

# Does User-Centered Design (UCD) Matter? Perspectives of Malaysian IT organizations

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**Abstract**— In the field of Human-Computer Interaction (HCI), user needs are recognized to be the most crucial component in designing towards usability, hence user experience (UX). This paper explores the most valued component at the earliest phases of design and appreciation of end users among information technology (IT) personnel with different roles at organisations in Malaysia. The organisations are divided into three (3) categories; government agencies, government-link company (GLC), private company. Eighty four (84) personnel are surveyed using a semi-structured questionnaire. The study investigates the gap of awareness in User-Centered Design (UCD) and most important values during IT development process in the organisations. The result points that little evidence is available on the level of user involvement during the design process even though many respondents believe that user should be the centre of the design process. There is a gap in the International usability standards currently embedded at the national and organisational level at all organisations.

**Index Terms**— HCI; standard; usability; user experience (UX); organizations; Malaysia

## 1 INTRODUCTION

HUMAN-Computer Interaction (HCI) is evolving and introduces terms like User-Centered Design (UCD), Human Centered Design (HCD), usability, Interaction Design (ID) User eXperience (UX). The main focus of HCI is to produce useful, usable and desirable technology [1]. UCD and HCD are normally used interchangeably as it is perceived as heterogeneous and frequently use with a very similar meaning. However, [2] make a distinction between the two. In this paper, the term UCD and HCD is used to refer to a process or activity related to the user when designing and/or evaluating an interaction and/or interface [3]. The interface to an interactive system is all those parts of the system with which people come in contact, physically, perceptually and conceptually [4]. Thus, IT interface has become ubiquitous and immersive into today's world in general.

In the digital economy rankings (which is formerly known as "e-readiness rankings"), Malaysia is ranked number 36 out of 70 countries [5]. However, questions still remain unanswered as to whether a well-defined quality assessment exists in Malaysian digital product. Reference [6] suggest that there are two perspectives to study quality; one related to the end product itself and another related to the process, where the end product is

produced.

There exists a widely practiced assessment criteria by Carnegie Mellon's Software Engineering Institution (SEI) that emphasizes on Capability Maturity Model (CMM). CMM intends to evaluate the software maturity and development process in order to produce quality software. However, local research conducted with more than 50 considered world class Malaysia multimedia super corridor (MSC) companies found that there is no significant difference between software development companies with CMM certification and no CMM certification [7]. Both companies facing the same problems inherent within the requirement engineering (RE) process such as poor user understanding rather than to factors external to the RE process.

According to [7], high-maturity ratings of CMM do not generally correlate better performance and do not indicate effective practices in IT development process or its product. Therefore, other alternatives or direction should be considered to assess the quality of IT process and product. No major research efforts have been allocated neither to investigate how IT developers design and evaluate their own work, nor helping the individual developer to evaluate their own practice on a day-to-day basis [8]. Evidently, many users' frustrations studies have validated the lack of user involvement throughout the system development in Malaysia [9]. These frustrations not only cause personal dissatisfaction and loss of self-efficacy, but may disrupt workplaces, slow learning, and reduce participation in local and national communities [10].

The underlying practice in IT development process is unknown especially in RE [7]. The aim of this research is to explore the most important values in development process and to find the gap in user appreciation among developers in IT organizations. This study is significant due to the national target to push 90% service to be online by 2015 [11]. Various IT applications such as websites

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violate user’s goal and expectation, hence lead users to feel frustrated, thus reject the websites [12][13]. The contribution of this study is to highlight constraints within the region where little study can be found towards embedding UCD in practice.

## 2 RELATED LITERATURE

### 2.1 User-Centered Design in Practice

The origin of user-centered design (UCD) practices can be traced back in the mid-1950s by the establishment of a human factors organization at IBM [14]. The practice has become obvious by incorporating ideas from IBM project teams via the company’s UCD Advisory Council, and from industry peers via the Computer Human Interaction (CHI), Usability Professional Associations (UPA currently known as UXPA), and Human Factor Ergonomics Society (HFEM) conferences and standards organizations such as International Standard Organization (ISO), American National Standard Institute (ANSI) and National Institute of Standards and Technology (NIST).

