TRUST, SATISFACTION, AND LOYALTY ACROSS CULTURES IN M-COMMERCE APPS

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TABLE OF CONTENTS

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Culture, Mobile applications, m-commerce, trust, satisfaction, loyalty;

ABSTRACT
There has been a recent proliferation of the use of mobile shopping apps in the domain of m-commerce. This community of people shopping from their mobile devices is broadly multi-cultural. Hence, it calls for a need to understand how the behaviors towards using these apps vary across different cultures. Consideration of cultural differences in the design aspects of mobile shopping apps raises the necessity for apprehending whether there are existing interface elements specific to certain cultural groups and the consequential effects of using these elements on trust, satisfaction and thereby loyalty. To address this, a multi-phased study is conducted, the first phase aiming to identify the cultural markers in m-commerce applications, and the second phase analysing the influence of localized app on user trust, satisfaction and loyalty, and the last phase leading further investigations on these measures, across different cultures. A review of the literature, including the hypotheses formulated, is presented. Based on the data collected, no significant interactions are reflected between localization and the measures of trust, satisfaction, and loyalty between the cultural groups. Findings suggest that colour plays a crucial role in imparting user trust in the case of mobile shopping apps with cooler blue colour instilling more trust in users than the brighter red and orange. In addition, the use of colours along with abstract or concrete icons can have considerable repercussions on the loyalty or tendency of users to use the app in the future. These results suggest app designers and developers can manipulate colours and icons to regulate the ramifications on trust and loyalty, though differences across cultures require further research to affirm any consolidated inferences.

1 INTRODUCTION

Online shopping is a multicultural community and mobile apps are becoming an integral part of that realm. The technological advancements across the world have led to an increasing number of smartphone users throughout the last decade. From 2.5 billion users in 2016, there's been a whopping 3.3 billion users of smartphone devices as of 2019 ("Number of smartphone users worldwide 2014-2020 | Statista", 2019). Along with the increasing smartphone sales, the other noteworthy thing is the availability of inexpensive internet, for instance, in Europe alone, the average amount of mobile data consumed daily is 1,120 MB ("Topic: Smartphone market in Europe | Statista", 2019). Any business activities like retail shopping, banking, investing and rentals involving economic transactions are referred to as e-commerce whereas the financial interchanges that take place on wireless devices like smartphones, laptops and tablets are termed as m-commerce or mobile commerce (Niranjanamurthy, Kavyashree, Jagannath & Chanhar, 2013). Online shopping or e-shopping is an elemental part of e-commerce that involves users purchasing goods or products through a web browser or mobile apps. The combination of availability of smartphones and technological advances in the e-commerce sphere has led to the stupendous growth of online shopping, with e-retail sales accounting for 14.1% of the retail sales worldwide. In the field of e-commerce, understanding trust, satisfaction and loyalty is a key imperative (Moorman, Deshpande & Zaltman, 1993; Kang & Corbitt, 2001; Jones, 2002). The emergence of the new market for mobile

shopping apps or m-commerce apps, thus, triggers the purpose of understanding the interactions of trust, satisfaction and ultimately loyalty, in this budding field.

Design characteristics are related to trust, satisfaction and loyalty and studies of cultural preferences for website design properties had been systematically examined (Yoon, 2002; Cyr, Bonanni & islever, 2004; Flavian, Guinali & Gurrea, 2006; Cyr, 2008). But, there hasn't been any momentous work done on the design of mobile apps across cultures. As Cyr, Bonanni & islever(2004) says:
"Further, it is of interest to determine how design elements resulting in e-loyalty may be applied in the realm beyond PC-based electronic commerce" (p.357). Although there's been a comprehensive review of culture in the literature, the guideline of cultural markers by Barber & Badre(1998) is limited to the aspect of websites. Also, trust and satisfaction had been scrutinized as a precursor of loyalty(Ling & Yang, 2006; Chae & Kim, 2001; Flavian, Guinaliu, Gurrea, 2006; Lauren & Lin, 2003; Yoon, 2002; Cyr, 2008), but the interactions of these three measures for mobile shopping apps across cultures haven't been studied before.

The interest in this field of research is threefold. Firstly, we try to identify the cultural markers present in the m-commerce apps across two cultural groups. Second, we try to better understand the concept of localization for m-commerce mobile apps and the process by which the use of different interface design elements makes an app adaptive towards a particular culture. Third, we focus on the apprehensions of trust, consumer satisfaction and thereby loyalty and it's relation with localization. We also aim to decipher the cultural differences that might be present between the app localized to a certain cultural group and another app which is localized to a different culture, in terms of the trust towards the apps, the satisfaction from using those apps and the intention of using those apps again.

Therefore, this investigation is developed in two separate phases. The first phase largely incorporates the identification of cultural markers across the two cultural groups taken into consideration, the British and the Chinese. An exploratory analysis of the top 10 free shopping apps on the App Store of these two cultural groups was followed by a preliminary survey to assort the concreteness and abstractness of the icons, icons being one of the cultural markers for the m-commerce applications. The second phase addresses the effect of these cultural markers on trust, satisfaction, and m-loyalty across the two cultural groups using an extensive online survey and subsequent quantitative analysis of the data collected.

Our report unfolds as follows, it starts with a comprehensive discussion of culture, and an ensuing review of literature of cross-cultural research on website preferences along with the repercussions of cultural differences on trust, satisfaction, and consequently loyalty. This is followed by the discussion on the preliminary study performed to decipher the cultural markers in mobile shopping apps across the two cultural groups under investigation. Successively, the outline of the methodology is led with a detailed description of the survey and data collection. Following this, the main findings of the study are detailed. The conclusion is drawn with a brief discussion on the implications and findings of our work on the design of shopping apps for mobile devices.

2 LITERATURE REVIEW

In this section a review of literature emphasizes design, trust, satisfaction, and loyalty in reference to culture. It unfolds with a discussion on understanding culture and how considerations of cultural differences are involved in the design of websites and mobile applications. This is followed by a review of the concepts of trust, satisfaction and m-loyalty, and the cultural interferences with these parameters.

2.1 Defining culture and exploring cultural considerations in design

The term 'culture' is complicated and difficult to unwind. Several endeavours had been made to untangle this complex web in the literature. Hofstede (1991) defines culture as "every person within him or herself carries patterns of thinking, feeling and potential acting which is learned throughout their lifetime"(p. 4), and that culture is a collective phenomenon shared by people inhabiting the same social environment. "Culture is always a collective phenomenon because it is at least partly shared with people who live or lived within the same social environment, which is where it is learned. It is the collective programming of the mind which distinguishes the members of one group or category of people from another" (p. 5).

A considerable amount of cross-cultural research exists in the field divided into two distinct themes: information systems and marketing literature. Watson and Raman(1994) concluded that a group support system (GSS) consisting of computer, communication and decision support technologies, should be sensitive to cultures and the technical and social facilities of the GSSs should be altered in order to be successfully used by different cultures. Another notable work in this domain is of Straub's (1994) which looked into the differences between Japanese and American knowledge workers towards perceptions about new technologies like email and Fax. Steinwachs(1999) used Hofstede's cultural model(discussed in the next paragraph) to find differences in information processing among different cultural groups which affected the decision-making processes across four different components of the information system: the producer of information, the recipient of information, the information content, and the information channel. Efforts were made to understand behavioural distinctions in gathering information by the Asian and North American cultural groups leading to significant results since Asians were found to seek increased levels of interpersonal communications affecting the trustworthiness of the source of information(Tseng & Stern, 1996). In the field of cross-cultural studies, Lackman et al.(1997) looking into the reactional uniqueness to marketing and advertisements,and the effectiveness of promotional functionality of sales advertisements across European, US, Asian and Latin respondents, unveiled consequential incongruities existing among the cultural groups.

In the domain of cross-cultural study, the most notable contribution is by cultural anthropologist Geert Hofstede. During the 1980s, he conducted detailed interviews with IBM employees across 53 countries. The IBM interviews underwent statistical analysis of the data sets to extract patterns of thoughts, feelings, and actions that he termed as 'mental programs'. The four distinct dimensions generated were individualism/collectivism, masculinity/femininity, uncertainty avoidance, and power-distance. Later in the 1990s,he collaborated with Michael Bond, a Canadian living and

working in the Far East since 1971, and produced a Chinese Value Survey that replicated the dimensions found earlier in the IBM survey apart from the fifth dimension which was found from the Chinese Value Survey which was named as 'long-term vs short-term orientation' by the researchers. In 1991, a much more accessible and consolidated version of the research was published as 'Culture and Organizations: Software of the Mind" (a rewritten version was published in 2005 and a third-version in 2010). Hofstede presented the five distinct dimensions: individualism/collectivism, masculinity/femininity, uncertainty avoidance, power-distance, and long-term/short-term orientation as a score of 0 to 100 across all of the 53 countries, the manifestation of these different dimensions are reflected in the choice of symbols, values, rituals, preferences of design properties which were exhaustively used by many researchers through time. The following discussion will involve the five dimensions of Hofstede's research.

The five dimensions Hofstede proposed are:
The first of the patterns identified was termed as power-distance (PD) index which relates to the dependency relationships in a cultural group. It is defined "as the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. Institutions are the basic elements of society, such as the family, the school, and the community; organizations are the places where people work" (Hofstede, 2010, p.76). Countries with lower power distance index exhibit emotional comfort in interdependence among the people of different power levels, lower hierarchy and democratic leaders in organizations, and privileges and status symbols being deprecated. On the other hand, countries with higher power-distance reveal inequalities among people, organizations reflecting deep hierarchies, and people's acceptance of privileges and status symbols in the society.

The second cultural dimension is described as individualism/collectivism. An extensive number of people reside in societies where the interest of group triumphs individual interests, these cultural groups referred to as collectivists. Collectivism pertains to "societies in which people from birth onward are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty" (Hofstede, 2010, p.92). As its opposite, individualistic societies are marked by individuals being brought up to look after only his/her individual interests or that of their immediate families.

Masculinity/femininity is Hofstede's third cultural dimension which largely deals with differences existing in different cultures based on gender roles. Hofstede associated assertiveness, toughness and focus on material success to the characteristic traits of men and tenderness, modesty and concern for the quality of life to the women's mannerism in a masculine society. Whereas in feminine cultures, there exist overlapping gender roles and negligible distinctions are a witness between men and women.

The fourth dimension formed from the patterns emerged from the IBM study by Hofstede(1991) is referred to as Uncertainty Avoidance(UA). Some people feel more anxious about uncertain things as opposed to some who find comfort and accept the unexpected. Countries with higher uncertainty

avoidance index tend to bespeak worries among health and money, people have higher hesitancy for trying out new technological products, innovations are sparse, and a display of more ethnic prejudice is pronounced. By contrast, in low UA countries, businesses tend to be more informal and strategic matters are aligned with business goals, and presence of more ethnic tolerance is noticed.

The fifth and final dimension Hofstede proposed is long-term vs short-term orientation, where long-term orientation stands for "fostering of virtues oriented towards future rewards—in particular, perseverance and thrift. Its opposite pole, short-term orientation, stands for the fostering of virtues related to the past and present—in particular, respect for tradition, preservation of "face," and fulfilling social obligations"(Hofstede, 2010, p.239). Long-term oriented cultural groups show concern with personal adaptiveness, and an overall appeal of knowledge and education. On the opposite end, countries with short-term orientation lay concern with personal stability, and shows the presence of a sense of wisdom.

