Impact of Power Distance Cultural Dimension in E-Learning Interface Design among Malaysian Generation Z Students

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ABSTRACT Adapting the user’s cultural background to Interface Design (ID) can increase student engagement in e-learning. The cultural dimensions of Hofstede’s model have often been used as guidelines when adapting cultural interface design. As Malaysia’s power distance cultural dimension has a perfect full score based on Hofstede’s model, many interface developers tend to be guided solely based on the power distance cultural dimension. Therefore, this study aims to identify the impact of the power distance cultural dimension in e-learning interface design in Malaysia. A survey was conducted among generation Z students in public universities in Malaysia and collected 367 data. This study found that the power distance index of e-learning interface design by generation Z students in Malaysia scored 63, compared to the score from Hofstede’s study, which was scored 100. Generation Z students in Malaysia disagreed with using images of leaders and theme colour of institutions in e-learning. They prefer the image element related to students and learning. It was also found that students want the theme colours of e-learning are not the formal colours of the institution. However, they still want the official logo of the institution to be presented in the e-learning interface. Therefore, this study can help e-learning interface developers design a worthy interface for generation Z students which increases student engagement in e-learning.

INDEX TERMS Human-computer interface, Cross-cultural projects, Cultural and social implications

I. INTRODUCTION

Recently, education institutions have progressively emphasised e-learning opportunities to offer distribution of learning materials to all, especially in developing countries [1]. The number of users using e-learning platforms has exponentially increased. However, the effectiveness of e-learning solutions is still the main concern of many researchers [2], [3]. E-learning interface design is an important characteristic that needs to be improved to facilitate interaction between the system and users [4]. Designing an interface based on the user’s cultural background is essential to ensure the success of the e-learning system. Previous researchers stated that student engagement towards e-learning is still low and unsatisfactory [5] [6]. The poor look and feel of e-learning interface design cause the students are unconcerned about e-learning [7]. Various studies have shown that cultural adaptation in the interface design has positive feedback towards the acceptance and usability of system applications [8]. Research by a previous study stated that cultural interface design could better understand the system without misinterpreting the meaning of interface elements [9]. Besides, a well-designed interface could increase users’ satisfaction [10]. Previous researchers have agreed that culture could influence users’ preferences towards e-learning interface design [9] [11]. For instance, users from different cultural backgrounds react differently towards the interface design in accordance with their nationality, generation, state and religion [12].

Among the elements of the interface also known as cultural markers that affect the cultural differences are languages, colours, symbols, icons, layout, graphics, navigation, and typography [13], [14], [15]. For instance, colours have symbolic or hidden meanings for different cultures in various countries. For example, green is a preferred colour in Islamic countries and red is a preferred colour in China [16], [17]. Based on previous studies, interface design elements such as colour, graphic (including logo, symbol, and icon), typography, layout, navigation, and audio-video are frequently used in e-learning interface design [18], [19], [20], [21]. Thus, these six elements of interface design are reviewed extensively in this study. Besides that, these interface design elements could ensure the look and feel of the e-learning
interface are more appealing to its users, especially for generation Z students.

