CULTURAL DIMENSIONS OF MALAYSIAN TEENAGERS AND THEIR RELATIONSHIP WITH INTERFACE DESIGN

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ABSTRACT

This study aimed to identify the relationship between cultural dimensions of adolescents in Malaysia and their tendencies with interface design of computer applications. Numerous studies have used Hofstede's cultural dimensions to design user interfaces and tested their application in many countries. However, test results in Asian countries such as China and Taiwan are not significant because the cultural dimensions are unsuitable for these countries. Therefore, this study will use the cultural dimensions of Malaysian society to test the relationship with interface components tendency. Respondents of different races and religions, with different family incomes, and from urban and rural areas are selected from six secondary schools. Pearson correlation analysis with a significance level of 0.05 is used to determine the relationship between cultural dimensions, namely, harmony, relationship, hierarchy, collectivism, shame, polychronic time, high-context communication, and religion, and the use of interface components, namely, metaphor, mental model and navigation, interaction, and appearance. Result shows that four cultural dimensions have a significantly positive relationship with the interface components (hierarchy, religion, polychronic time, and collectivism) with an r value of more than 0.1.

Keywords: *Interface design, Cultural Interface Design, Interface Components, Culture Dimensions, Culture Interface Preferences*

1. INTRODUCTION

Interface is a medium that enables users to interact with computers. In the 1980s and 1990s, computer applications were used only by professionals for work. This situation is unlike the present day, when everyone can use computer applications for every task. The application interface also enables users to communicate beyond the boundaries of countries [2]. Interface is used through various media such as computers, tablets, and mobile phones.

Various features and user backgrounds should be considered when developing applications because of the high demand of computer and the Internet [8]. Different societies have different cultures and ways of life in accordance with nationality, state, and religious. Thus, societies respond differently to interface design [23]. Among the aspects of interface that affect the cultural differences are language, colors, symbols, icons, layout, and navigation style [6]; [16].

The process of identifying relevant consumer characteristics has become a subject of interest in research on culture interfaces [19]. One important factor is users' culture. The usability of information systems for users can be improved when the functions, layout, and knowledge structures are optimized for each type of culture [9]. To identify and differentiate culture by country, researchers used the cultural dimensions of some anthropologists, such as Edward T. Hall (1959, 1976), Florence Rockwood Kluckhohn and Fred L. Strodbeck (1961), Geert Hofstede (1980, 1988), David A. Victor (1992), and Fon Trompenaars (1994, 1998).

Interface researchers have used cultural dimensions from above mentioned anthropologists to build interface designs based on the tendency of cultural diversity. For example, [4][20] issued guidelines for interface design for Hofstede's cultural dimensions. These design guidelines have been widely adopted by interface developers for website localization for different countries. [5] conducted a study on interface design according to each dimension from 29 cultural dimensions of 9 anthropologists. Each of these cultural dimensions have a proposed interface design as a metaphor, navigation, mental model, interactions, and performances that need to be addressed by the interface developer.

However, all the aforementioned cultural dimensions were obtained by Western anthropologists, who used Western society as a sample; the lifestyle of such a society is distinct from that of the multicultural society of Malaysia. For instance, Hofstede's cultural dimensions are widely used in designing Internet applications for the localization process. Hong Kong researchers [7] conducted a study on an interface designed according to Hofstede's cultural dimensions of students. These researchers attempted to discover if interface design according to Hofstede's cultural dimensions affects the result of students' learning and perceptions. Results showed that the interface has no effect on the results of students' learning and perceptions.

Therefore, the use of appropriate cultural dimensions according to local culture is important. People in Malaysia who are from different ethnic groups, such as Malays, Chinese, Indians, Sabah, and Sarawak, possess different cultures, which also vary from those in the other countries. Based on these cultural differences, the user interface design should also be distinct from what was developed by Aaron Marcus. This paper will discuss the relationship between cultural dimensions with interface design in accordance with Malaysian culture.

2. MALAYSIAN CULTURAL DIMENSIONS AND INTERFACE DESIGN

According to anthropologists, culture can be studied at the conscious and unconscious levels. Examples of culture that can be studied at the conscious level are artifacts, clothing, cooking, and games [24]. The unconscious level involves mental programming that sets the pattern of thinking, feeling, and acting [1]. Thus, culture unifies all members of a society through language, dress, food, religion, beliefs, aspirations, and challenges [3].

