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UNDERSTANDING THE RELATIONSHIP BETWEEN ORGANIZATIONAL CULTURE AND USER INTERFACE DESIGN IN THAI SOFTWARE SERVICES INDUSTRY

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Abstract: *In this research, we attempt to understand the influence of organizational culture onuser interface (UI) design during information systems development in Thailand's software services industry. The results show that almost all Thai software service organizations realize the importance of UI design in the usability of their product. Nevertheless, the family (clan) culture was found to be somewhat connected to UI design. An in-depth study of the relationship showed that family culture affects the diversity of a design team member. Team characteristics support the optimization of UI design to make it user-friendly. In addition, during the UI assessment process, a significant finding was that validation of a developed UI is appropriate when the development teamis influenced by family, market, and hierarchical cultures.*

Keywords: *User Interface Design, Organizational Culture, Competitive Values Framework, User-centered Design.*

1. INTRODUCTION

Whenever users interact with an information system (IS) in order to carry out their duties, they are communicating with an IS *via* a user interface (UI). Accordingly, a UI is a significant part of an IS and has the responsibility of translating interactions between an IS and a user. On the web, if a UI is hard to use, userstend to rapidly leave the site. In an IS used in an organization, if the UI is difficult to use, it wastes the users' time, and so will reduce employee productivity (Nielsen, 2012). To mitigate this, user enjoyment and ease of use are key factors that impact upon the success of an IS. Design teams make several attempts during the development process to make a user-friendly system. Kennard and Leaney (2010) suggested almost 50% of application code and

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time are dedicated to UIs. Even IS creators have realized the importance of the UI but asignificant reason for IS failure still stems fromproblems with usability. Many researchers have suggested that maybe it come from dissonance between usage and development values (Kappos and Rivard, 2008).

In terms of use, a UI for a user group in one culture may not be suitable or "friendly" for users within another (Barber and Badre, 1998; Evers and Day, 1997; Wallace, Reid, Clinciu, and Kang, 2013; Young, 2008). Culture is a critical factor influencing users when interacting with systems (Al-Qudah and Ahmad, 2013; Xie, Rau, Tseng, Su, and Zhao, 2009). An IS that appears and performs as influenced by the users' culture in consideration of the users' cultural background can make a difference towards better solutions for the users (Khaslavsky, 1998; Reinecke and Bernstein, 2013). Therefore, to design an appropriate UI, designers must take themselves as well as the differences between user groups into account (Shneiderman and Plaisant, 2010).

On the other hand, culture does not only affect IS usage, but also IS development and characteristics (Dubé and Robey, 1999; Kappos and Rivard, 2008; Leidner and Kayworth, 2006). Many researchers have attempted to identify the effects of culture on ISs using various research methods. Regardless of culture level, national culture affects the development and success of an IS. For example, designers in Australia, Sweden, and Denmark prefer to design people-oriented solutions with little concern for cost and technology. In contrast, U.S. and Canadian designers are concerned with cost, technology, and design in efficiency-oriented solutions (Dagwell and Weber, 1983; Kumar, Bjorn-Andersen, and King, 1990). Systems analysts from Singapore (high collectivism, low uncertainty avoidance) are conscious of dominating users but those from Canada (strong individualistic, low uncertainty avoidance) are more participative with users (Hunter and Beck, 1996). These studies have helped us to understand that a globalized IS should recognize the context of use at thecountry level (Reinecke and Bernstein, 2009).

For localized IS at the organizational level, an organization needs to emphasize the influence of culture on how users are likely to use an IS. Kappos and Rivard (2008) found that mutual core values in an organization influence the development process and the characteristics of an IS. Organizational culture has a relationship with software deployment methodologies (Iivari and Huisman, 2007; Iivari and Iivari, 2011; Muller, Nielsen, and Boldsen, 2008; Nielsen and Ngwenyama, 2002; Shih and Huang, 2010). Values in a firm modify the relationship between the design process and the UI, and controls the connection between the UI and acceptance or resistance of users in a firm. Therefore, an appropriate fit between values embedded in the IS development process and overall values in the usage environment will increase the chance of delivering successful software (Dubé and Robey, 1999; Shih and Huang, 2010).

Different values of the development team in one organization and user groups in another have manifested in mistaken interpretations in terms offunctionality leading to disagreement between them. As a result, at the post-implementation stage, members

of user groups may find that a system is too complicated to be used as a routine tool (Abubakre, Coombs, and Ravishankar, 2014). An IS may be acceptable and efficient for users if it fits appropriately within the culture of IS development and usage while, in contrast, there may be resistance, rejection or sabotage if it does not (Gallivan and Srite, 2005; Kappos and Rivard, 2008). The results of these researches facilitate the understanding that culture as a factor that affects UI design. Consequently, education on the influences of culture on ISs will assist in reducing the negative power of cultural differences on the IS development process and the proper use of an IS (Kappos and Rivard, 2008).

The importance of UIs and the influence of culture on IS development is the starting point of this research, the aim of which is to understand the effects of organizational culture (OC) on UI design in Thailand software services industry context and, to this end, elements of OC and UI design in IS development were identified, collected, and analyzed. This paper is structured as follows. In section 2, background knowledge on the topic is presented. A description of the research model and research hypotheses are presented in section 3, and the research model is covered in section 4. The results of the study are contained in section 5, and the research is discussed and conclusions are drawn in section 6. Finally, limitations of this work are suggested in section 7.

2. LITERATURE REVIEW

2.1. Concepts of Organizational Culture

In any workplace, Organizational culture (OC) enable severy employee in the organization to do their task (Hofstede, Neuijen, Ohayv, and Sanders, 1990) and influences how individuals in the organization perceive, think, feel, and behave (Deal and Kennedy, 2000; O'Reilly, Chatman, and Caldwell, 1991). According to Schein (1992), OC is "a pattern basic assumption that the group learned as it solved its problem of external adaptation and internal integration" (p. 12). As a result, OC is one of the significant factors that affect to the way that employees do, think, and communicatein the firm.

