



Observing the Influence of Cultural Differences Within India on User Experience of an E-Commerce Application: An Experimental Investigation

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Abstract. Though several studies have reported differences in online behavior across different cultures where countries have been treated as a single cultural unit, there are limited studies on the influence of subcultural differences on the online behavior of users within a country. Especially within India, there is a dearth of literature investigating the influence of subcultural differences on user preferences on mobile application designs. This paper reports an experimental investigation into consumer preferences for e-commerce mobile application users from three distinct cultural regions within India. Culturally suitable design variations for the three regions were created using user interface markers from literature. This was followed by remote usability testing and structured interviews with participants. It was observed that there were differences between preferences of users from different cultural regions within India and the users from a particular subcultural region preferred the design variation made for that region using culturally suitable user interface elements.

Keywords: Subcultural differences · Mobile user preferences · Online shopping behaviour · E-commerce applications

1 Introduction

With the ubiquity of the internet, geography has ceased to be a limiting factor in the exchange of information [1]. However, the way this information is received depends on several factors like receivers' opinions, beliefs and cultural perspectives [2, 3]. This has led to an attribution of importance to the concept of culture in the design of interactive systems [4, 5]. Even in the context of mobile HCI (Human Computer Interaction), this concept can be viewed from multiple viewpoints, such as accessibility and ergonomics, market advantages and social sustainability [6]. Consequently, cultural gaps have become an important topic in consumer research for mobile devices, and more so for developing countries with their cultural and economic heterogeneity [6]. An experimental study into consumer preferences for e-commerce mobile application users from three distinct cultural regions within India is recorded in this article. Literature has shown that in India there are three distinct cultural areas with different cultural dimensions [7]. It has also

been reported that there is a correlation between the preferred elements of user interface to cultural differences between the users [8, 9].

This study reports findings from usability testing and personal interviews conducted on a total of 24 users from different cultural regions within India, while they made a purchase on an e-commerce mobile application. Each user made the purchase on three different designs for the mobile application (app), leading to a total of 72 usability tests. The design variations in the mobile app were made according to the culturally preferred user interface elements as reported in the literature [10]. Of the 24 users, eight belonged each to South India, North India, and North-East India, which are Indian regions with significant cultural differences [7]. The participants were also interviewed before and after the task was done to get additional insights. The results of this research show that there is a differentiation between the user preferences of three different cultural areas within India. It was also noted that if the app user-interface (UI) is designed in accordance with the cultural aspects of the area of which the user belongs, the user's reaction to using the mobile app is favourable.

2 Background

2.1 Cultural Models

Cultural models generally provide parameters that demonstrate different cultures, but because of their systematic nature, they may be mapped on other structures such as management models [6]. There are several popular theories that have proposed dimensions to a culture like Hall's theory of high or low context cultures [11]; Kluckhohn's five dimensions of attitude to problems, time, nature, form of activity and reaction to compatriots [12]; Trompenaars's seven dimensions of universalistic vs particularistic, individualist vs collectivist, specific vs. diffuse, achievement oriented vs ascriptive and neutral vs affective [13] and Hofstede's 6-D model of power distance, collectivism vs. individualism, femininity vs masculinity, uncertainty avoidance, indulgence vs. restraint and long term vs short term orientation [14]. However, the simple structure of the Hofstede model makes it more accessible in HCI research, especially where a method of calculation or numerical data is needed [6]. The dimensions of this model, for example, have been used to assess performance based on cultural differences [15].

2.2 Distinct Cultural Regions Within India

While the possibility of multiple cultural groups within national borders has been argued in prior studies [16], there is limited research on the design impact of national cultural differences, especially within countries such as India [17]. Based on the anthropological classification of India [18, 19], the following three distinct cultural regions within India have been identified in literature [7]. Figure 1 shows the reported difference in cultural dimensions of these three regions:

1. North India - including the Indian states of Kashmir, Uttarakhand, Delhi, Chandigarh, Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Gujarat, Rajasthan, Maharashtra, Goa, Daman & Diu, Dadra & Nagar Haveli, Bihar, Jharkhand, Odisha and West Bengal.
2. South India - including the Indian states of Karnataka, Tamil Nadu, Kerala, Andhra Pradesh, Telangana and Puducherry.
3. North-east India - including the Indian states of Sikkim, Assam, Manipur, Arunachal Pradesh, Mizoram, Nagaland, Tripura and Meghalaya.

