

ELEMENTS IN GUI DESIGN FOR ISLAMIC TOURISM MOBILE APPLICATIONS: A VISUAL RESEARCH FRAMEWORK

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Abstract

The visual representation of the interface holds significant importance in captivating users through its aesthetic appeal, facilitating easier interaction with the system. Decisions related to signs, visual elements, layout, and composition are pivotal. Beyond the utilization of standard icons in mobile applications, designers must craft interfaces that align with the application's underlying concept. Notably, operating systems like Android continuously update their interfaces to enhance the user's experience. The incorporation of colour and shape, alongside text and images, is ubiquitous in interface designs. Some elements adhere to standard visual representations. This paper delves into the meticulous process of selecting appropriate visual elements for use in an Islamic Tourism mobile application. The design undergoes a comprehensive process, including a visual analysis of elements tailored to the target audience. Beyond considerations of design principles, other aspects play a crucial role in interface design. Heuristics theory serves as a valuable reference for enhancing interface usability, while the Semantics theory aids in choosing images that effectively convey information and instructions. These considerations informed the construction of questionnaire items. Expert consensus is instrumental in item selection, with data collection preceding the design phase. The mobile application development process follows the Design and Development Research (DDR) model, encompassing phases such as need analysis, design, development, and evaluation. The design concept must align seamlessly with the application's theme. A systematic design process not only fulfills the objective of creating an attractive and user-friendly interface but also contributes to cost and time efficiency in development.

Introduction

Islamic Tourism stands out as a key industry with the potential to significantly contribute to a country's economic growth. Malaysia, recognizing this potential, has been actively offering Islamic tourism packages, attracting Muslim tourists, particularly from the Middle East, who increasingly choose Malaysia as a destination for their summer vacations. The affordability and availability of halal food options further contribute to Malaysia's appeal. Despite these advantages, a notable gap exists in the realm of Islamic tourism apps, as most available travel applications lack specific focus. This article addresses the need for a dedicated mobile application catering to Islamic tourism in the state of Selangor, Malaysia. Communication challenges among Arab tourists, who often do not speak English, have been identified, prompting the development of a prototype to address this issue. The initiative aims to enhance the overall experience for Arab tourists and bridge the communication gap with locals. The development process involves multiple stages, including need analysis, design, development, and evaluation phase. Key considerations in the design phase encompass the selection of relevant information, interaction types, and interface presentation. Collaborative efforts from experts in tourism, academia, multimedia design, and information technology are integral throughout these stages, ensuring a comprehensive approach to achieving the project's objectives. This article specifically focuses on the interface design phase, recognizing its paramount importance in setting the project's direction, expediting the development process, and minimizing costs. Challenges encountered during the prototype development are discussed, with a bilingual interface in English and Arabic identified as a crucial feature, enhancing accessibility for Middle Eastern tourists. The envisioned application has the potential to not only address the identified challenges but also serve as a valuable tool for promoting Selangor and Malaysia as preferred tourist destinations, contributing to the post-pandemic economic recovery for both the state and the nation.

Islamic Tourism of Selangor

The report from The Organisation of Islamic Cooperation (OIC) and The Statistical, Economic, and Social Research and Training Center for Islamic Countries (SESRIC) in 2017 outlines the prioritization of five key components in Islamic tourism, drawing on the adaptation of Akyol and Kilinc's (2014) framework. These components align with conventional tourism but distinguish themselves by necessitating adherence to Halal and Shariah standards. These crucial components include Halal Hotels, Halal Transportation, Halal Food Premises, Halal Travel Packages, and Halal Finance. As indicated in the OIC & SESRIC Report (2017), Ariffin and Hasim (2009) note that Malaysia has actively entered the Islamic tourism market by offering products and services such as natural (eco) and health tourism. Malaysia's commitment to Islamic tourism is further demonstrated through the hosting of international events like the inaugural Islamic Tourism Exhibition and the World Islamic Conference in Kuala Lumpur in 2008, attracting Muslim tourists, including those from the Arab region.

