

## The Suitability of Cross Cultural Models in Predicting Car Center Stack Design Preferences

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### Abstract

Car center stack design is an important feature in a car interior as drivers will interact with car center stacks while using their vehicles. Drivers with different cultural backgrounds may have different expectations of how car center stack designs are supposed to be. Cross cultural models from Hofstede and Hall were utilized to determine the suitability in predicting design preferences. The interpretations of Hofstede's model from previous researchers were utilized in this study. The interpretations offered by Jhangiani and Marcus on Hofstede's cultural dimensions did not match with the results showed by this study. Jhangiani and Marcus predicted that high power distance cultures prefers limited choices on interfaces but the results showed otherwise (92% prefers variety of features). It was also inferred from Jhangiani and Marcus that low uncertainty avoidant cultures such as Malaysia would tolerate inefficiency in interface layout and unclear menu labeling, but the results showed the opposite. Future research should consider alternative approaches when it comes to cross cultural design of car center stacks.

**Keywords** - cross cultural design, car center stack, Hofstede, Malaysia.

### 1.0 Introduction

In an increasingly globalized world, products and technology knows no boundaries. Products are being marketed all over the world and being used by users from various nationalities and culture. Websites and software are common examples of global products; apart from them cars have started to become increasingly global as well. Car makers such as Volkswagen for example have embraced the idea of having "global car" designs where these "global cars" will be sold worldwide in order to enhance economies of scale while leveraging their market share (Reuters, Feb 2013). Considering the global market demands, it is a challenging task to design a car that will be accepted by every individual user. Each individual user may have different needs and requirements; and their design expectations will be different as well. Design expectations may come from the internal belief system of users, which is dictated by their cultural background. What is beautiful in one culture may be offensive to another culture. In demonstrating the importance of cross cultural design,

researchers such as Zahed et al (2001) showed products designed according to the Western practices may be rejected in favor of products that are designed according to the local customs and belief. Other researchers such as Zakaria and Stanton (2003), Choi et al (2005), Jhangiani (2006), Eune and Lee (2009) and Young et al (2011) have iterated the importance of integrating cultural aspects in the design of products. It is a common fact that users from different cultures will have different mental models, thus the importance of cross cultural design of products can never be underestimated. Cars are ubiquitous products, and typically a car manufacturer would sell their cars to people from all over the world. The issue of cross cultural design of cars then comes into the picture. How do designers take into account all the cultural differences of users from all over the globe? The quick and easy solution is to apply the existing theories and knowledge from eminent cross cultural researchers such as Trompenaars, Hofstede and Hall. Can these models be applied for car center stack designs? Therefore in this study, cross cultural models from Trompenaars & Turner, Hofstede and Hall were reviewed briefly and the suitability of applying cross cultural models in the design of car center stack was elaborated in a pilot study.

## 2.0 Culture and Cross Cultural Models

Culture is a widely discussed concept, in many different fields of study. Definitions do differ from one field of study to another, as well as how culture is being interpreted in the context of different thinking approaches (cognitive and behavioral). In the cognitive approach, culture is looked upon as those ideas, belief or knowledge held by a particular group of people (Lee, 2001). The behavioral approach looks culture as those patterns of actions belonging to a group of individuals, which is largely driven by their common understanding (Lee, 2001). Geertz (1973) defined culture as “the fabric of meaning in terms of which human beings interpret their experiences and guide their action”. A similar interpretation was given by Lederach (1995) where culture is described as “... the shared knowledge and schemes created by a set of people for perceiving, interpreting, expressing, and responding to the social realities around them”. Comparing the definitions of culture given by Lederach and Geertz, culture is interpreted according to the cognitive approach. The cognitive approach in looking at culture seemed to be the most appropriate when it comes to designing products or interfaces.

Values, beliefs and ideals are the most commonly mentioned terms when it comes to culture. In distinguishing one culture from another, it is important to have a set of values so different cultures can be compared on a level basis. For this purpose, several cross cultural models have been proposed by eminent theorists such as Hofstede (1980), Hall (1973) and Trompenaars & Turner (1997). According to Lonner (1980) an existence of a consistent ground is necessary to compare various cultures therefore cross cultural models are excellent tools in comparing different cultures. In this regard, the cross cultural models from Hofstede (1980), Hall (1973) and Trompenaars & Turner (1997) were reviewed briefly.