So far, various studies have been conducted to investigate the relationship between interface design and culture, more specifically in e-learning [2]. Meanwhile, numerous cultural models are developed to understand these cultural differences such as mentioned in several previous studies [22]. Besides that, cultural models can also help in identifying and designing the interface. Hofstede's cultural model is a well-known model used to explore different aspects of culture and interface design [23]. Hofstede's cultural model contains six dimensions where each cultural dimension impacts interface design and how interface elements such as images, colour, typography, icon, layout and metaphor must be considered when designing the interface [9], [14], [24]. There are many studies that explored users’ behaviour during e-learning using Hofstede's cultural model [25], [26], [27]. Hofstede's cultural dimensions have been extensively used in user interface of mobile health application [28], mobile [29], government websites [30] and e-commerce [31]. Meanwhile, there are some studies that employed Hofstede's cultural dimensions in designing user interface of e-learning. For example, Nordin et al. (2021) in [4] adapted Hofstede’s cultural dimensions when identifying the design characteristics of colour and graphic of e-learning interface for generation Z in Malaysia. During the literature review stage has suggested that Malaysian preferred national colours and the images of important people in the interface design. Those design characteristics implicates high power distance culture. However, further research revealed that Malaysian generation Z students preferred colours that unrelated with national colours and want image related to students. Besides, Baharum et. al (2017) in [20] also referred to Hofstede’s cultural dimension to determine the user’s expectation towards e-learning for Universiti Malaysia Sabah (UMS) and developed a new interface for e-learning based on their findings. They also conducted the evaluation on the new and existing interface and the results revealed that many students preferred the new interface design because the new design is simple, easier to navigate, convenient to students and user friendly. Generation Z students born between 1995 and 2010 have been shaped by the advancement of technology [32]. Their daily life involves gadgets such as laptops, smartphones, and the internet, including studying and playing games [33], [34]. Thus, adequate teaching-learning approaches and design strategies should be considered to support generation Z [35]. One of the most crucial actions to attract these new generation learners is to provide new teaching and learning methods by investing more in technological resources [36]. Because of their dependency on gadgets and the internet, they want a high-quality interface design, including e-learning [37]. However, less research on generation Z students’ preference towards e-learning interface design has been conducted. Nowadays, generation Z students are in universities [73], so developing e-learning interface design that suitable for generation Z is crucial in order for student to increase student engagement in e-learning. Therefore, this study discussed the preferences of the e-learning interface design of Malaysian generation Z students in terms of the power distance dimension only. Power distance scores by Hofstede has been reassessed based on generation Z students’ preferences of e-learning interface design.

This paper is organised as follow: Section 2 presents the literature review. Section 3 focuses on the research method. Section 4 provides results and discussions. Section 5 provides a conclusion, limitations and future works of the study.

II. LITERATURE REVIEW

A. HOFSTEDIE’S CULTURAL MODEL (HCM)

Identifying characteristics of interface design elements have become the subject of interest in cultural interface design. Dimensions of a specific cultural model must be considered to design an interface for a particular culture. The most popular culture and interface design model are Hofstede's Cultural Model (HCM). Hofstede has developed six dimensions to distinguish cultural dimensions, which are Power Distance (PDI), Masculinity (MAS), Individualism (IDV), Uncertainty Avoidance Index (UIA), Long Term Orientation (LTO) and Indulgence vs Restraint (IVR) [38]. Figure 1 shows the relationship between the e-learning interface design and the cultural dimension by Hofstede. This relationship is important to construct questionnaire items related to the culture, which will be discussed in the methodology section.

![Figure 1. Relationship between interface design elements and cultural dimensions based on previous research.](image)

Hofstede has conducted studies about culture’s values and behaviour, which covered almost every country, including Malaysia. Each country is evaluated with a score from 1 to 100 on each dimension, whereby the highest score represents the intended dimensions. Various studies have been done on how these dimensions can affect the interface design and numerous guidelines have been produced based on the result from Hofstede's study. Interface developers have widely used these guidelines for different countries and cultures, Hofstede's study in Malaysia has shown a perfect score of power distance dimensions which equals 100. Since Malaysia is a high power distance country, many interface developers tend to design the interface according to Hofstede's model's Power Distance Index (PDI) dimension [39]. In high power distance countries, authority plays an important role. So, numerous interface designs such as...
university websites use images of important people such as the vice-chancellor or monuments instead of images of students. Although Hofstede's study in Malaysia is almost 40 years old, various studies still rely on Hofstede's study to design the desired e-learning interface. However, the newer generation has different preferences towards e-learning interface design [4].

