

A Comparison Between User Interface Design for Different Kinds of Mobile Applications

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Abstract: *In present research, a comparative study is conducted between designs of various mobile applications in terms of their usability. It includes review of design guidelines to suit the mobile platform. This research studies the growing need for developing mobile applications for various websites.*

Purpose: *Purpose of this research is to understand the reason behind success and failure of an application on mobile interface. In this study, existing popular applications have been explored and evaluated against the existing design guidelines in order to compute their usability. Existing guidelines have been grouped into generic design guidelines and specific design guidelines for Mobile Interface*

Methodology: *Existing mobile applications have been clustered into five different groups depending upon their functionality and services provided to the user. An empirical study has been conducted to select the popular applications from the users in the form of Questionnaire and Interviews. In addition, review of applications in terms of number of downloads and star rating was taken into account from different platforms such as Google's play store, Windows phone store. A quantitative analysis is carried out to measure the usability and success rate of an application by determining the number of design guidelines followed.*

Originality: *Categorisation and comparison of mobile applications in terms of user centred design interface*

Keywords: *UI-Design, Mobile Applications, Web Applications, Usability*

I. INTRODUCTION

In HCI, the term usability is used frequently to refer ease of use. ISO defined usability as *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use"* Effectiveness means completeness and accuracy with which users achieve specified goals. For example-use of correct and consistent terminology for different features in design can make an interface effective. Use of clear and easy to understand and interpret symbols can increase in accuracy of the user's tasks. Efficiency refers to the speed at which users can complete the task in a particular system. ISO 9241 defines efficiency as total resources expended in a task. Simple interface design with limited features can increase the efficiency of the system. [5] However Whitney expands the term of Usability and extends it further, adding three more characteristics to it. They are

Engagement: An interface is said to be engaging if it is pleasant and satisfying to use. Style of visual representation (graphics, colours, multimedia), style of writing text in case of websites, readability of the text can influence the interaction of user with the interface.

Error Tolerant: An interface can be error tolerant if it prevents or handles errors caused by user's interaction. Errors can be prevented by predicting them well in advance during user testing and designing constraints thus limiting the user from making a mistake. In case where error occurs, interface should be able to define the error in simple or less technical language and provide solutions for it to the user.

Ease of learning: An interface is said to be easy to learn when it has successfully removed fears from novice user's mind [11]

User friendly interface is easy to interact with and easy to remember the steps involved. In order to build positive User experience, potential users should be brought in direct contact with the designers. Instead of studying them and building prototypes, designers need to involve users in the process of design. It is also known as participatory design. Design Process must be iterated in order to provide better results in terms of usability. Usability tests are conducted to record and analyse user's performance, thoughts and attitude while they are involved in a task. Usability tests are critical because people who have developed a system think differently about its use. [3]

Although they are often lumped together as computing devices, smart phones and desktop computers are very different: small screen versus big screen, intermittent versus reliable connectivity, low versus high bandwidth, battery powered versus plugged in, and so on. Given this list, one might be tempted to think of mobile devices as underpowered versions of 'real' computers. But this would be a mistake. In fact, the reverse is true: Smart phones are actually more powerful than desktops in many ways. They are highly personal, always on, always with us, usually connected and directly addressable. Plus, they are crawling with powerful sensors that can detect location, movement, acceleration, orientation, proximity, environmental conditions and more.

Rest of the study is organised as followed. Section 2 consists of literature review of work done that signifies the difference in design guidelines and approaches for mobile and web interfaces. Section 3 deals with the objectives and hypothesis formed to meet the requirements of the present research. Section 4 describes the research methodology adapted for this study in order to explore various design principles and test them against the mobile applications. Section 5 explains the results and conclusion that originated from the present research.