Malaysian culture has numerous meanings that usually describe the way of life of a community member. According to [1], way of life includes how group members understand and interpret the world around them, their ideas and beliefs, and how they relate to other people and organize their daily activities. Thus, culture is the set of behavioral patterns associated with thinking, manners, and actions that are shared, learned, and taught by members of the society to the next generation [1].

Malaysian culture is influenced by people from other cultures who come to the country for study, work, and travel. [1] studied the cultural organization and discovered eight cultural dimensions that represent Malaysian society: harmony, relationship, hierarchy, shame, high context communication, polychronic time, collectivism, and religion. In Malaysia, most ethnic groups have their own distinct culture that distinguishes them from the others. Whether they are Malay, Chinese, Indian, Sikh, Iban, Kadazan, Melanau, and so on, each of these ethnic cultures and customs are based on a set of values adopted by the members of the group through social activities and cultural programs.

Harmony requires orientation to meet the needs of the surrounding environment, whether natural or humanitarian. Disagreements and conflicts among people must be reduced or avoided, as this will cause an uncomfortable environment and pressure for those involved. The value of harmony is also influenced by the religious and spiritual education in an individual.

Relationship orientation is described as a situation in which an individual, group, or organization focuses on companionship in achieving a specific goal. Those who belong in this group will build and maintain harmony, stability, fun, and intimacy with friends, relatives, superiors, subordinates, and colleagues.

Hierarchy is related to the value of respect for the elderly and reputable individuals. The older generation is traditionally associated with wisdom, experience, and knowledge. Younger people would listen and nod when older people are talking. Although the two have different opinions, the younger ones will obediently listen without protest.

Malaysian culture is associated with "face" issues. Shame is very important in shaping the behavior of society irrespective of races such as Malay, Chinese, or Indian. Among Malaysians, the concept of face is related to honor, self-image and family image, organization, and the good name of parents or members of the family.

Communication patterns are usually indirect, where meaningful information either resides in the physical context or is internalized in the person to whom the information is directed. An important task is to pay attention not only to what a person says, but also how, where, and to whom he/she says it to, as he/she is likely to use metaphors, analogies, and hidden meanings in their conversation.

The influence of collectivism is demonstrated by affiliation to culturally homogeneous groups, usually of the same ethnic

identity, because it fosters a sense of belonging and team spirit at work or play. Malaysians are likely to spend time and money on their immediate family members, such as their parents, grandparents, aunts and uncles.

Polychronic-oriented cultures are likely to perceive time as flexible. People spend less time looking at the clock and more time attending to strong interpersonal relationships. Time is fluid, whereas punctuality and timeliness are not absolute.

To most Malays, implementing religious teachings in their everyday life and at the workplace is important. They usually find solace in praying and meditating, as they believe this would have a positive effect on the body, mind, and soul. All ethnic groups in Malaysia are allowed to observe their respective religions, namely, Islam, Hinduism, Christianity, Buddhism, and Taoism. Each religion has its own rituals, ceremonies, and spirituality.

Hofstede's cultural dimensions are most commonly used as a guide in interface design. Hofstede's cultural dimensions are widely used because he conducted a study on 74 countries, and the scores given to each are robust. Among the interface researchers who have used Hofstede's cultural dimensions are [21], [19], [11], [14], [10], [5], [17], and [17].

During the development of the cultural dimensions of society, the researcher referred to cultural dimensions developed by other researchers [5]. However, the meaning and values of the culture can be modified to meet the characteristics of Malaysian society. The Table 1 below shows the types of cultural dimensions that are based on other dimensions.

Table 1: Malaysian Cultural Dimensions And Related Culture Dimensions

Cultural Dimensions	Related Culture Dimensions	Proposed Interface Design
Harmony	Affective (emotional) versus neutral cultures (Parsons, Trompenaars)	Interaction
	Specific versus diffuse cultures (Trompenaars, Parsons)	Interaction
Relationship	Affective (emotional) versus neutral cultures (Parsons, Trompenaars 2013)	Interaction

	Specific versus diffuse cultures (Trompenaars 2013, Parsons)	Interaction
Hierarchy	Power distance (Hofstede, 1993)	Metaphor, mental model, interaction
Shame	Saving face (Victor)	Metaphor, mental model, interaction
High-context communication	Context (Hall 1987, Victor)	Metaphor, mental model, navigation, interaction, appearance
	Nonverbal communication (Victor 1987)	Metaphor, interaction, appearance
Collectivism/ group orientation	Collectivism (Hofstede, Trompenaars, Parsons, Kluckhohn and Strodtbeck, Adler, Condon and Yousef)	Metaphor, mental model, interaction, appearance
Polychronic time	Time perception (Kluckhohn and Strodtbeck, Adler, Condon and Yousef)	Metaphor, interaction, appearance
Religion	Meaning of life (Condon and Yousef)	Metaphor, appearance

The interface design in this Table 1 is the proposed design resulted from a study conducted by [5]. In his research, he collected all the cultural dimensions developed by experts in culture and then asked them to select the cultural dimensions that are most relevant to interface design. However, he only proposed an interface design and did not perform an empirical study to test the theory. The present study will prove the relationship between the dimensions of Malaysian culture and Baumgartner's interface design recommendations.

