized in each component. The MCV and SDCV in each component are represented as C1 (low, high), C3 (medium, low), C2 (medium, high), C4 (medium, high), or C5 (high, low). With the introduction of the combination values of MCV and SDCV, the statistical characteristics of each component can be comprehensively discussed. **Table 4** shows the frequency, mean, and standard deviation of the significance scores (SSs) and their ranks and the coefficient variation (CV) of each cultural artifact.

The first characteristic of C1 is its high explanatory power of the variance in PCFA, which is 43.0% (**Table 4**). C1 dominates in capturing the structural characteristics of the SSs of all artifacts much more effectively than the other components. Thus, C1 is the most "authoritative criterion" to judge whether each project belongs to the "majority" or "minority." The second characteristic of C1 is low MCV. Low MCV indicates a high mean and a low standard deviation of the SS. Thus, the artifacts in C1 were practiced most intensively and widely in the surveyed projects. Therefore, the characteristics of C1 are its dominant power to capture the structural characteristics of the entire data of the SSs and the most intensive and wide practice of its artifacts. The practical interpretation is that a project in which artifacts in C1 are not intensively practiced is considered a minority project (from the second characteristic) and actually a "true" minority project (from the first characteristic). These characteristics are expected to be the foundation of C1's high explanatory power for project performance.

The first characteristic of C3 is a lower explanatory power of the variance in PCFA than C1, which was 5.15% (**Table 2**). It should be noted that C3 thus does not form "major" statistical structural characteristics of the SSs of all artifacts, unlike C1. The second characteristic of C3 is medium MCV and low SDCV. Medium MCV indicates a medium mean and a medium standard deviation of the SS. Medium MCV implies that artifacts in C3 are generally practiced intensively and widely but not as intensively or widely as in C1. Low SDCV indicates that the CVs are not varied among the artifacts in the component. To determine the reason for this lack of variance, the correlation coefficients of the SSs among the three artifacts in C3, namely ACA1, ACA2, and ACA3, were examined. These correlation coefficients were 0.586, 0.727, and 0.771 in the ascending order. Accordingly, it is possible that all artifacts are practiced similarly. The third characteristic of C3 is its straightforward interpretation: contractor assurance. All artifacts concern contractor assurance. Therefore, the characteristics of

Statistics criteria	C1	C2	C3	C4	C5
Mean of CV (MCV)	0.198	0.263	0.239	0.259	0.337
Standard deviation of CV (SDCV)	0.0300	0.0346	0.0127	0.0371	0.0145

Table 3. Mean value and standard deviation of the CV of the artifacts categorized in each component.

ID	Cultural artifacts	Frequency of significance score (SS)					Number of valid samples	Mean of SS	SD of SS	Mean rank	SD Rank	Coefficient of variation (CV)	CV rank	Component category
		1	2	3	4	5								
AG2	Obligation clarification by contractor	0	5	14	155	25	199	4.01	0.55	2	1	0.136	1	C1
AG3	Obligation clarification by client	0	6	11	143	39	199	4.08	0.61	1	2	0.149	2	C1
AP2	Available opportunities	0	12	42	130	14	198	3.74	0.68	6	3	0.181	3	C1
AG4	Mutual understanding	1	12	34	133	19	199	3.79	0.71	4	4	0.189	4	C1
AH1	Emphasize leadership	1	14	37	131	16	199	3.74	0.73	5	6	0.194	5	C1
AH3	Direction by project leaders	1	18	49	124	6	198	3.59	0.72	13	5	0.201	6	C4
AP1	Value project participants' contributions	0	16	28	123	31	198	3.85	0.78	3	8	0.201	7	C1
AG1	Project objectives clarification	2	17	36	128	16	199	3.70	0.78	7	9	0.210	8	C1
ACA5	Client's obligation to agreements	0	23	44	117	14	198	3.62	0.78	11	10	0.217	9	C2
AC4	Trust-sharing atmosphere	1	24	52	114	7	198	3.52	0.77	16	7	0.220	10	C1
ACA1	Contractor assurance to project quality	1	22	43	118	15	199	3.62	0.80	10	11	0.221	11	C3
AC3	Roles of project manager	0	21	51	104	23	199	3.65	0.82	9	12	0.225	12	C1
AC2	Information exchange	1	24	35	119	19	198	3.66	0.83	8	14	0.227	13	C1
AC1	Effective interactions at work	1	25	46	110	17	199	3.59	0.84	12	17	0.233	14	C2
AP4	Recognize achievements	1	25	59	99	14	198	3.51	0.82	17	13	0.235	15	C2
AC6	Idea exchange and support	0	28	50	104	16	198	3.55	0.83	14	15	0.235	16	C2
ACA3	Contractor assurance to project budget	0	34	44	110	10	198	3.48	0.84	18	16	0.240	17	C3
ASA4	Supervisor's obligation to work	0	33	43	108	14	198	3.52	0.85	15	18	0.242	18	C1
ACA2	Contractor assurance to project schedule	1	36	44	103	15	199	3.48	0.89	19	22	0.257	19	C3
AC5	Openness and mutual respect	1	35	46	99	15	196	3.47	0.89	20	20	0.257	20	C2