To underst and OC, many researchers have developed frameworks along a "dimensional" approach to classify a conceptual basis for the study of OC by its quantity of variables (Fletcher and Jones, 1992; Scott, Mannion, Davies, and Marshall, 2003). An example of this is O'Reilly *et al.*'s (1991) study, which suggested seven dimensionsin an OC profile, whereas Hofstede *et al.* (1990) presented six dimensions in a multidimensional OC model. Another approach to exploring OC is to classify it in a "typological" approach that consists of different mixtures of cultural values in categories (Fletcher and Jones, 1992; Scott *et al.*, 2003). For example, the competitive values framework (Quinn and Rohrbaugh, 1983), the theoretical model of culturaltraits (Denison and Mishra, 1995), and the cultural audit was established to summarize some

of the OC dimensions into four general types (Fletcher and Jones, 1992).

In this research, we studied the relationship between OC and UI design. Therefore, a suitable model to assist us in assessing OC in afirm needs to be chosen. We need a framework that supportsus by illustrating how OC in terms of the internal/external environment and stable/flexible control dimensions affects UI design. The chosen framework should assist us to compare OC types with each other for a wide variety of organizations. Moreover, the chosen model should have an acceptable validity and reliability to assess a broad range of cultural dimensions.

For the reasons mentioned above, we selected the competitive values framework (CVF) of OC to debate the relationship between OC and UI design. Quinn and Rohrbaugh (1983) established this framework to examine the relationship between OC and organizational effectiveness. They explained that many organizational effectiveness criteria are better understood when theyare organized along the two axes of internal-external focus and flexible-stable control (Quinn and Rohrbaugh, 1983). The internal-external axis shows whether a firm concentrates on running smoothly internally or in response to pressure from external factors. The flexible-stable axis determines whether a firm is concerned with structure and control or with flexibility (see Figure 1). The CVF has broadly accepted schemas that outline how employees think, how they organize their values and ideologies, and how they process information (Cameron and Quinn, 2011).

Although the CVF consists of only two dimensions, it is made up of a combination of the four common dimensions established by Detert, Schroeder, and Mauriel (2000): stability *vs.* innovation, isolation *vs.* collaboration, control *vs.* autonomy, and internal *vs.* external focus. Therefore, this framework has wide spread implications (Yu and Wu, 2009). Additionally, in Asia, it has been used to studied the impact of OC on many variables across countries such as China, India, Iran, Japan, Korea, Thailand, and Vietnam (Dastmalchian, Lee, and Ng, 2000; Deshpandé and Farley, 2004; Shih and Huang, 2010; Valmohammadi and Roshanzamir, 2014). It has been tested and applied in organizational research by many researchers in several topics from pattern of leadership and human resources management to effectiveness definition in enterprises around the world (Cameron and Quinn, 2011; Yu and Wu, 2009).

From the results of internal/external and flexibility/stability dimensions, four OC types have been identified; Figure 1 shows the CVF in detail for leadership style, shared core values, and effectiveness in firms.

Each type of OC is different. The clan culture (collaborative) is a friendly, relaxed place to work where the employees and boss share a lot mentally. It feels like an extended family and the head of the organization controls the team in a family way. To achieve this, these firms emphasize on training, HR development, open communication with involvement, and participation in decision-making. The

Figure 1: The competing value framework (adapted from Cameron and Quinn, 2011).

adhocracy culture (creative) is a dynamic, creative, and flexible workplace where the employees and boss love to take risks and be innovative. These firms emphasize on growth and resource achievement by increasing adaptability, change and visionary readiness communication, and flexible decision-making. This culture type is often found in software development firms (Cameron and Quinn, 2011).

The market culture (competitive) is found in results-oriented organizations working towards getting the job done. People in this group prefer a competitive environment and measure the success of employees by their outcomes. These organizationsneed planning and instructive communication with centralized decision-makingin order to reach their goals. The hierarchical culture (control) is a very formal and structured place to work in with vertical clear-line centralized decision-making. The boss needs to be a good coordinator and tries to maintain a smooth-running organizationby using standard rules and work procedures for employees.

We decided the CVF, which categorized organizational culture in any company into four types as an analysis tool to support us in this research.

2.2. User Interfaces and Usability

Users are able to converse with an IS through a user interface (UI) (Dix, Finley, Abowd, and Beale, 2004). A UI provides the look (presentation of information) and interaction between the user and the system, called feel (Callahan, 2005). UIshave been defined in numerous ways, such as being the bridge between the user and system (Kikuchi, Kimura, Ohkubo, Inamura, and Takeshita, 2010), UI are components of IS that help user to do their particular task (both hardware and software) by support information and controls(ISO, 2010). UI is all aspects of system design that affect a user's ability to

handle tasks (Smith and Mosier, 1986). Marcus (2009) defineda UI as the common human-computer surroundings of human-computer interaction and communication which may cover visualization and non-verbal content. However, to summarize, in this research, in which theneed is to understand the relationship between OC and UI design, we follow the meaning and components of a UI, as provided by Marcus and Gould (2000):

> "A computer-mediated means to facilitate communication between human beings or between a human being and an artifact. The user interface embodies both physical and communicative aspects of input and output, or interactive activity. The user interface includes both physical objects and computer systems (hardware and software, which includes applications, operating systems, and networks). A user interface may be said to consist of user-interface components including metaphors, mental models, navigation, interaction, and appearance." (p. 24).

The appropriate combination of all five UI components (metaphor, mental model, navigation, interaction, and appearance) affect the communication quality between user and the IS. We selected Marcus's (1998) UI components to apply in this research because theyhavebeen used in many studies on the influence of culture on UIs. The results of many previous investigations primarily suggest that users from different cultures show differences in the usage of UIs (Duygu and Eristi, 2009; Ford and Gelderblom, 2003; Ford and Kotzé, 2005; Ishak, Jaafar, and Ahmad, 2012). The meaning of each UIcomponent are as follows:

- Metaphors are computer-related elements which help a user to understand, remember, and enjoy using an IS (Evers and Day, 1997; Marcus, 1998).
- Mental models involvethe structure of data, function, tasks, roles, and people (Borgman, 1985; Westbrook, 2006).
- Navigators allow movement through the mental model via menus, windows, dialogue, and/or icons (Gell *et al.*, 2000; E. A. Maguire, 1998).
- Interactions include feedback and devices to receive input and return output to the user via a mouse, keyboard, monitor, and/or speakers(Gell *et al.*, 2000; Marcus and Gould, 2000).
- Appearances include perceptual attributes, such as visual, sound, colors, fonts, animation, verbal style, and tactility.

