

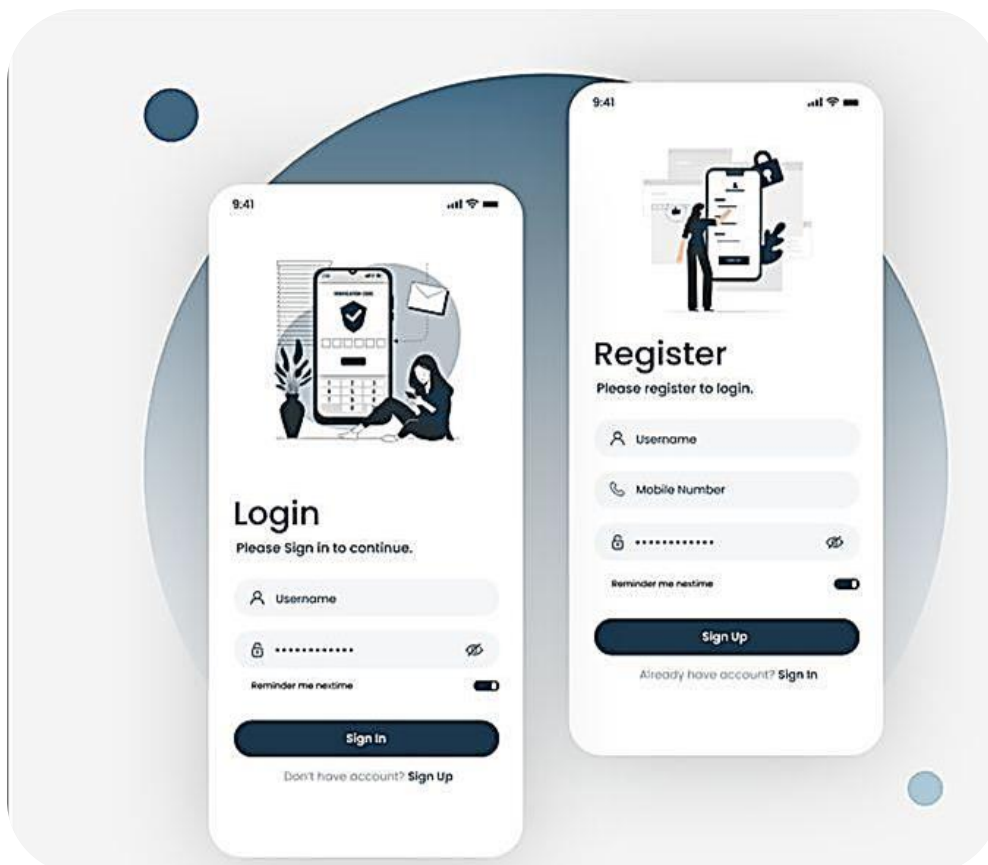
Software Design

User experience (UX) design in Mobile Application

إعداد

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Abstract:

User experience (UX) design is a key to app success since it directly impacts the engagement level of users with the application. This research aims to understand the role of the usability, accessibility, aesthetics, and functionality of UX design in enhancing user satisfaction and engagement of Mobile applications. In this work, cross-referencing the feedback from users of the selected applications, the results of surveys, and usability tests of a set of mobile applications that belong to different categories, this study will establish which of the UX design principles is most crucial for improving the user experience. The study's findings reveal these principles' significance in apps' design and offer specific guidance for developers, aiming to enhance users' experience and ensuing engagement.

Keywords: Software Design- User experience -(UX) design in Mobile Application.

Introduction:

Mobile applications have now also become a necessity in today's swiftly and continuously changing digital environment as people use such applications for a multitude of purposes, from communication to purchasing and working. The market share is made of millions of apps available on different operating systems, which fight for the users' attention. One of the main components that define an app's popularity is the UX design, which involves principles that are aimed at making the interaction between the user and the application flowing, fast and fun.

Importance of UX Design

UX design can be defined as more than just the aesthetic appearance of the interfaces with the focus on how easy the usage of the app is; if it is easily comprehensible, reachable and effective. This is because effective utilization of the principles of UX design helps to achieve high levels of user satisfaction, thus growing the rate of usage among users. On the other hand, poor UX design leads to dissatisfaction of users, negative comments and even failure of the application.

Literature review:

The concept of User Experience (UX) design has progressively become a major focus of discussion in the present years especially with regards to mobile applications. Depending on the focus of the literature review, the following areas will be reviewed: usability, accessibility, aesthetics, and functionality as key UX design principles specifically for

mobile applications. Familiarizing one with such principles is particularly important with the view to making applications that are not just good and efficient but are fun and easy to use by all individuals.

Usability

The primary of most UX designs is undoubtedly usability, which relates to the convenience with which consumers engage an application. Findings further show that usability substantially influences the level of satisfaction and time spent by users on a system. Some of the Nielsen's usability heuristics like the visibility of the system status, user control with liberty, and minimize error conditions are some among the most widely referenced norms when it comes to the design of interfaces for easy and effective use. Research has revealed that, usability leads to more user satisfaction, less time is taken by the users to learn the application more and hence boosts the retention rates. For instance, Johnson et al. (٢٠١٨) have shown that in utility gadgets like mobile applications having good and easy to understand navigation and good feedback features were associated with high user satisfaction scores in surveys conducted.