Even as a developed state, Selangor emerges as a noteworthy destination for Arab tourists. According to the Tourist Arrival Statistics Report (LSKP) released by Tourism Selangor, there was a substantial increase in the number of Arab tourists from 2015 to 2017, rising from 160,615 to 360,749 (Tourism Selangor, 2022). This influx has significantly contributed to Selangor's economic growth, with the state's Gross Domestic Product (GDP) experiencing a noteworthy growth of 7.1% in 2017 compared to 4.8% in 2016 (Department of Statistics Malaysia, 2017). The tourism sector plays a pivotal role in propelling the economic prosperity of Selangor. Aligned with the SMART concept, which focuses on smart governance through integrated technologies, this study aims to support Selangor's economic growth by developing the i-Rehlah Mobile Application for Islamic Tourism. This initiative resonates with the state's aspirations and contributes to the broader discourse on the survival, recovery, and adaptation of the hospitality and tourism industry in the SMART Special Issue.

Mobile Application

The annual increase in the time people spend online underscores the growing distinction between desktop and mobile usage. As of 2021, Americans dedicate four hours per day to mobile devices, marking a twelvefold surge from a decade ago, while desktop or laptop computer usage stands at two hours daily (Ceci, 2022). E-marketer predicts that mobile internet usage will account for approximately four hours per day, with an 88% increase in time spent on mobile apps compared to browsers. This underscores the importance of developing unique, responsive applications alongside optimizing businesses' mobile websites (Hussein & Ahmed, 2022). Among the most impactful mobile applications currently facilitating travelers' experiences are those related to tourism. This mobile tourist software aids users in navigating unfamiliar locations effortlessly, providing vital and valuable information about points of interest (Vatankhah et al., 2014).

The tourist mobile application features images and textual descriptions of hotspots, allowing users to access information about amenities near specific locations, such as entertainment and dining, hotels, and other nearby attractions. This smartphone application surpasses traditional printed maps, enhancing tourists' ability to plan and experience events more organizedly (Afiza Ismail et al., 2016). Smart tourism is transforming how tourists seek information, expanding and making the phases of data collection and acquisition for tourism information more flexible.

The development of the mobile application demands expertise in Information Technology, Multimedia Design, Arabic Language, and Islamic Tourism. The design phase, crucial for achieving project objectives, involves three key aspects: Information Design, Interaction Design, and Interface Design (Kristof & Satran, 1995). Information Design focuses on selecting content in line with Islamic Tourism requirements, guided by feedback from industry and academia experts. Interface Design considers the visual elements' presentation to align with the concept of Islamic Tourism, while Interaction Design incorporates user-friendly features facilitating information retrieval and page navigation. A cohesive design necessitates synergy among these three aspects.

Graphical User Interface

The graphical user interface (GUI) serves as an integral element of a system, enhancing user experiences through effective graphic presentations. A well-designed user interface incorporates a balanced combination of input and output mechanisms tailored to meet users' needs, capabilities, and limitations (Galitz, 2017). The International Standard Organization (ISO, 2010) outlines seven attributes related to visuals, serving as a guide for interface design development. These attributes encompass clarity, discriminability, conciseness, consistency, detectability, legibility, and comprehensibility.

In the context of mobile applications, interface design holds significant importance. It serves as the initial impression influencing users' decisions to choose or download an application. An appealing, tidy, and visually pleasing interface is crucial. Visual elements within the interface contribute to users' perceptions of the application. The development of a user interface necessitates a comprehensive design process, considering the end-user as the primary audience. This involves making informed decisions regarding content selection, interaction types, and overall interface concepts. The presentation of the interface plays a pivotal role in usability, directly influencing the overall user experience. Visual elements, aligned with heuristics theory, can enhance usability and, consequently, user satisfaction. Therefore, a meticulous design process is essential to ensure that the user interface meets aesthetic standards, aligns with user expectations, and ultimately contributes to a positive user experience. These can be achieved by referring to the heuristics theory.