Reference [15] conducted similar survey with this study in 1993 to identify practices of UCD and noted that developers thought that they practice UCD but they are not. The definition of UCD has no real meaning in industry [16]. Therefore, it requires shift of attitude towards user involvement as in roles, activities and artefacts. It is very difficult to study real life practices. According to [17], practitioners are usually not inclined to listen to researchers who do not express sincere respect for their practice. Therefore, to study practice, it requires strong communication skills and empathy among researchers.

Several researchers have conducted studies on measuring usability awareness in organizations [18][19]. This measurement has also been used in India (Anirudha Joshi, 2004). However, in a case where usability is only recently introduced or has only a limited impact, there are apparently additional dimension to be considered for assessing the UCD as in Table 1 [19].

TABLE 1. UCD OBSTACLES IN PRACTICE

Obstacles	Issues	Authors
Awareness	Values and belief of design principles, developers thought they practice UCD not they actually not.	[20][21] [22]
Attitude	Do not appreciate usability, take advantage of customer who are not asking for usability, resistance to usability	[14][22][23]
Skills	Communication skills needed to explain to customer and management	[14][24]
Empowerment	Management awareness, developers have less authority in decision-making	[25] [26] [27]
Resource	Companies support usability based on Return of Investment (ROI), time, money, tools and technologies.	[15][24] [28]

### 2.2 Development Process in Malaysia

It is crucial to identify knowledge and skills that HCI graduates in particular should possess when they enter the workforce [29]. This factor varies and at least could be categorized under two: those can be controlled and those cannot be controlled. Factors that can be controlled by the developers include knowledge and belief, awareness, skills and attitudes. Factors that cannot be controlled may include organizational, social and culture. However, lack studies on real world practices are normally because of many uncontrolled factors [30].

Table 2 shows several studies conducted by local researchers to understand the work settings and real practice. To the author’s limited knowledge, [31] focuses on the adoption of agile method in the software development process, which is part of user-centered design (UCD) technique. Reference [36] found that System Development Life Cycle (SDLC) is the most practiced methodology in software development in Malaysia.

TABLE 2. REAL WORLD PRACTICE STUDY IN MALAYSIA

Authors	Respondents	Methods	Focus
[31]	MSC Status companies	Survey: Mail questionnaire	Agile methods in practice
[32]	MSC Status companies with CMMI certification in Malaysia	Survey: Mail questionnaire	Requirement Engineering (RE) in development process.
[33]	IT practitioners	Survey: Online questionnaire	Usability awareness
[34]	Malaysian-based Software Firms	Survey: Questionnaire and Interview	Requirement Engineering in practice
[35]	IT companies, IT departments	Ethnography study: Observation, Interview, Semi-structured questionnaire	HCI awareness

An indication of the extent that UCD is being practiced may be reflected by the existence of internationally recognized job in related to HCI in local organizations. Reference [33] performed an analysis of HCI-job related and found that the information is lacking. This may be because of the complicated bureaucracy required in many organizations when a new job title is introduced. Therefore, further investigation is needed to identify any silence practice out there. Although HCI course has been introduced since 1990 in many public and private universities in Malaysia, this does not indicate the knowledge is applied in work settings [35] [36].

## 3 METHOD

In this research, both quantitative and qualitative methods are adopted, which are questionnaire and interview. The organizations are selected based on the

industrial link with the researcher’s university. A semi-structured questionnaire was distributed during students’ industrial attachment within May to July 2009 in IT department among different level and roles of IT personnel in seven (7) different organizations. The target respondents are those who are based at the IT department of an organization or any software development companies. Part of the result of this paper are published at [35]. Therefore, to avoid redundancy, some of the results are not reported in this paper for example respondents’ awareness of HCI.

### 3.1 Questionnaire

There were two part of the questionnaire; one for respondents who involve directly in software development including requirement gathering and user testing (developers) and one for respondents who are not involve directly with development process (non-developers). The questionnaire on developers consisted of 20 questions including open-ended questions. The questionnaire on non-developers consisted of 15. Of these, all questions are overlapped.