According to the Social Science Citation Index, Hofstede's books Culture's Consequences (1980) and Cultures and Organizations (1991) have been cited for over 3500 times across cross-cultural psychology, sociology, management and communication (Callahan,2005). Although Hofstede's theory of cultural dimensions had been cited by an enormous number of cross-cultural research studies, it has also been severely criticized over the years. Questions have been raised about the methodology and validity of the data collected. While reviewing the citations and replications of Hofstede's research Sondergaard(1994) deciphered patterns or themes in the study of the reviews related to three major constraints in Hofstede's research:

a. Arguments were made about the fact that the data collected between 1968 and 1973 is no longer valid after so many years.
b. Questions were raised about using employees of a single company as a representative sample of a cultural group.
c. Another main area of contention was that the use of attitude surveys isn't a valid method in this type of research

Smith(2002) also criticised Hofstede's individualism/collectivism dimension. He put forth the argument that although certain work goals call for more individualistic approaches, work goals and life goals can't be considered as similar identities. Smith also contended that there wasn't sufficient data in Hofstede's work to support the claim that power distance and individualism/collectivism are closely correlated.

The essay by McSweeney(2002) triggered the most interesting debate as he raised arguments about false assumptions in Hofstede's research. The principal assumptions he criticized as false were:

a. The organizational culture of IBM is homogenous across different countries, so the differences observed can be taken as the results of cultural upbringings.
b. The employees of one company can be considered as a representation of an entire nation.
c. A questionnaire is a valid tool for identifying notable dimensions of national culture.
d. Workplace attitudes are reflected in other aspects of people's lives.

Hofstede, however, replied to McSweeney's criticisms in the subsequent issue of Human Relations (Hofstede, 2002) referring that most of the arguments raised by McSweeney had already been addressed in the revised edition of Cultural Consequences(2001). He defended the fact that the

questionnaire wasn't the optimal way of studying cultural differences by stating that surveys should not be disregarded because they are a common method of sociological research and are valid as long as they are supported by other methods (Hofstede, 2001). Additionally, he argued that cultural dimensions change at a rate so slow that even a twenty-year old data can still give accurate results (Hofstede, 2001). Howbeit, he acknowledged that nationality isn't the best unit to segregate cultural groups but the fact that the determination of cultural boundaries is too cumbersome to leave any other choices for researchers. He also responded to the criticism of the representative sample from a single company as a representation of a national dimension by stating, "Any set of functionally equivalent samples from national population can supply information about such differences. The IBM set consisted of usually well-matched sample s of an unusually large number of countries" (Hofstede, 2001, p.73). Williamson(2002) backs up Hofstede's responses by adapting a neutral standpoint. He upholds the fact that Hofstede's perspective is interpretative whereas McSweeney's viewpoint is functionalistic, and that one can't disagree with Hofstede's framework because it's a noteworthy framework in sociological research which is outside the functionalist paradigm.

Website design had been the central point of a number of cross-cultural investigations using Hofstede's cultural dimensions. A set of user interface guidelines based on the lines of the five different dimensions was created by Marcus & Gould (2000). Another study by Robbins and Stylianou (2002) examined 500 commercial websites across the six clusters based on Hofstede's study: Anglo cluster(consisting of Australia, Canada, Great Britain, Ireland, New Zealand, South Africa and USA), Nordic cluster(comprising of Denmark, Finland, Netherlands, Norway and Sweden), German cluster(including Austria, Israel, Germany and Switzerland), Latin cluster(Belgium, Brazil, France, Italy, Mexico and Spain), Asian cluster(consisting of Hong Kong, India, Malaysia, Philippines and Singapore), and Japan(considered as a separate cluster owing to its unique cultural development). The study showed that websites of countries with high power distance indices displayed organizational charts, voices of executives and sketches of top leaders. Security provisions and privacy policy statements were indicative of individualism/collectivism. Another thread investigated university websites of different countries (Rajkumar, 2003; Dormann and Chisalita, 2002). For example, an evaluation of Indian and U.S university websites showed significant differences in certain aspects of website design properties, in relation to the cultural dimensions of individualism/collectivism, long-term/short-term orientation, and uncertainty avoidance (Rajkumar, 2003). U.S being rated higher on individualism index, their university websites showed the use of pictures of individuals, addressing methods as 'you' instead of 'we', success stories of individuals, personalized features and use of personal opinions. On the contrary, Indian university websites displayed a mission statement impacting a large group, images of groups of students, use of formal speech and stated opinions of the group instead of an individual. On the lines of long-term/short-term orientation, the results were consistent with Hofstede's dimensions. The American websites focused on recent news and alerts, emphasized clear strategic plans and displayed step-by-step guides. On the other hand, the Indian websites used symbolic images, archives on convocation pictures and images of founders to evoke tradition. However, for the uncertainty avoidance, Indian university websites provided evidence for higher index rating with the use of listings of rules and regulations, legal guidelines and university policies, organizational charts and other elements that support high uncertainty avoidance behaviours.

University websites from Malaysia, Ecuador, Greece, Japan, U.S.A, Sweden, Denmark, and Austria were investigated by Callahan(2005) leading to the results showing a positive correlation existed

between the use of official logos and pictures of faculty members in the university websites of the country and its power distance index. Images of buildings were presented on the websites of countries with higher masculinity indices. On the other hand, negative correlations were found between the number of links, the use of abstract pictures, and horizontally scrolling pages with uncertainty avoidance.

Therefore, the literature suggests that Hofstede's dimensions of culture are indeed a notable tool in interface design which supports the use of the dimension of individualism/collectivism in the present study. All these dimensions intermingle together to fabricate a sense of patterns on which particular countries can be differentiated and essentially leading to different cultural groups preferring different user interface elements that leads us to the concept of 'localization'. Cyr & Trevor-Smith(2001) defined localization as the process of adapting a digital product "to a particular language, culture, and desired look and feel"(p. 2). The process of successfully localizing a product means it's built for a particular cultural group with the goal of providing adequate technological, linguistic and cultural support using a framework that incorporates contents and functionalities tuned to the local culture (Shannon, 2000). The use of some significant design parameters in the localized design leads to the concept of cultural markers which is reviewed in the following section.

2.2 Cultural markers in user interfaces

The elements of user interfaces that have significance for a certain cultural group are termed *cultural markers*. These might include particular colours, icons in particular styles, national flags and other features, denotes a cultural integration that often has a conventional use in the design of web or mobile applications among that cultural group.

Barber and Badre (1998) conducted an extensive research on the identification of cultural markers across websites to form a guideline comprising of a list of cultural markers using across websites of different genres. The study began with a foraging stage creating a database of 168 native-language websites categorized by country, genre, and language used on the website, followed by a closer inspection for the identification of cultural markers that were listed by country and genre of the websites. A design element used in a website becomes a cultural marker when it is highly prevalent within the websites of a particular cultural group and at the same time, less prevalent or absent in the websites of the other groups. The emerging patterns suggested the presence of culturally specific design markers and that some of the cultural markers may be specific to a particular country, an example is Brazil's multi-coloured government websites, or cultural markers may be genre-specific, for example, the cultural icon: the national flag is used in government websites across different countries. Although there's no proper quantitative data summed by the researchers about the proportions of the presence of cultural markers within the websites of a specific cultural group, or the methodology used to determine the emergent themes or patterns, the use of cultural markers in the design of websites paves the way for localization.

Badre(2000) summarized these cultural markers and presented a follow-up study where he manipulated the cultural markers: colour coordination, background images, navigational icons and the graphics to localize a website to Italian and US style. The Italian style website featured more

dynamic colour, architectural pictures whereas the US site displayed national flag and patriotic colour of blue, red and white. The navigational icons contained pictures that were 'culturally meaningful'. He led a task-based analysis where significant differences were found between the preference towards navigational design with the Italian participants preferring the navigational icons adapted to their culture as compared to the ones localized to the US. However, differences weren't found on the basis of colours used despite the colours being country colours which raises questions about improper design implementations.

Table 1. Cultural markers identified by Barber and Badre(1998)

HTML Specific	**Icons/Metaphors**	**Colors**	**Specific colors**	**Grouping**
# of lines # of centres # of images # of links # of external links # of internal links link color visited link color horizontal bars tables bold italics underlines frames audio video background image background color text color	international local clocks newspapers books pages homes stamps envelopes musical notes paperclips thumbtacks other	red blue green purple pink black yellow gold teal white multiple	flag graphics pictures borders background	symmetrical asymmetrical proximity alignment boundary enclosure connection
Flag	**Language**	**Geography**	**Orientation**	**Sound**
native foreign multiple	native foreign multiple	maps outline globe	centered left-right right-left	music voice
Font	**Links**	**Regional**	**Shapes**	**Architecture**
cursive italics bold size shading	color embedded stand alone internal external	foliage animals landscape water desert	squares circles triangles rectangles lines	state building house church office cityscape

Sun (2001) used the cultural markers identified by Barber and Badre(1998) to analyse the cultural markers present in two multilingual websites localised to the German, Danish, Chinese and Brazilian

users and found language, visuals, colours and page layout as the cultural markers used to localize the websites to the different cultural groups. Although the study suffered from arguments on smaller sample size and the methodology used comprising of a task-based analysis and follow-up interview to understand the impact of cultural markers on usability, this study puts forth the concept of localization and how different elements of interface design can be used in making a digital product suitable to a particular cultural group.

The guideline provided by Barber and Badre (1998) is being further used in the study to examine the presence of cultural markers in the domain of mobile application design, especially the m-commerce apps, which is the field chosen for this research work. The next subsection discusses the two principal cultural markers taken into consideration for this research. A preliminary foraging study to analyze the top m-commerce apps of the Chinese and British app store was conducted to identify the cultural markers, which is further discussed in section 3.

2.2 Icons

In the realm of user interface design for mobile apps, icons are a predominant aspect. Usually, an icon consists of two elements, a figural image, and a textual label. The image is sometimes referred to as a pictograph where's the label is termed as the referent. The following discussion unfolds with definitions of icons extracted from the literature followed by a discussion of the characteristics of icons that differ across cultures.

2.2.1 Classification of icons

The idea of abstract and concrete existence was discussed by Yazdani & Barker (2000) who interpreted that an object represented by the pictograph of an icon can have a concrete existence (such as a traffic signal or airplane) or it would be abstract in nature - a thought, a concept or an idea. However, a large number of further interpretations were laid on the underpinning for the concepts of pictograph and referent. A pictograph is defined as the symbol in an icon, and the referent acts as the object it depicts along with the icon label. Lodding (1983) categorized icons into three categories namely representational, abstract and arbitrary. Icons that contain images mimicking an object was described as representational icons. Abstract icons were elucidated as images of objects that displayed associated concepts, for example, a broken wine glass depicting the “fragile” nature. The icons with images whose associations of meaning are arbitrarily established, like the red cross indicating first aid, are designated as the arbitrary icons. Similar classifications were also made by Rogers (1989) who classified icons as resemblance icons, arbitrary icons, exemplar icons, and symbolic icons as well as Lidwell et. al (2003) who designated icons as similar, exemplar, symbolic and arbitrary.

McDougall et al (1999) compared the same cognitive features for 239 symbols using a 5-point Likert scale involving the correlations between the different parameters. Apart from complexity, the concreteness of the symbols was found to be clenching strong correlations with meaningfulness and familiarity. The findings of McDougall et al were similar to Rogers (1989) who concluded that concrete symbols are potentially more meaningful. One of the probable reasons is because the

concrete symbols depict real-life objects, people tend to attach meaning to them on their confrontation with these kinds of symbols. On the other hand, some of the symbols which aren't concrete are sometimes considered meaningful if they are familiar. Thus there is a negative correlation between concreteness-meaningfulness as the symbol-functions relationship develops which is in-line with similar investigations (Stammers, George & Carey, 1989). Ng & Chan (2008) segregated icons based on the five main cognitive features icon research proposed by McDougall et al(1999): concreteness, familiarity, complexity, meaningfulness, and semantic distance. The researchers stated that "Icons are considered concrete if they depict real objects, materials, or people; those that do not are considered as abstract" (Ng & Chan, 2008, p.2). Hence, if we look at Fig 1(a), a shopping cart representing the 'cart' icon is an example of the concreteness of the icons, whereas, Fig 1(b) represents an arbitrary relation depicting abstractness.

(a) (b)

Fig. 1 Concreteness and Abstractness of icons

Therefore, most of the previous work classifies icons based on the three following directions: direct representations that explore the visual similarity between a pictograph and its referent, arbitrary representations established by social conventions, and indirect representations that explore the semantic relationship between a pictograph and its referent.