B. RELATED WORK
Hofstede's work still been referred by many researchers although the results are more than 40 years ago [40]. Eringa et al. (2015) in [41] conducted research aimed to validate Hofstede’s results by applying his approach on the student population from various countries. The results showed that power distance score have increase among Dutch, German and South African students but decrease among Chinese and Qatari students [41]. Alsswey and Al-Samarraie (2021) in [42] explored the role of particular cultural predilections in the user interface design of Arab users. Hofstede’s cultural dimensions were used and data were collected from 78 respondents. Results showed high satisfaction among Arab users when considering culture dimension in the user interface design. Alsswey. Al-Samarraie et al. (2021) in [29] investigated the possibility of combining Hofstede’s dimensions of Arabic culture for modelling mobile user interface. The findings of this research could use in mobile health application development and facilitate the preferences and needs of a group-sensitive user interface as differences observed between Mainland China and United States preferences. However, many researchers in various areas still wondering whether the results from Hofstede's study are acceptable in the new era especially for new generation.

1) HOFSTEDÉ’S STUDY IN MALAYSIA
Studies conducted by Hofstede have been around for a long time, leading to new dimensions in 1991 and 2011, namely long-term orientation and indulgence [38]. Hofstede's cultural model has always been referred to by previous researchers as a standard guideline when a cross-cultural study is involved in interface design. Besides that, Hofstede has conducted studies about culture in more than 60 countries, including Malaysia. Malaysia is a multiracial and multicultural country that consists of Malays, Chinese, Indians and other diverse minor ethnicities [44]. The diversity of cultures, religions, races and ethnicities is a significant characteristic of Malaysia. Figure 2 shows the result of Hofstede's study in Malaysia.

FIGURE 2. Result of Hofstede’s study in Malaysia

Based on Figure 2, power distance value in Malaysia has scored extremely high which is 100 and is the highest among other countries [45], [46]. Besides, previous research also states that majority websites in Malaysia are focussed on power distance solely [47]. Power distance is defined as the extent to which less powerful members of a society accept that power is distributed unequally [38]. High power distance is described as the extent to which society accepts social hierarchy and social inequalities such as power, status and wealth. Less powerful members of society should follow people with a higher position in the hierarchy [48]. Accepting inequality in a high-power distance culture is considered a norm.

Meanwhile, low power distance is described as social equality and everyone is stressed to show more power tolerance [49], [50], [51]. In high power distance cultures, the educational aspect is usually teacher-centred, whereby teachers must be respected inside or outside the classroom [51]. The relationship between teacher and student is formal, where students do not ask questions during class. In addition, students stay quiet if they disagree with their teacher. This is because students see the teacher as someone with power and must be respected [45], [52], [53].

Although power distance in Malaysia is the highest among other countries, limited studies are conducted on PDI in Malaysia. Different cultural dimensions are not considered as the index of these dimensions is similar to other countries where similar cultural values exist. In addition, findings from the countries which share common cultural values with Malaysia can also be adopted and further applied. Saudi Arabia and China also have high power distance value which is 80 and there are few studies regarding cultural interface design for Saudi Arabia [24], [54]. Research conducted by Alexander, Thompson and Murray in [24] regarding website design preference of Australian, Chinese and Saudi Arabian found that images of leaders were most popular in Saudi Arabian websites and followed by Chinese websites while images of people in daily life were popular in Australia websites. The use of leader images in the websites shows the high power distance culture in Saudi Arabia and China. Power distance can be detected in websites where most interface design characteristics in Malaysia are adapted to high power distance. Past researchers' interpretation of high power distance on interface design is strongly focused on authority. For example, many websites in Malaysia use images of people with authority, such as teachers, leaders or vice-chancellors, instead of images of
the students [47], [51], [24]. Moreover, certain websites also use images of the monument or official buildings of the institution reflected as high power distance. It is symbolic that Malaysians have a strong sense of national pride [47], [55]. Special titles such as Professor or Dr., which have been conferred on members of the organisation, have always been seen on the websites to be effectively addressed and shown respect by others [56], [57]. Usually, an organisation chart that clearly describes and emphasises the hierarchy level can also be found on the websites so that people can understand the basic structure of the institutional hierarchy. Logo, symbol, official stamp and certification, awards and prizes that show the greatness of organisations can be found on the website's interface as well [56], [57].