Aesthetics

Aesthetics, in UX design context, means how an application looks like, how are the items arranged, what colors are used, what font type is chosen and in general what style is employed. The concept of beauty, as an aspect of design, has been previously investigated in the academic research and is now known as one of the fundamental characteristics of mobile application design. It is not a secret that beautiful things contain sub concepts such as proportionality, harmonization, and unification. There are also users' overall impressions about the application that depends on the UI and it's often framed in one-second decisions about whether they want to use this app or not. This research material has revealed that usability can be boosted; if interfaces are developed with good aesthetics of designs. For example, several works show that the aesthetics of the apps influence the first impressions that the app receives from the users, retention as well as the overall ease of usage.

Functionality

Functionality analysis is another important aspect in mobile application design which really means a set of functions and properties which will meet the user's expectations in terms of completing a particular task. Main components of the sub-design of functionality are as follows: First, there must be satisfactory levels of usability in terms of navigational aid provided by the design; second, the design should be

accurate in its presentation of information to the user; third, depending on the purpose of the website/business/program, the design should be suitable for the target audience; lastly, there should be an adequate level of safe-guarding features incorporated into the design. Navigation here refers to the way users can be able to get from one section of the application to another while accuracy means the app always gives correct answers. The first one, the suitability, guarantees that the application has enough functions for the needed work load, and the second one, the security, avoids the interference and access of outsiders in the services or information. Some of these include: Research has shown that when functionality levels are high, there are positive enhanced interactions between the mobile application users. For example, application features that comprise of good search and tracking features together with well-organized presentation of information get to increase the time and enthusiasm of the user in doing their tasks.

Combined Impact of Performance Indicators on Mobile Applications

Aesthetic and, more generally, usability and accessibility, as well as the effective and efficient functioning of mobile applications are essential for success. Research carried out on these principles of design demonstrates that the combination of the individual concepts leads to an increased UX satisfaction, enriches the user experience, and enhances the general performance of the application. For instance, a rigorous work by **Huang and Benyoucef (٢٠١٣)** established that Wear applications that complied with the four principles received high actual usage, retention, and positive ratings as compared to others.

In conclusion, it can be also noted that the effectiveness of multimedia contents and in particular of the mobile applications depends on usability, accessibility, aesthetics, and functionality. Although each of these principles has an independent function, they are all connected and form a complex that has an impact on the level of the user experience. By incorporating all these aspects, developers of wireless telecommunication applications can be in a position to design mobile applications that are not only productive and accurate but also fun to use and friendly to everybody. Future research should examine the new increases in UX design and their relevance to creating peculiarities of mobile applications considering the demand of users.

My Research Objectives:

Usability is one of the most important design dimension considered when designing a mobile application. They define usability according to ISO as the ease of use, the freedom with which the mobile application

can be used by the particular users to accomplish the particular tasks within the particular setting. Because mobile application usability is quite distinct from the mobile device usability, the latter has been significantly dealt with for facilitating the mobile application interface design which is linked to ease of use and user-friendliness. Perceived usefulness on the other hand can be defined as the extent to which a user believes that the particular system will help him/her to get the work done. Catholic to user-friendliness is the perception of aesthetic design in relation to mobile application interface. Most research work leverage on multiple features to explain mobile application usability design. I discovered that mobile application usability must incorporate learnability, efficiency, memorability, error, satisfaction effectiveness, comprehensibility and learning performance. Simplicity, support, accessibility, visibility, reversible actions, feedback, and personalization are some of the dimensions of usability. To elaborate, simplicity here means using simply functions; support is more of ensuring that the user is always in control; accessibility and visibility might be achieved by making objects accessible and visible; reversible action means having undo functions at all times; feedback is about providing a visible comment mechanism after services; and personalization is about allowing the user to customize the interface.