In line with communication theory, the UI has responsibilities as a medium for two-way communication. Ithas a duty to translate messages between the IS and the user (Dix *et al.*, 2004), and so a satisfactory UI as a translator should as is the user to communicate with the IS in a user-friendly fashion. Communication quality is one significant characteristic that is reflected in a UI in terms of usability (Gorla and Lin, 2010; Issac, Rajendran, and Anantharaman, 2003; Kitchenham and Pfleeger, 1996; Mayhew, 1999; Nielsen, 2012; Shackel, 1991). In the human-computer interaction (HCI)

field, usability oran as-is utility indicates whether the function of the product is suitable for a user, robust to user errors, and readily available to memory and use (Nielsen, 2012; Shackel, 1991). From the viewpoint of a standardized process, the International Standard Organization (ISO) defined usability in standard ISO-9241 as, "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (ISO, 2010). Jacob Nielsen (2012), a UI expert, defined usability with five attributes as follows: learn ability (time to learn), efficiency (speed of routine), minimal errors (error rate by users), memorability (retention over time), and satisfaction (subjective fulfillment), which have been utilized in this research.

Consequently, in this study, Marcus's (1998) UI components and usability elements of ISO-9241 (ISO, 2010) and Nielsen (2012) were used to identify influences of OC on UI product characteristics.

2.3. User Interface Design

The usable product design is referred to as either user-centered design (UCD) or human-centered design (HCD) (Bevan, 2006; ISO, 2015; Jokela, Iivari, Matero, and Karukka, 2003; Mayhew, 1992; Nielsen, 1992). From the beginning of prototyping and the iterative design approach, UCD has been applied as a standard to ensure that the final product is developed from a user standpoint and achieves the users' requirements (Kikuchi *et al.*, 2010).

As shown in figure 2, the first process of UI design is understanding and specifying the context of use; critical questions that designers have to answer are: who will use the system (user context), what is the system used for (task context), and what are the conditions of the product (environmental context) that will be used (Folmer and Bosch, 2004; Ford and Gelderblom, 2003). The second process is specifying the UI

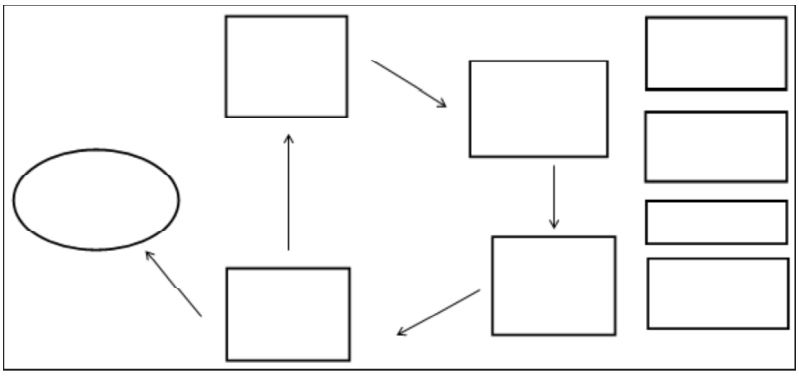

Figure 2: The UI development process

requirements; UI designers and users must consider the attributes of the UI specification as well as the goal and evaluation method for each of them. The UI design team should give the same priority to functional or other non-functional requirements of the UI. The UI requirements must be clear so that they can be validated and traced during the development period (Lauesen and Younessi, 1998; Shneiderman and Plaisant, 2010). When producing design solutions, the third process, a design team with user involvement creates a UI that meets the requirements. Finally, design evaluation is made against the requirements, during which stage the design team evaluates the UI prototype. This assessment process should be performed by representative end users or UI experts, or both. It is important that the designers perform a proper test with the user group. The expert and intended users may give suggestions to improve the UI (Shneiderman and Plaisant, 2010)

Using these techniques, designers should create a UI by bringing the users on board as critical participants in the design process. Lack of user involvement is a recognized information system failure factor when assessing usability (Gorla and Lin, 2010; Peterson and Kim, 2003). This process requires a collaborative effort from various sources of knowledge, experience, and expertise in a team; their various background will help generate recommendations to improving the UI design, and this cooperative process is called the team multi-disciplinary approach (Maguire, 2001). Tailor-made UI design based only on the knowledge or experience of the designer may not be enough to ensure the usability of an IS.

Therefore, UI design guidelines and processes which provide a clear set of principle recommendations should be applied to create a more usable UI (Folmer and Bosch, 2004; Shneiderman and Plaisant, 2010). HCI researchers, standards organizations, and software vendors provide guidelines, rules, and standards for UI designers to follow. However, it may not be possible to have a "cookbook" approach to ensure good interface design is applied in every set of circumstances (Mayhew, 1999). The ease of use of UI development software facilitates designers to create UIs (Shneiderman and Plaisant, 2010). Even though a UI design tool is selected dependent on the development framework or chosen technology (Mijailovic and Milicev, 2013), it helps designers and users to clarify what a system should look like.

Usability practitioner surveys in many countries have shown that encouragement and realization of usability by users, project managers, developers, management, and sufficient budget are the important key factors in successful UI development. Appropriate management support and adequate budget will lead to user-friendly systems (Gorla and Lin, 2010; Gorla, Somers, and Wong, 2010; Gulliksen *et al.*, 2004). So, another factor that effects the usability of a system is team support. Everybody in the software design team should emphasize on product usability.

3. RESEARCH MODEL AND HYPOTHESIS

The objective of this study is to understand the relationship between OC and UI design. To this end, the research model that illustrates the big picture of this study and the research hypotheses that were testedare covered in this section. The results of the tests are answered and described in the results section of this paper.

3.1. Research Model

Figure 3 shows the research model for this study, which was developed to predict UI design for the four OCs mentioned earlier.