3. RESEARCH METHOD

This research will test the relationship between cultural dimensions of high school students with the tendency to use an interface. A questionnaire was used, in which a set of questions is based on the Likert scale. Questions on cultural dimensions were constructed and modified with reference to the views of [1], who developed the cultural dimensions of Malaysian culture. Questions on interface design were developed based on the interface design theory of [24] and other interface experts.

Pearson correlation test was used to determine the relationship between these two variables. The independent variables that were used are harmony, relationship orientation, group

orientation, hierarchy, shame, polychronic time, high-context communication, and religion. The dependent variables are metaphor, mental model and navigation, interaction, and appearance.

Students from Form 3, 4, and 5 were selected from six several secondary schools that are located in rural and urban areas. Probability sampling was used to select the type of respondents. The question survey is divided into parts A, B, and C. Part A contains 32 questions related to cultural dimensions. Part B contains 31 questions related to the tendency to use interfaces components. Part C contains questions related to the respondents' demographics.

4. RESULTS DISCUSSION

Correlation analysis was used to examine the relationship between the dependent variable and the independent variable. The purpose of this analysis was to test a theory or hypothesis for this study. Correlation is used to describe the relationship between two variables, namely, the cultural dimension and interface component preferences. Cultural dimension is the independent variable, whereas the interface component is the dependent variable. The Figure 1 below shows the relationships between cultural dimensions and interface components. These relationships will be tested whether each of its correspond to its related components.
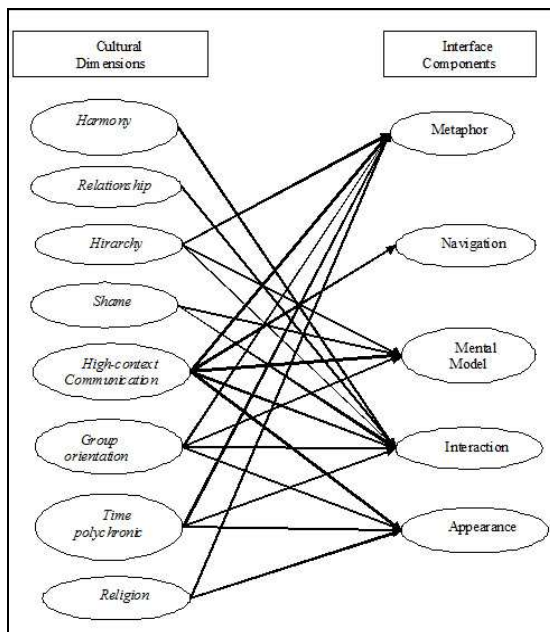

Figure 1: Culture Dimension-Interface Components Relationships

The obtained statistical value is Pearson's product-moment correlation (r), as well as the statistically significant values for r. The correlation coefficient provides a summary of the direction and strength of the linear relationship between two variables. The correlation coefficient value is between -1 and +1. A correlation value of 0 indicates no relationship between the variables. The value of the variable is the strength of the relationship that varies according to statisticians. Cohen (1988, pp. 79–81) in [22] provided r = 0.10 to 0.29 (small), r = 0.30 to 0.49 (medium), and r = 0.50 to 1.0 (strong).

Correlation analysis was conducted according to the null hypothesis of the study. The first test was conducted to find the relationship of hierarchy, high-context communication, group orientation, polychronic time, and religion with the dependent variable of interface component, that is, metaphor. Table below shows the results of the relationships. The hypothesis is: Are the hierarchy, high-context communication, group orientation, polychronic time, and religion dimensions influence the design of metaphor component?

The Table 2 below indicates that the cultural dimension of hierarchy has a modest relationship with metaphor (r = 0.340). Group orientation has a very weak relationship with with metaphor (r = 0.226). Polychronic time and religion also have a very weak relation with metaphor, with r = 0.247 and r = 0.238, respectively. While high-context communication has an r value of 0.006, which indicates no association with the metaphor.