Heuristic evaluation is a “discount usability engineering” method for evaluating user interfaces to find their usability problems (Nielsen, 1994). Basically, a set of evaluators inspects the interface with respect to a small set of fairly broad usability principles, which are referred to as the “heuristics.” The original

set of usability heuristics used for several early studies was developed with the main goal of making the method easy to teach. The development of the user interface considers all aspects of the theory namely the visibility, the match between the system and the real world, user control, consistency, error prevention, recognition, flexibility, aesthetics, recovery from the error, and help guide. The presentation of GUI will attract the user to use the application. It should not only be attractive but need to be easy to use. As mentioned by Yeung & Law (2006), users will stick to the application when it is easy to use.

Visual Research Framework

Visual elements play a significant role in the realm of interface design, necessitating thorough research on these components. This research entails a comprehensive understanding of Visual Communication, Graphic Design, and Typography, incorporating the elements and principles of design alongside the theories of semantics and heuristics. The conceptualization of the design draws upon this knowledge, aiming to align with the application of Islamic Tourism and represent the state of Selangor effectively. Adnan (2015) categorizes visual elements on the interface into text, image, shape, and colour, emphasizing their profound impact on the overall look and feel of the design. To achieve an optimal presentation of the user interface, it is crucial to conduct visual analysis by examining existing mobile apps with similar functionalities. This analysis delves into the visual elements present in each interface, and their combination with a well-organized layout contributes to a visually appealing and effective presentation of the interface.

Painter and design theorist Maitland E. Graves (1951) defined the elements of design as line, direction, shape, size, texture, value, and colour. He concludes in his book that "these elements are the materials from which all designs are built." According to Alex White (2011), to achieve visual unity is a main goal of graphic design. When all elements are in agreement, a design is considered unified. No individual part is viewed as more important than the whole design. A good balance between unity and variety must be established to avoid a chaotic or a lifeless design. He elaborates on the principles of symmetrical, asymmetrical and radial balance, hierarchy, dominance, emphasis, scale, proportion, similarity and contrast. Balance is a state of equalized tension and equilibrium. A good design contains elements that lead the reader through each element in order of its significance. The type and images should be expressed starting from most important to the least important. Dominance is created by contrasting size, positioning, colour, style, or shape. The focal point should dominate the design with scale and contrast without sacrificing the unity of the whole. Using the relative size of elements against each other can attract attention to a focal point. When elements are designed larger than life, the scale is being used to show drama. Planning a consistent and similar design is an important aspect of a designer's work to make their focal point visible. Too much similarity is boring but without similarity important elements will not exist and an image without contrast is uneventful so the key is to find the balance between similarity and contrast.

Beyond mere aesthetic appeal, an interface should possess attributes such as identifiability, representativeness, and seamless interaction between pages. Visual elements must effectively communicate information through straightforward interactions. The Interaction Design Foundation (2022) asserts that visual design transcends aesthetics, emphasizing the strategic placement of elements to optimize user experiences and drive conversions. These elements are pivotal in enhancing the attractiveness and user-friendliness of the interface. The judicious selection of colour contributes significantly to the interface's appeal, aiming for a balance between brightness and subtlety. A designer's understanding of colour properties and the colour wheel is paramount. The use of primary, secondary, and tertiary colours aligns with their intended purposes. Careful consideration of colour goes beyond aesthetics; it serves to convey meaning in the interface. Typography, a crucial element, influences legibility, with sans serif fonts, associated with modern typefaces, being preferable for on-screen design. Sans serif fonts are commonly used in signs, app text, and map labels (Todd & DeCotes, 2022).

Shape, as evident in navigation buttons, plays a vital role in distinguishing graphic objects from buttons. Consistency in shape creates a visual grouping, influencing clarity, simplicity, consistency, and discriminability, as noted by Galitz (2007). The image component of the interface comprises icons, symbols, and indexes, each carrying meaning. Understanding the theory of semantics, which explores the relationship between signs and meanings, is crucial. Images or icons should be representative and easily interpretable in line with the design concept. Proper utilization of images contributes to effective navigation, avoiding distractions and confusion (Galitz, 2007). Interfaces commonly employ a combination of images and text to represent interaction buttons. Lidwell et al. (2010) advocate for this approach, noting that the pairing of images and words enhances memorization and user understanding.