3.2. Hypotheses Development

Of interest is whether the four OC types have an effecton UI design (see figure 3). Previous investigations on the influence of OC on the CVF (Hauser and Paul, 2006; Ngwenyama and Nielsen, 2003; Shih and Huang, 2010) have helped in developing the hypotheses. It was assumed that different OC types are related to how employees understand and perform UI design.

UIdesign and usability can be separated into two styles: process-oriented and product-oriented (Folmer and Bosch, 2004; Keinonen, 1998). In this research, which was established to understand the connection between OC and UI design, UI design is separated into two variable types (see Table 1). The first is the UI design process, which consists of a context analysis, UI requirements, development, evaluation, user involvement, multi-disciplinary team, design guidelines, tools, and support by the design team. The second type is UI product design characteristics, which is a combination of usability attributes and UI components.

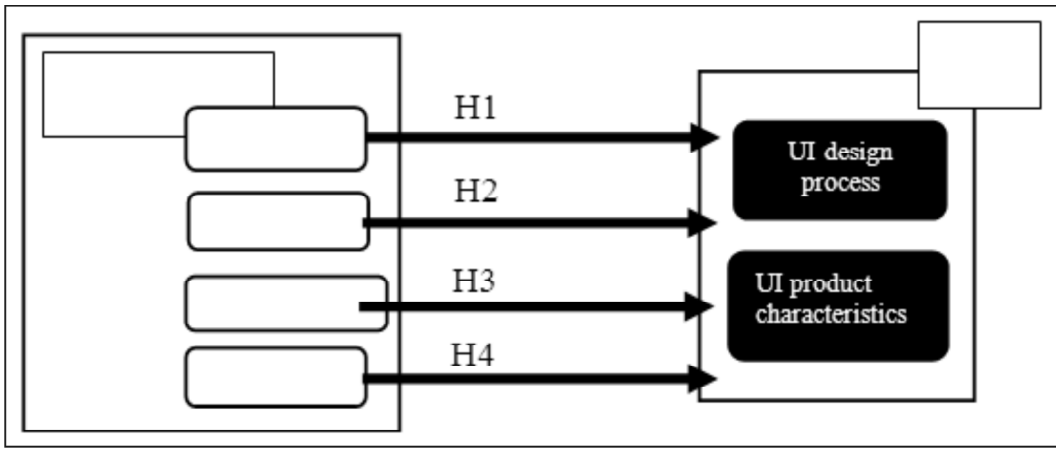

Figure 3: Conceptual Research Model

Table 1
UI Design Process and UI Product Characteristics Variables

Type of Variable	*Variable*
UI Design Process	– UserContext Analysis – UI Requirements – UI Development – UI Evaluation – User Involvement – UI Design Guideline – UI Design Tools – Multi-disciplinaryTeam – Design Team Support
UI Design Product Characteristics	– UI Components – Usability Elements

Clan culture organizations emphasize on relationships between members and uses a flexible control system that focuses on internal relationships. They believe in giving opportunities to fail or succeed together. This workplace makes employees think they are special and an important part of the team. The team leader is seen by team members as a helper or possibly even like a parent. Their commitment transfers to team members and improves project ownership by the team(Cameron and Quinn, 2011; Shih and Huang, 2010). Thisfamily-type culture has a greater emphasis on diversity in theteam, staff development, learning, and capacity building in their UI design. Additionally, this culture treats thecustomer as a vital partner and emphasizes on the useras a core team value, which leads to the hypotheses:

- **H1:** There is a positive relationship between clan culture and UI design.
- **H1.1:** There is a positive relationship between clan culture and the UI design process.
- **H1.2:** There is a positive relationship between clan culture and UI design product characteristics.

The adhocracy culture organizationemphasizes on external technology and flexible control. This culture is concerned with creativity and innovation and is often found in IT companies, which are often concerned with external environmental pressures and look at possibilities to maximize their software quality (Cameron and Quinn, 2011; Hauser and Paul, 2006). Therefore, innovative firms are positively interested in UI design that involves their users, which leads to the hypotheses:

- **H2:** There is a positive relationship between adhocracy culture and UI design.
- **H2.1:** There is a positive relationship between adhocracy culture and the UI design process
- **H2.2:** There is a positive relationship between adhocracy culture and UI design product characteristics.

The market culture emphasizes on external market situations with a consistent control system. This culture desires the achievement of goals emphasized on productivity and financial operations. In order to reach the target, the organization focuses on planning, forecasting, controlling and the design decision structure to match the external environment. Firms with this culture operate in a competitive environment with selective concern for customer values (Cameron and Quinn, 2011). Thus, market firms try to produce products with attention to users in order to be the leader in a competitive market, which leads to the hypotheses:

- **H3:** There is a positive relationship between market culture and UI design.
- **H3.1:** There is a positive relationship between market culture and the UI design process.
- **H3.2:** There is a positiverelationship between market culture and UI design product characteristics.

In contrast to the clan culture, the hierarchy culture's emphasis is on operating smoothly with clear control policies. This type of organization has a formal approach to communicating and is interested in a task more than an individual relationship. Employees are likely to do their jobs by following the specified rules, procedures, and methods withperformance evaluation as the explicit criteria (Cameron and Quinn, 2011; Shih and Huang, 2010). The focus is on formalized organizational processes to improve efficiency and performance with limitations on employee choices and actions. Therefore, this culture is likely todesign UIs using a formal process or clear guidelines, which leads to the hypotheses:

- **H4:** There is a positive relationship between hierarchy culture and UI design.
- **H4.1:** There is a positive relationship between hierarchy culture and the UI design process.
- **H4.2:** There is a positive relationship between hierarchy culture and UI design product characteristics.

4. RESEARCH METHOD

Currently, software services in Thailand are classified into four categories: software package development (except games), custom software development (web and non-web), software consulting, and data management services (Software Industry Promotion Agency, 2015). According to the database of the Department ofBusiness Development of Thailand, software services businesses are quite popular; there are about 3,500 firms still available at the time of this research.