II. LITERATURE REVIEW

In the previous research, various human factors were reviewed that affects the design of a product. [1]. Designing for traditional Graphical User Interface, WYSIWYG (What you see is what you get) guideline works well as Designer has full control over the graphics. Every pixel will look exactly the same as a designer wants it on the user's screen. Designer can control user's actions by using modal dialog box thus preventing the user to forward without giving a response. But in web design, Designer needs to give up full control and share responsibility for the User Interface with users and their client hardware/software. User decides his navigation through the web pages without the consent from designer. There is a freedom of Movement. Since mobile web application varies from a website interface, it works on WYSIWYG where designer have full control. [10] Guidelines in Design are map that leads towards success and growth of an interface of a system. In mobile era, the number of design guidelines increased from 85 to 210. It happened because of the increase in requirements of the user and development in the field of mobile usability. Success rate of accessing web application on mobile was quite less when the design interface was same as tested by Nielsen. Thus it was established guideline that designs a separate interface for mobile web application. Nielsen's study also confirmed that apps beat web in terms of usage thus there is growing need to develop apps for websites meant for traditional desktop.[9] Popularity of mobile interfaces proves that mobile usability is measured in terms of 3 attributes namely effectiveness, efficiency and satisfaction.[4]

However Kayla's article discusses responsive web design that responds towards user's needs by having automatic screen resolution and flexible images corresponding to the platform. This will save designers to build separate versions of application for different platforms. Essentially it will help to reduce number of individual design guidelines developed by each platform. Flexible layout of interface is possible with the use of CSS media queries in standard HTML [7]

1. Limitations of Mobile interface: Mobile Context: While interacting with mobile applications, user is not stationary. User may also be interacting with other people and objects in his surrounding which could distract his attention.

Connectivity: Connectivity is often slow and unreliable on mobile devices. This will impact the performance of mobile applications that utilize these features.

Small Screen Size: In order to provide portability mobile devices contain very limited screen size and so the amount of information that can be displayed is limited.

Different Display Resolution: The resolution of mobile devices is reduced from that of desktop computers resulting in lower quality images.

Limited Processing Capability and Power: In order to provide portability, mobile devices often contain less processing capability and power. This will limit the type of applications that are suitable for mobile devices.

Data Entry Methods: The input methods available for mobile devices are different from those for desktop computers and require a certain level of proficiency. This problem increases the likelihood of erroneous input and decreases the rate of data entry [13]

2. Design Guidelines: Design guidelines are general design rules that an interface should follow in order to be user friendly. They are not as straight forward as following cooking recipe. Design rules usually describe goals rather than actions. They can be broadly applicable to different kind of interfaces and their interpretation is subjective [6].

Horizontal Swiping has gain popularity in mobile interface design. Still it requires a visible clue so that users do not miss it by mistake. It should not be multifunctional. If swipe gesture means different on different areas of the same screen then users are more likely to get confused. So Swipe Ambiguity must be avoided. However, Desktop websites have a strong guideline to avoid horizontal scrolling. [11]

Another guideline is to develop for small screen thus limiting the features. Usually user is using the mobile web while travelling, walking down the street, waiting for the bus, social gathering, bored lectures. Thus he is not entirely focused on the task. It is allowed to give limited info as his brain is just trying to accommodate the free time. Based on his workshops, mobile consultant Jonathan Stark compiles the top principles of mobile interface design and explains how to take your mobile app from concept to completed design :Mobile Mindset, Mobile Context, Global guidelines, Navigation models, User input, Gestures, Orientation, Communication, Launching, First Impression

A good design adapts to the user's behaviour rather than users adapting towards the design. [1]. User's perception and their learning styles are also crucial to understand in order to analyse user's pattern. [2]

Two- best known list of user interface design guidelines are:

- Strive for consistency- consistent in design , layout , language
- Cater to universal usability
- Offer informative feedback- feedback about what has been done
- Design task flows to yield closure
- Prevent errors
- Permit easy reversal of actions
- Make users feel *they* are in control
- Minimize short-term memory load [12]

- Consistency and standards
- Visibility of system status
- Match between system and real world
- User control and freedom
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Provide online documentation and help [8]

Design guidelines extracted and tested in this research paper are:

