Cultural Aspects for the User Interface Design of Health and Fitness Apps

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ABSTRACT

Cultures influence preferences towards user interface (UI) which prompted the emergence of the culture-based UI design approach. Hofstede's cross-cultural theory identified Hong Kong as having a unique culture orientation in comparison to western countries or mainland China. This study aimed to investigate Hong Kongese preference on the UI of health and fitness apps. Three human factors experts systematically analysed two comparable apps designed by mainland Chinese and Western companies. The results were then used to guide an online survey (n=103) exploring the preferences of Hong Kongese. The systematic analysis showed that UI differences observed between the two apps corresponded well with cultural dimension differences between the United States and Mainland China; suggesting an unmet need for culturally sensitive UI. The online survey showed that UI preferences are also significantly affected by age and gender ($p < 0.05$); suggesting the culture-based UI design approach alone was insufficient to guide UI design.

KEYWORDS

health and fitness apps, user interface design, culture

Introduction

In the year of Covid-19, the shockingly high number of deaths and illness aroused people's awareness of health and fitness. The data from MoEngage (2020) shows that between Q1 and Q2 2020, health and fitness app downloads increased by 45.66% worldwide. Using health and fitness apps for home exercise reflects that people are actively coping with the lockdown challenges. This study was completed before the outbreak of Covid-19 pandemic. However, we hope it will help to improve human wellbeing in the New Normal.

The user interface (UI) design should not only consider the needs of the user and the tasks they need to accomplish, but also recognise the value of the user's cultural context (Shen et al., 2006). Many studies have investigated implication of cultural dimensions on websites design e.g. Calabrese et al., 2012; Lachner et al., 2018. However, none of the existing studies specifically addresses the implications of cultural dimensions on the UI design of health and fitness apps. Although there are studies that fall within the remit of smartphones, their focus is neither on the smartphones' design of UI e.g. Walsh et al., 2010; Shin and Choo, 2012 nor for a specific app e.g. Kim and Lee, 2005. Thus, we aim to fill this gap by identifying aspects of UI design and exploring preferences on health and fitness apps.

Hong Kongese are quintessentially Chinese but share a way of life, core values and an outlook which resembles more of the average New Yorkers or Londoners than those in Mainland China (Tsang, 2005). According to Hofstede's cross-cultural theory (Hofstede Insights, 2018), Hong Kong is identified as having a unique culture value orientation that is not identical with any of other countries. Unfortunately, many iOS smartphone applications, including health and fitness apps, that are widely

used in Hong Kong are designed and released by western countries or Mainland China and not localized. We decided to use Hong Kong as a case study to investigate Hong Kongese preference on the UI of health and fitness apps.

Definition and models of culture

Hofstede's model showed that national culture consisted of six consistent and fundamental cultural dimensions: power distance index (PDI), individualism index (IDV), masculinity index (MAS), uncertainty avoidance index (UAI), orientation index (LTO), and indulgence index (IND) (Hofstede, 2010). The scores for Hofstede's six cultural dimensions of Hong Kong, Mainland China and the United States (Hofstede Insights, 2018) shows that the profile of scores for Hong Kong are very different to those for Mainland China or the United States.

Hall's cultural dimension (1990) is independent of Hofstede's model. He examined a cultural dimension based on the way of culture acting in communication and identified cultures with small range of context and cultures with high range of context. Several studies have identified Hong Kongese to possess high-context culture (Würtz, 2006).

Culture and user centred design

Marcus and Gould (2000) incorporated Hofstede's model and developed a theory which provided connections between common elements of website UI and cultural dimensions. Würtz (2006) used Hall's high and low context dimensions to investigate the differences in communication patterns between high and low context cultures in website UI.

Upon identifying similarity of the approach and findings between Würtz (2006) and Marcus and Gould (2000), Calabrese et al. (2012) integrated these two frequently adopted models of culture. For each dimension of culture, they grouped the trends observed on common elements of websites into five categories including: 1) value promotion which indicates the culture values and can be found in the web images, sounds and video, 2) structure which is shown by the layout and the way data and menu are organised, 3) navigation which refers to the easiness or complexity of navigating through a website, 4) interaction which indicates the level of involvement of the users in interacting with a website, and 5) appearance which reflects the choices on images, colours and graphics of a website.

Since similar findings for UI design of smartphone apps was not yet available, we decided to use the model table created by Calabrese et al. (2012) to compare and identify differences on UI design of health and fitness apps which are developed by American and Mainland Chinese companies.

Methodology

This study followed a three-stage methodology. This was an incremental process and the stages were connected to each other, which meant that the information of previous stages was considered and used as the bases for further developments. Data were collected using a mixed-method approach – evaluation of UI design involving human factors (HF) experts and online survey, which were previously approved by the ethics committee of the host university.