4.1. Materials and Methods

Data was gathered from firms within the Thailand software services industry. The questions in the questionnaire were translated by professional translator into Thai to

make them more easily understood by our respondents. Each organization received the questionnaire in two parts. The first part contained translated Organizational Culture Assessment Instrument (OCAI) questions and the other portion encompassed questions on UI design. Based on the CVF, Cameron and Quinn (2011) proposed the OCAI as a tool for researchers around the world to apply with organizational culture research. There were six questions in the OCAI with four variables. For each question, the respondent rated their values concerning the firm by dividing 100 across the four variables. The second part of questionnaire comprised questions about UI design. For each question on UI design, measurement was carried out using a 7-point Likert scale from 1 (hardly ever) to 7 (frequently). The researcher requested that respondents answer as much as possible about the OC values in their firms and for one respondent to represent the UI process in the organization.

Self-administered questionnaires were sent to organizations, and the researcher used two methods to gather the data. The first was by email containing a web link to the questionnaire. More than 300 registered email addresses from the Association of Thai Software Industry, the Thailand Software Park, and the Software Industry Promotion Agency databases were collected. There are various E-questionnaire providers onthe market; we selected SurveyGizmo.com to create the questionnaire and generate a web link to send to the respondents. More than 1,000 emails were sent to the representative persons (one for the cooperative request and two reminders for each company). Consequently, from more than 300 firms, 74 organizations kindly provided the data;of this number, 41 companies supplied information about the OC of their company. After this process, data collected from completed questionnaireswas found to be insufficient, and so another method to collect data was additionally required.

The second data gathering method was by drop-off/pick-up. Although higher implementations cost, this technique help us to push up the response rate (Allred and Ross-Davis, 2011). Contacts in software services firms were collected from the open database of the Department of Business Development of Thailand. The researcher contacted them via telephone for permission to approach them beforehand. After that, questionnaires were sent to the companies and left for ten days. In addition, a follow-up visit was made. 18 companies permitted data collection, and so, in total, 59 organizations involvedin this research.

4.2. Measures

In this research, several measures: OCAI, the UI design process, and UI product design were employed and validity and reliability of these measures tested. Even though OCAIs have been tested by many researchers around the world (Cameron and Quinn, 2011), validity and reliability testing was carried out nevertheless using factor analysis. If all items measuring a construct are loaded onto a single factor, conceptual definition exists, which means that items found from prior researches are applicable to the

research context. To measure the reliability of constructs, Cronbach's alpha was used where avalue of 0.70 or above insinuates reliability, but this can be decreased to 0.60 in exploratory research (Hair, Black, Babin, and Anderson, 1998).

As a general rule of factor analysis, the sample size has to be at least five times the number of variables to be analyzed (Hair *et al.*, 1998). With regard tothis research, 12 variables derived from 47 items were used. Unfortunately, the sample size of this study is 59 usable responses and so does not exactly follow the rule. In order to increase the ratio of the sample size to the number of items, separate factor analyses were performed. The results of these analyses also indicate the validity and reliability of this study's constructs.

4.3. Independent Variable: Organizational Culture

To assure that 24 translated items from OCAI are reliable, four-factor analyses were conducted. Unfortunately, the loading factor of item 2C to measure market culture was 0.16. According to Hair *et al.* (1998), the lowest significant value for factor loading is ± .30. As a result, item 2C was removed from the measure ofOC in our study. In terms of the reliability of the questionnaire, Cronbach's alpha values were calculated for each type of OC and the values ranged between 0.67 and 0.77, as can be seen in Table 2.

Table 2
Factor Analysis and Reliability of OC

Item	*Short Question*	*CLAN*	*ADH*	*MAR*	*HIE*
1A	The organization is a very personal place.	0.61			
2A	The leadership is generally mentoring.	0.49			
3A	The management style is characterized by team work and participation.	0.72			
4A	The glue that holds the organization together is loyalty and mutual trust.	0.72			
5A	The organization emphasizes human development.	0.80			
6A	The organization defines success on development of human resources.	0.72			
		Eigen value = 2.783, Cronbach's alpha = 0.76			
1B	The organization is a very dynamic, entrepreneurial place.		0.45		
2B	The leadership is generally innovating.		0.73		
3B	The management style is characterized by individual risk-taking.		0.78		
4B	The glue that holds the organization together is commitment to innovation.		0.69		
5B	The organization emphasizes acquiring new resources and creating new challenges.		0.66		
6B	The organization defines success on the basis of having the newest products.		0.73		
			Eigen value = 2.799, Cronbach's alpha = 0.77		

Cont. table 2

Item	*Short Question*	*CLAN*	*ADH*	*MAR*	*HIE*
1C	The organization is very results oriented.			0.82	
2C	The leadership is generally results-orientedfocus.			0.19 (not used)	
3C	The management style is characterized by hard-driving competitiveness.			0.60	
4C	The glue that holds the organization together is the emphasis on goal accomplishment.			0.84	
5C	The organization emphasizes competitive actions and achievement.			0.83	
6C	The organization defines success on winning in the marketplace.			0.59	
				Eigen value = 2.801, Cronbach's alpha = 0.67	
1D	The organization is a very controlled and structured place.				0.63
2D	The leadership is generally smooth-running and efficient.				0.65
3D	The management style is characterized by security of employment.				0.64
4D	The glue that holds the organization together is formal rules and policies.				0.66
5D	The organization emphasizes permanence and stability.				0.72
6D	The organization defines success on efficiency.				0.66
					Eigen value = 2.604, Cronbach's alpha = 0.73

4.4. Dependent Variable: Ui Design Process and Ui Design Product Characteristics

In developing a UI, the UCD process should be applied. This process involves collecting and analyzing IS usage context, developing clear UI requirements, designing the UI, and finally evaluating the quality of the UI. In order to test content validity for each design process construct, again, factor analyseswere conductedand the results are presented in Table 3. They all showed factor loadings greater than 0.7, which isin accordancewiththe requirements for Cronbach's alpha, since they ranged between 0.71 and 0.94.

To measure information systems UI design, usability and component of the UI design were assessed. Each construct consisted of five questions. The values of Cronbach's alpha for the constructs were between0.83 and 0.94, which means that both constructs are applicable to assess information system UI design. Furthermore, details of this are also shown in Table 3.