Table 2: r Value For Metaphor

	Hie	HC	Col	PT	Rel	Met
Hie	1.000	-0.151**	0.345**	0.184**	0.320**	0.340**
HC	-0.151**	1.000	-0.055	0.166**	0.018	0.006
Col	0.345**	-0.055	1.000	0.176**	0.412**	0.226**
PT	0.184**	0.166**	0.176**	1.000	0.245**	0.247**
Rel	0.320**	0.018	0.412**	0.245**	1.000	0.238**
Met	0.340**	0.006	0.226**	0.247**	0.238**	1.000

A second test was performed on the second hypothesis which is: Are high-context communication, group orientation, polychronic time, and religion influence the design of the appearance components?. The obtained values are as follows:

Table 3: r Value for Appearance

	HC	Col	PT	Rel	App
HC	1	-0.055	0.166**	0.018	-0.010
Col	-0.055	1	0.176**	0.412**	0.296**
PT	0.166**	0.176**	1	0.245**	0.221**
Rel	0.018	0.412**	0.245**	1	0.427**
App	-0.010	0.296**	0.221**	0.427**	1

The value in Table 3 indicates that the correlation value of religion is the highest (0.427) and the value indicates a moderate relationship between religion and appearance . The r value of group orientation is 0.296, which indicates a moderate relationship with appearance. The r value of polychronic time is 0.221, which indicates a very weak relationship with appearance. High-context communication has an r value of 0.010, which indicates no relationship with appearance.

Next, the correlation analysis was carried out to examine the third hypothesis which is: Are hierarchy, shame, high-context communication, and collectivism influence the design of the mental model component?. The following Table 4 shows the obtained correlation values.

Table 4: r Value for Mental Model

	HC	Col	Hie	Sh	MM
HC	1	-.055	-.151**	.278**	-.049
Col	-.055	1	.345**	.177**	.207**
Hie	-.151**	.345**	1	.108**	.266**
Sh	.278**	.177**	.108**	1	.069
MM	-.049	.207**	.266**	.069	1

The Table 4 shows that the r value of hierarchy is 0.266, which indicates a moderate relationship with mental model. Group orientation has an r value of 0.207. Shame and high-context communication have r value of 0.069 and 0.049, respectively, which indicates no relationship with mental model. The figure 5 below shows the relationships between the cultural dimensions and the navigation components together with correlation value.

The next analysis was done to test the forth hypothesis: Is high-context communication influences the design of navigation structure?. The

following Table 5 shows the correlation of the two constructs.

Table 5: r Value for Navigation

	HC	Nav
HC	1	-.049
Nav	-.049	1

The Table 5 above shows that the r value of high-context communication is -0.049, which indicates no relation with navigation.

The next correlation tests were performed for the fifth hypothesis: Are high-context communication , harmony, relationship , hierarchy, shame, group orientation, , and polychronic time influence the design of interaction components?

Table 6: r Value for Interaction

	HC	Har	Rel	Hie	Sh	Col	Int
HC	1	.049	-.006	-.151	.278**	-.055	.037
Har	.049	1	.020	.003	.157**	-.022	.035
Rel	-.006	.020	1	.396**	.247**	.293**	.251**
Hie	-.151**	.003	.396**	1	.108**	.345**	.258**
Sh	.278**	.157**	.247**	.108**	1	.177**	.120**
Col	-.055	-.022	.293**	.345**	.177**	1	.192**
Int	.037	.035	.251**	.258**	.120**	.192**	1

The Table 6 above shows that the r values of relationship, shame, collectivism, and polychronic time are 0.251, 0.120, 0.192, and 0.141, respectively, all of which indicate a very weak relationship with interaction. The r value of harmony is 0.35, which indicates no relationship with interaction.

5. DISCUSSION

Based on the results of the analysis above, it was found that the some relationship between the dimensions of the Malaysian culture and interface components are not in accordance with what is

proposed by [4]. The table 7 below shows the analysis of the relationship.

Table 7: The correlation analysis results of Malaysian culture dimensions with the interface components

Culture Dimension	Interface Components				
	Metaphor	Mental Model	Navigation	Interaction	Appearance
Hierarchy	S	S	-	S	-
Collectivism	S	S	-	S	S
Relationship	-	-	-	S	-
Religion	S	-	-	-	S
Polychronic time	S	-	-	S	S
Shame	-	X	-	S	-
High context communication	X	X	X	X	X
Harmony	-	-	-	X	-

According to Table 7 above, the correlation results of cultural dimensions hierarchy, collectivism, relationship, religion and polychronic time are significant to the interface components tested. However, the cultural dimension of shame only significant with interaction component, but no significant effect on the mental model component. High context communication culture dimension is not significant to all interface components tested. Harmony cultural dimension is also not significant to the interface component interaction.