Evaluation of two popular freely available apps by human factors experts

The first study was an empirical study to identify and compare the differences on the UI design of two freely available health and fitness apps. The first 20 ranked apps under the category of 'Health & Fitness' of the iTunes Apple Store in Hong Kong on 20 July 2018 (SimilarWeb, 2018) were used to narrow down the apps' selection. For each app, we then identified the following: the companies that develop the apps, the target users, whether the app can be used independently without an additional instrument (e.g., fitness tracker) and the key functions of the app. We ultimately identified two comparable apps – 'Keep – 自由市场' (version 5.18.0) and 'Nike Training Club' (version

5.14.0). Both apps provided similar key functions, targeted adult female and male users, and were usable independently. Keep was in simplified Chinese and developed by Beijing Calorie Technology Co., Ltd. Nike Training Club was an English app and developed by Nike, Inc. in the US.

Three Hong Kongese human factors experts examined the two apps individually and identified cross-culture differences of two apps by using the table created by Calabrese et al. (2012). The experts were requested to complete the same tasks on each app to ensure that they had a similar level of exploration. The tasks were as follows: registering as a user, designing a personal training plan, viewing all of the workout courses available, looking for a beginner-level and non-equipment-based abdomen training course from all the workouts, completing one abdomen training course selected and identifying the channels to interact with other users. Upon completing the tasks, the experts wrote down their observations and identified differences (if any) for each cultural dimension and category as shown in the table created by Calabrese et al. (2012). The notes from the experts were then compared and analysed qualitatively. Similarities and differences of observation between the experts were noted.

Online Survey

The second study was an online survey on cross-culture Design Features of Health & Fitness Smartphone Apps. This study was guided by the findings from the first study. A pilot study was conducted, and questions were modified based on the outcome of the pilot study. Survey questions were written in both English and Traditional Chinese and targeted to Hong Kong permanent residents. The survey contained a total of 22 questions and estimated to take less than 20 minutes to complete. For non-demographical questions (question no. 9- no. 22, see Table 1 below), a Chi-Square Test was used to identify if age (< 45 years old and ≥ 45 years old) or gender is significantly associated with the aspect being queried.

Table 1: Survey questions

Q9	I would like to share my personal information with the app developer to set an effective training plan and gain accurate training results	Q16	It is acceptable for an App to use horizontal scrolling menus
Q10	It is important for me to understand how my data would be used by the App developer	Q17	Animation would make the App content more vivid
Q11	I would like to share my exercise routines and results with my friends in the App	Q18	Which kind of setup wizard do you prefer? A detailed setup wizard; A simple setup wizard; No preference
Q12	I would like to share my exercise routines and results with any other users (the public)	Q19	If there is an instructor to guide you through an exercise, which style do you prefer? Very authoritative; Authoritative; Neutral; Friendly; Very friendly
Q13	I am motivated to do more exercise if I see other users achieved exercise progress	Q20	How do you prefer the App to encourage you to achieve better training results and continue your exercise routine? Reward after each exercise; Reward after achieving stage goals are achieved; No preference
Q14	I would like to share my personal information with the app developer to set an effective training plan & gain accurate training results	Q21	Which kind of user menu do you prefer? Concise structure; Complex structure; No preference
Q15	It is important that the App has consistent design for its user menus	Q22	Which App colour theme do you prefer? Simple &low-profile; Diversified and cheerful; No preference

Results

Evaluation of two popular freely available apps by human factors experts

Although the evaluation of the apps was conducted individually by each HF expert, the analysis of their notes revealed that there was a large agreement on their findings. Analysis of the findings revealed that UI differences observed between the two apps corresponded well with cultural dimension differences between the United States and Mainland China (see Table 1). The UI of Nike Training Club reflected the United States cultural profiles i.e. high level of individualism, low power

distance, short-term orientation and higher level of uncertainty avoidance. Likewise, the UI of Keep reflected Mainland China cultural profiles i.e. low level of individualism, high power distance, long-term orientation and lower level of uncertainty avoidance.

Table 2 provides a summary of the evaluation results of the two apps. As it has been mentioned in the methodology section, the evaluation results were then used to explore further preferences of Hong Kongese on the UI designs by means of an online survey.