Seven (7) questions include background information of the respondents (level of education, job title, ethnic group, job description, proficiency, length of work, empowerment, previous jobs related to software development), knowledge (HCI terminologies, HCI job-related) and awareness (user appreciation, design goal, existing guidelines and standard). Questions on knowledge, job description, guidelines use and design goal were partly open-ended questions.

### 3.2 Interview

Semi-structured interviews are based on open-ended questions with developers and non-developers about their awareness of UCD and current work. Questions are mostly following dichotomies type of close-ended questions such as “have you heard of the term user-centered design (UCD)?”, if the answer is yes, the next open-ended question is “where?” and “do you think it is important”, “how?”, “do you apply the knowledge in your current work?”. In order to elicit the end-user appreciation in the development process, a dichotomy question is provided such as “do you think end-user should be included in any phase of software development?” followed by, “which phase is important?”, then, “why?”.

### 3.3 Hypotheses

In this paper, we only focus on the following hypotheses:

H1: There is no significant difference in the value of user between female and male respondents in the study.

H2: There is no significant difference between the job experience and level of proficiency.

H3: There is no relationship between types of organization with appreciation of user in software development.

## 4 RESULTS

### 4.1 Profile of Respondents

In this survey, the data of 84 respondents were used for SPSS version 19 analysis. The part aimed at identifying the respondents’ demographic information and background such as gender and age, education level, work experience and level of proficiency. Result show that 39.3 percent of the respondents are male and 60.7 percent are female. Goodness-of-fit test shows that  $\chi^2_{(1, 82)} = 3.857$ ,  $p = 0.050$ ,  $p < 0.05$ . There were significantly more females than males in the study.

An independent-sample t test is conducted to identify if there is any significant difference on the user appreciation between male and female respondents. Lavene’s test for equality of variance of test scores shows that F value of 2.612 ( $p = 0.110$ ), which is greater than 0.05. Therefore, H1 is rejected. Both male and female respondents agree to the importance of user focus in the development process.

The respondents were asked to provide their ethnicity due to the nature of multi-racial people lives in Malaysia. Based on the results, 82.1 per cent of the respondents are Malays, 8.6 percent are Indian, 8.3 percent are Chinese and 6.0 percent identified themselves as others. This may be the indigenous ethnic who lives in Sabah and Sarawak. Goodness-of-fit test shows that Malay ( $n=69$ ) > Chinese ( $n=7$ ) > others ( $n=5$ ) > Indian ( $n=5$ ),  $\chi^2_{(3,82)} = 146.667$ ,  $p = 0.000$ ,  $p < 0.05$ .

Years of working among respondents is equally distributed, thus fail to reject hypotheses null of Chi-squared with  $\chi^2_{(4,82)} = 1.238$ ,  $p = 0.872$ ,  $p > 0.05$ . There is a significance difference in the job proficiency among respondents with  $\chi^2_{(2,82)} = 12.214$ ,  $p = 0.002$ ,  $p < 0.05$ . Majority of respondents as in plotted in figure 1 are mostly in the age group between 30 – 39 (40.5 percent). 31.0 percent were at the age of 20 – 29 and 28.6 percent were more than 40 years old. However, there is no significant difference in the distribution of the age group among the respondents,  $\chi^2_{(2,82)} = 2.000$ ,  $p = 0.368$ ,  $p > 0.05$ .

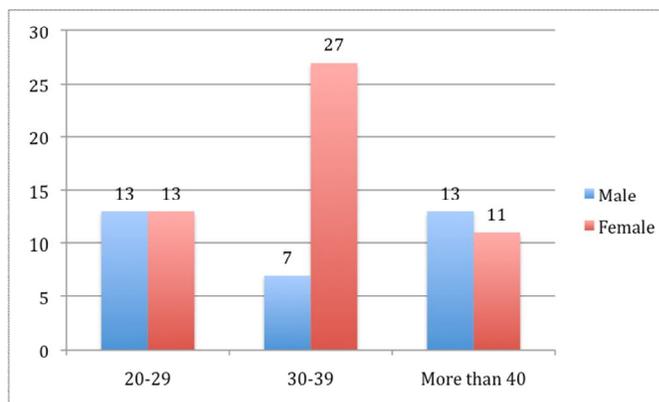


Fig. 1. Age and Gender Distribution (n=84)

In Fig. 2, the majority of respondents’ education level was presented.

