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Evaluation of User Experience of Bangladesh E-government Services: A Student's Perspective

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Declaration of Authorship

This is to certify that the work presented in this thesis is the outcome of the analysis and experiments carried out by Md. Adnan Rahman Robe, Nafiz Imtiaz, and Ibtid Rahman under the supervision of Md. Jubair Ibna Mostafa, Assistant Professor of the Department of Computer Science and Engineering (CSE), Islamic University of Technology (IUT), Dhaka, Bangladesh. It is also declared that neither this thesis nor any part of this thesis has been submitted anywhere else for any degree or diploma. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of references is given.

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Abstract

With the government striving to make the country digitally driven, the Bangladesh National Digital Architecture (BNDA) framework was made to ensure improved and more user-friendly services. The e-services of the Bangladesh Government have already implemented the BNDA framework. The usability of those services is a prime concern to be able to reach a large number of users. Although previous studies on the usability of government websites were made, no significant research from the user experience perspective has been done on the newly designed e-service websites. This research aims to evaluate the User Experience(UX) of two e-service websites namely, Railway Service and Surokkha-Vaccine Management System of the Bangladesh Government from the students' perspective. As students are a majority part of the user base of these e-services both directly and indirectly, it is crucial to know about their user experience. The study uses the widely recognized Jakob Nielsen's 10 Usability Principles for user interface design for Heuristic Evaluation (HE) and User Experience Questionnaire (UEQ) questionnaire for the evaluation of user experience. The findings prove that the user experience of the e-services is still not meeting the UX standards. Specifically, the novelty factor needs more improvement than the rest of the factors as their results are mostly below average or less according to the gathered data. The data gathered from this research can be used to make e-service websites that give a more user-friendly experience by following UX standards.

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Chapter 1

Introduction

Bangladesh has experienced significant technological growth, aiming to create a Digital Bangladesh, through the implementation of e-services and the Bangladesh National Digital Architecture (BNDA). However, the usability of newly designed e-service websites following the BNDA framework has not been extensively researched. This paper addresses the lack of user experience study and evaluates two websites of the Bangladesh government following the BNDA framework to improve their user experience. By prioritizing user-centered design, Bangladesh can enhance the effectiveness and inclusivity of its digital governance initiatives.

1.1   Overview

In the last decade, Bangladesh has seen an impressive rate of growth and development in technology[1]. The Bangladeshi government is striving to digitalize the country, by ensuring an ICT(Information and Communication Technology)-based society in which government and private and autonomous organizations can perform their duties using digital technology[1]. The nation had an ambitious plan of creating a Digital Bangladesh, which aimed to improve various aspects of life such as education, healthcare, and employment opportunities through the effective utilization of digital technology. However, this also resulted in digital fragmentation, where departments within the organization became isolated from one another and faced a great deal of difficulty in coordinating their efforts. E-Services are a key factor in building e-Government. All departments of Digital Bangladesh are currently providing electronic services or e-Services to citizens and businesses. These e-Services are the final result of the Bangladesh National Digital Architecture(BNDA). The BNDA infrastructure is being used to create an overall better user experience by government organizations.

User experience (UX) is a crucial aspect of website and application design, focusing on the overall experience and satisfaction of users during their interaction with digital products. According to Norman and Nielsen [2], "User experience" encompasses all aspects of the end-users' interaction with the company, its services, and its products. It encompasses a wide range of factors that influence how users perceive and engage with a system, including aesthetics, usability, functionality, and emotional response. Understanding and evaluating user experience is essential for designing effective and user-centered digital solutions. This thesis paper aims to explore the user experience factors specific to Bangladesh e-services websites, providing insights into how these factors impact user satisfaction and informing recommendations for improvement.