Interface design with high power distance uses black or white as the background colour. The black and white background focused on the institutional name and image used in the interface [55], [17]. Other than that, interface with high power distance uses institutional corporate colour or national flag colour as their theme colour for the website [58]. Table 1 summarises the previous studies of high-power distance towards interface design.

III. METHODOLOGY

The study aimed to identify the characteristics of interface design that are suitable for generation Z in Malaysia. In addition, it also questioned the validity of Hofstede's study in accordance with generation Z preferences towards e-learning interface design in Malaysia. The research methodology employed in this study is illustrated in Figure 3.

A. PHASE 1: DEVELOPMENT OF THE QUESTIONNAIRE

After studying every questionnaire item from the previous studies, a set of questionnaire items was developed to achieve the survey's proposed objectives. In this study, the questionnaire was developed by adopting items from the Value Survey Module 2013 (VSM2013). VSM2013 is an updated module that includes new dimensions of Hofstede’s cultural model. VSM2013 is an advancement from the older module VSM82 (4 dimensions) and VSM94 (5 dimensions) [59]. VSM2013 was designed by Geert Hofstede and used by previous studies to develop questionnaire items related to cultural based research. VSM2013 consists of 24 items related to six dimensions of Hofstede's cultural model. Four items of VSM2013 represent each dimension. In this study, 9 of the 48 proposed questions were mapped the interface design element that related to power distance dimension. Table 2 shows the proposed questionnaire items representing the dimension of power distance adapted from VSM2013 before being validated by experts.

TABLE 2. Proposed questionnaire items that represent the power distance dimension before expert validation.

| Code No. | VSM2013 | Proposed Questionnaire Items | Element of ID |
|----------|---------|------------------------------|--------------|
| 02       | VSM2013 | I am comfortable with the theme colour of e-learning which doesn't represent the institution. | Colour       |
| 07       | VSM2013 | I like unstructured layout compared to the structural layout. | Layout       |
| 20       | VSM2013 | I still using e-learning although I am disturbed with the theme colour of e-learning. I still using e-learning even though the graphic is not clear and does not have meaning. | Colour, Graphic |
| 23       | VSM2013 | I like to see different colours on a different page in e-learning. I can tolerate different graphics on different pages in e-learning. I like many choices in e-learning. | Colour, Graphic, Navigation |
B. PHASE 2: PILOT STUDY (EXPERT VALIDATION AND RELIABILITY TEST)

After constructing questionnaire items by adapting VSM2013, the questionnaire was reviewed and validated by two experts in culture and interface design before it could be used in the proposed survey. Expert validation is a crucial step in the pilot study. The chosen experts are academicians, and they have experience of more than 10 years in culture and interface design. In this study, the experts validated 48 proposed questions that were adapted with VSM2013 and they agreed with all 9 items under the power distance dimension. However, they changed an item that was proposed under the indulgence vs restraint (IVR) dimension to the power distance dimension, as shown in Table 3.

TABLE 3. Correction proposed by experts

| Elements of ID | Proposed Questionnaire Items | Proposed VSM2013 (Dimension) | Corrected by Experts (Dimension) |
|---------------|------------------------------|-----------------------------|----------------------------------|
| Layout        | I can tolerate with a consistent and familiar layout. | Do other people or circumstances ever prevent you from doing what you want to? (IVR) | Have a boss (direct superior) can you respect. (PDI) [02] |

Overall, 10 questionnaire items are related to the PDI dimension. After expert validation, a pilot study for a reliability test was conducted. A reliability test was conducted to identify weaknesses in the instrument and research procedure before the actual survey. Besides that, a reliability test was also done to make sure all questionnaire items were free from any errors [60]. For the pilot study, 50 questionnaires were distributed and only 35 were returned. Purposive sampling was used to select the respondents for the pilot study. Besides that, these respondents are generation Z students and have experience using the e-learning platform. This pilot study also focused on each respondent’s duration to answer the survey and revised all items and instructions so that students could understand the questions or statements in this survey. Table 4 shows the reliability test results which was collected during the pilot study.