Hierarchy is a dimension that refers to the dimensions of Achievement vs. ascription and Power Distance. According to [20] and [4], the design of this dimension focuses on the use of public figures, buildings or any image that symbolizes the organization. [20] does not provide a guide for the dimensional design metaphors related to hierarchy, but [4] suggests the metaphor as a component to be taken into account. The design of which should be taken into consideration is the use of icons, the use of 'I' and 'you' by animation while responding to users. Symbols and images can also be used to represent objects in everyday life.

For interaction component, cultural dimension hierarchy has a significant relationship to the error message stating the error and how to resolve (supportive error messages). Compared to the design of [20], this is the same design with low power distance dimension. Design applications that respond after a user performs a task is also significant to the dimension hierarchy. This design is equivalent to designs for high power distance dimension.

Culture imension hierarchy has significant value to the mental model component. Based on the analysis of each interface design [15], this dimension tends toward a two-dimensional menu, as well as embedded hotlinks menu and map menu. All three of these menus is not linear where users have more options for accessing the application page. They are more comfortable with independent access and find the menu they like. The design of this hierarchy dimension is equal to the dimension of high power distance [20].

Religion cultural dimensions are tested with metaphor and appearance components. If tested with each of the component design in metaphor, this dimension is significant to the use of menu in the form of icons, symbols and images to represent objects in everyday life. For the component appearance, dimensions religion has a significant relationship with all the components.

Culture dimension of collectivism is tested with metaphor, appearance, mental model and interaction components. For the metaphor, this dimension has a significant relationship to the use of icons, symbols and images that facilitate the use of applications for representing objects in life. When tested with a navigation component, collectivism dimension tends towards combo boxes, fisheye menu, and hotlinks embedded menu and map menu. If you look at the trend, this dimension prefer non-linear navigation. The trend towards navigation is not specified by [21] for collectivism dimension.

Collectivism dimension is also inclined towards the interaction of several components. Users of this dimension prefer to use the keyboard while doing a task. They also liked the instructions for further action to guide them while using application. They also require error message that states how to resolve the problem. Along with that, they also liked the software that provides a lot of information.

For the appearance component, collectivism users shows the tendency of some components related to the use of color. According

to [28], collectivism users tends towards colorful interface. This is evidenced by the findings of this study in which the design of the interface is colorful, has a significant value. [8] and [18] has shown that the color and design of the screen in a web page have a psychological and sociological impact towards culture. The use of color for the icon can also speed up their duties.

There are two designs that support the guidelines of [21]. Collectivism dimension is not likely to use a similar color to the related items; and they do not prefer color code commonly used in daily life. In addition, the dimensions of collectivism is not likely to use icon as menu. They prefer text-based menu. This is contrary to the design indicated by [21] that the dimensions of collectivism prefer more images than text.

6. CONCLUSION

This study examined the relationship between cultural dimensions and interface components. Results of correlation analysis found that there are relationships exist between several cultural dimensions with certain interface components. The result proved that cultural dimensions can influence the interface components preferences. Each user has their own tendency to the interface components. This tendency is to some extent influenced by their cultural characteristics. In every culture, there are elements such as the use of symbols, language, form, color, design inherited by each individual from their cultural group. The use of this element is indirectly applied in the computer interface and has affected majority of users from all over the world.

The theory of cultural dimension and its relationship to the tendency of interface were developed by [4]. He has proposed interface design for 29 dimensions of culture that he has identified. The dimensions of the Malaysian culture is mapped according to the existing cultural dimension. Relationship between cultural dimensions-interface components are built and the strength of this relationship were tested. However, when tested in this study, there are some of cultural dimensions that are not significant with some interface components. To get a more accurate relationship and a clear tendency towards cultural dimension, the interface design should be tested with every type of design such as icons, images, colors, navigation linear, non-linear navigation, and layout objects. This relationship will give more specific guidance on the design of more precise and can be enhanced by other interface researchers.

Since this research is using the dimensions of the Malaysian culture, the trend of design information were obtained from literature review and previous studies, then tested on the respondents by using surveys. For further study, the researchers can use a cultural marker method to get a design which are most widely used. Interface components collected can be retested to target users whether they like the design or not.

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