Hofstede (1980) proposed five values for comparing cultures, namely power distance, uncertainty avoidance, individualism/collectivism, masculinity and femininity, and long term orientation. Power distance looks at how members of a society accept inequalities of power distribution of members in society. One example of a country with a high power distance index is Malaysia (104), while Denmark has a low power distance index of 18. Uncertainty avoidance is a “society’s tolerance for ambiguity and uncertainty” (Hofstede, 1980). Cultures with low uncertainty avoidance index tend to be more agreeable to changes while the opposite is true for cultures with high uncertainty avoidance index. The individualism/collectivism index is a measure of how well

individuals are integrated into a part of a group (Hofstede, 1980). Cultures with high individualistic tendencies tend to place a lot of emphasis on individual achievements and are expected to stand up on their own, while collectivist cultures place emphasis on belonging to a larger group and being in harmony with the others. Meanwhile, masculinity and femininity are related to the “distribution of emotional roles between genders” (Hofstede, 1980). Masculine cultures emphasize competitiveness, materialistic values together with ambition and power, while for feminine cultures place more value in quality of life and relationships. Lastly, the long term orientation (LTO) value is Hofstede’s attempt in understanding Asian cultures influenced by Confucian philosophy (Hofstede & Bond, 1988). LTO refers to how a society treats values and traditions. Societies with long term orientation tend to value traditional beliefs and respect long time traditions.

Apart from cultural dimensions proposed by Hofstede, Trompenaars & Turner (1997) proposed a unique set of values for comparing cultures. A study was conducted by Trompenaars & Turner (1997) involving 15,000 middle managers from 28 countries. Based on the study, Trompenaars & Turner (1997) suggested values as listed below:

- Universalism vs. particularism: This dimension looks at whether people apply broad and general rules for all situations in life or find exceptions of the rule.
- Individualism vs. collectivism: Similar to Hofstede’s dimension where the emphasis is either places more on the individual rights or community.
- Neutral vs. emotional : In neutral oriented cultures, displays of emotions are seen in a negative light, as opposed to the emotional cultures where emotions are expected to be expressed freely.
- Specific vs. diffuse: In diffuse oriented cultures, private and working lives are not kept separate but mixed together, while in specific oriented cultures, private and working lives are separate.
- Achievement vs. ascription: Ascription oriented cultures tend to place more weight on titles, social position and age. Respect for superior is important. In achievement oriented cultures, status is accorded based on accomplishments. Titles and social positions are only mentioned when necessary. (Do we have to prove ourselves to receive status or is it given to us?)
- Sequential vs. synchronic : Synchronic cultures tend view time as something flexible whereas in sequential cultures time is viewed as discrete units therefore punctuality is very important. Synchronic oriented cultures tend to work on multiple things at a time, compared with sequential cultures which values order and staying on schedule.
- Internal vs. external control: In external oriented cultures, the environment is perceived to be more powerful and attempts should be made to live in harmony with the environment. In contrast, internal oriented cultures assume that the power lies in the individual to change the environment and efforts should be made to subjugate the environment according to personal demands.

Another prominent cultural theorist is Edward T Hall. Hall (1973) proposed several cultural dimensions such as context, time and space. With regards to time, Hall divided time into two distinct classifications, polychronic and monochronic. Polychronic cultures tend to attend to many

things at a time, and usually get things done at a leisurely pace compared with monochronic cultures, where monochronic cultures pay close attention to the time while doing things. Careful planning is one of the characteristics of monochronic cultures. In terms of context, there are low context cultures and high context cultures. Context primarily implies how messages or communication is done in a culture. Low context cultures communicate in overt and explicit messages, as well as express themselves outwardly. In a high context culture, messages are delivered in an implicit manner. Contextual elements in the environment are taken as cues to understand the message being communicated. The dimension of space refers to how cultures view personal space. Some cultures are highly territorial; areas are clearly demarcated and more emphasis is placed on the ownership of material things (e.g. what is “mine”). Low territorial cultures are less concerned with boundaries of space, spaces are shared and material ownership are taken for granted.

Cross cultural models from Hall, Trompenaars & Turner and Hofstede are great contributions when it comes to understanding and comparing cultures at the national level. The question remains as to whether the cross cultural models are indeed useful or not when it comes to designing products for a cross cultural audience.