The importance of user experience (UX) in the e-service websites of Bangladesh cannot be overstated. These platforms serve as vital channels for citizens to access government services and information. A positive user experience ensures that users can navigate the websites effortlessly, find the desired information quickly, and complete tasks efficiently. It fosters user satisfaction, trust, and engagement, ultimately leading to increased adoption and usage of e-services. Moreover, considering the diverse digital literacy levels and cultural backgrounds in Bangladesh, a well-designed and user-centric UX helps bridge the digital divide, making government services more inclusive for all citizens. By prioritizing user experience in e-service websites, Bangladesh can enhance the effectiveness, efficiency, and overall satisfaction of its digital governance initiatives.

1.2   Problem Statement

While the government of Bangladesh has made significant efforts to digitize public services and improve accessibility through the implementation of the Bangladesh National Digital Architecture (BNDA) framework, there is a lack of research on the usability of the newly designed e-service websites. While previous studies have examined the usability of government websites, it is crucial to evaluate the usability of specific e-service websites following BNDA architecture, as this can help identify usability issues and improve the quality of the e-services. Therefore, this research aims to evaluate the usability of three e-service websites of the Bangladesh government and provide insights for improving the usability and accessibility of e-services in Bangladesh.

Our hypothesis for this research,

Null hypothesis: The E-service websites of the Bangladesh Government have a satisfactory user experience.

Alternate hypothesis: The E-service websites of the Bangladesh Government do not have a satisfactory user experience.

1.3 Motivation & Scope

Bangladesh has people with different levels of digital literacy. Bangladesh's e-services are driven by the desire to enhance the overall user experience, accessibility, and effectiveness of these digital platforms for Bangladeshi people. With the government's focus on digital transformation and improving service delivery, it is crucial to evaluate the usability of e-government services to identify any usability issues, challenges, or barriers that users may encounter. By understanding and addressing these concerns, the study aims to improve user satisfaction, increase user adoption and engagement, and ultimately, enhance the effectiveness and impact of e-government services in Bangladesh. After implementing the BNDA framework on the e-services, the overall experience is claimed to be improved. Previous studies have found usability problems in the earlier versions of the e-government websites of Bangladesh. there is no available research to evaluate the overall user experience of these newly constructed websites. Moreover, with the end of Vision 2021, it is necessary to analyze if the outcome is satisfactory or not.

Evaluation of user experience on Bangladesh e-government services involves evaluating the UX aspects of selected e-service websites or applications. The study will utilize established usability evaluation methods, such as heuristic evaluation and usability testing, to assess various factors including user interface design, navigation, content organization, responsiveness, and novelty. It will focus on specific e-government services that are widely used by citizens. By conducting this study, valuable insights will be gained into the strengths, weaknesses, and areas for improvement of e-government services, leading to actionable recommendations for enhancing user experience and overall service quality. The findings of the study can help inform the design and development of user-centric, effective, and efficient e-government services that meet the needs and expectations of the people of Bangladesh.

1.4   Research Challenges

Conducting a usability study on Bangladesh e-government services with student partici-
pants presents several considerations. Firstly, recruiting an adequate number of students
for the study can be a task that requires careful planning and coordination. Accessing
and engaging students from different universities and academic disciplines may require
collaboration with educational institutions and navigating institutional protocols. Addi-
tionally, ensuring a diverse representation of students in terms of demographics, digital
literacy levels, and prior experience with e-government services can be challenging to
achieve.

Secondly, managing the availability and scheduling of student participants can be an-
other hurdle. Students often have busy academic schedules, exams, and extracurricular
commitments, making it challenging to coordinate their participation in the usability
study. Ensuring a sufficient sample size within the given timeframe may require careful
planning, flexibility, and efficient communication with potential participants.

Additionally, maintaining participant engagement throughout the study is crucial for
obtaining reliable data. Student participants may face competing priorities and limited
attention spans, making it necessary to implement strategies to motivate and incentivize
their active involvement. Clear communication, regular updates, and offering incentives,
such as gift cards or certificates, can help sustain participant engagement and increase
the response rate.

1.5   Thesis Outline

In Chapter 1 we have discussed our study in a precise and concise manner. Chapter 2
deals with the necessary literature review for our study. In Chapter 3 we have stated the
total workflow of our proposed method. Chapter 4 discussed the results and comparative
analysis of the data we gathered using HE and evaluation using the UEQ questionnaire.
The final segment of this study contains all the references and credits used.