1. Consistency: identical terminology in prompt, menus, help screens, similar interface styles for web and mobile-if they are too different then user will get confused and leave ; consistent sequence of actions
2. Visibility/short cuts: enable users to use shortcuts such as clear icons, symbols, keys. Symbols should prevent ambiguity and confusion. There should be some kind of visible format for touch screen swipe otherwise it will be missed
3. Universal- Is design well adapted by other parts of the world. Globally.
4. Minimum memory load: design should be simple enough so that user does not have to remember a lot of things. At the same time it should be logical so that easy to remember. Limited number of features so as to avoid complicated design and speed up the user's task. It will help to reduce the memory load.
5. Error handling: errors briefly explained in simple language with the help of notification. Design should be able to prevent errors by predicting them in advance. And also also solve the error
6. System Feedback: notification for the user's action taken.
7. Freedom, User control- best example is navigation between the links.
8. Flexible- design interface should be flexible and adapt itself from web to mobile interface. Navigation from full site to mobile site should be easy without breaking the link.

III. OBJECTIVES

1. To determine relevant design guidelines from existing literature in HCI with respect to mobile applications.
2. To explore and categorise current mobile applications on the basis of their usage and functionality.
3. To study the influence of design guidelines on the popularity of applications. Popularity of an application can be determined by accessing number of downloads for a particular application, star-rating and reviews from the users. In this research paper it is assumed that popular application follows the design guidelines.

Research Methodology: 4 categories are taken into account namely Social Networks (SN), E-commerce (EC), Education (E) and News-Magazines (N). Each of the categories consists of 2- 5 current mobile applications available in Google's repository known as Google's Play.

Applications are selected based on an exploratory study conducted where primary data is collected from users in the form questionnaire, observations, feedbacks and interviews. Selected applications are then filtered out based on their availability, number of downloads, star rating and user reviews.

Each application was tested against the 8 design principles extracted from existing literature. Usability tests were conducted where users were asked to perform specific task while operating the application.

User tasks were mainly primitive such as sending instant messages, playing a game, video calling, looking up the news headlines, navigating between the links. Users were observed closely and their behaviour, pattern, number of clicks, opinion and overall satisfaction were recorded.

Design for all applications account from Google Play-Android Platform

Categories	Social networking apps	E commerce	Education	News-Magazines
Application Name-Developer	Facebook-Facebook Inc	Flipkart Flipkart.com	History TV-18 Network 18	CNN Breaking US & World News-CNN
	WhatsApp Messenger-WhatsApp Inc	Amazon-Amazon Mobile	TED – TED conferences	TOI- Times Internet Limited
	Hike Messenger-Hike Limited	eBay-eBay Mobile		Plash-Plash Digital Labs Pvt Ltds
	Viber Free Calls-Viber Media	MakeMyTrip-MakeMyTrip.com		ESPN Sports Centre ESPN Inc
	Skype-Free IM Skype	BookMyshow-Bigtree Entertainment Pvt Ltd.		
		SnapDeal-SnapDeal.com		

IV. RESULTS AND CONCLUSION

Table 4.1

Application	Ratings out of 5	Size (MB)
Whatsapp	4.4	14.6
Facebook	4	Varies with device
Hike	4.3	14
Viber	4.3	29
Skype	4.1	10

Table 4.3

Application	Ratings out of 5	Size (MB)
CNN	3.8	23
TOI	4.3	5.3
ESPN	4.2	14
Plash	4	6.2

Table 4.2

Application	Ratings out of 5	Size (MB)
Flipkart	4.3	5.3
Amazon	4.3	Varies with Device
SnapDeal	4.1	Varies with Device
Ebay	4.3	-
MakemyTrip	4.1	-
BookMyShow	4.3	-