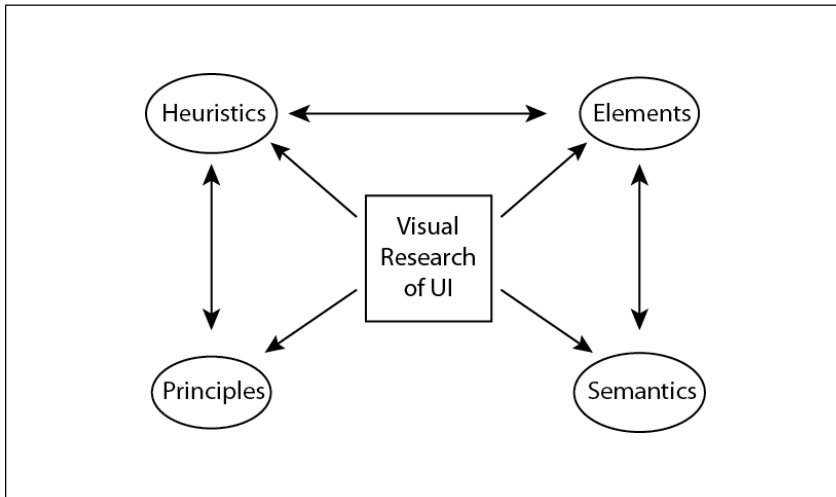


Figure 1: Visual Research Framework on GUI Design

The research framework focusing on the visual aspects of the user interface. It played a crucial role during the design and development phase. This framework facilitated the creation of the construct items for the survey. The selection of elements such as text, image, colour, and shape aimed not only at achieving an aesthetically pleasing interface but also at aligning with usability principles when integrated with the theories of heuristics and semantics. To garner expert opinions and reach a consensus, experts were consulted regarding these components. The agreed-upon items were then recommended for implementation on the graphical user interface (GUI). It's imperative to note that individual elements alone do not guarantee an attractive and usable interface. Designers must adhere to the principles of design, incorporating concepts such as balance, contrast, hierarchy, emphasis, and unity.

A comprehensive understanding of these principles contributes to enhancing the overall composition of elements on the interface. The selection of questions was also referred to the Heuristic theory. This theory is widely used now by application and website developers to identify the usability of the product. Table 1 explains the Heuristics principles of usability which relate to visual research of user interface design. The interface should be visible, identifiable, controllable, consistent in its representation, attractive in design, and recognisable.

Table 1: Usability Theory by Jakob Nielsen

| No. | Principle | Explanation |
|-----|---|--|
| 1 | Visibility of system status | The design should always keep users informed about what is going on. |
| 2 | Match between the system and the real world | The design should speak the users' language. Use words, phrases, and concepts familiar to the user, rather than internal jargon. |
| 3 | User control and freedom | Users often perform actions by mistake. Allow them to leave the unwanted action. |
| 4 | Consistency and standards | Follow platform and industry conventions. Same words, icons, actions. |
| 5 | Error prevention | Prevent problems from occurring in the first place. Notify the user if an error appears. |
| 6 | Recognition rather than recall | Minimize the user's memory load by making elements, actions, and options visible. |
| 7 | Flexibility and efficiency of use | Cater to both inexperienced and experienced users |
| 8 | Aesthetic and minimalist design | Ensure that the visual elements of the interface support the user's primary goals. |
| 9 | Help users recognize, diagnose, and recover from errors | Error messages should be presented with visual treatments that will help users notice and recognize them. |
| 10 | Help and documentation | Provide documentation to help users understand how to complete their tasks. |