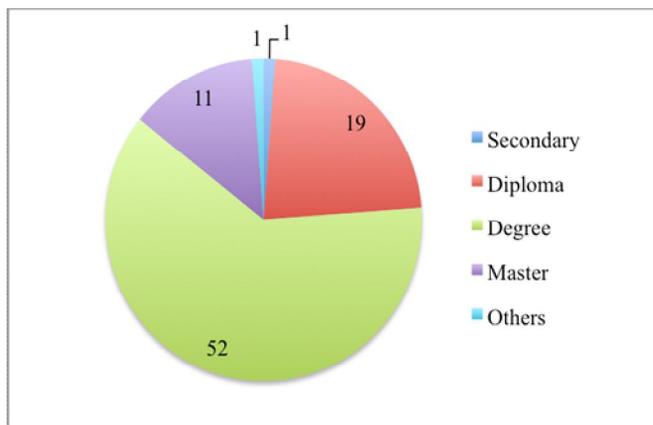


Fig. 2. Highest Degree Held (n=84)

As illustrated in the figure 2, most of the respondents have Bachelor’s degree, followed by Diploma, master’s degree, 61.9 percent, 22.6 percent and 13.1 percent respectively. 1.2 percent earned a high school education and other certificate. Goodness-of-fit test shows that there is a significance difference in respondents’ educational level who participate in this study,  $\chi^2_{(2,82)} = 105.762$ ,  $p=0.000$ ,  $p<0.05$ .

Kruskal-Wallis test performed identified that the distribution of education and job proficiency respectively are the same,  $\chi^2_{(4,82)} = 1.255$ ,  $p=0.869$ ,  $p>0.05$ . Therefore, there is no significant difference in the level of education with the level of job proficiency. The result implies that the higher the education of respondents do not have any impact on whether they are at beginner, intermediate or proficient level in their jobs.

One-way ANOVAs were conducted to analyze differences between length of work and job proficiency. Results showed that F value is 7.503 ( $p=0.01$ ), which is lesser than 0.05, hence rejecting H2. Figure 3 indicates that the respondents’ job experience have significant difference for at least two different job proficiency claimed by the respondents.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	926.598	2	463.299	7.503	.001
Within Groups	5001.837	81	61.751		
Total	5928.435	83			

Fig. 3. One-Way Anova (Job Experience\*Job Proficiency)

Post-Hoc comparison test with HSD (Honestly Significant Difference) showed that the mean for group proficient and intermediate is significantly higher than beginner. Kruskal-Wallis is conducted and resulted  $\chi^2_{(2,81)} = 11.405$ ,  $p=0.022$ ,  $p<0.05$ . Hence, there is a significant difference in the distribution of job experience and the use of design guidelines is based on own experience

## 4.2 Profile of Company

A total of seven (7) organizations participated in the study. These organizations are defined into three (3) types in accordance to their relationship to the government of Malaysia. A company limited by share, which is also known as private company, a company with unlimited share such as a sole proprietor of a business and those who have relationship with government (Companies Act 1965). The latter is divided into three (3) other types: government agencies; government link company; small/medium enterprises (SMEs).

Table 3 shows type of organizations participated in the study. Government, government link company (GLC) and private company takes up 28.6 percent of respondents, followed by 14.3 percent of sole practitioner. There is significance different in the respondents’ distribution of each company  $\chi^2_{(2,81)} = 1.500$ ,  $p=0.472$ ,  $p>0.05$ . The highest respondents are from company A, which takes up 24.0 percent of overall number. The least number of respondents is from company G with 2.0 percent.