2.2.2 Icons and cultures

The idea of abstractness and concreteness relates to my study in the sense that icons are an integral part of user interfaces of mobile applications, and one of the identified cultural markers based on the guidelines of Barber and Badre(1998). This concept of abstractness and concreteness of icons is associated with cross-cultural preferences. In a study by Rau et al. (2004) error rates were calculated among American and Chinese participants with the manipulations of knowledge representation(abstract and concrete) and the structure of the interface(functional and thematic). Chinese participants displayed lower error rates with thematic interface structure. However, critics can be made when the authors tried to generalize the results as difference in cognitive style between the 'Westerners' and 'Easterners' which lacks any sufficient data to support the argument. These fundamental differences in thinking styles were used as the foundation of icon recognition by Kim & Lee (2005), who inferred the improved performance in recognition in case of concrete icons by the Koreans, whereas the Americans identified the abstract icons quicker and better, the conclusion in-line with the previous findings by Rau et al.(2004). Thus, the consideration of icons as a fundamental part of our research, and exploration on the lines of abstractness and concreteness of the icons is of primal importance in the analysis of cross-cultural preferences of mobile apps.

2.3. Colour and Culture

Several studies have dealt with the preference of colour across different cultures. Based on the colour - culture chart (Boor & Russo, 1993), Barber and Badre (1998) used the colour-culture chart, as shown in Table 2, to suggest that "colour may impact the user's expectations about navigation, links, and content, for example, as well as overall satisfaction." (p. 3)

Table 2: Colour-culture chart illustrating the different meaning of the same colour across different cultures

Colour	China	Japan	Egypt	France	United States
Red	Happiness	Anger Danger	Death	Aristocracy	Danger Stop
Blue	Heavens Clouds	Villainy	Virtue Faith Truth	Freedom Peace	Masculine
Green	Ming Dynasty Heavens	Future Youth Energy	Fertility Strength	Criminality	Safety Go
Yellow	Birth Wealth Power	Grace Nobility	Happiness Prosperity	Temporary	Cowardice Temporary
White	Death Purity	Death	Joy	Neutrality	Purity

Cyr & Trevor-Smith (2004) compared websites from Germany, Japan, and the U.S., to investigate how language and script, use of symbols, content, and structure, navigation, and colour, varied between them. They found considerable variations in the use of colour. While Japanese sites used red twice as that of German or American websites, blue was the most popular colour used by German and American websites showing an inclination towards the use of grey. On contrary to what proposed by Barber and Badre(1998), white was used as the background colour across the majority of the websites, notwithstanding the fact that white represents death in Japan according to the colour-culture chart by Boor & Russo(1993).

Notwithstanding the fact that considerations of cultural differences in the study of colour are sparse, there are some noteworthy studies which had analysed the behavioural responses towards the use of certain colours. Studies have revealed the use of cooler colours such as blue and green is favoured more as compared to warmers colours like yellow or red (Marcus and Gould,2000), to specify, blue is amalgamated with "wealth, trust and security" and hence used in corporate entities such as

websites of corporate banks (Lichte, 2007). The propensity to the choice of the colour blue as a website colour by web designers as well as users was also confirmed by Bonnardel et. al. (2011). Eye-tracking and interview methods were implemented in studying proclivity for specific colours across different cultural groups (Cyr et. al., 2010) confirming the dislike towards yellow colour scheme among Canadian, German and Japanese audiences. The study also corroborates the inclination towards the colour blue among German participants and grey among the Canadian participants which is in-line with previous studies. (Cyr & Trevor-Smith, 2004). It also highlights the concept of colour appeal which is defined as the degree to which colours used in websites are perceived as appealing and appropriate. Silvennoinen, Vogel & Kujala (2014) looked into the research of visual aesthetics in a smartphone user interface in two application contexts: and entertainment style. The results of this work indicated the preference of users for the coloured 2D version over the black and white version and the coloured 3D version in both contexts of use, which indicated that colours and perceived dimensionality included in interface design can concoct subtle stylistic impressions.

Collectivist cultures like China have an increased preference for visuals where the individualist cultures like Germany favor a more logical and structured layout (Sun, 2001). Cyr(2008) explored this effect on trust owing to visual design unraveling that fact that visual design having a significant effect on trust in the case of collectivist Chinese cultural group, unlike the individualist Germans and Canadians. The effect of visual design on satisfaction, however, failed to reach the same conclusion with all of the three countries exhibiting satisfaction to better aesthetics.

Hence, colour is an intrinsic part of visual design as well as interface design, and also one of the constitutional cultural markers led by the guidelines of culturability in website design by Barbe and Badre(1998). Not only there exist differences between the emotional and behavioral responses elicited by various colours, but literature also upholds cultural preferences of colour and substantial effect on trust and satisfaction, two of the measures built-in this research.

2.4 Concepts of trust, satisfaction and loyalty in studies of digital technologies, and considerations of culture

The following section reviews the existing literature of trust, satisfaction and loyalty in relation to the design of digital applications and discusses the role cultural differences play in influencing these three parameters in review.

2.4.1 Trust and Culture in Digital Technologies

Despite the extensive research on the concept of trust and the endeavours to disentangle the complexities of the concept, this field of research still remains very complicated. Traditionally, trust is defined by the consumers' perceptions derived from marketing attributes including brand, products or services, organization selling a product, salesperson and the organization in which the transaction is taking place (Ganesan, 1994). Some researchers have classified trust as a multidimensional entity, for Chen and Dhillon (2003) McKnight, Choudhury and Kacmar (2002), and Oslina and Lew, 2017), whereas, on the other hand, other researchers consider trust to be a single

dimension, for example Shannon(2000) and McKnight and Chernavy (2001). The latter researchers reviewed the literature on trust among various fields including psychology, political science and business, and uncovered four common themes:

- benevolence, the degree by which trustee cares for the trustor;
- competence, the degree of task achievement by the trustee;
- integrity, the truthfulness of trustee towards the trustor; and
- predictability, ability of trustor to predict the actions of the trustee).

Trust is also viewed through a marketing lens by Zucker (1986) who divided trust based on organisational behaviour: characteristic-based trust (when the trust is based on similarities between the consumer and supplier, for example, sex, ethnicity, etc.), process-based trust (trust developed owing to a sense of belief resulting from past transactions), and institutional-based trust (trust developed due to deliberate intentions to build holder's ability and integrity). Another exploration led to the classification of trust into quality-based (when suitable information and functionality is provided by the product), performance-based (when the product holds appropriate use of resources), security-based (when the access to information is limited to the user and suitable authorization levels are provided) and usability-based (when the product provides optimized affordances including ease of learning, accessibility and sufficient protection against errors) (Oslina and Lew, 2017). The single-dimensional analysis of trust is reflected by the work of Corritore, Kracher and Wiedenbeck (1971) who states that trust in an online environment includes different cognitive and emotional elements but it encompasses "an attitude of confident expectation in an online situation or risk that one's vulnerabilities will not be exploited"(p. 740).

Several studies have explored the relationship between web design and trust, but not much work could be found in the literature on trust and the design of mobile apps. Website design characteristics are found to be antecedents to trust, including satisfaction and loyalty (Flavian, Guinali & Gurrea, 2006). Yoon (2002) conducted a similar study exploring the effects of website design characteristics on trust which led to conclusive results of the design properties which influenced trust and subsequent purchase intentions: width of product selections, the accuracy of online information, and navigational functionality. Well-aligned with the current research, in a multi-phased study, Cyr(2008) investigated the effect of three different dimensions of website design on trust, satisfaction and e-loyalty: information design, visual design and navigational design, using a mixed cultural sample comprising of German, Canadian and Chinese participants. A strong relationship between visual design and trust was found overall.

This relationship between website design properties like navigational design incorporating navigation: one of the cultural markers identified by Barder and Badre(1998); visual design: incorporates use of colors, icons/metaphors, fonts: all of which are cultural markers identified by Barber and Badre(1998); as well as information design: includes grouping of item yet another cultural marker identified by Barber and Badre(1998); and trust, indicates the use of cultural markers can result in differences of trust towards a particular product/service among different cultural groups. So inferring from the literature and investigating the effects on the lines of mobile design, it

can be said that the Chinese participants will trust a mobile app localized to their own culture, whereas the English participants will trust a mobile app which is culturally adapted to their preferences, that formulates the first hypothesis of our study:

Hypothesis 1a: Participants will trust a mobile app localized to their own culture in comparison to one localized to a different culture.

Hofstede's dimensions relates with the concept of trust. Previous studies have shown that collectivist cultures have a higher propensity to trust compared to individualist cultures (Egger, 2001; Hoffman & Novak, 1996; Urban et. al, 2000). In the case of collectivist cultures, their cooperative nature and greater levels of trust are manifested in that people rarely move in and out of groups, whereas individualistic cultural groups demonstrate lower levels of trust and cooperation. This is also exploited by Cyr, Bonanni & ilsever (2004) who investigated differences in website trust, satisfaction and loyalty across local and foreign websites with participants from the U.S., Canada, Germany and Japan. Participants from all these countries manifested significant differences in trust, satisfaction, and loyalty for their local websites. In another cross-cultural study with participants from Germany, Canada, and China, a research investigated the relationship between website design and the three measures of trust, satisfaction, and loyalty (Cyr, 2008). Among the varied conclusions reviewing the moderation of loyalty by trust and satisfaction, the exploration of design and trust led to a crucial finding that visual design affected trust, only in collectivist Chinese culture, but not for the Germans or Canadian cultures. Also, the examination of the relative strength of trust and satisfaction on e-loyalty showed that the effect of trust on e-loyalty is of more statistical significance than the satisfaction leading to loyalty in countries with higher uncertainty avoidance like China and Germany as opposed to more risk-taking nature of Canadians. This leads to the hypothesis that Chinese participants will trust their localized app more than the UK participants trust their local app, owing to their collectivist nature and the manifestation of higher levels of trust for their own group members as compared to the individualist.

Hypothesis 2a:
Participants from a collectivist culture will trust an app localized to their culture more than participants from an individualist culture.

The tendency to trust, however, is the reverse to the pattern of trust implied on native products by the cultural groups. The self-reliance and utilitarian view of people in higher individualist cultures promotes a higher tendency to trust others among them, unlike people in collectivist cultures. The interdependence of people in collectivist cultures leads to the concept of social-relatedness and increase awareness towards the ingroup-outgroup boundaries (Triandis, 1989). Yamagashi and Yamagashi (1994) undertook a large cross-national survey to show the greater tendency to trust among the individualists as the American respondents were more trusting of other people as compared to the collectivist Japanese. Similar findings are also noticed in other studies (e.g. Inglehart, Basañez & Moreno, 2008). There is an existing cloud over this concept of tendency to trust products/services, as several studies produced contradictory results where the participants from

collectivistic cultures showed greater tendency to trust than the respondents from individualistic cultural groups (Simon, 2001; Jarvenpaa, Tractinsky & Saarinen, 2006). However, based on the literature showing the higher tendency to trust others by cultural groups having higher individualism indices, it can be said that the UK participants will trust the localized app more than the Chinese participants which leads to the third hypothesis.

Hypothesis 3a: Participants from an individualist culture will trust a mobile app localized for a collectivist culture more than participants from a collectivist culture will trust a mobile app localized for an individualist culture.

2.4.2 Satisfaction and Culture in Digital Technologies

End-user satisfaction is widely used in HCI research to determine the success of information systems. Evaluation of the aspects of the relationship between consumers and products refers to the concept of consumer satisfaction, in which satisfaction is expressed as a function involving the extent of success in the perceived quality matching the consumer expectations (Anderson & Sullivan, 1993). The appreciative nature of the consumer is reflected through satisfaction. Hence, consumer satisfaction has considerable importance in the domain of e-commerce.