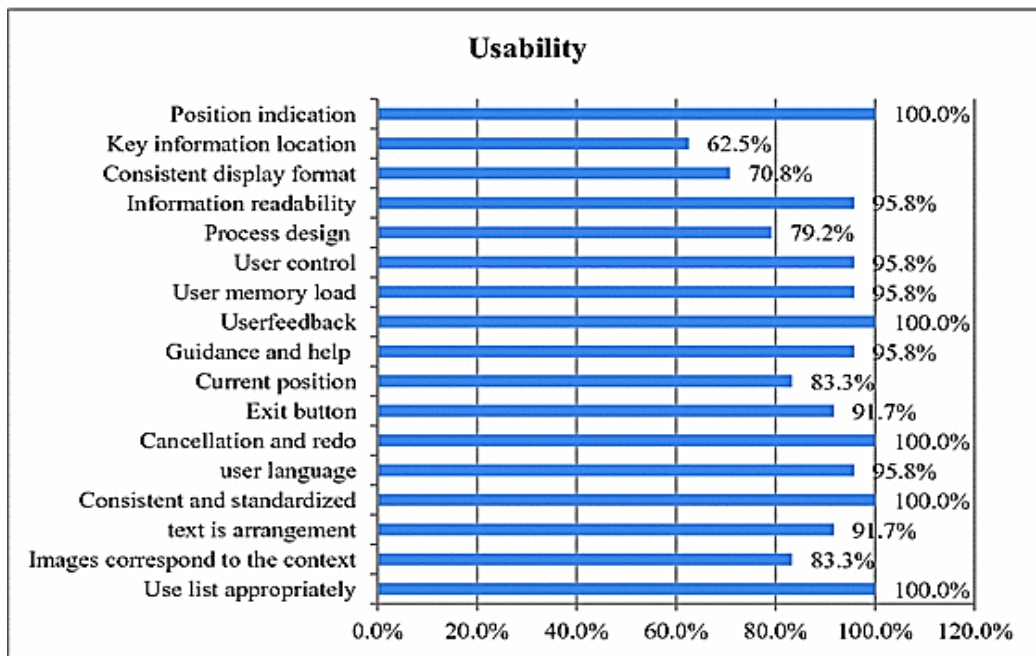


Figure 1

Aesthetic

(Huang & Tian, ٢٠١٨) Aesthetic design has a historical background in research literatures and is widely recognized as one of the preliminary forms of mobile application design. It comprises principles like proportions and symphonies as well as aspects of beauty; order, symmetry, and definitiveness. Designing is the first that an individual gets an impression about information systems since they make rapid evaluations based on the design of the system. This was seen in studies which sought to determine the interaction between various design characteristics and perceived pleasantness by varying the visual elements systematically. There is a correlation between aesthetic design and the performance, the frequency of use, and perceived quality of information systems. For instance, making icons more appealing and recognizable enhances the ability of users in finding relevant information and services. In addition, rich graphical interfaces also improved the quality of the mobile applications – draw users' attention and help to solve tasks. Thus, the concept of aesthetic design in mobile applications should encompass diverse sub-design aspects, such as text design, color, text formatting, icon design, and multimedia.

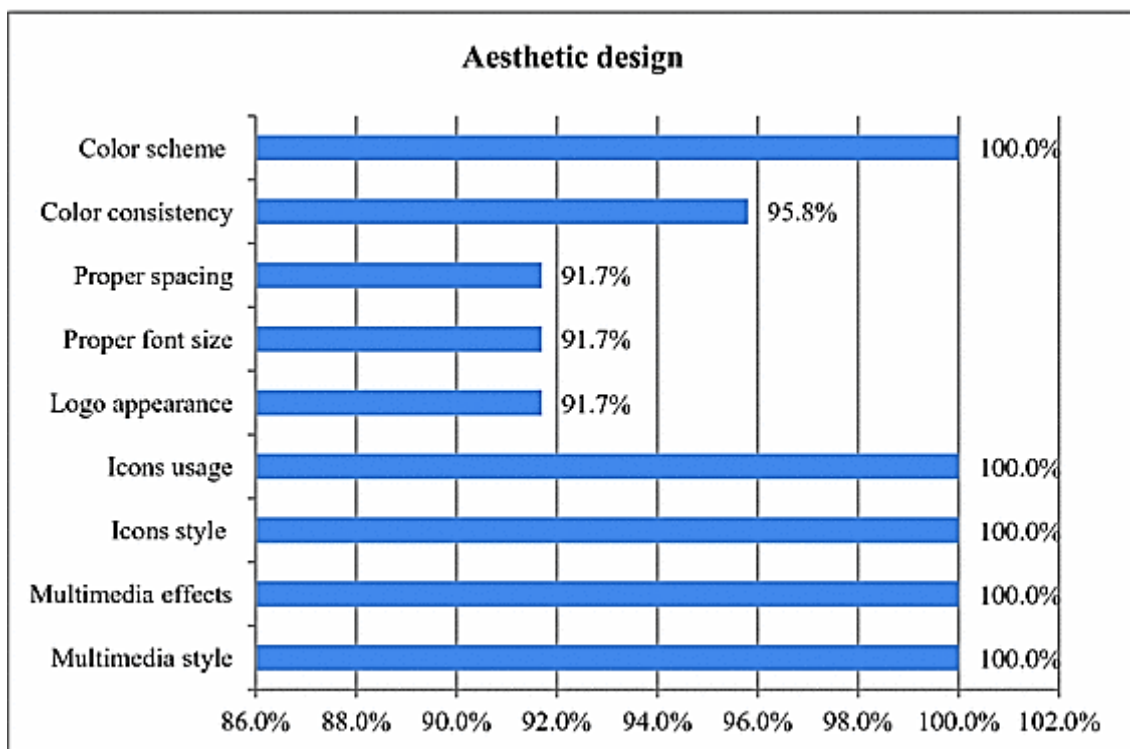


Figure ٢

Functionality is another core area of the mobile application's design based on whether the application is functionally good or not. Functionality usually entails the functions and characteristics that enable

the user to accomplish their tasks in the most appropriate manner; it may also contain several sub-aspect of design [E٣] as follows: Other aspects of ease of use; • Navigation. In other words, navigation describes the ability to include effective user direction; accuracy is the capability of delivering the correct information or result at the right level of precision; suitability describes the incorporation of suitable functions for the necessary tasks; and security is the achievement of exclusion from services or information by unauthorized persons. Mobile applications contain two groups of distinct parts: purposeful ones (search function, tracking function, etc.) and non-purposeful ones (information presentation, information structure, etc.). These functions and services provide the platform on which client interfaces are developed. Therefore, more advanced capabilities of users lead to better performance of using information and services in mobile applications.