ID	Cultural artifacts	Frequency of significance score (SS)					Number of valid samples	Mean of SS	SD of SS	Mean rank	SD Rank	Coefficient of variation (CV)	CV rank	Component category
		1	2	3	4	5								
AH4	Instruction by project leaders	1	48	63	81	6	199	3.22	0.86	23	19	0.269	21	C2
AP3	Promote empowerment	4	41	45	101	7	198	3.33	0.91	22	24	0.274	22	C4
AH5	Participation in decision making	2	58	60	74	5	199	3.11	0.89	26	21	0.287	23	C2
AG5	Commitment of project benefits	6	38	56	76	22	198	3.35	1.01	21	26	0.301	24	C2
AH2	Encouragement in decision making	2	72	60	60	5	199	2.97	0.90	28	23	0.303	25	C4
AP6	Encouragement of respectful attitudes to workers	5	56	50	72	13	196	3.16	1.00	25	25	0.316	26	C5
AC7	Assignment of blame and accountability	12	42	56	68	19	197	3.20	1.07	24	29	0.335	27	C2
AP5	Emphasize training works	8	66	41	73	9	197	3.05	1.03	27	27	0.337	28	C5
AP7	Emphasize good conditions for workers	8	80	45	52	12	197	2.90	1.04	29	28	0.357	29	C5

Table 4. Frequency, mean, and standard deviation of the significance scores (SSs) and their ranks and the coefficient variation (CV) of cultural artifacts.

C3 are summarized as follows. C3 does not form major statistical structural characteristics, unlike C1. However, C3 is interpreted straightforwardly, and all artifacts are practiced intensively, widely, and similarly. The practical interpretation is that if one artifact is not intensively practiced in a project, the other two artifacts are also less likely to be intensively practiced. Thus, a project in C3 is clearly differentiated from other projects that have an intensive practice of artifacts. These characteristics appear to be the foundation of C3's high explanatory power for project performance.

The first characteristic of C5 is a lower explanatory power of variance in PCA than C1, which was 3.69% (**Table 2**). Thus, it should be noted that similar to C3, C5 does not form the "major" statistical structural characteristics of the SSs of all artifacts. The second characteristic of C5 is high MCV and low SDCV. High MCV indicates a low mean and a high standard deviation of the SSs. High MCV implies that the artifacts in C5 are generally practiced least intensively. In some projects, however, these artifacts are practiced intensively. Low SDCV indicates that the CVs are not varied among the artifacts in the component. To determine the reason for this lack of variance, the correlation coefficients of the SSs among the three artifacts in C5, namely AP5, AP6, and AP7, were assessed. These correlation coefficients were 0.687, 0.703, and 0.756 in the ascending order. Accordingly, it is possible that all artifacts are practiced similarly. The third characteristic of C5 is its straightforward interpretation: workforce emphasis. All artifacts implicate workforces. Therefore, the characteristics of C5 are summarized as follows. C5 does not form major statistical structural characteristics, similar to C3. However, C5 is interpreted straightforwardly. Although the artifacts are practiced least intensively, there are also some projects in which all the artifacts are practiced intensively. The practical interpretation is that if one artifact is intensively practiced in some project, the other two artifacts are also likely to be intensively practiced. Thus, a project in C5 is clearly differentiated from other projects that have a less intensive practice of artifacts. These characteristics seem to be a foundation of C5's high explanatory power for project performance.