Links between trust and satisfaction are evident from previous studies (Kennedy, Ferrell & LeClair, 2001; Bauer, Grether & Leach, 2002). Kennedy et al. (2001) developed a consumer trust model including salesperson competence, selling tactics, service quality and manufacturers' ethical concerns as antecedents to trust as well as satisfaction, and that satisfaction fosters manufacturers to trust. While analyzing relationship marketing, different web properties like constant availability of information, efficient information transfer, real-time interactions, and multimedia capability of a website were found to foster commitment, trust, and satisfaction. In addition, Bauder, Grether and Leach (2002) found a direct relationship between trust and satisfaction. In a buyer-seller relationship where trust and satisfaction are correlated, on the one hand, trust is the key variable in the deliberation of enhancement of relationship. On the other hand, satisfaction comes into play when the buyer concerns about the continuity of the buyer-seller relationship (Selnes, 1998). This relationship was also used by a study in alignment with our research (Flavián, Guinalíu & Gurrea, 2006), which confirmed the positive influence of increased satisfaction on website trust. Since it is a digital product domain, similar results can be expected in the case of mobile apps.

Online consumers show more satisfaction towards websites that are localized to their particular culture (Simon, 2001). Hence, a mobile app that is localized to the preferences of a specific culture is expected to satisfy the users more than a foreign app, the localization, carried out by the use of cultural markers idiosyncratic to that cultural group.

Hypothesis 1b: Participants will be more satisfied with a mobile app localized to their culture in comparison to one localized to a different culture.

A few studies have connected Hofstede's dimensions of individualism with the attitude of consumer satisfaction. In a study with a control group of Australian students, it was found that 70 percent of the Asian students (from the collectivist cultures of Indonesia and China) were satisfied with a technological interface adapted to their cultural preferences as opposed to 87 percent of the individualist Australians (Evers & Day, 1997). The exploration by Cyr, Bonanni & ilsever (2004) to demystify the cloud of cross-cultural website design preferences also led to similar results in which the collectivistic Japanese participants were the least satisfied with their localized website in comparison to the U.S, Canada and German participants who are from more individualistic cultures. The increased consumer satisfaction behaviour among the individualist cultures is assumed to be due to their self-sustenance and pragmatic nature leading to a more utilitarian approach towards products or services. Though these studies deal with web applications, the purpose of my research is the exploration of the cultural differences in satisfaction with the use of mobile applications, which steers the next hypothesis that the British participants being rated high on individualism will be more satisfied than the collectivist Chinese participants with an app localized to their respective cultures.

Hypothesis 2b: Participants from an individualist culture will be more satisfied with an app localized to their culture than participants from a collectivistic culture.

2.4.3 M-loyalty and Cultures in Digital Technologies

E-loyalty is defined as the intention of the customer to come back to a website or buy from it again (Cyr, Bonanni & ilsever, 2004; Flavián, Guinalíu & Gurrea, 2006). Gommans, Krishnan & Scheffold (2001) formulated a framework of trust in the electronic marketplace where five key elements were said to influence customer intentions of visiting the website or purchase from it again, one of which was the website design properties that included navigational capability, efficient search and language options, customizable features and designing for targeted customers, which is essentially the concept of localization. Yoon (2002) verified a model in which design features like the accuracy of the information, efficiency, speed of navigation tools, and the overall operational potential significantly influences trust, and satisfaction. Both of these effects on trust and satisfaction, in turn positively affect intentions to visit again and hence loyalty. A lot of previous studies show trust and satisfaction to be precursors to e-loyalty (Flavian, Guinaliu, Gurrea, 2006; Laurn, Lin, 2003; Yoon, 2002; Cyr, 2008).

Similar to e-loyalty defined in the web domain, mobile loyalty or m-loyalty is defined as the willingness of a user to revisit a mobile service (Ling & Yang, 2006; Chae & Kim, 2001). Perceived value, trust, and satisfaction were shown to be the antecedents to customer loyalty in m-commerce, after research was carried out by an extensive survey with 255 participants across Taiwan (Ling & Yang, 2006). Chae & Kim(2001) deduced four dimensions: content quality, connection quality, interaction quality, and contextual quality, which relate to customer satisfaction and consumer loyalty in the case of mobile-commerce. Of our interest, it is the interaction quality which is composed of structure, navigation and presentation, which are again design features that can act as cultural markers and hence contribute to localization of a mobile app to a particular cultural group. There is still a scarcity of research investigating loyalty across cultures, with the only exception of

Cyr, Bonanni & islever (2004) who found significant differences across collectivist Japanese and individualist American, Canadian and German respondents in terms of loyalty towards localized websites. On the lines of this work, and considering the previous literature in the m-commerce domain, I investigated the following hypothesis:

Hypothesis 1c: Participants will be more loyal to a mobile app localized to their own culture in comparison to one localized to a different culture.

No sound theory exists that relates m-loyalty to the dimensions of cultures. But if we look back to the definition of collectivism by Hofstede, it states the integrity and "unquestionable loyalty" exhibited by the collectivistic cultures (Hofstede, 1991). Collectivism fosters loyalty, where people move-in groups and value relationships over anything else. The literature has shown the influence of trust on loyalty (Ling & Yang, 2006; Chae & Kim, 2001; Flavian, Guinaliu, Gurrea, 2006; Laurn, Lin, 2003; Yoon, 2002; Cyr, 2008), as also the greater proneness to trust local products by the collectivists in comparison to the individualist cultures (Egger, 2001; Hoffman & Novak, 1996; Urban et. al, 2000). All these deductions culminate in the hypothesis that the Chinese, being a collectivist culture, will be more loyal to their localized app, as compared to the English who reflects individualism:

Hypothesis 2c: Participants from a collectivist culture will be more loyal to an app localized to their culture than participants from an individualist culture.

2.7 Problem Analysis

The initial steps involved the identification of cultural markers in the domain of mobile apps. As of December 2018, there are 4.1 billion Internet users in the world and China has the most interest users among all the countries. ("Internet Statistics & Facts (Including Mobile) for 2019 - HostingFacts.com", 2019). Keeping this in mind, and the difference in Hofstede's dimensions of individualism/collectivism, China and the United Kingdom(based on the country where the study is conducted) are chosen as the two contrasting cultures to evaluate the research thread of mobile app design across cultures and its effect on trust, satisfaction and thereby loyalty. Their individualism indices are summarized in Table 3 derived from Hofstede (1991):

Table 3. Individualism Index and Rank for countries under investigation

Country	**Rank in Hofstede's Scale for Individualism values for 76 Countries and Regions**	**Individualism Index**
United Kingdom	3	89
China	58-63	20

3. PRELIMINARY WORK

The top 10 free shopping applications from the App Store was selected for both the UK and Chinese versions.[(accessed on July 6, 2019)] These applications were then analyzed by the researcher based on the guidelines provided by Barber and Badre(1998). The guidelines specific to HTML were eliminated since the research is specifically for mobile apps. The results of the analysis are provided in Appendix A-B. Consultation with a local expert was taken to translate the label of the icons. The initial analysis was made on the lines of the deduction made from the literature related to the definition of icons, where icons were considered as concrete when there was a visual similarity between a pictograph and its referent, as abstract when the relationship was arbitrarily established and as semi-concrete when there was a semantic relationship between the two. However, for the survey which was distributed among the participants, simplicity had to be maintained for clear communications and hence the definition derived from Ng & Chan(2008) was used which stated "Icons are considered concrete if they depict real objects, materials, or people; those that do not are considered as abstract." The results of the foraging study culminated in the following cultural markers across the apps between the two cultural groups.

Table 4: Summary of initial analysis based on the guidelines by Badre(2000)

Country	Colours	Specific Colours	Icons	Icon Style	Language
China	Use of multiple colours, use of gradients	Use of flag colour and shades of brighter colours(red, yellow, orange, purple, green)	An admixture of concrete and abstract icons with use of semi-concrete icons	Inconsistent use of icon style	Mandarin
UK	Use of single colour, with an accent colour(in some cases)	Use of brand colours and cooler colours(blue, crimson red, black)	An admixture of concrete and abstract icons with the negligible presence of semi-concrete icons	Consistent use of icon style	English

The classifications of icons required further classifications and hence an initial survey was generated to determine the abstract and concreteness of icons in each of the Chinese and English apps.

3.1 Initial Survey

3.1.1 Survey

For the initial survey, each of the icons was extracted from the screens with the use of the software Sketch App for Mac. The icons along with the label were amassed to form a survey, randomization was maintained to eliminate any order effect. The similar icons(like cart, profile, chat) were presented separately in case any distinctive visual differences(colour, icon style) were present, else a single representative one was shown. The participants were asked to rate the icon on a 7-point Likert scale with 1 being 'very abstract' and 7 being 'very concrete'. Due to a large number of icons extracted from the 20 apps, two separate surveys were compiled. The first survey comprised of 51 Chinese icons and 24 UK icons, and there were 41 Chinese icons and 23 UK icons in the second survey.

3.1.2 Participants

There were a total of 24 participants taking both of the surveys, 12 for each with an equal distribution of British and Chinese participants. 66.7% of the participants were of ages 18-24, whereas the rest of them ranged from 25-39 years. All of the participants were recruited online through Facebook groups, participation being voluntary. No incentives were being provided for this phase of the study.

3.1.3 Results

Each of the two surveys was separately analysed using SPSS. Independent samples Mann-Whitney U tests were performed to discern the icons which had significant differences in perception between the two cultural groups. In the case of 8 Chinese and 6 UK app icons, the null hypothesis could be rejected which manifests a significant difference in perception of abstractness and concreteness among the Chinese and British participants (See Table 5). Descriptive statistical analysis showed the overall perceptions of abstractness and concreteness of the icons. A median of 2.0 or lower was considered abstract, and a median of 6.0 or higher was considered concrete. Participants opted for concreteness in the case of 13 Chinese app icons and 16 UK app icons, whereas 12 Chinese icons and 10 UK app icons were rated abstract. This result is different from what is expected from previous studies since the English being a Western country shows a preference towards abstract icons and thus, the use of abstract icons was expected to be reflected in their apps. However, this might be resulting from the choice of applications and that the designers' motivation towards using concrete icons in the case of the UK apps might be a fact of using familiar icons and making it more relevant to the real world. Nonetheless, the results of this initial survey helped in the design of the app screens that are used for the next phase.

Table 5: Summary of the results from initial surveys

CH = Icons extracted from Chinese apps UK = Icons extracted from the UK apps S1 = First Survey S2 = Second Survey

Frequencies		**Independent samples Mann-Whitney U test**		
Icons	**Median**	**Icons**	**Sig.**	**Decision**

CH3, CH9, CH19, CH20, CH23, CH24, CH25, CH26 (S1)	2.00	CH32	0.015	Reject the null-hypothesis
CH19, CH31, CH36, CH41(S2)		CH36	0.004	Reject the null-hypothesis
CH14, CH15, CH16, CH17, CH27, CH31, CH33 (S2)	6.00	CH43	0.041	Reject the null-hypothesis
CH10, CH12, CH13, CH22, CH34, CH27 (S 2)	6.00	UK2	0.009	Reject the null-hypothesis
UK3 (S1)	1.00	UK7	0.026	Reject the null-hypothesis
UK18,UK19(s1); UK1, UK11(s2)	2.00	UK9	0.004	Reject the null-hypothesis
UK23,22(S1)	2.50	UK12	0.026	Reject the null-hypothesis
UK11, UK15, UK17(S1)	6.50	CH5	0.032	Reject the null-hypothesis
UK5, UK12, UK13, UK21(S1)	6.00	CH14	0.008	Reject the null-hypothesis
UK4, UK5, UK7, UK13, UK17(S2)	6.00	CH16	0.032	Reject the null-hypothesis
UK10, UK12, UK15, UK17(S2)	6.50	CH19	0.032	Reject the null-hypothesis
		CH31	0.032	Reject the null-hypothesis
		UK6	0.008	Reject the null-hypothesis

4. METHODOLOGY

4.1 Design of Screens

The cultural markers taken into consideration in this study are Colours and icons. The language wasn't considered as a marker because of the expected inability of the British participants to understand Mandarin causing a resulting obstruction in the data collection. Eight different

manipulations were made based on these two cultural markers. Icons have a further subdivision into concrete and abstract. The manipulations are summarized in Fig 2. All these eight versions were designed using Sketch App for Mac. The screens were then placed in iPhone mockups, and each of the mockups was further used in the survey development. The selection of icons was made from the results of the initial survey. Each of the versions consisted of six icons, selected from the concrete and abstract range derived from the preliminary study. The choices were made keeping in mind that there is no repetition of similar icons on any screen.