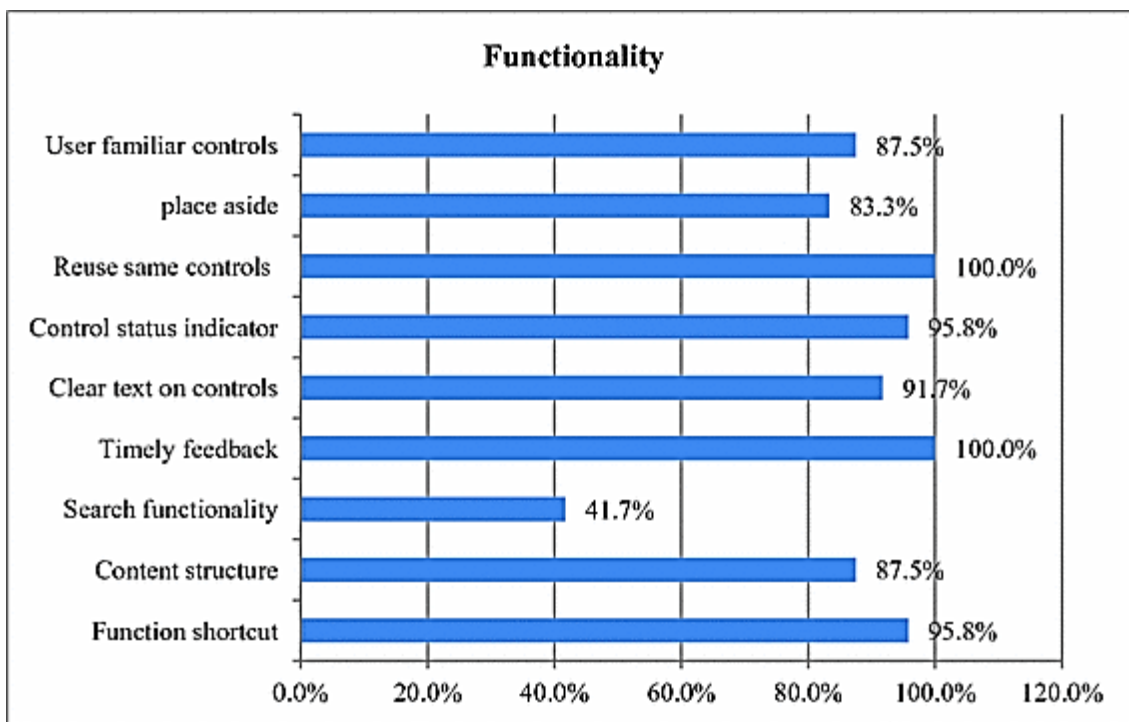


Figure ٣

Research method:

The research method used in this study supports and features a blend of a broad qualitative approach toward the exploration and comparison of a range of different interface designs of the student projects in a bachelor's degree course offered at the Department of

Information Science, College of Computers and Information Systems. Five user interface testing methods were employed: Heuristic evaluation, perspective based user interface test, cognitive walk through, pluralistic us walkthrough and a formal usability inspection.

Heuristic evaluation is where a team of evaluators looks at the product against the applies principles that have been put in place. The kind of user interface testing that lies in the perspective bases involves testing for a range of issues when aspects of the user interface are tested from different perspectives. In other words, in pluralistic walkthroughs, the users get to give feedback about the product and the actual product team just listens and watches as well as responding to questions. Another way of usability inspection is the formal inspection conducted by a professional who supervises the process.

This type of evaluation is acknowledged to be relatively rapid in nature, and is employed by professionals to gauge the usability and interface design of an application, using specific known sets of heuristics such as Nielsen's Heuristics. By using two sources, PUII provides inspectors with two views of a single component that optimizes the usefulness and functionality. These views are aligned with the type of activity that takes place at a particular level or mode of the HCI model, in terms of providing ideas for coming up with solutions to some of the problems faced during interaction.

Thus, during my research, these user interface testing methods will come in handy in the assessment of different interface designs of student projects. With reference to the research objectives, the qualitative method used in the research study and the cross-sectional evaluation methodology integrating multiple views on the interfaces aim at identifying usability problems as well as enhancing the general user experience of the evaluated interfaces.

Cognitive Walkthrough:

Cognitive walkthrough is also helpful as an assessment technique where the reviewers perform a series of tasks while they ask questions within the context of a typical user. New or infrequent users can be asked questions about the system to determine how well spiel can be understood by such persons using this test. Originally applied to walk up use systems like post box communicative bisques and automated teller machines, cognitive walkthrough has been used in assessing complicated systems such as software or new development tools for the first impressions that an end user may get of the system.

Pluralistic Walkthrough:

Literal definition of pluralistic walkthrough is a utility testing technique, where a set of paper tasks is given for completion to a group of users that collectively mimic a particular product interface. In this method, utility practitioners, who oversee the operation and explain its use to users while gathering general group comments, can assist in the production of initial design evaluations.