Semantics constitutes a component of the semiotic theory pioneered by Charles Sanders Peirce (1839-1914), specifically addressing sign relations. The three primary categories of sign relations include semantics, syntactic, and pragmatics. According to Noble (2005), semiotics serves as a fundamental strategic approach for discerning the underlying meaning within texts, graphics, and images, allowing for deconstruction and interpretation. Drawing a connection with icons, Galitz (2007) suggests that icons exhibit the technical qualities of syntactics, encompassing the physical structure of the icon, including its shape, colour, and dimensions. The meaning conveyed by the icon is intricately tied to semantics, while the process of how the icon is produced falls under the realm of pragmatics. According to Mäder (2020), Semantics is called the theory of the meaning of signs. Designers can give meaning to the text and other elements through their appearance or positioning.

In general, the appearance should support the content and not force a meaning. This is the reason why it is also included in this framework. This is to make sure that the design elements are used appropriately. All images and texts that are being used in the interface carry the right meaning. Users do not get confused with the icons, whether they are used as information or as a navigation button. The developer creates or encodes a sign, and the user will interpret or decode the meaning. It is vital to understand the users, their background, and their culture in order to make the sign effective, which can be easily interpreted by them.

Methodology

The research phase involved in developing the GUI is the design phase. The design phase of the study requires a group of experts to evaluate the appropriate components or elements included in the prototype. This phase uses the Fuzzy Delphi Method (FDM) approach. The survey was conducted with the experts as purposive sampling. The questionnaire was designed to cover all aspects of Interface design according

to the framework. The number of experts for both sub-phases is 10. The list of experts can be seen in Table 3. This is based on the view of Adler and Ziglio (1996) who asserted that the number of experts for the Delphi technique is as many as 10 to 15 people if the experts are able to get a high agreement among themselves. Table 2 shows the final findings for the interface design component which has been agreed upon and recommended by the expert panels.

Table 2: Item/Elements of Interface Design based on Fuzzy Score.

| No. | Item / Element | Fuzzy Score (A) | Expert Consensus |
|-----|---|-----------------|------------------|
| 1 | Graphic presentation is important when I choose a mobile app. | 0.910 | Accepted |
| 2 | Sans serif font is more readable than serif font for displaying content. | 0.800 | Accepted |
| 3 | Navigation buttons should be presented by icon/image rather than text | 0.833 | Accepted |
| 4 | Navigation buttons should be represented by text and icons in some cases for user convenience. | 0.853 | Accepted |
| 5 | I prefer to choose a topic from a list of texts. | 0.800 | Accepted |
| 6 | I prefer to choose a topic from a list rather than from grids. | 0.900 | Accepted |
| 7 | Accessible interface design is important for a mobile app to help those with disabilities. | 0.880 | Accepted |
| 8 | I always use both hands when interacting with a mobile app. | 0.870 | Accepted |
| 9 | Colour of the interface design does not affect my interest in using a mobile app. | 0.927 | Accepted |
| 10 | Animation can help to improve instruction in navigation | 0.837 | Accepted |
| 11 | The layout of the navigation buttons can make it easier for users to interact with the application. | 0.910 | Accepted |
| 12 | Arabic text should be placed on the navigation button to facilitate interaction | 0.817 | Accepted |