5. DATA ANALYSIS AND RESULTS

5.1. Demographics of Respondents and Companies

Table 4 shows details of respondents who carry out the UI design process in their firm. 59% of the respondents were male (35 from N = 59) and aged between 26 and 35 years old (54.2%). More than half of them have worked for more than five years in software development (~60%), though almost all of them have spent just 1 to 5 years

Table 3
Reliability of UI Design

Variable Type	*Variable Name*	*Short Description*	*Items*	*Short Question*	*Factor Loading*	*Eigen-value*	*α*
UI Design Process	CONTEXT	Context analysis process in UI design	3.12	Collect and analysis environment context	0.90	2.18	0.81
			3.13	Collect and analys is user context	0.91		
			3.14	Collect and analys is task context	0.74		
	UI_REQ	Clear UI requirement gathering process	3.15	We have clear UI requirements	–	–	–
	UI_EVA	Clear UI evaluation process	3.16	We have an evaluation process.	0.70	1.98	.71
			3.17	We prepare evaluation resources.	0.86		
			3.18	We prepare evaluation person	0.87		
	USER	Active user involvement	3.1	We have active user involvement	–	–	–
	MULI	Multi-disciplinary team members	3.2	We have a multi-disciplinary team	–	–	–
	SUPPORT	Team member and management support	3.5	Team member support	0.84	5.06	0.93
			3.6	Team member experience	0.90		
			3.7	Team member knowledge	0.80		
			3.8	Programmer support	0.85		
			3.9	Budget support	0.74		
			3.10	PM support	0.92		
			3.11	Management support	0.88		
	TOOL	Usable design tool	3.4	We have usable UI design tools	–	–	–
	GUIDE	Usable design guideline/standard	3.3	We have usable UI design guidelines	–	–	–
UI Design for Product Characte-ristics	USAB_ATT	Design for usability of the UI	3.24	UI Efficiency	0.91	3.99	0.94
			3.25	UI Effectiveness	0.93		
			3.26	User satisfaction	0.88		
			3.27	UI Memorability	0.91		
			3.28	UI Learnability	0.84		
	UI_COMP	Design for component of the UI	3.19	Metaphor of UI	0.71	3.02	0.83
			3.20	Mental model of UI	0.74		
			3.21	Navigation for UI	0.80		
			3.22	Interaction for UI	0.80		
			3.23	Appearance for UI	0.83		

Table 4
Respondent's Demographics

	N	%
Gender		
Male	35	59.3
Female	24	40.7
Age		
< = 25	7	11.9
26-30	16	27.1
31-35	16	27.1
36-40	13	22.0
> 40	7	11.9
Education		
Bachelor	33	55.9
Master	25	42.4
PhD	1	1.7
Course		
Computer science	15	25.4
IT	19	32.2
Computer engineering	1	1.7
Software engineering	4	6.8
Graphic design	2	3.4
Computer for business	7	11.9
ISM and MIS	2	3.4
Other (MBA, entrepreneurship, management etc.)	9	15.3
Experience in this Company		
1-5 years	40	67.8
6-10 years	10	16.9
11-15 years	7	11.9
More than 15 years	2	3.4
Task/Position		
Product/project manager	25	42.4
System analyst/Business analyst	31	52.5
Team leader	14	23.7
Programmer	27	45.8
Graphic designer	7	11.8
Tester	20	33.9
Other Task	10	17.0
Work Experience		
< = 5 years	20	33.9
6-10 years	11	18.6
11-15 years	15	25.4
16-20 years	10	16.9
More than 20 years	3	5.1

Cont. table 4

	N	%
Task/Position Experience		
Product/project manager	25	42.4
System analyst	35	59.3
Business analyst	17	28.8
Software development team leader	20	33.9
Programmer	36	61.0
Graphic designer	11	18.6
Tester	28	47.5
Network Administrator	5	8.5
IT technical support	18	30.5
Other Task	8	13.4

in their current employment. In terms of education, more than half have a degree in computer science or IT (57.6%) with almost all (more than 90%) having graduated with a bachelor's and master's degree.

With regard to the profiles of the companies, we find that. 60% of them have been operating for more than ten years (~60%), and half of them are categorized as small-medium enterprises (SMEs) (less than 50 employees). Most of them offer software development services (~80%), and 40% provide services in software consultancy and software package development. Other services include hardware consultancy, data processing, copyright management, and animation services. Most software provided to their clients are web applications (93%) followed by desktop applications (56%) and mobile application development (54%). Nearly 70% apply software development methods that they have developed on their own (40 from 59), and traditional SDLC and Agile development methods are the most commonly used (44% and 39%, respectively). Detailed information is reported in Table 5.

Table 5
Company Profiles

	N	%
Company Age		
1-5	15	25.4
6-10	9	15.3
More than ten years	35	59.3
Employees		
1-10	13	22.0
11-50	21	35.6
51-200	13	22.0
More than 200 employees	12	20.4
Products/Services		
Software package	26	44.1
Copyright	4	6.8
Software development	51	86.4

Cont. table 1

	N	%
Software consultant	32	54.2
Hardware consultant	19	32.2
Data processing	9	15.3
Animation and Special technique	5	8.5
Other	9	15.3
Product Platforms		
Desktop application	32	54.2
Web application	55	93.2
Mobile application	33	55.9
Cloud computing	16	27.1
Other	1	1.7
Software Development Method		
In-house method	40	67.8
Traditional SDLC	26	44.1
Iterative and incremental	17	28.8
Rational Unified Process	6	10.2
Agile	23	39
Standard certified	21	35.6
Other	3	5.1

5.2. General Information Related to UI Design

Data on details of the UI design process provided by respondents is presented in Table 6. The results show that nearly all of the companies (about 85%) recognize the importance of UIs and usability of their software. As can be seen, interviewing and user surveyare the most often methods applied to collecting the context data (71% and 68%). In thecase of gathering UI requirements, approximately 40% of companies perform this process for every project; and only three companies (5%) never do it. Furthermore, there are only five firms said that they do not include UI assessment processes in their work. More than half of companies responded that their UI designs are evaluated by the design team, by a representativeuser, or by a project stakeholder (57.6%, 54.2%, and 55.9%, respectively). In order to perform the evaluation process, 69.5% of the organizations employ user while about 45% of the companiesrequested other IT people in the team, such as SAs, business analysts (BAs), or testers to take on this responsibility.