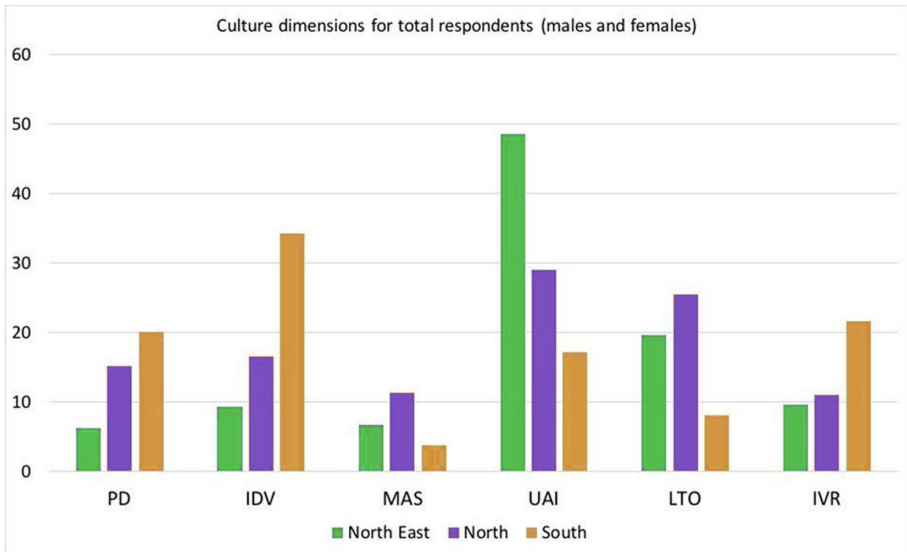


Fig. 1. Difference in Hofstede's culture dimensions for three different Indian regions [7]

2.3 Influence of Culture Differences on UI Elements of HCI Designs

Based on the association reported in literature between the preferred user interface elements and the cultural differences between users [10] and the dimensions of culturally distinct regions within India [7], Table 1 lists the mapping of user-interface design elements for three cultural regions in India:

Table 1. Preferred user interface design elements for three cultural regions in India based on reported literature

Design aspect	South India	North India	North East India
Navigation	Linear, different paths	Linear, restricted	Non-linear, different paths
Error messages	Formal	Formal	Friendly
Structured data	Necessary	Not necessary	Not necessary
Interface level info	High	Low	Low
Support – help, FAQ	Strong	Strong	Not necessary
Image to text ratio	Balanced	Balanced	High
Multimodality	Balanced	Balanced	Low
Color palette	Little saturation	High contrast/bright color	Little saturation
Text content	Friendly	Encouraging words	Friendly
Hierarchy	Flat	Flat	Deep

3 Research Methodology

The experimental study reported in this paper was conducted in three steps. Firstly, an existing popular e-commerce application in India was studied for its information architecture and various user interface elements. The mobile app was then re-designed into three design-variations according to the preferred UI elements for users of three cultural regions of North, North-East and South India (Table 1).

Next, 50 participants belonging to different cultural regions within India were given an online questionnaire to get their demographic data and their availability for the experiment. Out of these, 24 participants of similar age group, gender and educational background were identified, eight from each of the three cultural regions based on how long they had stayed in their native region. The participants were contacted through emails and telephone and were explained the study intent and the methodology in detail. Informed consent to participate in the study and to use the data collected through it was taken through emails.

Further, the users were given a task to make a purchase from the three versions of the mobile application and synchronous remote usability tests [20] were conducted on the 24 users while doing a task on each design variation using a popular remote usability testing tool [21]. Videos of the UT sessions were recorded with the participant's consent and were used for analysis of the data.

Finally, structured telephonic interviews were conducted after the experiment to gather insights about the participants overall experience with the three versions of the websites. The steps of the research methodology are detailed below.

3.1 Redesign of an Existing Popular E-commerce Application

An existing e-commerce mobile application popular in India was studied for its information architecture and its user interface (UI) elements and information architecture (IA) was mapped. The app was then re-designed into 3 variations using the cultural dimensions for North, North-East and South India and their corresponding UI preferences. Figure 2 illustrates the working prototypes that were created for the three versions.