Table 2: Summary of UI design between Keep and Nike Training Club

Cultural aspects	Keep	Nike Training Club
Individualism Index	Integrate social communication function in all the modules & services; expect that users are willing to share private information	Provide social communication function in designated module; treat User privacy with more caution
Power Distance Index	Use instructive voice prompt for training guidance	Use less authoritative voice prompt for training guidance
Masculinity Index	Promote competition among users	Focus on individual performance
Orientation Index	Use long setup wizard in the registration Reward users for completion of each exercise	Use short setup wizard in the registration Reward users when goals are achieved
Uncertainty Avoidance Index	Use inconsistent & complex menus and data structure; adopt both vertical & horizontal scrolling menus; use large amount of animation	Use consistent & simple menus and data structure; rely heavily on the vertical scrolling menus; use limited animation
Low vs High Context	Use diversified & cheerful colour scheme Use inconsistent & complex menus and data structure; adopt both vertical & horizontal scrolling menus; use Large amount of animation	Use simple & muted colour theme Use consistent & simple menus and data structure; rely heavily on the vertical scrolling list; use limited animation

Survey

A total of 103 responses was received. 43 and 60 respondents were males and females, respectively. Only 10% of respondents exercised more than three times per week. Most of the respondents (68%) exercised once per week or less than once per week. Only 40% of participants have used a health and fitness app. Using English or Traditional Chinese while using the apps were equally supported by the participants. About 10% of the participants did not have preferences in terms of the language.

Prior to analysing the survey responses, statistical test related to validity and reliability of the questionnaire were conducted using SPSS. The test was only conducted on Q9 to Q17 as they were scale questions. Pearson Product Moment Correlation showed that the 9 questions correlated significantly with each other. This correlation shows a good construct validity for the instrument with respect to Hong Kongese preference on UI design for health and fitness apps. The online survey was also found to be highly reliable (9 items; $\alpha = .814$).

Aspects of UI design related to IDV were explored in Q 9 to Q 13. The survey results showed that 50% of participants were willing to share personal information (including height, weight, exercise routines and date of birth) with the app developer in order to set an effective physical training (Q 9). Furthermore, 90% of respondents believed in the importance of understanding the need for the app to access personal data (Q 10). The survey revealed that only 34% of respondents did not agree to share individual exercise routines and results with friends in the app (Q 11), but 56% of the

participants were not willingness to share exercise routines and results with the public in the app (Q12). Age and sharing preferences with public were found to have significant relation, X^2 (2, N = 103) = 7.53, p <0.05. Those aged less than 45 were more likely to be reluctant to share with the public compared to those older than 45. Finally, only about 27% of respondents reported that they were not motivated to do more exercise if they saw other user's exercise achievement or progress (Q 13).

An aspect of UI design related to PDI was explored in Q 19. The survey revealed that about 52% respondents preferred friendly exercise coaching style. Interestingly, gender and preference of coaching style were found to have significant relation, X^2 (2, N = 103) = 9.14, p <0.05. Females were more likely to prefer the friendly / very friendly exercise coaching style compared to males. While there was a trend that authoritative coaching style became less acceptable for older respondents, the relation between age and exercise coaching style preference was not found to be significant.

An aspect of UI design related to MAS was explored in Q 14. Only about 36% of respondents were motivated to do more exercise or achieve better training results if they were in a competition with other users. About 42% of male participants were responded that they were motivated through competition. However, despite this trend, neither age nor gender was found to have significant association with increased motivation to exercise through competition.

Aspects of UI design related to LTO were explored in Q 18 and Q 20. About 48% of participants preferred a simple setup wizard which allowed a quick start in using the app even if this gave them less effective training plan and less accurate training results (Q18). About 53% of female participants revealed that they would like to get reward each time exercise was completed and when stage goals were achieved (Q 20). In contrast, male participants were more supportive towards the idea of getting rewarded only when stage goals were achieved. A Chi-square test of independence further revealed that gender had significant relation with preference of reward style, X^2 (2, N = 103) = 8.67, p <0.05.

Aspects of UI design related to UAI was explored in Q 15 to Q 17, and Q21. About 73% of participants preferred consistent design of app menus (Q15). Moreover, participants had positive attitude to horizontal scrolling menus (Q16). About 67% of participants agreed that animations would make the app content more vivid (Q17). The survey also revealed that most participants (76%) liked to use concise menu structure with limited choices (Q21).

Aspects of UI design related to the cultural dimension of high vs low context was explored in Q 15 to Q 17, Q 21, and Q 22. As indicated in Table 2, there was some overlapping of UI design elated to cultural dimensions of tolerance vs avoidance of uncertainty and high vs low context. Consequently, survey questions that explored cultural value of tolerance vs avoidance of uncertainty (Q 15 to Q 17, and Q21) were also relevant for the cultural dimension of high vs low context. Simple & low-profile colour theme and diversified & cheerful colour theme were equally supported by participants (Q 22).

The survey results were also re-analysed by excluding data from participants (N = 40) with no experience in using health and fitness apps. Only the relation between gender and preference of exercise coaching style showed significant difference, X^2 (2, N = 40) = 11.46, p <0.01; with females preferred friendly coaching style than males. The relation between age and sharing preferences with the public was not re-analysed as all the participants in this group were less than 45 years old.