TABLE 4. Sample size of pilot study

| Questionnaire | Pilot study |
|---------------|-------------|
| Sample size   |             |
| Distributed   | 50          |
| Returned      | 35          |
| Returned (Online) | -         |
| Valid         | 32          |
| Cronbach’s Alpha (reliability) | 0.932 |

Based on Table 4, only 32 feedbacks were valid to be used for the reliability test. The past research recommended 10 to 50 respondents in pilot study for questionnaire instrument [17], [61]. The respondents were asked to rate each questionnaire item on a 5-point Likert scale which indicates 1 (strongly disagree), 2 (disagree), 3 (somewhat agree), 4 (agree) and 5 (strongly agree). The overall Cronbach’s alpha value for questionnaire items was 0.932, which indicates the reliability of the questionnaire was at an acceptable level. The value of Cronbach’s alpha between 0.70 and 0.95 is considered reliable. In contrast, the lower value suggests a low number of questions or poor correlations between items and the higher value indicates that some items are redundant [62].

In addition, Pearson correlation was conducted to confirm the validity of the questionnaire. Pearson correlation is a common method for assessing validity of the questionnaire instrument [63]. The simple way to confirm the validity of each item was by comparing the obtained value from the research with the critical value from the Pearson correlation table. Suppose the obtained value is higher than the critical value, so the question is significant and valid. Below is the simple formula to calculate the Pearson correlation for each questionnaire item.

\[
N = \text{sample size}
\]

\[
\text{Degree of freedom (df)} = N - 2
\]

Based on Table 4, only 32 feedbacks were valid, so the sample size (N) to calculate Pearson correlation was 32 and the degree of freedom was 30. The correlation significant for this study is 0.01. Figure 4 shows the results of the Pearson correlation test for power distance questionnaire items.

FIGURE 4. Pearson correlation of pilot study for power distance dimension.

From Figure 4, only the total value is needed to compare with the critical value. For example, obtained value for questionnaire item W1 is .522. and Figure 5 shows the critical value of the Pearson correlation table.

FIGURE 5. Pearson correlation table.

From Figure 5, the critical value at 30 df and correlation significant at 0.01 is 0.448. Questionnaire item W1’s obtained value is higher than the critical value, so the validity of questionnaire was supported.
C. PHASE 3: SURVEY
There were two methods in this study that have been used to distribute the questionnaire. The first method was employed by posting the online link of Google Form via e-mail, Whatsapp and Facebook. The second method was using a questionnaire form. 500 questionnaire forms were distributed among generation Z students at Higher Educational Institutions in Malaysia and only 298 feedbacks of questionnaire form and 88 online responses were received. Overall, 386 respondents participated in this survey. Based on Krejcie & Morgan [64], a sample size of 384 is recommended for a population size of more than 100,000. So, 386 feedbacks are acceptable for this study. The next section describes the discussion on the results, particularly focusing on the power distance dimension.

IV. RESULTS AND DISCUSSION
The survey data were analysed to obtain interface design features for generation Z students in Malaysia. Besides that, data from the survey were used to verify if the generation Z student's choice towards interface design features is still consistent with Hofstede's study. Thus, this study will also compare the PDI dimension from the survey with Hofstede's study in Malaysia.

A. DEMOGRAPHIC DATA OF RESPONDENTS
The respondents for this research are generation Z students at higher learning institutions, including universities and colleges. Table 5 shows the demographic data of respondents.