Chapter 2

Literature Review

Our literature study highlights several studies conducted on user experience and usability evaluation and improvement of various websites and applications. The studies employ different methodologies such as pre and post-usability testing, heuristic evaluation, analytical hierarchy process, design guidelines, inclusive design, and user feedback. The limitations of each study are also discussed, including factors like small sample size, lack of pilot study, limited participant selection, and focus on specific website types or attributes. Overall, these studies contribute to the understanding of usability evaluation techniques and provide recommendations for enhancing the usability and user experience of websites and applications.

2.1   Pre and Post Usability Testing

In the study by [3], the authors conducted two stages of usability testing on the Ministry of Education (MOE) web portal. The first stage involved pre-usability testing, where the usability of the current MOE web portal was evaluated. The authors observed the participants' effectiveness and efficiency by assigning them tasks to perform on the website. This initial testing aimed to identify any usability issues and areas for improvement.

Based on the findings from the pre-usability testing, the authors developed a web portal prototype as a usability enhancement for the MOE website. The prototype was designed to address the identified usability issues and improve the user experience. In the second stage, post-usability testing was conducted on the enhanced version of the MOE web portal. The authors utilized an improvised version of the Web Application Measurement

Inventory (WAMMI) questionnaire to evaluate the usability of the prototype.

The WAMMI questionnaire was used to assess usability factors such as efficiency, learnability, attractiveness, controllability, and helpfulness. By collecting feedback from participants through this questionnaire, the authors gained insights into the usability of the prototype and its effectiveness in addressing the identified usability issues. However, it is important to note that the study had some limitations. One limitation was the reduction in variation in performance metrics, which could have provided more comprehensive insights into the usability of the prototype. Additionally, the study did not include heuristic evaluation, which could have provided additional valuable input on usability aspects and potential improvements.

2.2 SIDE Framework

The study conducted by [4] aimed to assess the usability status of e-government websites in Bangladesh. The researchers employed Nielsen's Heuristic Evaluation and the SIDE framework for semiotic evaluation as their methodologies [4]. This study provided valuable insights into the overall usability of government services in Bangladesh. However, it had several limitations, including the absence of a pilot study, manual website selection without clear criteria, a small participant pool of only 22 individuals, and a lack of screening process for participant selection. Additionally, the paper did not propose specific guidelines for improving the usability of the websites evaluated. The selection of websites was also based on random choices. Moreover, the study did not cover the evaluation of newly designed e-services following the BNDA architecture, indicating the need for further research in this area.

In summary, while the study shed light on the usability of e-government websites in Bangladesh, its limitations in terms of methodology, participant selection, lack of guidelines, and focus on existing websites rather than newly designed e-services following the BNDA architecture indicate opportunities for future research to enhance the usability and user experience of government services in the country.

2.3 AHP Model

The research conducted by [5] introduces a usability evaluation technique that incorporates user feedback and the Analytical Hierarchy Process (AHP) model. The study involved the design of questionnaires to measure five attributes (Attractiveness, Controllability, Efficiency, Helpfulness, and Learnability) and their corresponding sub-attributes. The collected data from the questionnaires were utilized to create a comparison matrix and determine a usability score, which identified specific features that negatively impacted the website's overall usability. Notably, the obtained usability score was compared to the WAMMI report [6], and the findings were found to be consistent. However, it is important to note that this study was limited in its scope to academic websites and had a relatively small sample size.

The research presented by [5] proposed a usability evaluation technique utilizing user feedback and the AHP model. The study successfully assessed the usability of academic websites by measuring attributes and generating a usability score. The comparison with the WAMMI report validated the results. Nevertheless, the study's focus on academic websites and its small sample size highlight the potential for future research to expand the evaluation to other types of websites and increase the sample size for more robust findings.