TABLE 3.ORGANISATIONS’ PROFILE

Characteristics	Profile		
	Item	Frequency	Percentage
Working Sector	Government	33	39.3
	Government Link Company (GLC)	27	32.1
	Private Company	24	28.6
Company	A	27	24.0
	B	16	20.0
	C	17	19.0
	D	14	15.0
	E	1	10.0
	F	8	10.0
	G	1	2.0
Job Proficiency	Proficient	34	40.5
	Intermediate	37	44.0
	Beginner	13	15.4
Job Level	Top Management	19	22.6
	Supervisory and administrative	26	31.0
	Middle Management	11	13.1
	Technical and Operations	28	33.3

44.0 percent of the respondents claimed to be at the intermediate level of their job proficiency, followed by proficient with 40.5 percent and beginner 15.4 percent. However, there is no significant difference on the level of proficiency among the respondents ( $\chi^2_{(2,81)} = 12.214$ ,  $p=0.022$ ,  $p<0.05$ ). Majority of the respondents are from technical and operations (33.3 percent), supervisory and administrative (31.0 percent), top management and middle management (13.1 percent).

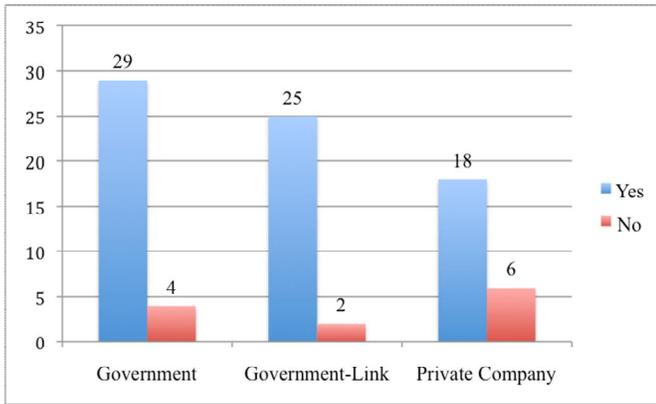


Fig. 4. Company \* End User Inclusion in Development

Fig. 4 shows a cross-tabulation between type of working sector and end-user appreciation. 87.9 percent respondents from government agencies agree that end user should be included in the development process. 92.6 percent from GLC and 75.0 percent from private company agree to the basic principle of UCD. The probability value  $F=3.419$ ,  $p=0.181$ , is more than predetermined alpha value (0.05), thus H3 was not rejected. Types of organization do not influence user appreciation.

According to [28], among the fundamental principles of UCD are user focus and the active involvement of user in the software development process. During the study, we asked the respondents on their values towards user focus. Goodness-of-fit test resulted  $\chi^2_{(1,81)} = 42.857$ ,  $p=0.000$ ,  $p<0.05$  confirmed that there is a significant difference in the respondents' attitude towards user involvement in development process.

TABLE 4. RANGKING OF MOST VALUED FACTORS IN DEVELOPMENT PROCESS

Most important values	Mean	SD
	Functional design	4.63
Client's satisfaction	4.62	0.775
User analysis	4.57	0.699
Design and attractiveness	4.20	0.929
Project's deadline	4.15	0.784
Decision maker's satisfaction	3.92	1.067

Table 4 shows that the most important considerations in development is functional design, followed by client's satisfaction and user analysis. The lowest mean scored is decision maker's satisfaction followed by project deadlines and design and attractiveness.

TABLE 5. DESCRIPTIVE ANALYSIS OF GUIDELINES USE

"Most likely we designed based on"	Mean	SD
	Client's guidelines	4.06

"Most likely we designed based on"	Mean	SD
	Internal guidelines	4.02
Self-intuition and experience	3.49	1.33
International guidelines (ISO)	3.49	1.46
National guidelines (e.g. MAMPU)	3.33	1.19

Table 5 illustrates the guidelines use by respondents during development process. The highest mean scored by client's guidelines, followed by internal guidelines and self-intuition and experience. The lowest mean scored is national guidelines and international guidelines.