Likewise, C2 and C4 have similar characteristics. The first characteristic is a lower explanatory power of variance in PCA, similar to C3 and C5, which was 6.40 and 4.25%, respectively (**Table 2**). The second characteristic is medium MCV and high SDCV. In particular, the values of SDCV in C2 and C4 were 0.0346 and 0.0371, respectively, which were more than twice as high as in C3 and C5. To determine the reason for this difference, the correlation coefficients of the SSs among the nine artifacts in C2, namely AG5, AC1, AC5, AC6, AC7, AP4, ACA5, AH4, and AH5, and the correlation coefficients of the SSs among the three components in C4, namely AP3, AH2, and AH3, were evaluated. Regarding C2, there were 36 correlation coefficients (=9*8/2). The distribution of their values is as follows: 0.300–0.399: 8; 0.400–0.499: 17; 0.500–0.599: 10; and 0.700–0.709: 1. Regarding C4, the correlation coefficients were 0.370, 0.382, and 0.449 in the ascending order. These correlation coefficients were generally smaller than those in C3 and C5. The above analyses of C3 and C5 suggest that the necessary condition for C2 and C4, which have lower explanatory powers of variance in PCA, to have a high explanatory power for project performance is to have high correlation coefficients of the SSs among artifacts in each category. However, C2 and C4 do not satisfy this necessary condition. Even if some artifacts are practiced intensively in one project, other artifacts are not necessarily practiced intensively. Thus, it is difficult to clearly differentiate projects based on C2 and C4.

A high explanatory power of C3 and C5 for project performance is worth noting because they have a much lower explanatory power of variance in PCA than C1. In the data structure of the SSs of all artifacts, the difference in the SSs of the artifacts in C3 and C5 was not as conspicuous as in C1. However, their improvement is expected to contribute to the enhancement of project performance. Furthermore, the mean values of the SSs in C3 and C5 were lower than in C1. This finding indicates that there is more room for improvement for C3 and C5 than for C1. This result is useful for project participants who would like to enhance their project as well as for policy makers who discuss and establish the future direction of the Vietnamese construction industry.

The project organizational culture dimensions were ranked by calculating the factor scores based on the average mean scores of each factor's artifacts. The mean score of these five factors indicated that the factors were above-average identifiers of project organizational culture in the construction industry, as shown in **Figure 1**. Moreover, problems have been reported in project performance in Vietnam with regard to poor quality, cost over runs, delays, and client dissatisfaction [54, 55]. This finding may infer a relevant connection between project organizational culture and project performance.