### **3.0 Cross cultural aspects in interface design**

Culture and product design has never escaped the attention of researchers (Ekandem, 2009; Lin 2007; Winter et al, 2011; Young et al, 2011). Lin (2007) proposed a model to integrate cultural aspects into product design. Lin analyzed a local Taiwanese cultural object in terms of meaning, interface, and context and developed a cultural product design model. Other recent example is study by Ekandem (2009) where researcher used themes and visual patterns of the American South in designing a table lamp. Ekandem (2009) and Lin (2007) used similar approaches when it comes to designing for specific cultures, e.g. the analysis of specific cultural elements of a target culture and applying it into design of products. However, when it comes to designing interfaces, different approaches are adopted by researchers.

In the human computer interaction field, the concept of culture has been taken into consideration by researchers. Earliest works of cross cultural website design were done by Evers and Day (1997) and Cagiltay (1999). Evers and Day (1997) looked at culturally specific design preferences in website design among Australians and various other international users. Differences were found in web design preferences among users from different cultural backgrounds; as well as how users perceive the usefulness and ease of use of the web design. Cagiltay (1999) applied Trompenaar’s model in determining the cultural differences from the human computer interaction point of view. Even though Cagiltay’s study did not indicate a statistical significance to represent each culture, the study did indicate cultural differences in how people interact with computer interfaces. One notable example is in terms of achievement versus ascription, Russians are more ascription oriented compared to the Americans (Cagiltay, 1999).

Other example of cross cultural research interface design was demonstrated by Choi et al (2005). Three different nationalities were involved in Choi et al’s study; Koreans, Japanese and Finnish. 52 attributes of mobile data service design and 11 critical attributes were described in Choi et al’s study. Choi et al (2005) tried to utilize cultural models and a list of mobile phone interface design attributes for a cross cultural study on interface design. A similar approach was used by Jhangiani (2006) who studied the perception of Americans and Indians over a mobile phone interface design. Both Jhangiani (2006) and Choi et al (2005) used cultural models in their research. Since both Jhangiani (2006) and Choi et al (2005) used a similar product in their study, therefore

their interpretations of the cultural models are somewhat consistent. To illustrate the similarity, Choi et al (2005) and Jhangiani's (2006) studies were compared in terms of uncertainty avoidance (UA) and individualism/collectivism dimension as proposed by Hofstede.

Both Choi et al and Jhangiani interpreted the cross cultural models qualitatively, e.g. models such as Hofstede, Hall and Trompenaars were interpreted according to the context of their study. According to Choi et al, users from a culture which is inclined towards high uncertainty-avoidance will not likely to use mobile services which are poor in service quality, or they may be reluctant to use new mobile services. Unfamiliar interfaces may also make them uncomfortable. Meanwhile, according to Jhangiani, "high uncertainty avoidance" is related to attributes such as minimal keystrokes/steps, secondary information on contents, clear menu labeling, large amount of information on screen, familiar interface. All these attributes were studied and linked to the appropriate cultural dimension by Marcus (2005). Features such as minimal number of keystrokes may be preferred by cultures with High UA since they would only want to access desired functions quickly without having to access lengthy menus. Choi et al and Jhangiani's interpretation seems to be rather consistent in this cultural dimension of uncertainty avoidance. When it comes to individualism/collectivism, Jhangiani and Choi et al have similar interpretations. According to Jhangiani, the cultural dimension of individualism/collectivism is linked with personalizable interface, programmable softkeys, and variety of font sizes and colors. All these mobile phone features allows users to customize their mobiles according to their preferences hence the link with Individualism and Collectivism dimension of the Hofstede model. Choi et al chose a similar interpretation as a culture with individualistic tendencies tend to prefer customizable interfaces. Studies from Choi et al and Jhangiani, and other earlier studies from Evers and Day (1997) and Cagiltay (1999) seem to further strengthen the inconsistencies when it comes to interpreting cross cultural models for the purpose of interface design. Each cultural dimensions were interpreted according to the study being done. One of the plausible reasons for a wide variety of interpretations is that the cultural models from Hofstede, Hall, Trompenaars and others were developed for the purpose of international business communication, and not for interface design. A wide gap exists between the cross cultural models developed by theorists and the actual reality of how people from various cultural backgrounds might interact with interfaces. It can be summarized that the interpretation of cross cultural models from Hofstede, Hall, Trompenaars and Turner can be context dependent.