Formal Usability Inspections:

Despite the fact that formal usability inspections have constraints, sometimes linked to characteristics of the interface features, there is a problem of limited sample, which may not always include samples typical for the target population. For a comprehensive engineering life cycle approach to interface development, comprising three stages of periodic testing: Theoretical model assessment includes comparing theoretical models with the results obtained and defining their efficiency in terms of further response testing.

User-Centric Design:

This paper seeks to focus on the importance of engaging the users during site and application development projects as a process referred to as User-Centered Design (UCD) while admitting that this concept is often neglected or not clearly understood. UCD involves the design of information/tools that are to be consumed by end-users by focusing on how these may be utilized effectively in the best way. The proposition that it is actually the fundamental component of the process of project success and not some cool extra which can be added to the developing process after all) it should expand on the process of how the user needs are to be met in the most user friendly manner possible.

Best Practices:

Best practice	How to	Pitfalls
Become your users	<ul style="list-style-type: none">• Listen to their needs.• Observe them in their natural habitat.• Create personas.• Empathize with them.	<ul style="list-style-type: none">• Don't assume that developers already understand the user.• Don't just listen; observe.• Don't confuse business stakeholders with users.• Don't confuse requirements gathering with user research.
Design first	<ul style="list-style-type: none">• Serve business goals by serving user goals.• Find and grow design talent.• Design for change.• Know your constraints.• Design for differences.• Borrow inspiration from other designs.• Start with low-fidelity prototypes.	<ul style="list-style-type: none">• Don't forget to design for all aspects of the user experience.• Don't think tools can design for you.• Don't ignore the user research.• Don't lock into a design too soon.• Don't rush to write code.
Trust no one — test	<ul style="list-style-type: none">• Settle irreconcilable differences through testing.• Take a shortcut with expert reviews.• Test continuously.	<ul style="list-style-type: none">• Don't just test for usability.• Don't forget to test for reliability.• Don't forget to test for security.
Inject user experience	<ul style="list-style-type: none">• Educate everyone on the team about	<ul style="list-style-type: none">• Don't make user experience

Figure ٤

Possessing knowledge about users' requirements, desires, expectations, wishes, fears, beliefs, and aspirations is very important when creating applications.

Listen to their needs: Organize one on one interviews, polls, and feedback gathering sessions to identify users' needs. Also, check social media and blog conversations in order to gain the insight on how users perceive your product and what they are expecting from it. Conventional requirement gathering activities must capture not only utility but also utility, use and desirability.

Observe them in their natural habitat: There are times when the users may not know what they want, so witnessing their engagements with your website or your competitors' websites is essential. Focus on the context in which users work so that overall activity will correlate with the user experience.

Create personas: Create personae as a composition of the findings where each of them reflects various segments of the users. These personas should reflect real-life attitudes, goals, and behaviors that were observed during the research and may be associated with names, images, and descriptions of the respondents. It may be that a single persona is created for a specific user segment for which the product or service is developed.

Empathize with them: To do this, you have to emulate the role of users and try to learn as much as possible about their hardships, concerns, and desires. Think about the circumstances generally in their lives and specifically in using this application. In other words, to ensure that the designed solutions effectively fit with user needs, it is necessary to empathize with users.

To ensure effective user experience design, it's crucial to avoid common pitfalls in user research:

Avoid assuming developers understand users: If real user information is missing then developers may end up inventing users to help them design an interface ultimately meeting imaginary user needs. This is to call for an orderly and disciplined ways of carrying out user research in order to avoid this.

Don't solely rely on listening: With reference to the above mentioned factors, the following can be summarized: Listening to users is also crucial but observation and empathy are unique on their own. This title suggests that designers can think more creatively about how to solve user's problems if they would just watch what they are doing and then adjust their solutions, even if the user does not know that they want a solution.

Distinguish between business stakeholders and users: Whereas numerous business stakeholders can be engaged to help establish business goals, user experience design should, in fact, address users' needs. This is an interesting implication, and could mean that sometimes, goals are attained at the cost of the user to provide stakeholders with features or decisions that favors them but not the user.

Differentiate between requirements gathering and user research: This very often puts traditional requirements gathering in contrast with the user and organizing requirements, ignoring the business ones. Thus, when organizing BA's work and positioning them to incorporate user needs into the solution, it is necessary to make certain that BA is aware of the difference between business requirement and user research.

For any users to get a good experience, then it has to be well planned by the firms and not left to happen by chance.

Align user goals with business goals: People requirements and organizational requirements are met by excellent website design. By identifying goal from the users and ensuring that they are incorporated into the design process, firms are able to design experiences that satisfy the users and at the same time achieving organizational objectives.

Cultivate design talent: To create a great design, it is necessary to integrate creativity, knowledge of the needs of the end-users, the objectives of the enterprise, and the possibilities of modern technology. Consulting with a skilled team or hiring professional agencies can be useful in designing excellent fulfilling user experiences. Organizational development can be useful in ensuring that such requirements are met through the recruitment and training of better internal talent.

Design for adaptability: It is important to understand that consumers' expectation is not fixed rather it fluctuates over time because of several reasons ranging from cultural to economic and technological. Design for change also entails figuring out the changes that the product may be required to adapt to in the future. In this way, firms can learn

from current constructions and consider future envisions that could impact the effectiveness of the user experiences.