| TABLE 5. Demographic of respondents |
|-----------------|--------|-----------------|
| **Demographic** | **Frequency** | **Percentage (%)** |
| Race            |        |                 |
| Malaysian-Malay | 342    | 93.2            |
| Malaysian-Chinese | 6     | 1.6             |
| Malaysian-Indian | 6     | 1.6             |
| Malaysian-Others | 13    | 3.5             |
| Gender          |        |                 |
| Male            | 145    | 39.5            |
| Female          | 222    | 60.5            |
| Higher Education Providers | | |
| University     | 207    | 56.4            |
| College        | 160    | 43.6            |
| Year of birth  |        |                 |
| 1995           | 66     | 18.0            |
| 1996           | 106    | 28.9            |
| 1997           | 26     | 7.1             |
| 1998           | 32     | 8.7             |
| 1999           | 137    | 37.3            |

From table 5, this survey involved 367 respondents, of which 145 (39.5%) are male and 222 (60.5%) are female and the majority of the respondents are Malay (93.2%). All respondents are generation Z students born from 1995 till 1999 and pursuing tertiary education in Malaysia.

B. DESCRIPTIVE ANALYSIS OF POWER DISTANCE DIMENSION IN E-LEARNING INTERFACE DESIGN
This section aims to analyse the features of e-learning interface design based on the preference of generation Z students in Malaysia for the power distance dimension. Past studies have mentioned that people from the same culture or country share particular features, including interface design preference [48]. Thus, such analysis would identify the features of interface design elements for generation Z students in Malaysia and specifically for the power distance dimension. Table 6 shows the Mean (m) and Std. Deviation (sd) values of generation Z students' preferences in e-learning interface design features for the power distance dimension.

| TABLE 6. The result from the survey for power distance dimension. |
|-----------------|-----------------|-----------------|
| **Elements**    | **Questionnaire Items (Power Distance Dimension)** | **Mean (m)** | **Std. Deviation (sd)** |
| Colour          | [02] I am comfortable with the theme color of e-learning which does not represent the institution. | 3.21 | 0.940 |
|                 | [W1]            |                 |                 |
|                 | [20] I am still using e-learning although I am disturbed with the theme color of e-learning. | 3.11 | 0.916 |
|                 | [W2]            |                 |                 |
|                 | [23] I like to see different colors on a different page in e-learning. | 3.68 | 0.974 |
|                 | [W3]            |                 |                 |
| Graphic         | [02] I like the image of students in e-learning compared to the image of a high ranking person in the institutions. | 3.66 | 0.935 |
|                 | [G1]            |                 |                 |
|                 | [23] I can tolerate different graphics on different pages in e-learning. | 3.60 | 0.765 |
|                 | [G2]            |                 |                 |
|                 | [20] I am still using e-learning even though the graphic is not clear and does not have meaning. | 2.75 | 0.999 |
|                 | [G3]            |                 |                 |
|                 | [02] University official logo must be placed on the main page of e-learning. | 3.75 | 0.922 |
|                 | [G4]            |                 |                 |
| Layout          | [07] I like unstructured layout compared to the structural layout. | 3.08 | 1.064 |
|                 | [L1]            |                 |                 |
|                 | [02] I can tolerate with the consistent and familiar layout. | 3.75 | 0.860 |
|                 | [L4]            |                 |                 |
| Navigation      | [23] I like many choices in e-learning. | 3.77 | 0.871 |
|                 | [N1]            |                 |                 |

Table 6 shows that most respondents somewhat agreed with using a theme colour that does not represent the institutions (m=3.21, sd=0.940). Most learning institutions in Malaysia use national colours as formal colours, including e-learning [65]. However, generation Z students are comfortable with the e-learning that does not use the formal institution colour. These changes show that low power distance culture among generation Z students is more independent and detached from the country's cultural thinking. Besides, most respondents somewhat agreed with using e-learning, although they feel disturbed with the theme colour in the e-learning interface (m=3.11, sd=0.916). This indicates a high power distance culture among generation Z students for being willing to use e-learning despite being less comfortable with the theme colours [66]. However, the majority of the respondents agreed with seeing different colours on different pages in e-learning (m=3.68, sd=0.974). Using a
different colour for different pages is against the conventional design principle, namely consistency. However, past studies have stated that using different colours in e-learning can improve memorisation, including remembering information location and layout of the interface design [67], [68]. These changes reveal that generation Z students feel more independent and do not fully bond with the thought of a unified national culture.