Other example came from Lee (2001) on the study of microwave oven interface design involving Koreans and Japanese respondents. Comparing Choi et al's findings on with Lee's work, there is a marked difference. Lee (2001) developed a model for analyzing cultural effects on Japanese and Koreans by using models of Trompenaars & Turner and Hofstede. In his study, no apparent attempt was made to link the cultural variables from Hofstede and Trompenaars to microwave interface design variables. In assessing the cultural differences between the Koreans and Japanese, 38 questions were generated from the cultural models of Hofstede and Trompenaars. The questions were then modified into product related questions. Lee's study showed that Koreans and Japanese have unique cultural profiles even though both populations have similar geographical locations. Koreans are more future oriented, collectivist in nature, ascription oriented compared to the Japanese, whom are more individualistic, achievement oriented, and less eager to wait for new products (Lee, 2001). The findings of Lee (2001) should not, and can never be generalized to each individual Korea and Japan, since generalization of findings would amount to committing an ecological fallacy. Lee (2001) referred to an earlier work done by Cagiltay (1999) where questions from the existing cultural models were adapted for human computer interaction purposes. Cagiltay

(1999), on the other hand have used the work from Evers and Day (1997) in formulating some of the survey questions for studying cultural differences in HCI field. The works of Cagiltay (1999) and Evers and Day (1997) were the earliest works done on studying cultural differences in the interface design field.

All the previous studies done by Choi et al (2005), Jhangiani (2006), Lee (2001), Cagiltay (1999) and Evers and Day (1997) have utilized cross cultural models which have yielded unique results. However, when it comes to car center stack design, the decision has to be made as to whether the cross cultural models are indeed appropriate in designing car center stacks for users from different cultural backgrounds. The main objective of this study was to determine the suitability of cross cultural models in predicting car center stack design preferences among young Malaysians. Method from Choi et al (2005) and the results from Jhangiani (2006) were utilized for this study. Both of these researchers were chosen as their work is closely related to interface design, and the focus of this study was on vehicle interiors, specifically the center stack.

#### **4.0 Method**

In this study, the authors used the methods from Choi et al (2005) and Jhangiani (2006), with the main objective of determining the preference of center stack design among young Malaysians aged between 18 to 30 years old. The critical design attributes from Choi et al were adapted for the pilot study looking at the car center stack design preferences. Those critical design attributes are:

1. Variety of contents and features
2. Clear menu labeling
3. Basic contents and features
4. Efficient space utilization
5. Large amount of information within the center stack
6. Iconic menu style at the center stack
7. Buttons with wordings only on dashboard
8. Variety of font sizes
9. Consistent font sizes on dashboard
10. Clarity of menu design

Items 3, 6, 7, 9 and 10 were added separately by the authors, while the rest of the items are very similar with the attributes described by Choi et al (2005), with the exception that the wordings were modified slightly for the application of center stack design in cars. In order to facilitate the interpretation of the results later on, each one of the attributes were then mapped to a corresponding cultural dimension from Hall and Hofstede as shown in Table 1:

**Table 1: List of center stack design attributes**

<i>Design Attributes</i>	<i>Cultural Dimensions</i>	<i>Source of Interpretation</i>
Variety of contents and features	Power Distance (Hofstede)	Marcus (2005)
Clear menu labeling	Uncertainty Avoidance (Hofstede)	Jhangiani (2006)
Basic contents and features	Power Distance (Hofstede)	Marcus (2005)
Efficient space utilization	Uncertainty Avoidance (Hofstede)	Jhangiani (2006)
Large amount of information within the center stack	Uncertainty Avoidance (Hofstede)	Marcus (2005)
Iconic menu style at the center stack	Context (Hall)	Choi et al (2005)
Buttons with wordings only on dashboard	Context (Hall)	Choi et al (2005)
Variety of font sizes	Context (Hall)	Choi et al (2005)
Consistent font sizes on dashboard	Context (Hall)	Choi et al (2005)
Clarity of menu design	Uncertainty Avoidance (Hofstede)	Jhangiani (2006)

In Table 1, a connection was made as well to the original source of interpretation; e.g. the authors who used the same cultural dimension in their studies. Later on, the interpretations for each design attributes would be explained in the discussion. The study employed 36 undergraduate students (n=36) in a Malaysian public university, which consists of 50% males and 50% females. Their ages ranged between 18 to 30 years old. Each one of the attributes were rated according to a four point Likert scale, ranging from where 1 indicates the least preference and 4 indicates the most preferred.