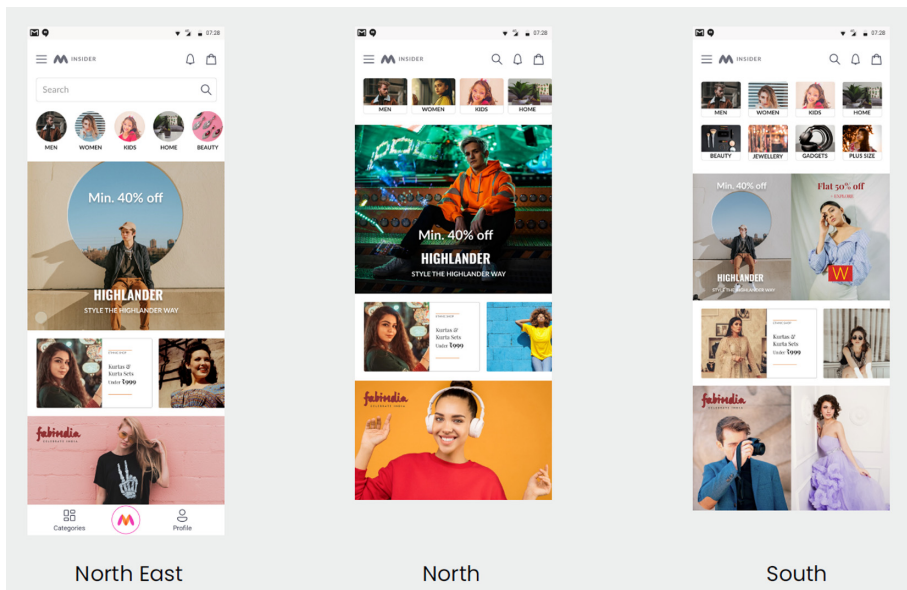


Fig. 2. Design variations of the e-commerce app for three different cultural regions in India

3.2 Participants

50 participants belonging to different cultural regions within India were given an online questionnaire to get their demographic data and their availability for the experiment. Of these, 24 participants of similar age group, gender and educational background were identified, eight from each of the three cultural regions based on how long they had stayed in their native region. The participants were all males with an undergraduate degree in the discipline of engineering or architecture. The age group of the participants was between 22–28 years with the average age being 25 years and standard deviation of 1.5 years. Each of the participants had stayed in his native place for more than 14 years and the average duration of stay for all the participants was 22 years while the standard deviation was 3.4 years. The participants were contacted through emails and telephone and were explained the study intent and the methodology in detail. Informed consent to participate in the study and to use the data collected through it was taken through emails.

3.3 Experiment Procedure

Firstly, demographic details like gender, age, native place and number of years lived in native place and other states was collected through an online form from each user. Then, the three versions were given randomly to each participant to minimize the ‘order effect’ using research randomizer [22]. The task given to the participants was: “Your friend from school is getting married. Since it’s lockdown and being home is the safest option, you plan to buy a shirt online as a gift for his wedding. Purchase a shirt from the available options in the application”. Next, remote moderated testing was conducted using a remote usability testing tool [21]. The investigators connected with the participants via a video call. Then the context and the intent of the experiment as well as the task were explained to the user. Informed consent was taken from the participants before the task began. The users were asked to share their screen while they performed the tasks, and the entire session was recorded. After each task, users were asked to rate the design version on a scale of 1–7 for the following five parameters:

1. Color Scheme - visual appeal to colors used in the layout and images.
2. Ease of Use - perform the tasks effectively and efficiently
3. Information Density - amount of content in the visible screen area
4. Look and Feel - aesthetic appeal of visual elements and layout of the application.
5. Overall experience - satisfaction level of the user in using this application

This was followed by a semi-structured interview of approximately 15 min to understand the user preferences. A few representative questions from the interview are listed below:

1. Did you face any difficulty while making the purchase?
2. Was it easy for you to navigate to other screens? Could you explain?
3. Would you have preferred more items on a single page?
4. How do you usually find a product in an e-commerce application? Do you use the search box to find the item while making a purchase or browse from the home page categories?
5. Which colour do you associate yourself the most? Can you elaborate please.
6. When you think of your native state, what images or thoughts come to your mind? What are your associations with these images?

4 Observations

It was observed overall, that participants from each particular region preferred the design variation made for that region i.e. users from the Northern, North East and Southern regions of India preferred the North Indian, NE Indian and South Indian variations of the application respectively. It was also observed that there was a preference for Content Density and Ease of use by the south Indian participants towards the northern variation, which affected the overall average scores of that region. Figure 3 illustrates the average ratings of the five design parameters for each variation by the participants, while Table 2 enlists a few representative extracts from the verbal reports of the interviews conducted post the usability tests, which provided further insights into the participants’ preferences.