Design recommendations

Based on the results of the online survey, the following recommendations are provided to enable designing health and fitness smartphone apps that suit Hong Kong users:

1. Use friendly tone for exercise coaching style, especially if the app targets female and older users. The survey revealed that about 52% respondents preferred exercise coaching style with a friendly tone. The survey also revealed that gender and preference of coaching style

was found to have significant relation, with females were more likely to prefer friendly exercise coaching style compared to males. This result did not fully reflect Hong Kong's PDI value (=68) which suggested that Hong Kongese were more receptive towards superior-subordinate hierarchy and authority. However, academic research has reported that females were, overall, more expressive, tentative, and polite in conversation, while men were more assertive (Basow and Rubenfield, 2003). Thus, the contradictory result between Hong Kong's PDI value and preference for exercise coaching was likely caused by a larger number of female respondents than male respondents in this survey.

2. Respect and protect the user's privacy. The survey revealed that 71% of respondents agreed that it was important to understand how their data would be used by the app developer. Furthermore, the survey also revealed that age and sharing preferences with public on exercise routines/results were significantly related, with those aged less than 45 were more likely reluctant to share with public. These outcomes showed that, despite having low IDV culture, Hong Kongese had some privacy concerns. The negative association between information privacy concern and IDV was in agreement with the majority of cross-cultural research, which generally found that people from low IDV culture were less comfortable with higher levels of disclosure of private information e.g. Bellman et al., 2010.
3. Use animations as appropriate and horizontal scrolling menu if it helps with the presentation of the apps. The survey revealed that only 2% of respondents viewed horizontal scrolling bar as unacceptable. This result indicated that Hong Kongese were willing to try new and different technologies and more tolerable towards chaos and ambiguity which reflected Hong Kong's UAI value (=29). The survey also revealed that 67% of respondents agreed that animation would make content more vivid. The survey results reflected Hong Kongese high-context culture which have been shown to influence preference towards animation.
4. Design consistent and concise user menus. The survey revealed that 77% of respondents preferred consistent and concise user menu, despite that low UAI culture generally emphasized the maximal content and choices and accepted the possibility that users would wander around and try different routes to navigate (Marcus and Gould, 2000). Research has suggested that consistent and simple navigation options allowed users to quickly acquire the information and have significant influence on user behaviours (Holsapple and Sasidharan, 2005; Lee and Kozar, 2012).
5. Provide options to rewards the users. The survey revealed that gender had significant relation with preference of reward style with female participants wanting to get more frequent rewards (each time exercise was completed and when stage goals were achieved) than male participants (only when stage goals were achieved). An app that provides frequent rewards represent high LTO as it values practices and milestones towards achieving results. On the other hand, an app that offers infrequent reward represented low LTO as it encouraged the desire for immediate results of goals. The significant difference in preference between male and female respondents was in line with the finding from AlAnezi and Alansari (2016) which showed that females had a significantly higher score of LTO than males.

Discussions

As part of the study, we conducted evaluation that involved three HF experts to identify differences in UI design of two comparable, popular and commercially available iOS apps designed by Mainland Chinese and Western companies. No fundamental differences were observed among the findings of the human factors experts even though the evaluation of the apps was conducted individually. This suggested that the table created by Calabrese et al. (2012) was indeed well-defined and interpreted more or less the same by the human factors experts. Furthermore, the results also provided an early indication of the suitability of Calabrese's et al. (2012) table to support evaluating the implications

of cultural dimensions on the UI design of smartphone applications. While we did not go further to support this conjecture, a further study could be done to establish whether this is indeed the case.

A trend that emerged from the study was the relationship between age and gender on preferences of UI design even within the same culture. Studies have found significant differences in how men and women differed in UI design preferences (Cyr and Bonani, 2005; Moss and Gunn, 2009). Likewise, it was also reported that age had significant relationship with UI design preferences (Lin et al., 2009; Chadwick-Dias et al., 2002) and attitudes towards technology use (Morris et al., 2007; Wagner et al.,2010). This study demonstrated that needs diversity of users due to age and gender difference should be considered while designing UI for the same culture.

The number of participants is this study was rather limited. Especially when other aspects (age and gender) that were found to be significantly related to UI preferences. Furthermore, only 40% of the study sample has had experiences in using health and fitness apps. While preferences of UI design can be hypothetically inferred from users without previous experience and can contribute towards establishing user requirements e.g. Hermawati et al., 2015, efforts should be made to involve users with previous experience. In this study, Hong Kongese's preference on UI design was explored through an online survey. A further study that involves exposing potential users to experience prototype of UI design may provide stronger evidence of Hong Kongese preferences on UI.

Conclusions

The evaluation of HF experts on two best ranking western and eastern health and fitness apps demonstrated the difference of their UI designs which reflected the cultural characteristics of their developers accordingly. However, the online survey results from the study further revealed that while UI design preference was influenced by cultural characteristics, age and gender also contributed to user's preference. Thus, other relevant aspects and established cultural dimensions should be used together and exclusion of one from the other should be avoided.

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