Table 3: Experts’ Consensus on Interface Design

| EXPERT | ITEM | | | | | | | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Head of Research & Innovation | 0.084 | 0.241 | 0.058 | 0.164 | 0.242 | 0.099 | 0.125 | 0.139 | 0.061 | 0.188 | 0.084 | 0.216 |
| Senior Lecturer | 0.084 | 0.115 | 0.193 | 0.520 | 0.106 | 0.099 | 0.125 | 0.139 | 0.061 | 0.188 | 0.084 | 0.216 |
| Manager | 0.084 | 0.153 | 0.495 | 0.046 | 0.446 | 0.099 | 0.047 | 0.038 | 0.092 | 0.064 | 0.071 | 0.177 |
| Lecturer | 0.071 | 0.115 | 0.058 | 0.046 | 0.106 | 0.295 | 0.047 | 0.038 | 0.092 | 0.204 | 0.071 | 0.767 |
| UI/UX Manager | 0.084 | 0.241 | 0.058 | 0.046 | 0.150 | 0.056 | 0.558 | 0.545 | 0.061 | 0.495 | 0.084 | 0.093 |
| Managing Director | 0.309 | 0.241 | 0.200 | 0.164 | 0.106 | 0.099 | 0.125 | 0.139 | 0.061 | 0.188 | 0.084 | 0.216 |
| Lecturer | 0.071 | 0.743 | 0.058 | 0.228 | 0.150 | 0.056 | 0.047 | 0.038 | 0.092 | 0.204 | 0.309 | 0.177 |
| Manager | 0.084 | 0.153 | 0.058 | 0.164 | 0.242 | 0.099 | 0.125 | 0.139 | 0.061 | 0.188 | 0.084 | 0.093 |
| Faculty Dean | 0.071 | 0.153 | 0.058 | 0.046 | 0.106 | 0.056 | 0.047 | 0.038 | 0.092 | 0.064 | 0.071 | 0.093 |
| Senior Lecturer | 0.084 | 0.241 | 0.193 | 0.164 | 0.150 | 0.056 | 0.125 | 0.038 | 0.061 | 0.064 | 0.084 | 0.216 |
| D-value | 0.103 | 0.240 | 0.143 | 0.159 | 0.180 | 0.101 | 0.137 | 0.129 | 0.073 | 0.185 | 0.103 | 0.226 |
| Expert Consensus (%) | 90.0 | 90.0 | 90.0 | 90.0 | 90.0 | 100.0 | 90.0 | 90.0 | 100.0 | 90.0 | 90.0 | 90.0 |
| Fuzzy Score (A) | 0.910 | 0.800 | 0.833 | 0.853 | 0.800 | 0.900 | 0.880 | 0.870 | 0.927 | 0.837 | 0.910 | 0.817 |

Triangular Fuzzy Numbers

- 1) Threshold Value $(d) \leq 0.2$
- 2) Expert Consensus $\geq 75\%$

Defuzzification Process

- 3) Fuzzy Score $(A) \geq \alpha - \text{cut value} = 0.5$

Instrumentation

The instrument items were adopted from previous studies by Richey and Klein (2007) known as Design and Development Research (DDR). This study includes a very organised and systematic process covering the design, development, and evaluation of a product. Apart from the literature review, a survey was conducted based on the visual research framework. The respondents are selected among experts in Research and Innovation, Tourism, and Arabic Language. The educators, designers, and developers were also giving their opinion in this survey. The seven Likert Scale was used to get a more precise result.

Finding & Discussion

Table 3 above shows the data gathered from the survey. The experts' consensus towards the item is high on all measurements. Based on the threshold value, all 12 items get 0.2 and below. Only two out of twelve get the value of 0.2. Some did not agree that the sans serif font is more readable as shown in item 2. As for item 12, some of them do not agree that the Arabic language should be used as a navigation button. However, based on the percentage, all items get a high score which is among 90% to 100% consensus. The Fuzzy Score (A) alpha cut value also indicates the consensus among experts for all items which ranges from 0.800 to 0.910. As a result, all of the construct items have been considered in developing the GUI for this application.

Conclusion

Visual research is important in developing interfaces for mobile applications. The integration between visual elements, principles of design, heuristics, and semantics theory will help designers to produce an effective GUI. The choice of elements like colours, icons, shapes, and text helps to improve the presentation of the interface. The understanding of the principles creates a neat layout and composition. Users should be given clear instructions to interact between pages. The elements have to be identifiable, and easy to be interpreted. Most of the heuristic principles like visibility, consistency, recognition, and aesthetics are related to visual design. The complete GUI prototype has gone through the research process. The experts had given their consensus regarding the presentation of the interface. The data showed that they had given a high value of agreement on the construct items. By using this framework, it was easier for the researcher to choose the survey items for GUI design. Hopefully, it can be used as a reference for future development of mobile application user interface design.

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