Table 4.4

Application	Ratings out of 5	Size (MB)
TED	4.5	5.1
History-TV 18	4.4	7.8

Record gathered from Google play store

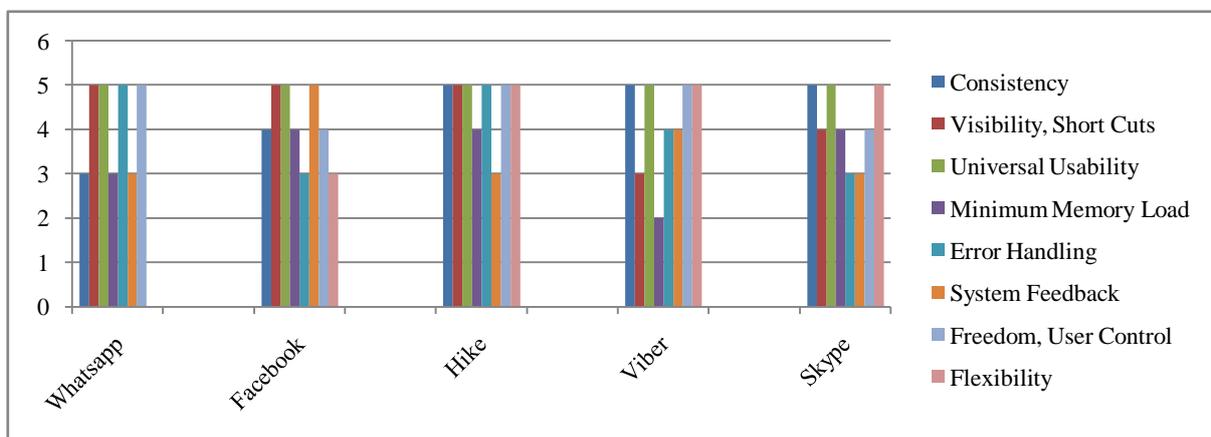


Figure 1

In Figure 1, social applications are tested against 8 design principles. The results show that highly consistent applications are flexible to users such as Hike, Viber and Skype. Whatsapp offers maximum freedom to the users and handles errors efficiently. Only Facebook offers maximum system feedback to the users.

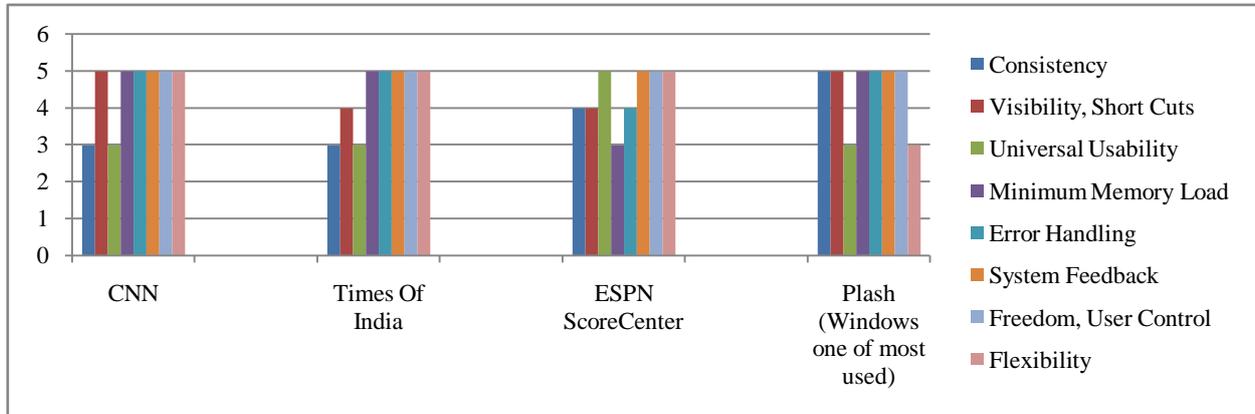


Figure 2

In Figure 2, news applications are tested against 8 designs principles. All the applications faired equally well in System Feedback and freedom to users.