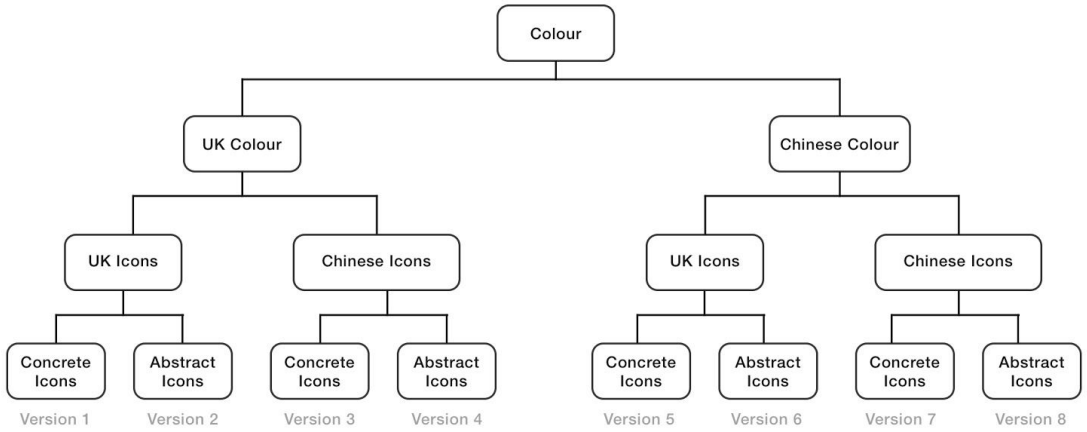

Fig 2: Summary of the experimental manipulation model

Regarding colour, in the case of the Chinese app, a gradient of red to orange(Hex code: #FF2120 to #FF7338; type-linear) was selected as it was beholden in 6 out of 10 apps scrutinized in this study. The choice of colours also affiliated with the flag colour(red) in the case of China which was also one of the cultural markers as dissipated by the preliminary study. On the other end, blue(Hex code: #3864CD) was selected as the primary manipulated colour in the case of English apps as it was the most-occurring primary colour in the apps investigated. A hybrid layout was used in the design so that layout isn't a constraint in the research. The layout was procured from the app layout which was common across both the cultural groups (Notice that navigational layout isn't a cultural marker which is depicted by the app analysis in the previous phase). Also, in as brand reputation is found as an antecedent to trust, satisfaction and loyalty in many previous studies(Zucker, 1986; McKnight & Chernavy, 2001; Ling & Yang, 2006; Chae & Kim, 2001) no particular brand logos were displayed to make sure institutional effect is diminished. The designs of the screens can be found in Appendix D.

4.2 Survey Development

A survey was composed to measure trust, satisfaction, and loyalty. The survey was drawn from the one used by Cyr, Bonanni & islever(2004) who used the items on trust and satisfaction drawn from Yoon(2002) and Gefen & Straub(2000). The validity and reliability of the survey were tested by the researchers, but the wording of the items was revised for better fit and comprehension. It has to be noted, that here the basic contract of IS Research about perceptions is used which fundamentally states that perceptions can be considered as a replacement for actions. The final version of the questionnaire comprised of three trust items, three items for satisfaction and two items for loyalty.

The version of the survey used appears in Appendix C. The tool to develop the survey was Qualtrics, and it was distributed through online platforms like Facebook groups, survey websites as well as through physical interaction with University students at the University Library.

4.3 Research Task

All the participants were instructed to look at each of the home screens which were designed, and based on their perceptions of the design and considering they were using an application with the same home screen, they were asked to answer the questionnaire. The same instructions were repeated for the eight versions. A demographics questionnaire was asked at the completion of the eight versions of home screens. On the completion of the survey, participants were rewarded with a £5 Amazon voucher as a token of appreciation.

4.4 Participants

Participants were random samples obtained from online as well as physical interactions. The original sample of 43 English participants and 27 Chinese participants was reduced to 37 British and 26 Chinese participants eliminating the incomplete responses. Respondents included 40% male participants, 55.7% female respondents, and 3.3% of participants self-described their gender identity. 50% of the participants belonged to the age range of 25-39 years, 28% of the age range 18-24, and the remaining participants were of the age range 40-59 years.

5. RESULTS

For the analysis, a four-way repeated measures mixed-design ANOVA was performed with both within-subject tests to find out the overall significant differences, and between-subject tests to uncover significant differences between nationalities. Key participant responses were extracted from Qualtrics data report and the data is prepared for analysis in MS Excel. The data was checked for approximate normality using Shapiro-Wilk's normality test. The questionnaire consisted of three trust items, three satisfaction items, and two loyalty items. The mean distribution for each of the eight versions was calculated and formulated as separate variables. For distinct analysis, the variables were coded as (country acronym)('c' for colour)_(country acronym)('con' for concrete and 'abs' for abstract), for example, chc_chabs means combination of Chinese colour and Chinese abstract icons.

5.1 Trust, Satisfaction and Loyalty across cultures

To understand the effect of colour, icons(belonging to the two different cultural groups) and icon style(concrete and abstract) on trust, satisfaction and loyalty across the two different cultural groups, the between-subject tests were conducted using repeated measures ANOVA, where the cultural group was selected as the between subject criteria. Mauchly's Test of Sphericity indicated that the assumption of sphericity hasn't been violated in all the different levels across the different groups, so spherically assumed values was used in the analysis of this study.

There was no statistically significant interactions of colour, icons and icon-style, individually or with any combination of them, with nationality on the trust scores. Also, the between-subjects tests as a part of the repeated measures ANOVA failed to indicate statistical significance F(1,61) = 0.379, p=0.540, $\eta^2_{Partial}$ = 0.006, for the trust items. Hence, the hypotheses H1a, H2a and H3a are not supported.

Table 6. Summary for between-subject(factor - nationality) tests on trust, satisfaction and loyalty

Between-subject Test for	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Trust	2.526	1	2.526	0.379	0.540	0.006
Satisfaction	10.061	1	10.061	1.548	0.218	0.025
Loyalty	7.850	1	7.850	1.046	0.310	0.016

For satisfaction, no statistically significant interactions were found between any of the cultural markers or any combination of them, and cultural groups. Consistent with the findings on trust, the between-subject tests didn't reveal statistically significant differences for the satisfaction scores between the Chinese and British participants : F(1, 60) = 1.548, p=0.218, $\eta^2_{Partial}$ = 0.025. Therefore there's no statistical support that can be provided for the hypotheses H1b and H2b.

Hypothesis 1c and 2c were also rejected as no significant interactions were evident with any of the cultural makers or any combinations of them, and nationality, on the loyalty ratings. The between-subject tests of the repeated measures mixed design analysis of variance failed to show statistically significant differences F(1,63) = 1.046, p=0.310, $\eta^2_{Partial}$ = 0.016, between the responses of participants from China and the UK, for loyalty items.

A summary of the results of the between-subject tests for the three measures are enlisted on Table 6. Please note here, that because every group had no more than 2 levels, Mauchy's test of sphericity estimated the same for all the items, so sphericity was assumed and no Greenhouse-Geisser correction was necessary. The measures of the descriptive statistics for the analysis are summarized in Table 7.

Table 7: Descriptive Statistics for trust, satisfaction and loyalty scores across cultures

Version	Nationality	Trust		Satisfaction		Loyalty	
		Mean	Std. deviation	Mean	Std. Deviation	Mean	Std. Deviation
UK Colour, UK	British	2.83	1.355	2.71	1.24	2.87	1.25
	Chinese	3.05	1.41	3.00	1.17	3.36	1.07

Concrete Icons	Total	2.92	1.26	2.82	1.21	3.06	1.20
UK Colour, UK Abstract Icons	British	2.76	1.15	2.78	1.13	2.84	`.25
	Chinese	3.03	2.87	3.11	1.07	3.07	1.11
	Total	2.87	1.114	2.90	1.11	2.93	1.19
UK Colour, Chinese Concrete Icons	British	2.76	1.19	2.78	1.15	2.83	1.23
	Chinese	2.83	1.12	3.16	1.09	2.78	1.11
	Total	2.79	1.16	2.93	1.13	2.81	1.17
UK Colour, Chinese Abstract Icons	British	3.10	1.28	2.92	1.19	3.17	1.35
	Chinese	2.97	0.76	3.01	0.85	3.21	0.93
	Total	3.05	1.09	2.95	1.06	3.19	1.19
Chinese Colour, UK Concrete Icons	British	2.75	1.24	2.61	1.10	2.73	1.18
	Chinese	3.06	1.13	3.02	1.15	3.25	1.24
	Total	2.88	1.20	2.95	1.06	2.93	1.22
Chinese Colour, UK Abstract icons	British	2.80	1.16	2.81	1.10	2.91	1.28
	Chinese	2.93	1.01	3.12	1.05	3.34	1.04
	Total	2.85	1.10	2.93	1.09	3.08	1.20
Chinese Colour, Chinese Concrete Icons	British	2.60	1.02	2.71	1.02	2.78	1.21
	Chinese	2.73	1.10	3.04	0.93	3.34	1.04
	Total	2.65	1.05	2.84	0.99	3.08	1.20
Chinese Colour, Chinese Abstract Icons	British	2.59	1.16	2.75	1.12	2.89	1.30
	Chinese	2.75	1.00	2.95	0.90	3.00	1.08
	Total	2.66	1.09	2.83	1.04	2.93	1.21

5.2 Colour and Trust

The repeated measures Analysis of Variance(ANOVA) on the collected data yielded Colour to have a statistically significant effect on trust, $F(1,61) = 5.985$, $p=0.017$, $\eta^2_{Partial} = 0.089$(see Table 8). Though this wasn't among the stated hypothesis, this is further explored in the discussion section.

5.3 Effect of colour, icons and icon style on Loyalty

The repeated measures ANOVA for loyalty scores revealed colour, icons (based on country) and ion-style had a combined statistically significant interaction on loyalty, F(1,63)=8.753, p=0.004, $\eta^2_{Partial}$ = 0.122 (see Table 8), further indications of which are reviewed in the discussion section of this report.

A summary of the tests for within-subject effects for the three measures of trust, satisfaction and loyalty are presented in Table 8. It is noted that nationality(the cultural groups) showed no statistically significant interactions with any of the three cultural markers or any combination of them, on the trust scores, satisfaction and loyalty.