Graphic is always in the spotlight while designing an e-learning interface design. Most respondents agreed that images related to students and learning should be used in the e-learning interface design (m=3.66, sd=0.935). Past studies have stated that the interface design in Malaysia tends to use an image of a leader or high ranking person because it shows the culture of high power distance [47], [51]. However, these results show that generation Z students prefer their images, indicating low power distance culture. For the official logo on the main page of e-learning, most respondents agreed that the official logo must be shown on the main page (m=3.75, sd=0.922), indicating the high power distance culture. The respondents agreed to maintain the official logo on the main e-learning page because it represents the identity of the institution [50]. The majority of the respondents also agreed to see different graphics on different pages on the e-learning interface (m=3.60, sd=0.765). Many of the respondents agreed that different graphics are used on each page of e-learning because graphics can be translated into various forms such as symbols, logos and images. Previous research stated that high power distance countries are more focused on the quality of information and limited graphic use [66]. However, these results showed that generation Z students wanted different graphics on different pages of e-learning and it is contrary to the high power distance culture. In addition, generation Z students disagreed with tolerating e-learning if the graphic is unclear and meaningless (m=2.75, sd=0.999). This outcome contrasts the previous research that stated that Malaysians could tolerate ambiguity and uncertainty [48]. Generation Z students are reluctant to accept meaningless and blurry graphics because it can be tiring for students to think about the function of the graphic. Graphics should be designed not to tire out the user, such as using simple, clear graphics and have meaning [69].

The layout is one of the important elements in e-learning interface design because users always pay attention to a certain layout design while using e-learning. Layout involves the position of interface elements such as graphics, logo, audio, and video. Based on Table 6, the majority of respondents somewhat agreed with an unstructured layout compared to a structured layout (m=3.08, sd=1.064). The unstructured layout refers to the content arrangement in the e-learning interface design that is disorganised and freer, indicating low power distance [66], [14]. These results contradict the previous research because structured layouts are preferred in high power distance culture with only minimum information at the first level and the information hierarchy is deeper [14].

However, generation Z agreed with the consistent and familiar layout (m=3.75, sd=0.860). Consistency and familiarity are interface design principles that are continuously being applied in the e-learning system. Generation Z students prefer to have many navigation choices in e-learning interface design (m=3.77, sd=0.871). Previous studies have shown that Malaysia is a high power distance country where interface design with limited options and navigations is common among Malaysians [70]. However, this result indicates a low power distance culture where students can access all the options offered in e-learning without any restrictions, which contradicts the past research. Generation Z students want many choices in navigation as it gives them more freedom when exploring e-learning. Many options in e-learning can offer more benefits and functions to the students.

C. ANALYSIS OF POWER DISTANCE DIMENSIONS FOR GENERATION Z IN MALAYSIA

Hofstede has conducted his study in more than 60 countries, including Malaysia. Based on Hofstede's study, Malaysia is a high-power distance country with a perfect score of 100. Besides that, past studies have stated that the power distance dimension directed the interface design of websites or systems in Malaysia solely. This is because power distance is usable in explaining cultural differences without involving other cultural dimensions and power distance is an accessible dimension to see and differentiate [71]. Because of Hofstede's study in Malaysia was a long time ago and culture change from time to time then power distance index needs to be calculated again in order to know either power distance value by Hofstede is suitable or not for the newest generation.