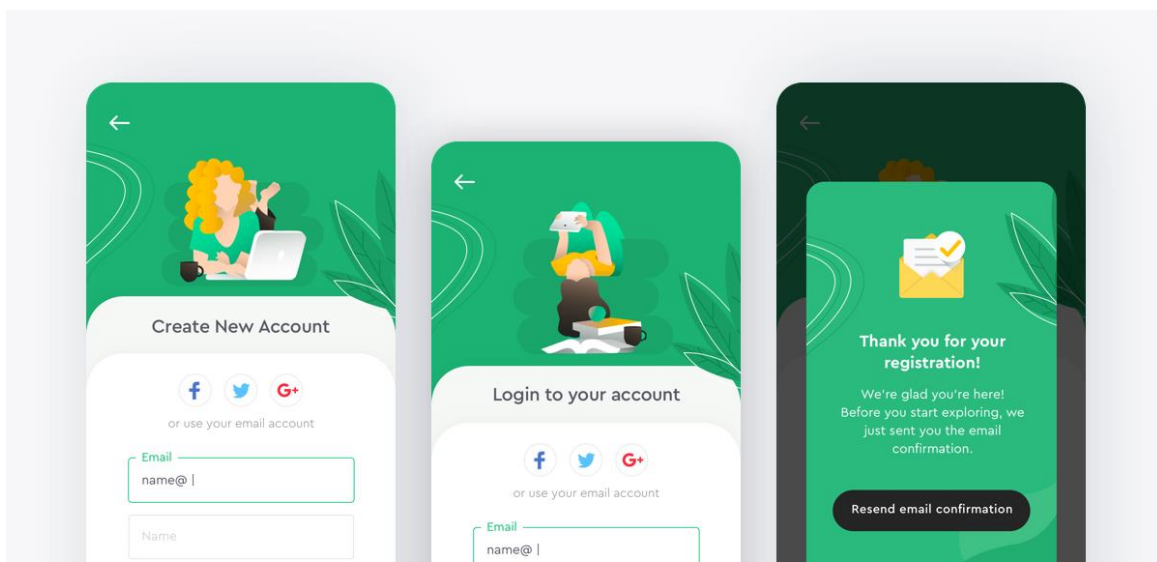
A mobile application user's day-to-day engagement with the interaction and specifically the user interface is the primary determinant in the fulfillment of its proposed objective. This research will focus on finding out how effectively interface design of mobile applications is perceived in student projects, and how misunderstanding of users of different backgrounds is a resulting in design complications.

Lack rightly underlines the need for the interface designers to make product specifications and demands as simple as possible which helps in orchestrating the visual user interface that mirrors human interaction abilities and digitally enabled apparatus. This revision is intended to assist researchers in coming up with idea with the Multigenerational Culture by presenting new user interface concepts.

This suggests that revisualization UI design, to some extent, requires additional information that goes beyond what is presented in the traditional stream of geo visualization. This focus expands and goes into making interactions and ensuring that there exist the support frameworks which are meant to provide for accessible flow of information and eliminate the barriers which exist between the different tiers. Suggested changes require UI designs that include registration interfaces for the end user trainers and trainee, login interfaces, learning interfaces where educational contents are viewed, live room interfaces where educative broadcasts are conducted and complaints interfaces where the users can express their grievances.

By applying these ideas into the research work, one can get a more comprehensive sense of not only what the specific problems faced by a user interface design are but also what the possible solutions for such issues are, especially applicable for the students who carry out projects targeting different types of users.

Different designs:



Design 1

The registration process in the app has a step-by-step flow that helps the user who is a first timer in the app, as well as the loyal user of the app. The first time that the user engages with the site creates the first process of registration where the user is required to fill personal details by completing a form. This information normally contains such elements like name, e-mail address, password, and, if necessary, any other information that is required by the app.

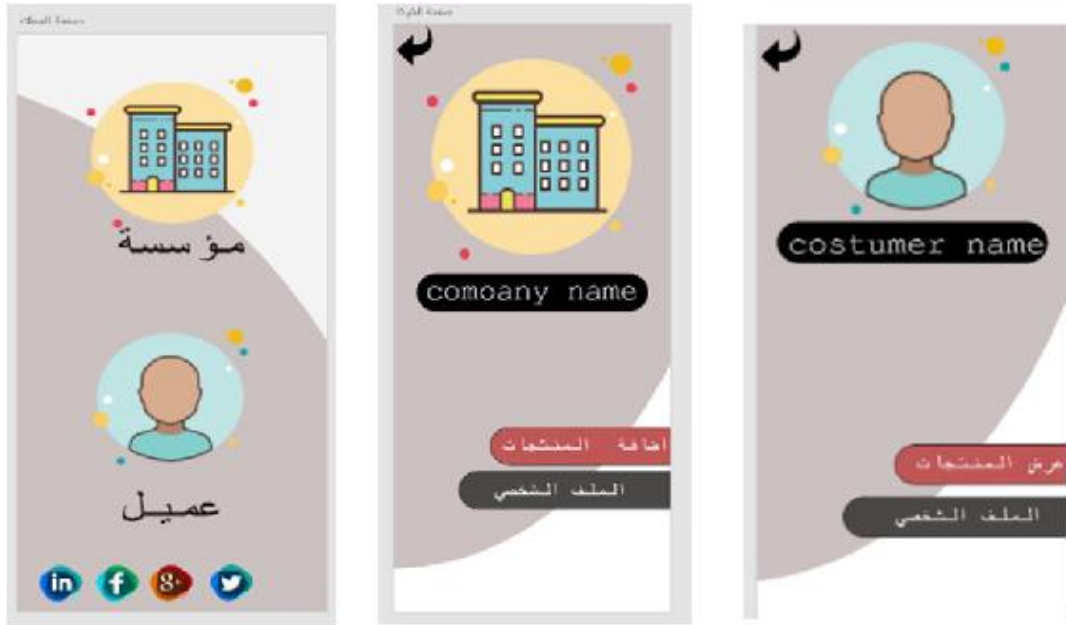
- After the new user completes the registration form and submits it, then he or she is build with the app. After that, they can use these newly created constants to log in to the platform, successfully.
- While new users will be registered by entering username and password into the application, the clients who already have an account can go directly to the login section of the application using their account details. It reduces the time taken by returning users because they need not go through some unnecessary steps that were inconsequential to the original aim.
- By providing such an opportunity to enter the application via a login and password and another option for those who do not remember the registration data, it considers both new users who have to create an account and registered users who want to use the app's options without entering the account details. This design choice helps with attentiveness to users' pathways and usability of the application as one decides to use it in varying years.