Table 8. Summary of test results of within-subject effects for trust, satisfaction and loyalty

Source	Trust			Satisfaction			Loyalty		
	SS	F	Sig	SS	F	Sig	SS	F	Sig
Colour	2.441	5.985	***0.017***	0.351	0.567	0.454	0.110	0.150	0.700
Colour*Nationality	0.184	0.451	0.504	0.047	0.075	0.785	0.664	0.907	0.345
Icons	1.495	1.020	0.316	0.048	0.045	0.832	0.917	0.668	0.417
Icons*Nationality	0.948	0.647	0.424	0.199	0.186	0.668	3.567	2.599	0.112
Icon_style	0.210	0.447	0.506	0.310	1.432	0.236	1.333	3.180	0.079
Icon_style*Nationality	0.150	0.319	0.574	0.400	1.846	0.179	0.318	0.759	0.387
Colour*icons	1.416	3.303	0.074	0.266	0.656	0.421	0.298	0.708	0.403
Colour*icons*Nationality	0.305	0.712	0.402	0.008	0.019	0.891	0.029	0.069	0.794
Colour*icon_style	0.413	1.211	0.276	0.015	0.053	0.819	0.014	0.057	0.812
Colour*icon_style*Nationality	2.292E-5	0.000	0.993	0.001	0.003	0.959	0.002	0.008	0.927
icons*icon_style	0.852	2.224	0.141	0.521	1.644	0.205	1.593	3.220	0.078
icons*icon_style*Nationality	0.005	0.014	0.907	0.234	0.739	0.394	0.162	0.328	0.569
Colour*icons*icon_style	0.419	1.370	0.246	0.048	0.173	0.679	3.110	8.753	***0.004***
Colour*icons*icon_style*Nationality	0.419	1.370	0.246	0.199	0.709	0.403	0.298	0.839	0.363

6. DISCUSSION

6.1 Trust, satisfaction and loyalty for localized mobile apps

As it was scrutinized earlier, localization is expected to influence the trust, satisfaction and loyalty of the users for a mobile app. But there were no statistical significance in the interactions of cultural markers and these three measures. Localization, in its core concept, relates to using some unique properties to make a product or service adaptable to a specific cultural group. While previous studies have proved the influence of localization on trust, and hence the consumer satisfaction and subsequent loyalty of the consumers to the product in the web domain, our study didn't succeed to reconfirm the same for the m-commerce mobile apps. Though researchers had signified the importance of trust, satisfaction and loyalty in the e-commerce domain(Kang & Corbitt, 2001; Jones, 2002) which was the principle behind electing the genre of m-commerce applications for the research in hand, it must be recalled that mobile apps is conspicuously different from the websites and the studies in m-commerce can yield remarkably different results as compared to e-commerce studies(Lin & Wang, 2006). The number of cultural markers dissipated from the initial analysis of the top free apps from the App Store of the two different countries, are appreciably less than the number of cultural markers identified by Barber & Badre(1998) in their extensive culturability inspection of 168 native-language sites. Although the genres inspected by the study were much more diverse, as also the number of websites investigated, it should be remembered that with the advent of mobile design guidelines and design systems, there exists an IOS design guideline for all the apps designed and developed for the Iphones and the material design guideline for the apps designed for Android devices, leading to limitations in the liberation to use various cultural markers to make an app adaptive to a particular cultural group. This results in a momentum which shifts the concept of localization to globalization, a concept which might have interfered in our study to prevent the results to be of notable denouement.

The localization of the home screen designs was carried out by the employment of icon-style(concrete & abstract) and colour as the two cultural markers in this study. Despite the fact that there exists substantial differences in the way of thinking between Westerners and Easterners (Rau, Choong & Salvendy, 2004), a generalization made by the authors which is criticized owing to lack of sufficient data, it can't be expected that the British participants to be thinking in a much more imaginative, abstract way whereas the Chinese participants, being Easterners, having a thought process of a concrete and synthetic construct. Although this difference in thinking processes are manifested in recognition rates and time for recognition (Kim & Lee, 2005), no previous studies have explored the same as a concomitant to trust or user satisfaction. With this in mind, it can be fairly said that these concrete or abstract icons, when coupled with colour, and used in the home screen of a mobile application, might be ineffective in effectuating impacts on trust imparted in the user or their satisfaction in using the product.

Antecedents to using a m-commerce product/service again or purchasing from it, are usually perceived value, trust and satisfaction (Lin & Wang, 2006). The smaller number of cultural markers along with the presence of the IOS design guidelines, is expected to force a parallel shift in users to

diminish the effects on trust and satisfaction, so a subsequent impact on failing to alter loyalty is of no big surprise. On the lines of globalization and developing the same apps for a global audience, it can be said that smartphone users come across a plethora of applications on a daily basis, which looks and feels the same. Especially when they are of a particular genre like m-commerce, shopping online through these applications often leads to the users not even noticing the differences in the app design and solely justifying the product based on the comprehended value, the ease of use, and the perceived usefulness of the design system, the concept of which is exhaustively scrutinized in the literature(Evers and Day, 1997; Cyr, 2008; Lin & Wang, 2006), forbye, quite similar to the concept of performance-based trust (Oslina & Lew, 2017). Hence, it can be concluded that several of these justifications culminates in the fact that localization of m-commerce apps didn't show any considerable impact on the trust imbibed in users, their satisfaction with the app and thereby loyalty towards the app.

6.2 Trust, Satisfaction and loyalty across cultures

Till date there hasn't been any study conducted on cross-cultural effects on trust or consumer satisfaction and subsequent loyalty for m-commerce apps or the mobile application domain in general. The exploratory nature of this study itself manifests a dive in a much unexplored field of cultural studies with mobile apps.

Hofstede's dimensions of collectivism and individualism, although being repeatedly asserted by so many studies, were conducted on websites or web applications. As stated there exist noteworthy differences between a mobile app and website, with the introduction of design systems and design guidelines driving the interactions on smartphone devices towards globalization.

Trust, satisfaction and loyalty are much related concepts which is evident from conclusions of previous research work. Despite valid theories existing in distinctions of proneness towards trusting products or services localized to their own culture between the collectivists and individualists, it has to be remembered in the e-commerce or m-commerce specialism, brand /vendor reputation plays a notable role in determining trust (Jarvenpaa, Tractinsky & Saarinen, 2006; Koufaris, 2002; Gefen & Straub, 2003). With hundreds of shopping apps on the market, users are inclined on using particular apps for their online purchases, and hence, when shown something different and new, even though it's localized and adaptive to their certain cultural group, the users hesitate to imply trust on the vendor. The same can be said for satisfaction, as with repeated satisfaction, loyalty or intentions to purchase again is instilled(Lam, Shankar, Erramilli & Murthy, 2004; Flavian, Guinaliu & Gurrea, 2006). Regarding satisfaction, it can also be said that users are satisfied after the task is completed, which involves interactions with the product. Since our study was mainly based on perceptions, the lack of actual interactions with the app or a prototype of it, might be a deciding factor in consumer satisfaction. The utilitarian view, the tendency to trust products more or even the more satisfying nature of individualism, is applicable through the interactions with a product or service, so although IS research states perceptions can be considered as a substitute for actions, the study doesn't involve interactions, a large concept which drives the entire individualism-collectivism index.

Further, with the evolution of technology and the explosive growth of smartphones, the world is being shrunk into a smaller co-habitat consisting of diverse cultural groups, and a place where products are made accessible to all. Cross-cultural dimensions like individualism or collectivism, though were valid in the 2000s, our research directs to the more evolutionary nature of cultural dimensions and might call for a recall of indices that define cultural preferences.

6.3 Colour and Trust

Colour consists of a potential to evoke emotional and behavioural responses which had been studied commodiously by the researchers. In our present study, while examining the effects of localization on the three measures of trust, satisfaction and loyalty, the repeated measures ANOVA revealed that colour had a significant interaction on trust. Further analysis were made where the descriptive statistics were used to explicate the results. The total trust scores were compared for the UK Colour(blue rgb#3864CD) and Chinese colour(Red and orange linear gradient; Hex code: #FF2120 to #FF7338) (see Table 9) which depicts that the colour blue instills more trust in users as compared to the red-orange gradient. This finding is similar to the conclusions of previous studies in evaluating the effects of colour, where cooler colours like blue & green were prefered to brighter Colours like yellow and red(Guilford & Smith, 1959; Adams & Osgood 1973; Latomia & Happ, 1987; Marcus & Gould, 2000). Noteworthy in this context, is the work of Lichte(2007) who analyzed the impact of advertisement's colour in eliciting emotions associating the colour blue with "wealth, trust & security" and more aesthetically appealing, which is reconfirmed by our findings.

Table 9. Summary of average means of total trust scores for the UK (blue) and Chinese(red-orange Colour)

Colour used	**Mean Trust score**
Blue (Hex code: #3864CD) (specific to UK)	2.9127
Red-orange gradient(Hex code: #FF2120 to #FF7338; Type: Linear) (specific to China)	2.7645

Especially in the field of m-commerce, blue elicits trust in users as opposed to brighter colours like red or orange and this can be used by the designers involved in designing m-commerce apps to better understand the preferences of the online customers in this competitive market of the present day world. While the results show strong significance in overall, distinctions between cultures weren't extrapolated. This isn't the first time that cultural differences in colour didn't see a confirming end. Cyr, Head & Larios (2009) while examining colour appeal in websites tried to elucidate differences among Japanese, German, and Canadian participants expecting the Japanese to favour yellow as it symbolises grace and dignity in their culture, according to the colour-culture chart by Boor & Russo(1993), only to deduce that the yellow colour scheme receiving adverse reactions from all the cultural groups including the Japanese. Similarly, though we expected the red-orange colour being favoured and inculcating trust and satisfaction for the Chinese users as red signifies happiness in China(Boor & Russo, 1993) and also is the flag colour of China, it's not the case that the

findings unearthed. As an argument to this it can be said that existing commonalities among cultural groups triumph socio-cultural meaning in certain cases(Adam & Osgood, 1973), one of the prime sources of commonality in case of preferences of colour being exposed to the same colours in the environment like blue skies, yellow sun, green trees, etc.

Regardless of the theory of cultural differences in colour, our findings stand strong in directing the app developers and app designers about using the colour blue and shades of blue in m-commerce apps will trigger a sense of trusting the app among users, a conclusion which is essential in manipulating emotional impact on users.

6.4 Colour, Icons and Icon Style and loyalty

As was deciphered in the results, the repeated measures ANOVA depicted a significant interaction of the three cultural markers, the colour used, the use of icons belonging to apps from two different cultures, and finally the icon-style which is fundamentally, concrete or abstract icons. Further analysis was performed to elaborate the interactional effects of colour, icons based on the source-country and the style of icons(concrete-abstract) on loyalty. Estimated marginal means and pairwise comparisons were conducted between the different levels of colour, icons and types of icons. Separate bar plots were plotted for the three-way interactions to better understand the interpretations. Three-pairs of plots were formulated for the three different groups which are shown in Fig 3-5. Examination of the bar plots grouped by the use of colour(Fig 3) communicates contrasting trends between the loyalty rating of the UK icons and Chinese icons on the basis of concrete and abstract icons. When the blue colour is used, concrete English icons affects loyalty more than the concrete Chinese, and the trend is reversed for the case of abstract icons, with Chinese abstract icons relating to more loyalty ratings as opposed to the abstract icons extrapolated from the British m-commerce apps. Hence, it can be recommended that use of concrete icons taken from English apps with the blue colour, will affect higher loyalty ratings among the users.