## 5.0 Results and discussion

From Table 2, it can be seen that with the exception of item 8 (Variety of font sizes on dashboard), all of the respondents indicated high agreement (more than 80%) with all the center stack design attributes listed. Looking at the results closer, attributes 3 (Basic contents and features) and 7 (Buttons with wordings only on dashboard) scored lower ratings when compared to the rest of the attributes. Respondents in this study were quite clear in stating their preferences when it comes to center stack design. However, when interpreting the results in light of cross cultural dimensions developed by Hofstede and Hall, several discrepancies were noted.

**Table 2: Results from the center stack design preference**

<i>Center Stack Design Attributes</i>	<i>% of voting "Agree" and above</i>
Variety of contents and features	92%
Clear menu labeling	89%
Basic content and features	64%
Efficient space utilization	92%
Large amount of information within the center stack	72%
Iconic menu style at the center stack	89%
Buttons with wordings only on dashboard	50%
Variety of font sizes on dashboard	8%
Proper space between buttons	92%
Consistent font sizes on dashboard design	100%
Clarity of menu design	97%

Below are the design attributes and a description of them in relation with Hofstede's cultural dimensions and Hall's cultural model. The design attributes were related to cultural dimensions set by Hofstede (1980) and Hall (1973), and those cultural dimensions related to the design attributes were described in Table 1.

- Clear menu labeling: This feature can be correlated with a high UA (uncertainty avoidance) score. (Jhangiani, 2006).

Findings - Malaysia scored 36 on the UA index, which is low. When referring to Jhangiani's interpretation, it is unclear if cultures with low UA would have the opposite preference, or the same preference for clear menu labeling. From the results, participants clearly preferred this attribute. It could also be interpreted that cultures with low UA also likes "clear menu labeling" in interface designs. This is supported by research done by Ford and Kotze (2005), where it was found that interfaces designed for high uncertainty avoidant culture (designed to reduce uncertainty) had superior usability ratings, regardless of whether the user comes from a high UA or a low UA culture.

- Basic versus variety of features and contents: A culture that has high power distance accepts large distances in social hierarchies and prefers limited choices on the interface (Marcus, 2005).

Findings - Respondents prefer a variety of contents despite the fact that all the respondents come from a culture which accepts large power distances. Malaysia is a high power distance culture (score of 104). According to Marcus's interpretation, Malaysians are supposed to tolerate limited choices on interfaces. Results were shown to be contrary to Marcus's interpretation. 92% of the respondents wanted a variety of contents and features compared to only 64% of the respondents preferring basic features and contents.

- Efficient space utilization: An efficient interface layout will reduce ambiguity considerably, therefore preferred by cultures with high uncertainty avoidance (Jhangiani,2006). According to Hofstede, Malaysia is a low uncertainty avoidance culture (score of 36), therefore Malaysians are supposed to tolerate inefficiency in screen layout.



Findings - Jhangiani's interpretation did not match with the current study's finding. 92% of respondents preferred this attribute. This attribute was mapped to a high uncertainty avoidance score, where respondents with high UA will prefer efficient space utilization. However, according to the Malaysian score of the uncertainty avoidance of Hofstede's model, the Malaysian score is low (36) which indicated that Malaysians are supposed to tolerate inefficiency in space utilization. The results proved to be conflicting with Jhangiani's interpretation of the Hofstede's model. However, the results supports the earlier findings of Ford and Kotze (2005), an interface layout which is goal and work oriented (hence speeding up tasks quickly) is also preferred by users from low and high UA cultures.

- Large amount of information within the center stack: This design attribute allows multiple icons and buttons to be displayed at the same time, thereby reducing ambiguity. Marcus (2005) related this attribute to a high uncertainty avoidant culture.