First, the cultural dimension of "project goal setting" (C1), which was ranked highest, can be connected with the cultural trait of mission in the model of Denison [56]. The specific indexes in this project cultural dimension clarify the goals and objectives, vision and strategy, which can provide project members with a clear direction for their work, answering the questions "where are they going" and how is their daily work" that contribute to the achieved project goals. This finding is also supported by the works of Cheung, Wong [51], who found that "goal setting and accomplishment" were significant among organizational culture dimensions in Hong Kong's construction industry. This finding clarifies the belief that a project organization is identified by its project participants' behavior, which in turn is formed by the project goals
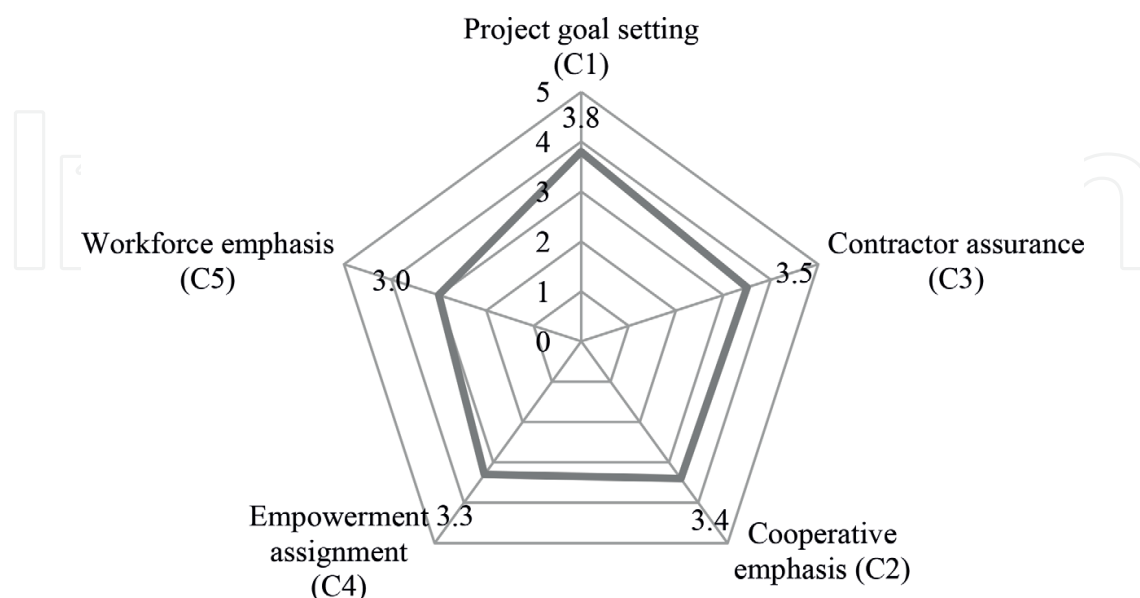

Figure 1. Framework of project organizational culture.

that are established and manifested by the activities implemented by the project members over the course of a project. In other words, clear project goals instruct the formulation of a project plan and viable execution. In addition, based on the results, the trust atmosphere is encouraged to be set. This finding may explain that with high uncertainty and conflicted benefits in construction contracts, the building of reliance rapports helps to promote agreement among project participants and reduces potential risk for all involved parties over the course of the project, contributing to the achieved project goals.

The project culture dimension of "cooperative orientation" (C2) refers to a coordination and integration culture with diverse participants and units of a project's organization, which helps project participants understand the mutual influences of their acts and ensures that all project members work together toward common goals. This result is to be expected. Due to the fragmented nature and temporary get-together of the construction industry, a highly cooperative orientation characterized by the free exchange of ideas and support, openness and respect, collaboration orientation, and the sharing of responsibility among construction project participants is an essential foundation for project success. By offering cooperation, project participants look forward to lessened project costs, shared project risks and rewards, and expanded mutual profits [57].

The project culture dimension of "contractor assurance" (C3), which was a relatively highly ranked factor, aptly reflects the emphasis placed on contractor obligation to contract, which acts as a customer-focused characteristic toward adaptability culture [56]. These results are also in line with previous findings which suggest that the contractor significantly influences project performance [4]. This culture orientation reflects the fact that contractors are more concerned about the needs to react to and serve the client and constantly commit more capacity for satisfaction of the client's future needs and expectations. Moreover, what is intriguing is the fact that construction project performance in terms of poor quality, over budget, and time delays has been reported for years in developing countries, such as Vietnam [48]. It can be inferred from this finding that practitioners appear more concerned about the prioritization of contractors on site.

The project culture dimension of "empowerment assignment" (C4) provides project members who have the requisite authority, initiative, and capacity with opportunities to organize and oversee their responsibilities at work over the course of a project. These results are not surprising in the domain of project management. Under the natural complexity and uncertainty of construction project management, promoting empowerment cultures enhances the capacity to acquire feedback or suggestions from project members at various levels to management and the decision-making process, which is pivotal to reducing risks and improving project performance. In addition, offering this culture can create a sense of ownership and responsibility for all project members, promoting greater emotion in work toward the project organization goals. For organizations where employees are encouraged to speak up and be heard, this reflects that organizations are "using their greatest asset to its highest potential and, in return, are becoming more competitive in the emerging global economy" [58].