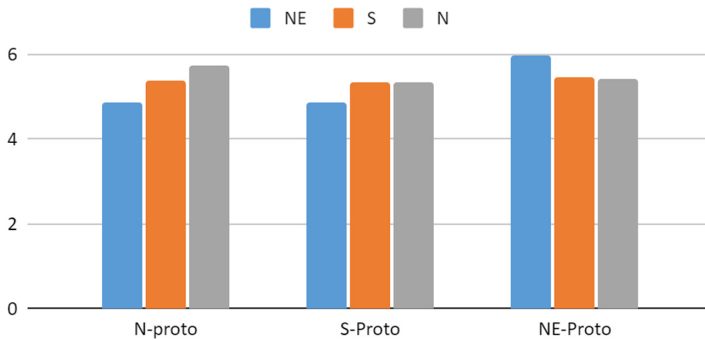


Fig. 3. Average ratings of five design parameters for the three design variations

Table 2. Verbal reports of the interviews conducted post the remote usability testing sessions

Participant code	Cultural region	Verbal report
PS8	South India	“I did not like the hexagons in the third prototype (N version)...”
PS6	South India	“I need all the information to be there. It need not be visible...”
PN1	North India	“Generally i prefer to have bright colors, that feeling of happiness and something cheerful going on...”
PN4	North India	“The second prototype (N version) with hexagonal shapes was very eye-catching. I liked it. I really like these regular shapes (with) sharp edges...”
PNE2	North-east India	“I personally like minimalistic (designs). Minimal content is always preferable for me, be it app, website or anything else...”
PNE7	North-east India	“I go to the categories and then pick a particular option. Also i’m a fan of (using) filters. It’s kind of difficult to use a search bar....”

4.1 Observations of Participants from South India

All south Indian users expressed their preference towards more graphical content (high image to text ratio). It was also found that there was a strong use of the search bar for locating a product. All the three versions were found almost equally easy to use by them. However, they preferred the North and North Eastern design versions for their overall experience. While literature had indicated that users from south India would prefer high information density compared to other two regions, it was found that most south Indian participants preferred minimal content. This may arguably be due to the educational background of the participants. These participants also reported preferring low saturation and bright colours. Figure 4 illustrates their average rating of each of the five design parameters for the three design variations.

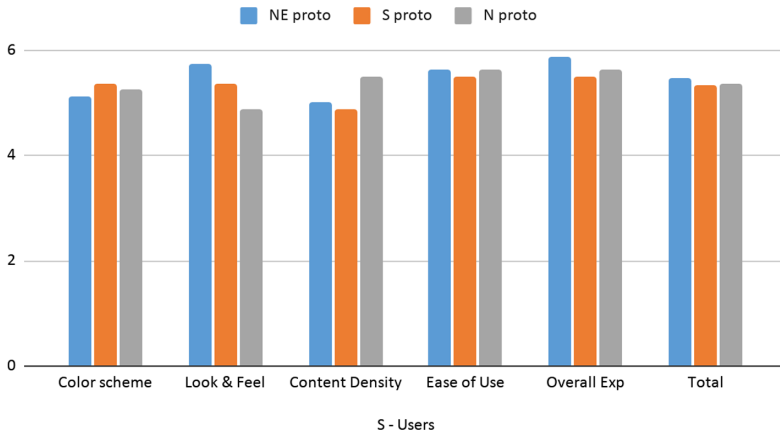


Fig. 4. Average ratings of each parameter by South Indian participants

4.2 Observations of Participants from the North India

Most of the North Indian participants reported that they preferred the content density, colour scheme, ease of use and overall experience of the North Indian design version. However, the look and feel of the North Eastern version was reported to be slightly preferred over the Northern version. The participants reported preferring high contrast bright colours and did not explore alternate paths for navigation reporting multiple paths to be a distraction. Figure 5 illustrates their average rating of each of the five design parameters for the three design variations.

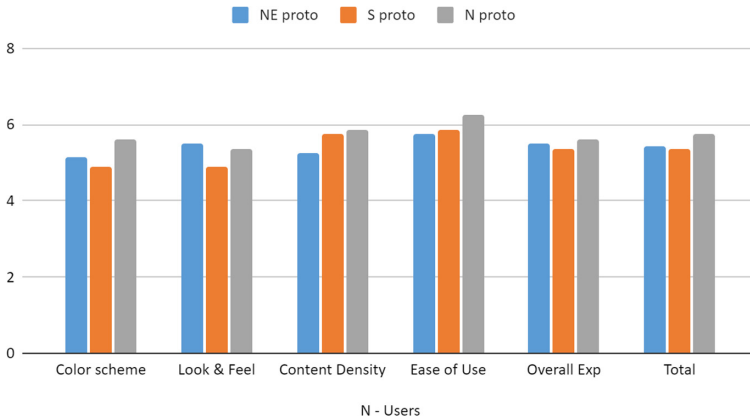


Fig. 5. Average ratings of each parameter by North Indian participants

4.3 Observations of Participants from the North-East India

A majority of North-East Indian participants reported that they preferred the minimal content density, look and feel, colour scheme, ease of use and overall experience of the North-east Indian design version. The participants reported preferring low contrast and less saturated colours and used category-navigation most of the time, rarely using the search-bar. This observation was in contrast to their preference for deep hierarchy as reported in literature. Figure 6 illustrates their average rating of each of the five design parameters for the three design variations.