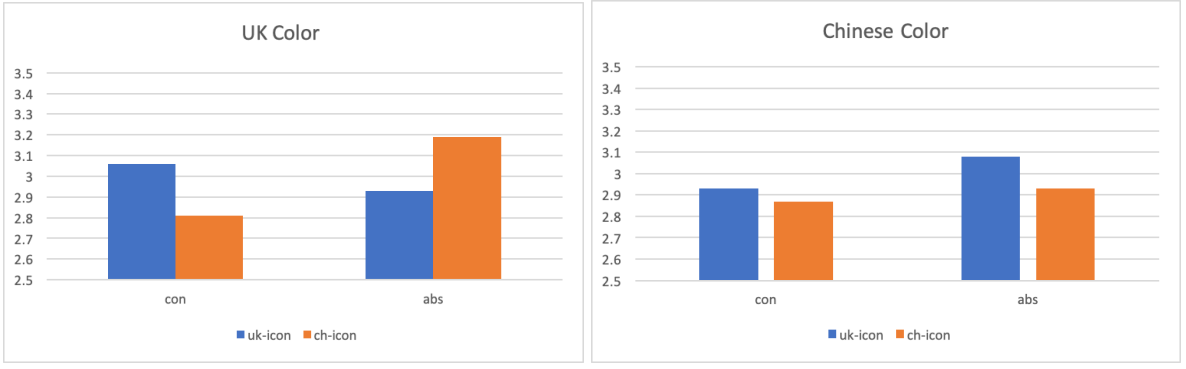

Fig. 3. Column Charts for loyalty means grouped by the use of colour

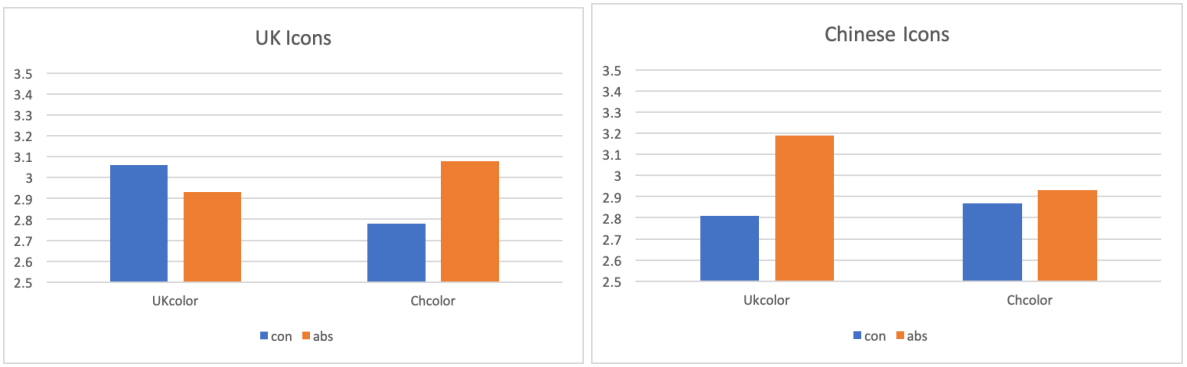

Fig. 4. Column Charts for loyalty means grouped by the use of icons

A closer look at the bar plots grouped by icons (entitled as 'UK Icons-Chinese Icons', Fig 4) disseminates that the use of icons extracted from the English apps has an opposite effect of instilling loyalty with the use of concrete and abstract icons when paired with UK colour(blue) and the Chinese colour (red-orange). Further, concrete British app icons indulge more loyalty in the users when used with the blue colour (UK Colour).

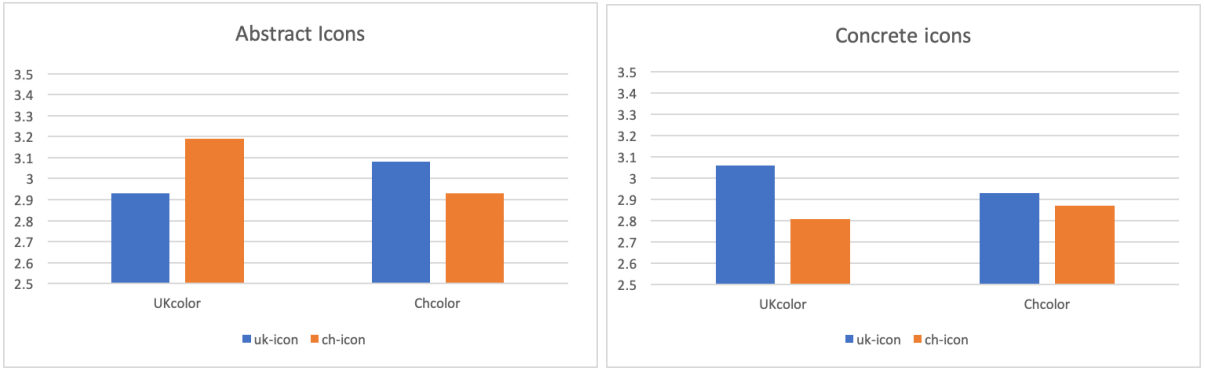

Fig. 5. Column Charts for loyalty means grouped by use of icon-type

A further look at the plots grouped by abstractness and concreteness of icons(see Fig. 5) unveils a similar opposing pattern with Chinese abstract icons having higher loyalty means than English abstract icons with the use of the colour blue, a pattern which is conversed with the use of brighter red-orange gradient. For concrete icons, the trend is parallel with the UK icons incorporating more loyalty in users in both of the colour usage.

If we combine all these interpretations to generate some recommendations for the mobile app designers and developers, it can be fairly said, that user interface designers can use this deduction to target the users, for instance, using Chinese abstract icons or concrete UK icons with the colour blue, will lead to increased loyalty among the users and enhance the chances of them visiting the app again. If, however, the designer opts for a brighter colour like red or orange, icons similar to that of the abstract icons obtained from the UK m-commerce apps should be used to expect the users having a higher intentions of using the app again. A thing to be noted, nonetheless, is that by Chinese abstract or UK concrete, we aren't referring to icons belonging to a certain country or

culture, rather recommendations on using icons similar to the ones used in the m-commerce apps of the respective countries is what is expected. This finding and the subsequent recommendations can be coupled with the conclusion on the effect of colour on trust to trigger the emotional response of the users which is of key importance in the design of mobile applications, especially the shopping apps which are being increasingly popular in the modern era.

6.5 Limitations and Future Work

This research investigation aims to decipher a much unexplored and complicated field. Cultural dimensions change with time, with the advent of a global market where global products or services are becoming increasingly popular, people are exposed to foreign products on a regular basis that diminishes the existing boundaries between cultural groups. The findings suggest that the cultural markers i.e colours and icons of the m-commerce apps doesn't inculcate noteworthy differences between the collectivist Chinese and individualist British respondents in terms of trust towards the app, the satisfaction in using the m-commerce app and subsequent motives of visiting it again.

Although the results of the research aren't in alignment with the expectations led, it provides important building block for further examinations. As with all empirical studies there are certain limitations to this exploration that might provide a stimulus for future studies. The methodology used in the research was perceptual analysis where the participants responded to the questionnaire based on their perceptions on viewing the home screen of the application. Despite the fact that the basic construct of IS research states that perceptions can be considered as a substitute for actions, in the m-commerce domain, the lack of actionable purchase acts as a limitation to the transferability of the results to real-life situations. In the case of a live prototype, the experience is more enriched with repeated interactions and that might lead to different trust, satisfaction and loyalty ratings. Further, since it was a single screen, the scope of reflecting the use of cultural markers was much limited, so it's difficult for the respondents to actually notice the different icons used and what does icons refer to which largely curtails the potential effects that the concreteness or abstractness have on impairment of trust and consumer behavior. Future work might involve developing a prototype of two different localized versions and performing a task-based analysis to measure the effects of localization on trust and the other two measures.

Another limitation of this study pertains to the exclusion of language as a cultural marker and consequent experimental manipulation. Language has played a significant role in all of the previous cross-cultural investigations and is one of the key cultural markers pointed out by the extensive research conducted by Barber & Badre(1998). Prior researchers used language as a manipulation, or used native website and applications in the local language while conducting a study across cultures (Simon, 2001; Cyr, 2008; Cyr, Bonanni & islever, 2004; Cyr, Head & Larios, 2009). In the present analysis, language wasn't considered as a marker owing to translatory difficulties since the researcher wasn't knowledgeable in Mandarin(the language used by the Chinese) as also due to the time constraints of this project. The exclusion of language as a cultural marker might lead to incompletion in localization of the mobile apps, a barrier that might have manifested in the results shadowing its effect on the users' trust, satisfaction and m-loyalty. Future inspections can involve

language as a cultural marker influencing the localization and thereby scrutinizing its effect on trust in combination with colour, icons and the type of icons.

Third, a fictional app home screen was designed for the experimental procedure and no brand or vendor was associated with any of the versions. While this was done to eradicate the vendor reputation as a constraint, not having a brand identity can predispose to the ratings of trust, satisfaction and thereby loyalty. Additionally, the environment provided for the experimental manipulation is an artificial online environment, further research can be conducted in a more natural environment to the user, with an actual mobile application which is available to both of the cultural groups.

Further, the discernment of the cultural markers for the m-commerce apps was done considering the top 10 free apps from the App store for the two cultural groups under inspection. Future research can look into a wider number of applications to observe patterns of cultural markers used, which consequently can be used to understand the concomitants of localization on the consumer behaviors. The deliberately exploratory nature of the present work also suffered the limitation of the smaller sample of participants owing to the restricted resources available including time constraints. In future research, a larger sample and a wider range of apps might enhance the generalizability of the research.

Mobile apps are highly multidimensional stimuli that can trigger respondents behavioral response in complex manners. The current work looked into the m-commerce apps because of their importance in the concepts of trust, satisfaction and loyalty, but in order to generalise the results a diverse genre of mobile applications should be investigated. Upcoming work can deduce the cultural markers used in apps of different genres and latterly reconnoiter the repercussions of localization on the measures of trust, satisfaction and m-loyalty.

8. CONCLUSION

Analysis of the effects of the use of user interface elements adaptive to a certain cultural group for mobile apps, is a stepping stone in the avenue of intersection of mobile interface design and culture. Entrustment towards a mobile app depends on several factors like vendor reputation, privacy settings, information design, visual design, content design, navigational design and several other unexplored aspects, and the fusion of cultural differences with that groundwork is of utmost importance considering the grasp of smartphones to people's lives. In the demesne of m-commerce, analysing consumer perceptions of trust and satisfaction across cultures opens up a new realm of research work and though not of statistical significance, this study reveals differences in perceptions exist among the collectivist Chinese and individualist English respondents that calls for further investigations. The findings of colour affecting user trust and the combined influence of colour, icons and icon-style on user loyalty in m-commerce apps lays a pathway for the app designers and developers to amalgamate these results in the process of user interface design. Mobile app designers can customize the icons to fit the dimensions of abstractness or concreteness and pair them with blue/red-orange colours to shape the behavioral responses of the users.

To conclude, the impact of certain user interface elements like colour and icons in shopping apps for smartphones on user trust, satisfaction and loyalty is demonstrated and subsequent impacts on different cultural groups is examined. This research has the potential to provide app designers with substantial knowledge to attract m-loyal customers, while across cultures, it appeals for cultural considerations in mobile application design a new home for research in emerging markets.

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APPENDICES

APPENDIX A. EXPERT ANALYSIS FOR THE TOP 10 FREE SHOPPING APPS FROM THE UNITED KINGDOM IOS APP STORE

(Please note that the table has to be divided into 3 parts due to space constraints)(Only the cultural markers provided relevant for mobile apps have been displayed)

Apps	**Icons/Metaphors**			**Navigation**			
	Abstract	**Semi-concrete**	**Concrete**	**No. of item**	**Item Order**	**Menu depth**	**Grouping**
Pinduoduo (2 icons rejected due to text)	5	3	5	10+	Sectional	4-6	Based on functionalities, categories
Taobao (3 icons rejected due to text)	1	2	9	10+	Sectional	4-6	Based on categories
Jingdong (3 icons rejected due to text)	2	2	8	10+	Sectional	4-5	Based on functionalities, categories
Xianyu	2	4	8	10+	Sectional	4-5	Based on functionalities, categories
Taojiji (2 icons rejected due to text)	2	2	3	10+	Sectional	4-6	Based on functionalities, categories
Suning Yigon	1	3	11	10+	Sectional	4-6	Based on functionalities, categories
Secoo Luxury	1	2	2	10+	Sectional	4-6	Based on functionalities, categories
Yoho! Buy	1	1	3	10+	Sectional	4-6	Based on functionalities, categories
Shengquian Kuaibao	0	4	10	10+	Sectional	4-7	Based on functionalities, categories
Alibaba	4	4	5	10+	Sectional	4-6	Based on