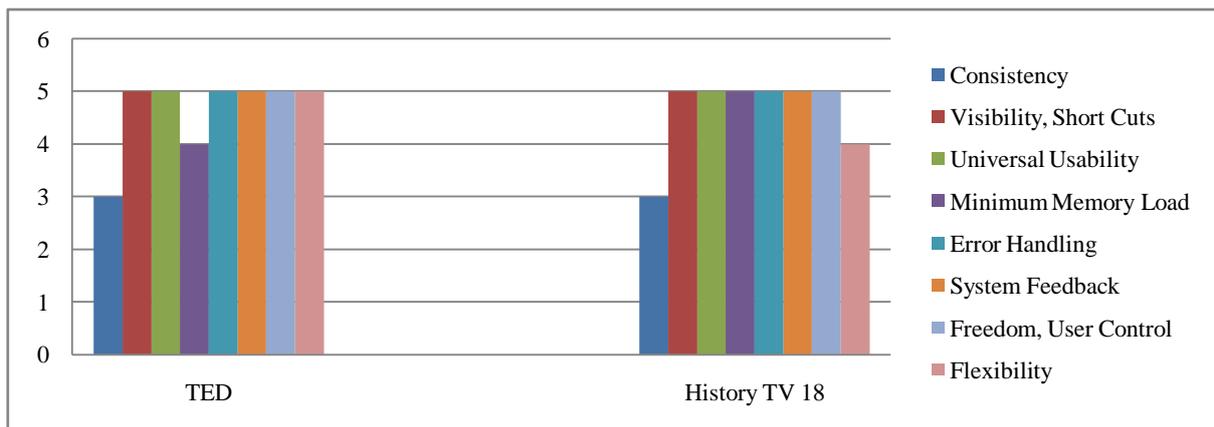


Figure 3

In Figure 3, entertainment applications are tested against 8 design principles.

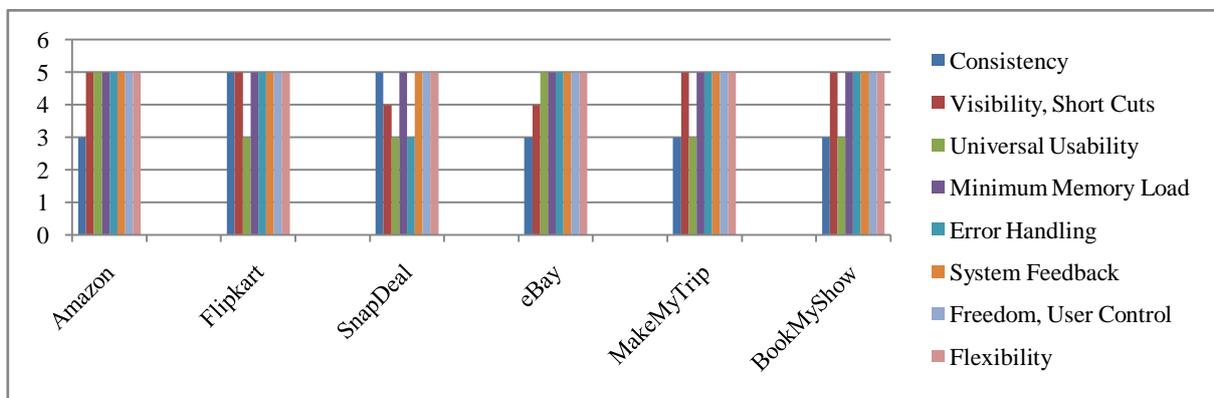


Figure 4

In Figure 4, e-commerce applications are tested against 8 design principles. Amazon scored fairly well in all the design principles except for Consistency. Flip kart scored low for universal usability. Make my trip and book my show scored less in consistent and universal usable interface

V. CONCLUSION

User surveys cannot be taken as accurate results and therefore there is a goal to research in an exhaustive way using statistical analysis in future. However user surveys shows that

1. There is a significant impact of consistent design on an overall performance of the mobile application.
2. Usability and Popularity of an application increases if it follows all the design principles. Popularity was based on the star ratings and number of downloads for each application.
3. Visible icons increase the popularity of an application.
4. Universally applicable design of an application has an influence over the usability of an application.
5. There is a significant impact of memory usage on the overall performance of the mobile application.
6. Error free applications are more popular.
7. Interoperability has an influence over the usability of an application. It means that flexible interfaces are efficient.

VI. REFERENCES

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