2.4 WCAG Guidlines

The paper by [7] presents several proposed solutions for improving web accessibility and usability. One of the key suggestions is the acquisition of IT skills and knowledge of new technologies. By equipping individuals with these skills, they can better understand and implement accessibility and usability guidelines effectively. Additionally, the paper emphasizes the importance of adapting existing web accessibility guidelines or developing new ones that are specific to the context of the websites in question. This tailored approach ensures that accessibility requirements are aligned with the unique needs and characteristics of the targeted user base.

Furthermore, the study advocates for the establishment of policies regarding web accessibility and usability. These policies serve as guidelines and frameworks that organizations

can follow to ensure compliance with accessibility standards. Alongside policies, the paper recommends the implementation of an enforcement procedure to monitor and enforce adherence to these guidelines. By having a clear enforcement mechanism in place, website owners and developers can be held accountable for maintaining and improving the accessibility and usability of their websites.

In assessing the usability of websites, [7] employed Nielsen's Heuristic Principles, a widely recognized set of usability principles proposed by Jakob Nielsen. These principles provide a comprehensive framework for evaluating the overall usability of websites. Additionally, the study utilized the Web Content Accessibility Guidelines (WCAG) 2.0 to assess the accessibility of the websites. WCAG 2.0 is a recognized standard for web accessibility and serves as a valuable resource for evaluating the accessibility features and compliance of websites.

2.5 Inclusive Design

The study by [8] focuses on developing a set of heuristics specifically tailored for evaluating the user interface of Arabic mobile commerce applications. The researchers identified six categories for these heuristics, namely Search and Findability, Visual Design, Translatability, Consistency, User Control and Freedom, and Adaptability. The development process involved multiple stages, starting with a comprehensive literature review to gather existing knowledge and insights. Subsequently, an expert review was conducted to gather feedback from usability experts in the field. Finally, an online survey was conducted with a community of usability experts to obtain further input and validation.

The set of heuristics proposed in the study aims to enhance the usability of Arabic mobile commerce applications and improve the overall user experience. By considering specific factors such as search functionality, visual design, translatability, consistency, user control, and adaptability, these heuristics address key aspects that influence user satisfaction and engagement. The research methodology consisted of four phases and three stages, allowing for a comprehensive and systematic approach to developing the heuristics. The inclusion of expert reviews and the feedback obtained through the online survey further validate the relevance and applicability of the heuristics.

The results of the online survey conducted with usability experts contribute to the final set of heuristics, providing a valuable resource for evaluating the usability of Arabic mobile commerce applications. These heuristics can serve as a practical and effective tool for designers, developers, and evaluators in assessing and improving the user interface of mobile commerce applications tailored to Arabic-speaking users. By considering the unique characteristics and preferences of this target user group, the heuristics aim to ensure a user-friendly and satisfactory experience in mobile commerce interactions.

2.6 Background Color and Symbol

The study conducted by [9] aimed to explore the impact of different background colors and symbols on the usability of smartphones across different age groups. The researchers recognized the significance of icons in smartphone menus, the challenges involved in their design, and the influence of age-related differences on human capabilities. To establish a foundational understanding of these topics, relevant knowledge was gathered before proceeding with the experimentation phase.

A total of 120 participants took part in the study, representing three distinct age groups: children (10-12 years old), adults (18-37 years old), and older adults (60-75 years old). The usability of the smartphone interfaces was assessed based on two key metrics: efficiency and satisfaction. Efficiency was measured by evaluating the time taken to complete the assigned task, while satisfaction was gauged through a questionnaire administered to the participants. The task itself involved searching for the same menu item in different locations across 12 different sets.

The results of the study indicated that multi-color pictorial symbols emerged as the most effective design choice across all age groups. This finding suggests that using vibrant and visually distinct symbols can enhance usability and improve the user experience for individuals of varying age ranges. By identifying the most favorable design elements, the study offers valuable insights for designers and developers seeking to create smartphone interfaces that cater to users of different ages, ultimately contributing to improved user experience and user satisfaction.