Design ٢

The second conception of the application demonstrates the possibility of creating multiple-level opening interfaces and provides a liberty of choosing the option to start working with the program.

- On top of it there are several symbols located which are quite important and central to the positioning of the aims and objectives of the application. They are informative tools that point towards something or explain certain features or aspects of the application to the user. Every icon is clear and as soon as a user sees it, he or she immediately knows what it refers to, making the fuel gauge icons easily recognizable and functional.
- When clicking an icon, users are linked to the related interfaces where detailed information about the aims and objectives of the application is available. With the help of these types, users are able to see what elements the application possesses, what it can do, and how it could be useful for them.
- Other than the goal aspects of the app, the second design also incorporates screens meant exclusively for the login/registration options. These interfaces help people create an account or prompt them to log in to an existing one, thus providing an effective onboarding experience to the customers.
- Moreover, there is another interface in this application which prompts the parent or the guardian if the child tries to open some features or contents embedded in the application. This is a proactive approach to controlling the use of the app among the parents, and these measures give a positive feel and safe environment to the clients.
- In addition to increasing security and ease-of-use of the software, the application has implemented a fingerprint interface to be used by parents in particular. Including this feature ensures that parents are able to unlock the application by using their fingerprint, which enhances the security of the data inputted by the user.
- In total, the second design of the application corresponds to the subject, engaging, and easily accessible, providing a list of features and functionalities that are needed by users today.



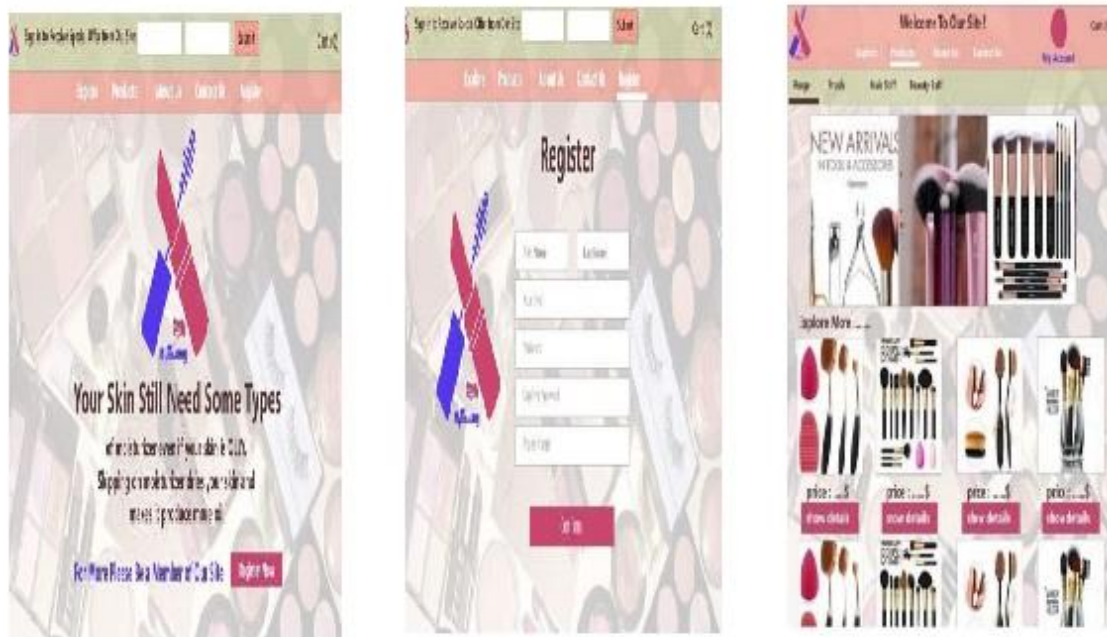
Design ٣

The concept of this application includes several amenities that are designed to give the user some over simple and entertain them. Here's a more detailed breakdown of the key components: Here's a more detailed breakdown of the key components:

- Login and Social Media Integration: There is normally a log-in section where users are allowed to log-in using their working credentials or else, use social media accounts, thus more convenient. The referral links simply provide users with convenient ways of informing their social acquaintances about the existence of the application, which may eventually boost their acquisition in the market.
- Sign-up Process: New comers are able to join the application through establishing new accounts. The registration process closest to THIS is the process of entering the basic personal data – name, email address, password. Finally, users have privileges to access other extra features and components within the application once they register.
- Product Management: Using this application, users can create products and link them to accounts and also add various details like the company name, image, and profile information. This

feature helps in effective advertising, whereby entities are allowed to present their products well, and it also offers all the necessary details to the users to enable them to make the right decisions.