One factor that affects a successful UI design is the application of useful UI design guidelines from trusted sources (Folmer and Bosch, 2004; Shneiderman and Plaisant, 2010). Table 7 shows details of UI design guidelines usage by company. The guidelines will be applied depend onwhich technologies are used in an enterprise. The guideline for e-commerce website suggested by Nielsen (2012) accounts for 23.7%, whereas W3C determined standards for a website are used by 30.5%. Google and Apple established UI design guidelines for mobile applications whichare utilized by businesses about 22.2% and 32.2%, respectively. Hence, these guidelines are chosen depending on the technology platform.

Table 6
UI Design Process Detail

	N	%
UI and Usability Level of Importance		
It is important in every project	50	84.7
It is important in some project	9	16.3
It is not important	0	0
Context Analysis Method		
Stakeholders analysis	30	50.8
Survey of existing users	40	67.8
User observation/Field study	34	57.6
Diary keeping	16	27.1
Task analysis	36	61.0
Scenarios of use	29	49.2
Persona	22	37.3
Interview	42	71.2
Focus group discussion	34	57.6
Other (A/B Testing, Prototyping, Meeting)	3	5.1
UI Requirements Gathering		
In every project	24	40.7
Sometimes, when usability problem occurs	14	23.7
Sometimes, when client need	12	20.3
Sometimes, when expertinvolves in team	6	10.2
Never perform	3	5.1
Evaluation Process		
We have evaluation process in-development team	34	57.6
We evaluate with collaborative of project owner	32	54.2
We evaluate with user collaborative	33	55.9
We have another evaluate process	1	1.7
We do not clearly evaluate process	5	8.5
Evaluation Person		
User	41	69.5
Software tester	25	42.4
SA	26	44.1
BA	15	25.4
Represent Stakeholder	27	45.8
UI expert	13	22.0

5.3. Testing Hypotheses

According to the research model (see Figure 3), hypotheses testing carried out in an attempt to understand the relationship between OC and UI design are demonstrated in this section. To identify the relationship, regression analyses were utilized with the types of OC as the independent variables and UI design as the dependent variable. This analysis technique is often used by social researchers to evaluate whether a

Table 7
UI Design Guidelines Usage

Type	*Guidelines*	*N*	*%*
Academic	Shneiderman (2010)	7	11.9
	Nielsen (1992)	14	23.7
	Smith and Mosier (1986)	2	3.4
	Another academic person	3	5.1
Organization	W3C	18	30.5
	NASA	1	1.7
	Usability gov	3	5.1
	The US ministry of defense	2	3.4
	Open source	5	8.5
	Standard organization	5	8.5
	Another organization	–	–
Vendor	Adobe Flex	2	3.4
	Oracle Java Look and Feel guidelines	8	13.6
	IBM Ease of Use	14	23.7
	Microsoft Windows and Windows Phone guidelines	7	11.9
	Apple iOS and OSX UI guidelines	19	32.2
	Google Android UI guidelines	13	22.2
	Another vendor	–	–

Note: Other sources: Experiences, UX, Guidelines from SA and Project Owner

specified dependent variable is affected by several independent variables (Babbie, 2007). The summarized results of hypotheses testing from our research model are shown in Table 8.

Table 8
Summary of Hypotheses Test Results

Hypothesis		*Supported*
H1	There is a positive relationship between clan culture and UI design	YES
H1.1	There is a positive relationship between clan culture and UI design process	YES
H1.2	There is a positive relationship between clan culture and UI product characteristics	NO
H2	There is a positive relationship between adhocracy culture and UI design	NO
H2.1	There is a positive relationship between adhocracy culture and UI design process	NO
H2.2	There is a positive relationship between adhocracy culture and UI design product characteristics	NO
H3	There is a positive relationship between market culture and UI design	NO
H3.1	There is a positive relationship between market culture and UI design process	YES
H3.2	There is a positive relationship between market culture and UI design product characteristics	NO
H4	There is a positive relationship between hierarchy culture and UI design	NO
H4.1	There is a positive relationship between hierarchy culture and UI design process	YES
H4.2	There is a positive relationship between hierarchy culture and UI design product characteristics	NO

Overall associations of OC to UI design are shown in Table 9. From the results of the regression analysis, a marginal relationship (*p-value* = .08, β = .82) was found between clan culture and UI design, whereas the others cultures did not show any relationships at all. Therefore, hypothesis H1 is supported, but H2, H3, and H4 are not.

Table 9
Regression Standardized Coefficients of Organizational Culture on UI Design

Independent Variable	*Dependent Variable (UI Design)*	*p-value*
CLAN	.82	.08#
ADHOC	.43	.29
MARKET	.69	.17
HIE	.53	.18

Note: # $p < 0.1$

To gain a better understanding, separated regression analyseswere repeated. First, to understand how OC influences the UI design process, Table 10 shows the relationship between them. As can be seen, a marginal relationship is shown between clan culture and the UI design process ($p < .1$, β = .67), whereas the other three cultureshad no effect. Therefore, hypotheses H1.1 is supported and H2.1, H3.1, and H4.1 are not.

Furthermore, details of regression analyses between OCs and the UI design process reported in Table 9 show a significant relationship ($p < .05$, β = .77) between clan culture and the evaluation process and a marginal relationship with a multi-disciplinary team ($p < .1$, β = .80). The evaluation process was also related to a hierarchy culture in a significantly positive way ($p < .05$, β = .70) and the relationship was found to be marginally positive for a market culture ($p < .1$, β = .75), whereas the adhocracy culture did not show any relationship with the UI design process. Hence, hypotheses H1.1, H3.1, and H4.1 are supported but H2.1 is not.