Finally, commitment to the cultural dimension of "workforce emphasis" (C5) generally indicates the culture of capability development [56] to which the project organization shares

Test method	Statistics	Project goal setting (C1)	Cooperative emphasis (C2)	Contractor assurance (C3)	Empowerment assignment (C4)	Workforce emphasis (C5)
Kruskal-Wallis test	Chi-squared	0.49	1.27	1.75	0.98	0.29
	P-value	0.48	0.26	0.19	0.32	0.59

Table 5. Analysis of variance (ANOVA) in regard to respondents' professions.

constant commitment to the development of employee skills and enhancement of work environment to remain competitive and improve competencies. However, the evaluation of this culture dimension obtained the lowest-ranked factor with a neutral score. This finding is compatible with previous research arguing that the construction industry maintains a lower priority on investment of the workforce as its greatest asset [59], and the construction industry also has one of the worst reported industry records with regard to health and safety and a poor record for recruitment and retention [60]. It can be inferred from this finding that the construction industry needs to pay more attention to training and development, health and safety conditions, decent site conditions, fair allowances and wages, and environment and sustainability, which are key to enhancing the industry's productivity.

The analysis of variance (ANOVA) results of this study indicated that at a 99% confidence level (i.e., at the $p < 0.01$ level) (**Table 5**), there were no significantly different mean scores among groups of respondents for the five project organizational culture factors. This means that despite their association with different types of involved organizations, the two groups of project stakeholders (clients and contractors) shared similar views regarding project organizational culture in the construction industry. However, this finding differs from previous studies, which have argued that the contracting organizations in a construction project have different backgrounds, business objectives, leadership styles, life cycles, and work patterns. Thus, the different contracting organizations may develop different cultures [17, 61]. It can be inferred from this finding that both groups of respondents agree with the practices on representativeness of the identified project organizational culture factors instead of their conventional perceptions, which proves the highly relevant practice that contracting organizations can develop common core values within a project.

In summary, the five factors identified by the PCFA in this chapter analyses are valid measures of project organizational culture, which reflects the practice-specific aspect of the construction industry.

5. Conclusions

This chapter aimed to better define project organizational culture and to detect its framework based on the work practice approach, which was characterized by the practices experienced over the course of a project. In this respect, 29 artifacts of project organizational culture were first derived through FGSs, literature review, and face-to-face interviews with practitioners in the industry. Using Vietnam as a case study, measurements of the experiences of construction

practitioners were then used in PCA to classify these artifacts into five factors of project organizational culture.

The most highly ranked project organizational culture factors of "project goal setting" emphasize the importance of clarification of project goals and objectives in which all project members are clearly provided direction and scope for their work over the course of a project. In addition, the relatively highly ranked project organizational culture factor of "contractor assurance" reflects the culture of customer focus, within which contractors are noted as the pivotal element to assure project performance. The project organizational culture factor of "cooperative emphasis" highlights the fragmentation characteristics and diverse individuals involved in a construction project. This makes perfect sense in construction project management, as having a cooperative atmosphere ensures that all project members mutually understand and work well together toward common goals. The factors of "empowerment assignment" and "workforce emphasis" reflect people-focused cultures, within which the human resource is viewed as the greatest asset. It thus implies that project management should invest more in humanity, to which project members are associated with a greater sense of ownership and responsibility, leading to a greater commitment to the project organization and an increased capacity for autonomy in the achievement of project goals.

The analyses identified no significant differences in the assessment of the culture factors provided by project stakeholders. The acceptance of these factors with moderate mean scores by the two groups of construction professionals suggests that core common values in projects can be generated by devoting efforts to derive project goals and objectives instead of individual benefits among contracting organizations. The policy implication is that project stakeholders should focus more efforts on promoting managerial practices that are deemed most cultural in the construction industry, potentially contributing to the practice of effective change in project management.

6. Research limitations and future research

This study suffers from limitations. First, the data collected were national character may yield some cautions of the generalizability of the research findings. In addition, there were broad cultural artifacts and sophisticated definition of cultural terms that may also appear non-friendly to practitioners in the industry. Future studies should consider a larger volume of data that can focus on conducting a comparative assessment using data from separate project stakeholders. This will provide a clearer understanding of how different stakeholders view common practices of project delivery.

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Conflict of interest

There is no conflict of interest.

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