2.7 WAVE

The research conducted by [10] highlights the pressing need for substantial improvements in the accessibility and usability of Taiwan's e-government websites to meet international standards. The study employed two evaluation approaches: automated WAVE Accessibility testing and a survey based on Nielsen's 10 Heuristics Principles.

The results of the evaluation revealed a concerning number of accessibility errors, surpassing 100 across the assessed websites. Additionally, the survey indicated unanimous dissatisfaction among users regarding the usability of these websites. These findings emphasize the urgency for further research and investigation to address the identified issues and align Taiwan's e-government initiatives with their ambitions.

To enhance the accessibility and usability of the websites, the study recommends focusing on various aspects of website design, including navigation, aesthetics, content presentation, accessibility features, customization options, and adherence to Nielsen's Heuristics Principles. By implementing these recommendations, Taiwan can take significant steps towards creating e-government websites that provide improved accessibility, and user-friendly experiences, and better serve the needs of its citizens.

Chapter 3

Methodology

Our methodology involved a systematic approach to analyzing, evaluating, and improving the user experience of government e-services in Bangladesh. By selecting representative websites, conducting a heuristic evaluation, building prototypes, selecting appropriate tasks, and conducting a controlled study, we were able to gain valuable insights into the strengths and weaknesses of the websites and identify areas of improvement.

3.1 Website Selection

The first step of our methodology involved analyzing existing government websites to select the ones that would be most relevant for our study. We started by scraping the most used government websites in Bangladesh and obtained around 100 websites. We then analyzed each website based on criteria such as relevance, user traffic, and popularity, and selected two websites that we deemed most relevant for our study. The websites mentioned in Table 3.1 are chosen for the study.

TABLE 3.1: Selected websites for the study

Website Name	URL	Short Form
Bangladesh Railway Service	eticket.railway.gov.bd	W1
Surokkha	surokkha.gov.bd	W2

3.2 Heuristic Evaluation

The second step of our methodology involved conducting a heuristic evaluation of the two selected websites from Table 3.1. We used Jakob Nielsen's 10 general principles

Table 3.2: Jakob Nielsen's 10 general principles

H1	Visibility of system status
H2	Match between system and the real world
H3	User control and freedom
H4	Consistency and standards
H5	Error prevention
H6	Recognition rather than recall
H7	Flexibility and efficiency of use
H8	Aesthetic and minimalist design
H9	Help users recognize, diagnose, and recover from errors
H10	Help and documentation

for heuristic evaluation, which are broad rules of thumb and not specific user interface guidelines.

We had five experienced designers currently working in a software company to conduct the heuristic evaluation. All of them had a minimum of two years of experience in the UX industry. The designers evaluated the websites based on the 10 heuristics of Table 3.2 and identified pain points that could be addressed in the prototype building stage. The designers identified several design problems that are presented in Table 3.3.

Table 3.3: Number of problems identified using Nielsen's heuristic

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Total
W1	4	2	0	2	2	3	3	2	1	2	21
W2	2	1	1	1	2	0	1	1	1	2	12

From Table 3.3 the problems related to our websites were highlighted. We can see a total of 21 and 12 problems were highlighted on W1 and W2 respectively.