1688 (one icon rejected due to text)							functionalities, categories

Apps	Colours	Specific Colours	Language	Grouping
Pinduoduo	Colour#1 (193,50,41)	Flag Colour	Mandarin	Based on Functionalities, categories, offers, sales
Taobao	Gradient - Pink(220,49,112)-Red(220,56,59); Purple(150,85,251) Blue(86,151,252); Yellow(241,200,77; Orange(222,81,13); Pink(214,65,105); Hot Pink(224, 124, 129); Gradient - Mustard(228,131,31) ;Dark Orange(222,85,15)	Flag Colour	Mandarin	Based on Functionalities, categories, offers, sales
Jingdong	#1 rgb(240,22,13) #2rgb(231,236,243) #3 rgb(253,184,33) #4rgb(212,124,133) #5 rgb(54,21,102) #361566	Flag Colour	Mandarin	Based on Functionalities, categories, offers, sales
Xianyu	#1rgb(182,179,196) #2 rgb(241,206,29) #3rgb(250,250,248)	--	Mandarin	Based on Functionalities, categories, offers, sales
Taojiji	#1 rgb(232,85,57) #2 rgb(225,50,29) #3rgb(255,255,255)	Flag Colour	Mandarin	Based on Functionalities, categories, offers, sales
Suning Yigon	#1 rgb(19,177,164) #13b1a4 (app colour) #2 rgb(252,92,29) #3rgb(246,246,245) #4rgb(194,197,203) #5 rgb(251,176,90)	--	Mandarin	Based on Functionalities, categories, offers, sales
Secoo Luxury	#1 rgb(39,39,39) (app Colour) #2 rgb(96,88,68) (Text Colour) #3rgb(143,133,113) #4rgb(179,171,159) #5rgb(233,233,232)	--	Mandarin/English	Based on Functionalities, categories, offers, sales
Yoho! Buy	#1 rgb(76,67,66) (app Colour) #2rgb(249,248,246) #3rgb(183,169,165)	Flag Colour	Mandarin/English	Based on Functionalities, categories, offers, sales

	#4rgb(249,248,246) (secondary Colour) #5 rgb(252,190,74)			
Shengquian Kuaibao	Primary Colour - Gradient : Colour #1 rgb(226,113,62) Colour #2 rgb(220,37,36)	--	Mandarin	Based on Functionalities, categories, offers, sales
Alibaba 1688	Primary Colour - Colour #1 rgb(214,92,130) Highlight Colour - Colour #2 rgb(222,82,14)	Flag Colour	Mandarin	Based on Functionalities, categories, offers, sales

Apps	Orientation	Links	Type of navigation	Shapes	Icon Style
Pinduoduo		links to other apps, sections of the same app	Bottom navigation	Minimal , Outlined	Skeuomorphic/consistent
Taobao	text : left-right vertical scrolling	links to other apps, sections of the same app, games, shopping mall	Bottom navigation, tabular navigation for categories	Minimal , Outlined	Skeuomorphic/consistent
Jingdong	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Minimal, Filled, Outlines	Inconsistent, use of both skeuomorphic and skew minimalistic icons
Xianyu	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Minimal, Filled, Outlines	Inconsistent, use of both skeuomorphic and skew minimalistic icons
Taojiji	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Inconsistent, use of both skeuomorphic and skew minimalistic icons
Suning Yigon	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Inconsistent, use of both skeuomorphic and skew minimalistic

					icons
Secoo Luxury	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Consistent, use of flat icons(outlined)
Yoho! Buy	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Inconsistent, use of both skeuomorphic and skew minimalistic icons
Shengquian Kuaibao	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Inconsistent, use of both skeuomorphic and skew minimalistic icons
Alibaba 1688	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Inconsistent, use of both skeuomorphic and skew minimalistic icons

APPENDIX B. EXPERT ANALYSIS FOR THE TOP 10 FREE SHOPPING APPS FROM THE CHINESE IOS APP STORE

(Please note that the table has to be divided into 3 parts due to space constraints)(Only the cultural markers provided relevant for mobile apps have been displayed)

Apps	**Icons/Metaphors**			**Navigation**			
	Abstract	**Semi-concrete**	**Concrete**	**No. of item**	**Item Order**	**Menu depth**	**Grouping**
Amazon	-	-	4	10+	Sectional	3-8	Based on functionalities, categories
Shein UK	3	-	2	10+	Sectional	4-6	Based on categories
Ebay	1	-	4	10+	Sectional	4-6	Based on functionalities, categories
Wish	-	-	5	10+	Sectional	5-7	Based on categories

Depop	-	-	5	10+	Sectional	5-7	Based on categories
Groupon	2	2	3	10+	Sectional	4-6	Based on functionalities, categories
Gumtree	-	-	5	10+	Sectional	N/A	Based on functionalities, categories
Boots	5	-	3	10+	Sectional	5-7	Based on categories
Shpock	1	7	9	10+	Sectional	4-6	Based on functionalities, categories
ASOS	-	-	4	10+	Sectional	5-8	Based on categories

Apps	Colours	Specific Colours	Language	Grouping
Amazon	Amazon logo blue Hex: #146eb4 RGB: 20, 110, 180 Amazon Logo Black Hex: #000000 RGB: 0, 0, 0	Brand colour	English	Based on categories, offers, sales
Shein UK	Red (193,50,41)	--	English	Based on Functionalities, categories, offers, sales
Ebay	Blue rgb(56,100,205)	Brand colour	English	Based on Functionalities, categories, offers, sales
Wish	Sky blue rgb(109,181,233)	Brand colour	English	Based on Functionalities, categories, offers, sales
Depop	Background white rgb(254,254,254) Primary black rgb(30,30,30) red rgb(219,40,3)	Brand colour	English	Based on sellers, functionalities, categories, offers, sales
Groupon	Primary Colour Green rgb(112,161,46) Background Colour White rgb(254,255,255)	Brand colour	English	Based on Functionalities, categories, offers, sales
Gumtree	Accent Colour crimson red rgb(220,121,116)	--	English	Based on Functionalities,

	Background Colour white rgb(254,255,255) Colour #3 rgb(73,150,181)			categories, offers, sales
Boots			English	Based on Functionalities, categories, offers, sales
Shpock	Primary Colour Green - rgb(125,204,111)	Brand colour	English	Based on Functionalities, categories, offers, sales
ASOS	Primary Colour - Black rgb(0,0,0) rgb(222,82,14)	Brand colour	English	Based on Functionalities, categories, offers, sales

Apps	Orientation	Links	Type of navigation	Shapes	Icon Style
Amazon	text : left-right vertical scrolling horizontal scrolling	Links to same app, and related apps of the same brand	Hamburger menu navigation	Geometric , Outlined	Consistent use of icons
Shein UK	text : left-right vertical scrolling	links to sections of the same app	Bottom navigation, tabular navigation for categories	Geometric , Outlined	Consistent use of icons
Ebay	text : left-right vertical scrolling and horizontal scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric , Outlined	Consistent use of icons
Wish	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Outlined	Consistent use of icons
Depop	text : left-right vertical scrolling and horizontal scrolling	sections of the same app	Bottom navigation, tabular navigation for brands, sectional navigation for categories	Geometric , Outlined	Consistent use of icons
Groupon	text : left-right vertical scrolling	sections of the same app	Bottom navigation, tabular navigation for categories	Geometric, outlined	Consistent use of icons

Gumtree	text : left-right vertical scrolling Horizontal scrolling	sections of the same app	Bottom nav, sectional nav for categories	Geometric, outlined	Consistent, use of flat icons(outlined)
Boots	text : left-right vertical scrolling	sections of the same app	Hamburger menu navigation	Geometric, outlined	Consistent, use of icons
Shpock	text : left-right vertical scrolling and horizontal scrolling	sections of the same app	Bottom nav, tabular top nav for categories	Geometric , Outlined	Consistent use of icons
ASOS	text : left-right vertical scrolling	sections of the same app	Bottom nav, sectional nav for categories	Geometric, outlined	Consistent use of icons

APPENDIX C. SURVEY ITEMS

(ANSWERED BY EACH PARTICIPANT FOR EACH OF THE EIGHT DIFFERENT EXPERIMENTAL MANIPULATIONS)

Trust
1. I will trust the online vendor.
2. The app looks credible to me.
3. I will trust the information presented on the app.
Satisfaction
1. The app will completely fulfil my needs and expectations.
2. This app will satisfy my particular needs well.
3. Using this service will be satisfactory overall.
Loyalty
1. I would want to visit this app again.
2. I would want to consider purchasing from this app in future.

APPENDIX D. DESIGN OF HOME SCREENS

(FOR ALL OF THE EXPERIMENTAL MANIPULATIONS PRESENTED TO THE PARTICIPANTS)

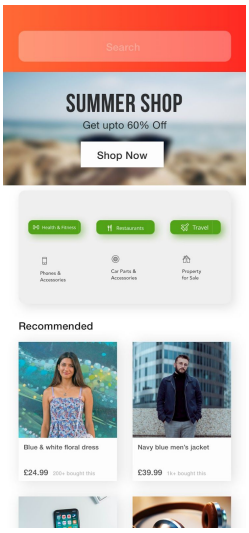

Fig: Chinese color with UK concrete icons

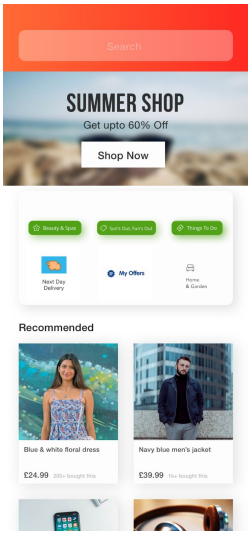

Fig: Chinese color with UK abstract icons

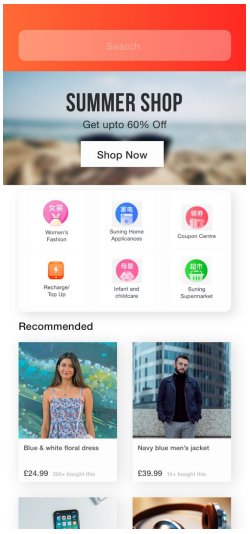

Fig: Chinese color with Chinese concrete icons

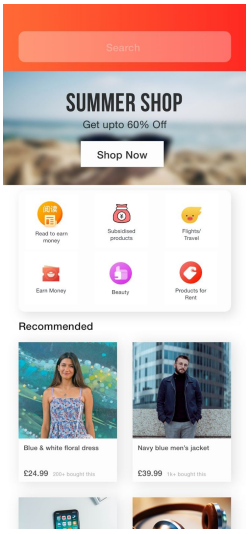

Fig: Chinese color with Chinese abstract icons

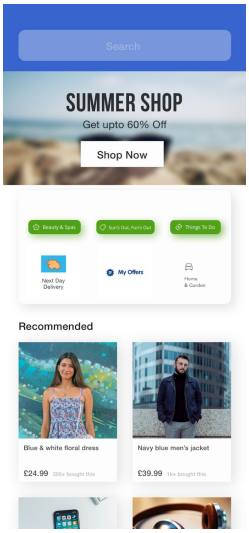

Fig: UK color with UK abstract icons

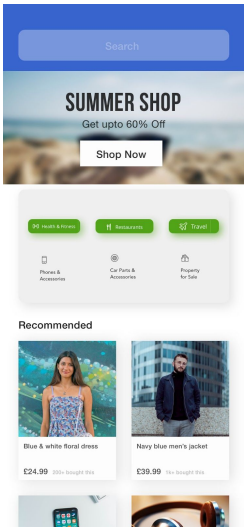

Fig: UK color with UK concrete icons

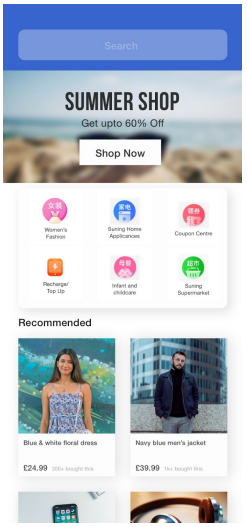

Fig: UK color with Chinese concrete icons

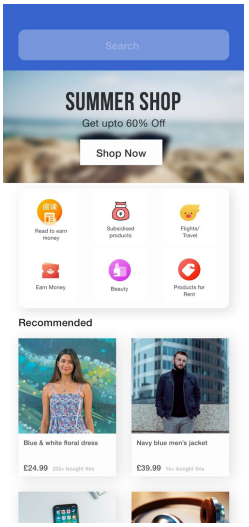

Fig: UK color with Chinese abstract icons