Findings - Results indicated that 72% of the respondents agreed with having a large amount of information within the center stack. Compared with "variety of contents and features" attribute, the agreement value (72% versus 90%) is lower. Respondents might have perceived the attribute of having large amount of information to be less desirable, although 72% of the respondents did agree on having a large amount of information in the center stack. This supports the respondents' preference on having a variety of contents and features in the center stack.

- Iconic menu style at the center stack: Low context versus high context cultures

Findings - 89% of respondents preferred this attribute. This seems to be more consistent with Hall's findings, e.g. people from Asian societies are high context cultures. In high context cultures, communication is indirect and implicit. So they prefer icons more than explicit words, which is consistent with the findings of this study.

- Buttons with wordings only on dashboard: Low context versus high context cultures

Findings - This seems to be very consistent with Hall's findings as Asians, specifically Malaysians prefer indirect and implicit way of communicating so this design attribute is less preferred compared to iconic design (refer to Table 2).

- Variety of font sizes on the dashboard: Low context versus high context cultures

Findings - According to Choi et al (2005), Japanese and Koreans prefer a variety of font sizes and colors for mobile phone interface. It was initially assumed that the preference would be similar for dashboard design, but unfortunately it is not so. Only 8% of the respondents agreed with the stated design attribute.

With regards to the "proper space within buttons" and "clarity of menu design", Jhangiani (2006), Choi et al (2005) and Marcus (2005) did not offer any interpretation regarding these design attributes. Both of these design attributes could be related to high uncertainty avoidant culture, but the results from this study showed them to be otherwise. Respondents in this study clearly preferred both of these design attributes. 92% of the respondents preferred "proper space within buttons" and 97% of respondents preferred "clarity of menu design".

The usefulness of the cross cultural models such as Hofstede and Hall is contingent upon how the models are interpreted. This is corroborated by Ford et al (2005), where the cross cultural models such as Hofstede are not to be faulted easily; rather it is how the models were used and

applied in the first place. Ford and Kotzé (2005) did point out the need to modify Hofstede's model to suit a younger set of participants as the Hofstede model was developed for a more mature audience. However, the method on how to improvise cross cultural models for the usage of interface design remains to be elusive.

The primary reason for utilizing cross cultural models in this study was that cross cultural models offer a robust platform in distinguishing cultures from all around the world. Lee (2001) argued that all cultures must have some functional basic requirements in order to function in this world. With this logic, all the cultures can be compared and understood through a set of basic principles or dimensions. Furthermore, a systematic classification of cultures can be done through cultural models (De Mooij (2003); Hoft (1996)). It was hoped by the authors that the cross cultural models like Hofstede and Hall can be applied to the design of car center stacks, but the results from this study had proven to be otherwise. Researchers such as Lee (2001), De Mooij (2003) and Hoft (1996) may argue that cross cultural models are appropriate in comparing cultures, but the statement may not be generalized for cross cultural interface design such as car center stacks.

## 6.0 Conclusion

The main objective of the study was to determine the suitability of cross cultural models in predicting car center stack design preferences among young Malaysians. All of the Hofstede's interpretation made by Jhangiani (2006) and Marcus (2005) were inconsistent with the results of the study. Therefore, the usage of cross cultural models is impractical when it comes to predicting car center stack design preferences among young Malaysians. With the exception of Hall (low context versus high context), Hofstede's model seems to be inappropriate when it comes to predicting the preferences of the respondents (Malaysians aged between 18 and 30 years old) in car center stack designs. The other cross cultural model like Trompenaars & Turner (1997) was not applied in this study due to resource constraints.

This study shed some light on the practicality of cross cultural models in predicting product preferences of users. There is a big gap between cross cultural models like Hofstede and product design preferences among different nationalities. Researchers such as Cagiltay (1999), Lee (2001), Jhangiani (2006) and Marcus (2005) have tried to bridge the gap between cross cultural models and cross cultural product design preferences by using Hofstede's model in their studies. Apparently, the gap still exists due to the limitations existing in the work of previous researchers (Cagiltay (1999); Lee (2001); Jhangiani (2006); Marcus (2005)). There is insufficient proof that cross cultural models can indeed be applied to predict product design preferences for different nationalities. Until there is a convincing method for doing so, there is an acute need to find another approach in integrating cross cultural aspects in product design, specifically the car center stack.

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