- **Product Details and Icons:** Information provided may also include descriptions, specifications, prices and the stock status of the products through which consumers can comfortably make orders. These are used to improve images as well as visibility and to help to identify specific aspects of products with ease.
- **Display Options:** It allows the user to select different way of displaying data to fit his/ her preferential mode of display. There is the option to modify the user interface to personal preferences for example, viewing in different formats as a list or grid, or even the ability to arrange the application in a way that is preferred by selecting the sort criteria and the filter criteria. This makes for a one on one browsing style whereby customers are able to see products that they can either use or buy.



Design £

The special offers are available to the users of the app at the time of registration and every time they log into the app to ensure engagement and to build App loyalty. Call to action or navigational links such as shopping cart and the menu are strategically positioned right at the top to enable product search or information about the business, contact details among others. These elements enable clear and intuitive navigation and help to improve the user experience of the resource.

- Various sections of the app offer product and accessory details, product and accessory prices, and search tools that put consumer choice in the driver's seat about what and where to look. Moreover, providing a consulting interface to access support teams, to share feedback to the company's products, or to get the contact details is beneficial for improving the customer services.
- In most of the designs, the best interfaces are meant to be used easily, and thus, the user should be able to go round the app without much interference. In a similar way, by eliminating all non-essential features and relying on recognizable navigational instruments – buttons and menus, the application optimizes usability and the speed of accomplishment of the tasks at hand.
- It has to be said that the consistent use of language, structure and layout throughout the app maintains usability positioning the different sections of the app easily and intuitively. This enables users to apply the same knowledge that may be useful in one area in other areas within the application which will increase efficiency and satisfaction among the users.
- While designing the layout of components of a specific mobile application, designers always plan the relations between spatial unit to enhance interactions. Thus, we found that the designers can intentionally incorporate objects into the interface to highlight specific information and direct the app users' attention where it matters most.
- Controlling luminosity, contrast, and texture also plays an important role in the creation of visual graphics to re-direct the focus and create the structure of the interface. Thus, effectively incorporating the above-mentioned design elements can make the interfaces visually appealing and user-friendly, which in return, minimizes users' dissatisfaction.

Pitfalls to Avoid in UX Designing for Mobile: Points to Consider to Avoid while UX Designing the Mobile:

Ignoring User Needs: It is possible that there is no need analysis and the absence of proper consideration for the needs of the users surely ranks among the biggest errors a mobile UX designer can encounter in their endeavors. Failure to provide information dealing with those users will lead to assumptions as the design criteria, thus leading to the development of unfavorable designs, which rarely represent what the users want or need.

Overloading Features: These interfaces are small and confined due to the screen of a latest generation smartphone, and if overloaded with icons or functions, the user experience may be tiring. To this end, there arises the importance of placing the emphasis on the functionality and the lower desire for additional complications with an aim for reaching what is possibly the minimum impairments.

Neglecting Performance Optimization: Among the them are high expectation levels on responsiveness whereby mobile users are always interested in experiences that are fast. Lack of adherence to the right performance particularly, the rate at which the page loads or the unresponsiveness of the input could make the users lose interest and leave the page or the application.

Disregarding Platform Guidelines: Application design has its standard of design, and even the mobile operating systems, iOS, Android etc., When such guidelines are not followed, then the flow of experience across the app–platforms becomes poor or even inverse, as in the worst-case scenario the users are becoming accustomed to the app in a wrong way.

Lack of Accessibility: This is a typical situation in the process of construction mobile UX: accessibility is usually the first thing to go when it is an affordance factor added to ensure that all people can comfortably use an application with assistive disabilities. Ignoring these features might further lead to development of a product, which essentially excludes a significant segment of their targeted audience.

Conclusion:

Finally, in this study i report examined the key features of user experience (UX) design for mobile applications. By analyzing various user interface testing and researching the problems to avoid in mobile UX design, significant insights have been obtained into designing intuitive, user-friendly mobile experiences.

The technique used in this study, which includes heuristic evaluation, perspective-based testing, and formal usability inspections, offers a comprehensive framework for analyzing and improving mobile app interfaces. Designers may develop mobile experiences that captivate consumers by prioritizing user demands, simplifying features, optimizing performance, following to platform rules, and guaranteeing accessibility.

Moving forward, mobile UX designers must be diligent in recognizing changing consumer preferences, technical breakthroughs, and industry best practices.

Designers may guarantee that their apps stay relevant, interesting, and accessible to a varied user base by iterating and improving mobile app interfaces in response to user input and usability testing on an ongoing basis.

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