Table 10
Regression Standardized Coefficients (β) of Organizational Culture on the UI Design Process

Independent Variable	*Dependent Variable*								
	Cont	*Req*	*Eva*	*User*	*Multi*	*Tool*	*Guide*	*Supp*	*Overall*
CLAN	.52	.29	.77*	.23	.80#	.48	.33	.42	.67#
ADHOC	.07	.15	.49	.13	.51	.38	.30	.14	.39
MARKET	.23	.18	.75#	.08	.64	.37	.18	.36	.48
HIE	.27	.22	.70*	.04	.49	.32	.31	.19	.43
	.125	.022	.099	.032	.098	.041	.045	.047	.079
	.060	– .500	.032	– .041	.032	– .031	– .025	-.023	.011
F-value	1.921	.306	1.477	.429	1.494	.570	.643	.672	1.157

Note: *$p < 0.05$, # $p < 0.1$

In order to understanding the relationship between OC and information systems UI design, UI components of Marcus (Marcus, 2002) were applied along with the five usability attributes of Nielsen and ISO (Abran, Khelifi, Suryn, and Seffah, 2003; ISO, 2010; Ji *et al.*, 2010; Nielsen, 2012). Table 10 shows the relationship between OC to usability attributes and UI components. All four OC types did not show any relationship with either UI components or usability attributes. Thus, hypotheses H1.2, H2.2, H3.2, and H4.2 are not supported.

Table 11
Regression Standardized Coefficients (β) of Organizational Culture on UI Design Product Characteristics

	Dependent Variable		
Independent Variable	*USA_ATT*	*UI_COMP*	*Overall*
CLAN	.09	– .02	.07
ADHOC	.06	– .03	.03
MARKET	.08	– .03	.06
HIE	.07	– .00	.05
	.06	.28	.07
	-.00	– .04	.00
F-value	.92	.39	.99

6. CONCLUSIONS AND IMPLICATIONS

According to this preliminary study, the results of the research support the findings from many studies suggesting that OC affects IS development (Claver, Llopis, Gonzlez, and Gasco, 2001; Iivari and Iivari, 2011; Leidner and Kayworth, 2006). One finding from this research shows that almost all software services companies sampled are concerned with the quality of UI and usability (85% of companies showed an interest).

The CVF provides a framework for measuring how organizational culture influences UI design. People employing various styles set different emphasis on UI design, ranging in focus from employee development, innovation, results-oriented or structured control. In particular, from the results of this research, it was found that OC affects UI design, especially, in family oriented organization. When examining the details of the relationship, clan culture, which emphasizes openparticipation in the team (Cameron and Quinn, 2011) is associated with appropriate design team characteristics that should be composed of members with a variety of knowledge and experience (multi-disciplinary approach).

The results of this study make it feasible to summarize that UI design is positively influenced by an organization concerned with personal valuesthatacknowledge informal control structures, employee development, decentralized decision-making, and incorporation and unity with open communication. High-level participation from experienced individualsin this manner will help designers and other people in the

team to brainstorm and share helpful comments. Information from their commentswill assist the design team to develop UIs that are not just based ona particulardesigner's experience.

Although the results from regression testingshowed thatthe other three OC types did not affect UI design, when you look at the testingin detail you can see thatcompetitive and control cultures still have a relationshipwith the UI evaluation process. Therefore, this means that these organizations that emphasizeonclearly formal rules and procedures have a somewhat meaningfulrelationship with the UI design process. The market and hierarchy culture,in attemptingto be the leader in acompetitive environment outside theorganization, assesses the final product quality afterpassing the quality assurance process might still offera competitive advantage for them;aproperassessment process will clearly assist them to achieve that goal. The concerns of the hierarchy culture areabout a formal decision-making process tolet their operation run smoothly. Anassessment processwould clearly help them to control and produce aquality product with production effectiveness.

Surprisingly, one of culture type that has not been mentioned in this section is adhocracy culture. The research outcomes showed thatorganizationswhich emphasize on innovation did not show a relationship with UI design in both the process and product characteristics, probably because they invest a lot more time and money before profits appear. The adhocracy culture's motivation is to make more profit over a shorterperiod of timeat minimal cost than other OC types and emphasizes growth with new technology; this approach may not meet with amethodwhichisconsidered to be old school.

The importantpractical implication for the industryis derived from results of this research which suggest that UI design might be improved if theOC is family-oriented.The clan culture's concern for relationships within a group and human resources development will push forward and distribute expertise and knowledge about UI design by emphasizing on user culture,as well as suggesting signification with internal staff development and learning. Theyare likely to take responsibility as a strong proponent of support and improvement of employee understanding and skills about the negative effects on OC gapsduring UI design.In addition, the control (hierarchy) and compete (market) cultures focus on working within formal processes and quality of the productshould encourage a standardized organizational cultural response towards UI evaluation. The hierarchy culture appears in organizations which are efficient, reliable, and operate smoothly with certain product quality. People and leaders desire the assurance that everything in product development is under control. Therefore, standardized UI evaluation guidelines with clear lines of decision-making, standard rules, and procedures are valued as answers. The market culture applies to firms concerned with results and consumer satisfaction. Employees and leaders have tasks that are productivity- and results-oriented with profit in mind. Therefore,

standardized UI evaluation guidelines with emphasis on results from the system and satisfaction of choosy customers are valued as solutions. Both the hierarchy and market cultures should take responsibility by becoming leaders in support of the industry by applying formal and trusted evaluation processes.

Software services companies seem to benefit from UI design knowledge and guidelines that were stated above to creating more usable UIs for users in particularOCs. When development teams design UIs alongthemesthat are found to be unsatisfactory to users, the usual inclination is conflict between the groups, both during the design process and product characterization. Hence, software services organizations should emphasize the effect of OC on both themselves and their prospective users, since values in the IS development context seem to have no significance for the user. Meanwhile, user beliefs affect the pattern by which they do their jobs.

7. LIMITATIONS

This research is not without its limitations. First, more than half of the samples are from the family (clan) culture. This limitation demonstrates the nature of Thai organizations, which are mostly concerned with seniority (high power distance) and internal relationships (high collectivism) (Hofstede *et al.*, 1990) and they are SMEs that have a positivecorrelation with clan culture (Dastmalchian *et al.*, 2000). Therefore, the results of this analysis may have been affected by the national culture or size of the organization. Second, this study was only focused on software services organizations; in-house software development and other types of IT business are beyond the scope of this research. Finally, this study and its outcomes were based on investigations in Thailand. As a result, generalizing to another culture or environment should be made with caution. This study employed CVF with OCAI to investigate the association between OC and UI design in IS development. However, values in users' firms that influence UI design could be analyzed to further improve understanding in this research field.

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