### 4.3 Development Process in Malaysia

This part of research aimed at investigating the respondents' belief and values of user focus and involvement in the development process. Twenty-one (21) respondents were interviewed for more than one and a half hour in each session. All interview session were recorded and transcribed. Some of the results are included here:

TABLE 6. INTERVIEW SCRIPTS

	Respondents' view on end-user and decision maker.	
	Do you think "end-user" should be included in project development? Why?	Do you think the role of decision-maker important in development project? Why?
P45	Yes, user is the main client or consumer. Sometimes, it is very tricky because most people who come to the office are not the real end-user. Do you understand what I mean?	Yes, decision maker is the most important in any project because he/she always wanted a good project output but he/she has less commitment in the process.
P64	No, it only represents one person's view as compared to the manager of an organizations. Sometimes they do not know what they want and their knowledge is very limited. Manager or higher authority represents the organization's view,	Yes, they involve in the procedural stuff. They also create policy and control finance. No money, no budget, no project, no salary.
P65	No, the person who represent the user is the most important. They know what they want. We want them to buy-in. After sign-off then, everything is under our control.	Yes, by virtue of being the project sponsor.
P19	No. I have experience talking to a client who is not the end-user. He wants the website to be according to his color, that is dark. The font is also black but he wants the size to be as big as possible. End user needs to be educated. They need HCI class. Can you help?	Of course, it's like the client I told you. He is the one who make decision to buy-in. no matter how bad his taste is, still, he has the power to control. Money and power.

Respondents' view on end-user and decision maker.		
	<i>Do you think "end-user" should be included in project development? Why?</i>	<i>Do you think the role of decision-maker important in development project? Why?</i>
P71	<i>No. They only needed during the sign-off.</i>	<i>Yes. Timeline and budget.</i>

Table 6 shows several responses by the interviewees participated in the interview session. In the quantitative analysis result, 12 respondents do not agree to include end user in the software development process. Contrary to the result of interview, 16 out of 21 respondents strongly disagree to the inclusion of user in development process. Several strong responses are received from the proficient developers who have the decision making power. Several beginners appreciate the importance of user focus, unfortunately, the decision-maker of the team or project do not understand the benefits of user inclusion in the project.

### 5 DISCUSSION AND CONCLUSION

The aim of this survey is to understand current situation in IT development process and to find gap in the UCD awareness among IT personnel. The findings yield insights to understand the constraints in the organizations towards promoting UCD in practice. Both genders in this study agree that user focus is important in development process. However, this result does not specify what kind of user focus should be considered in the development.

Reference [37] compare the unspoken and unconscious exercised that guide the process of development between male and female. Using the language of gender analysis, set of values identified in male includes objective, reason, impersonal, rational, power and things. Female is more towards nature, which include subjective, feeling, personal, emotional, love and people [37]. Future research may need to consider the separation of the head and the heart among developers.

The result of length of work and job proficiency points that no matter how long a person work in a certain job title, their proficiency will depend on the roles not the explicit description of the job. In the study, client's guideline is the most important benchmark. However, it is unknown how effective design guidelines can be applied. According to [38], authority and illegitimate power is very important to apply guidelines at any level. Whatever techniques use in any development organization, it cannot be effective unless senior management has demonstrated a commitment to usability [27].

The qualitative results show that developers think user do not know what they want and try to avoid their involvement in the development process. This result is inline with [39] and it is worried that the attitude of senior developers may influence the junior developers too. One way to create awareness of the importance of user focus may be by having developers witness user's

pained expression when they use their product [27]. The result of qualitative data points that questionnaire method in collecting real world data should be handled with extra interpretation to the setting of Malaysia.

This may be due to the Malaysian underlying values such as preservation of face [40]. Compliment method should be combined with questionnaire when conducting studies of real world settings. In this study, questionnaire result shows that the respondents agree to the importance of user involvement. However, during the interview, majority of the interviewee do not agree to the involvement of user in development process. There is a lack of alignment between objective and subjective measures, which is inline with [41] as cited by [40]. Therefore, a careful interpretation must be done when studying organizations as the settings.

We believe that, by addressing the user and involvement issues, developers will be able to understand the goal, tasks and expectation of users, which subsequently improve the quality of their product. Our future work will attempt to explore the most fundamental foundations from where developer's goal and assumptions arise about users. This understanding can facilitate them to apply UCD in the process hence create positive user experience in the end product.

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