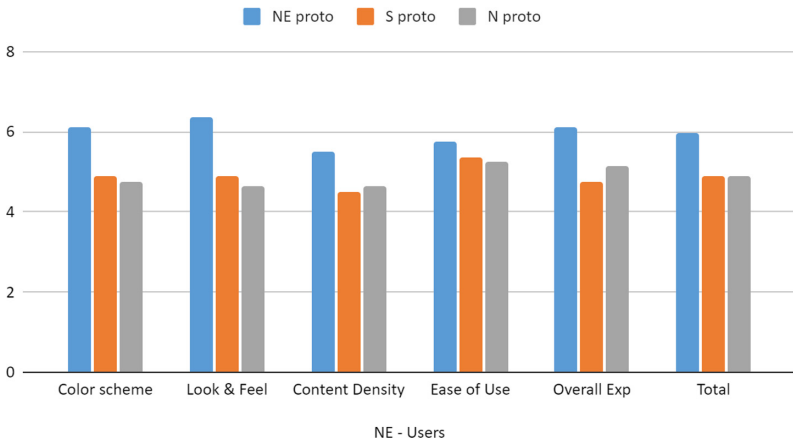


Fig. 6. Average ratings of each parameter by North-east Indian participants

5 Conclusion and Discussion

The contribution of this paper is in identifying and reporting user preferences for mobile application designs at subcultural level within different regions in India. The experimental research results indicate that subcultural disparities in India impact consumer preferences for e-commerce apps, as seen in Fig. 7. The insights from this study can be used in context of user preferences to develop more evolved interactive mobile application designs for sub-cultural Indians.

However, detailed studies are required to establish reasons for the observed differences as well as deviations. Differences for domains other than e-commerce also need to be explored through further studies with larger datasets. There were also limitations to this study, enlisted below; which can be attended to while extending further studies in this area:

1. The study was conducted on a restricted data set (24 participants). Expanding this could yield more conclusive results.

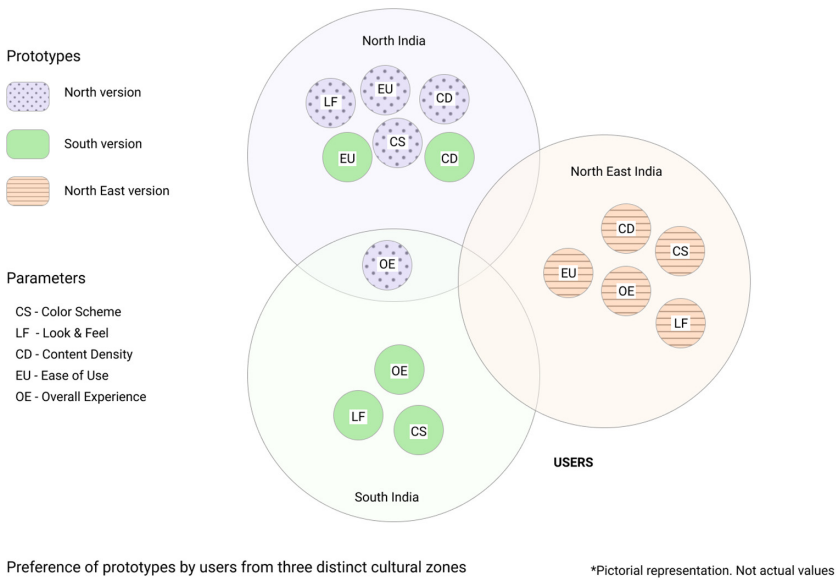


Fig. 7. Experimental observation of subcultural differences in user preferences for an e-commerce mobile application

2. Narrow time intervals between the three prototype tests may have made it difficult for the users to think aloud and could have affected their performance. Also even though randomizer was used to reduce the order effect, by the time the participants used the third design variation, they had become conversed with the task. This could have impacted the overall results.
3. Limited internet connectivity sometimes made it difficult to analyse facial expressions while the remote usability testing was conducted. Also, since the heat maps generated were completely based on mouse clicks in the remote UT tool, precise conclusions could not be made without considering the commonalities in the 5 mentioned parameters.
4. This study is conducted by re-designing an e-commerce mobile application. Different domains of HCI products may be explored further in future studies.
5. External influences of factors like designer’s own culture, were not accounted for in this particular study, which can be explored further to ascertain their effect to create culturally suitable designs.

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