The cultural index is calculated based on the formula developed by Hofstede. Every dimension has a different formula. Below is the formula to calculate the power distance index.

\[
PDI = 35(m07 - m02) + 25(m20 - m23) + C(pd)\]

where,
\[
m02 = \text{mean score for question number 02.}\]
\[
m07 = \text{mean score for question number 07.}\]
\[
m20 = \text{mean score for question number 20.}\]
\[
m23 = \text{mean score for question number 23.}\]
\[
C(PD) = \text{constant no. (can be chosen to shift PDI score to a value between 0 and 100).}\]

Question numbers from the formula were derived from VSM2013 and the result from each number of questions from the survey has been discussed in Table 6. Besides that, the constant number that has been chosen for this study was 100. The PDI dimension among generation Z students in Malaysia toward e-learning interface design is:

\[
PDI = 35(m07 - m02) + 25(m20 - m23) + C(pd)
= 35(3.08 - ((3.21+3.66+3.75+3.75)/4)) + 25
= (3.11+2.75)/2 - (3.68+3.60+3.77)/3 + 100
= 63.4
\]
The power distance index of e-learning interface design by generation Z students in Malaysia only scored at 63, compared to the score from Hofstede's study, which was 100. The power distance score has decreased from 100 to 63 after more than 40 years of Hofstede’s analysis. A few types of research were conducted that replicate Hofstede’s research to know whether Hofstede’s score is still relevant at this time. The study conducted by [41] on international students from Netherland, Germany, China, South Africa and Qatar found many differences with Hofstede’s original score. The differences are expected based on the new surrounding of the research, context and time [41]. This study’s power distance score is low compared to Hofstede’s original score due to generational or time effects [40]. Therefore, to use Hofstede’s scores to develop the interface design, especially for generation Z, is irrelevant. This is because Hofstede’s original score is obsolete to these new generations either in Malaysia or other countries.

V. CONCLUSION
User interface design has gained a lot of attention in all fields [74,75,76], including e-learning. This study aimed to reveal whether power distance of Hofstede’s score in Malaysia is relevant among generation Z students to developing the e-learning interface design. A survey was conducted among generation Z students to investigate their preferences towards e-learning interface design. The finding obtained from this research highlight that the power distance score is lower among generation Z in Malaysia compared to Hofstede’s study. The newly discovered score needs to be referred when developing an e-learning interface design for generation Z due to the changes in preferences. Past research stated that image of the leaders and colour that represent the countries or institutions are preferred in high power distance countries [47], [24]. However, generation Z students in Malaysia disagreed to use images of leaders and theme colour of institution in e-learning. They prefer the image element should be related to students and learning. They also want the theme colours of e-learning are not the formal colours of institution. However, they still want the official logo of institution to be presented in the e-learning interface. Prioritising the user’s preference for the interface design could increase student engagement towards e-learning and a positive learning experience. This study also involves improving knowledge on interface design based on user cultural background, which involves the details of generation Z preferences towards e-learning interface design. As generation Z is a technology generation [77], these details could help e-learning developers to develop more accurate interface designs based on generation Z preferences. This study also contributes to improving the existing model where previous research focused on one dimension only without taking into account the cultural background of target users. In addition, other researchers can also utilise this study as a reference in conducting further studies related to the culture or preferences of target users towards interface design either for e-learning or any other systems.

VI. LIMITATION AND FUTURE STUDY

This study discovers the latest power distance score and the interface design preferences among generation Z in Malaysia. Some limitations occur during this study. Firstly, previous research has often highlighted the perfect score of power distance culture in Malaysia and how interfaces should be designed in high power distance culture, causing this research only to focus on the power distance dimension. This study concentrated on the power distance dimension solely and neglected the other dimensions. Thus, all cultural dimensions should be reviewed equally and examine which dimension impacts generation Z students most.

Secondly, only four interface design elements covered power distance dimensions, namely colour, graphic, layout, and navigation. Moreover, the characteristics of each element were only briefly described. Therefore, more interface design elements for the power distance dimension should be reviewed in the future. Besides, the characteristics of each element corresponding to the cultural dimensions need to be investigated in more depth to ensure the design quality of the e-learning interface.

Finally, the study only focused on generation Z in public universities in Malaysia, which may not be illustrative of the overall population of generation Z. The application of e-learning platforms in public and private universities is different whereby e-learning is more successful in private universities [34]. Future studies are proposed to focus on private educational institutions and review the results obtained from this study to strengthen the interface design for generation Z students in Malaysia.

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VOLUME XX, 2017
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