3.3 Building Prototypes

The third step of our methodology involved building prototypes for the selected websites. The heuristic evaluation helped us to identify the pain points of the selected websites, and we used Figma to build our prototypes targeting to minimize the pain points. We incorporated design elements that improved usability, such as clear navigation, easy-to-use interfaces, and accessibility features.
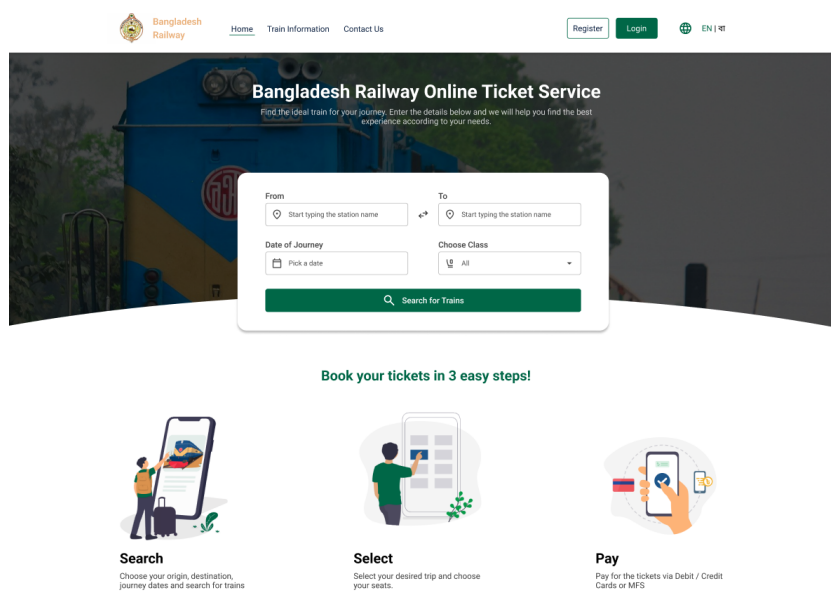
FIGURE 3.1: E-railway Prototype

FIGURE 3.2: Surokkha Prototype

3.3.1 Task Selection

The fourth step of our methodology involved selecting tasks that corresponded to the three selected websites. We selected two tasks that were representative of the their most used service offered by the websites.

TABLE 3.4: Task selected for the websites

W1	Book a railway ticket
W2	Download vaccine card

3.3.2 Experimentation

This subsection shows how we conducted our data collection procedure after the study on the websites were done.

3.3.2.1 Questionnaire Design

For our UX study on Bangladesh e-government services, we have selected the User Experience Questionnaire (UEQ)[11] as our evaluation instrument. The UEQ is a widely used and well-established questionnaire that assesses the user experience of digital systems and interfaces. It provides a comprehensive impression of the user experience by measuring both classical usability aspects and user experience aspects.

The questionnaire consists of 26 questions that cover various aspects of user experiences. They are attractiveness, perspicuity, efficiency, dependability, simulation, and novelty. We can take a look at these aspects in Table 3.5. Each of these questions is to be answered on a Likert scale of 7.

Table 3.5: Aspects of UEQ

Attractiveness	Do users like or dislike it?
Perspicuity	Is it easy to get familiar with and learn how to use it?
Efficiency	Can users solve their tasks without unnecessary effort?
Dependability	Does the user feel in control of the interaction?
Stimulation	Is it exciting and motivating to use the product?
Novelty	Is the design of the product creative?

However, for our specific UX study, we have decided to use 23 questions from the UEQ. We have excluded questions numbers 9, 17, and 20 as they do not align with the specific objectives and research questions of our study. Since the prototype is built on Figma which will be different from our live web, including these questions would create biases. This decision was carefully made to focus on the aspects that are most relevant to assessing the usability and user experience of e-government services in Bangladesh.

By utilizing the UEQ with the selected 23 questions, we aim to gather valuable insights into participants' impressions of the e-government services, including their perceptions of usability, clarity, trustworthiness, innovativeness, and engagement. These insights

will help us identify strengths and areas for improvement in the design and user experience of the e-government services, ultimately leading to recommendations for enhancing usability and user satisfaction.

3.3.3 Demographics

For our usability study on Bangladesh e-government services, we have carefully selected a sample size of 40 undergraduate students from Bangladesh [12]. The sample consists of 10 female students and 30 male students. The participants were all from the Islamic University of Technology (IUT).

In terms of age, the selected participants fall within the range of 21 to 26 years old, reflecting the typical age group of undergraduate students in Bangladesh. This age range is particularly relevant as it represents a significant user demographic that frequently engages with e-government services for various purposes, such as academic processes, accessing information, and availing government services.[1]

3.3.4 Setup Design

The usability study was divided into two distinct phases, each conducted in separate weeks, to ensure a comprehensive evaluation of the e-government services in Bangladesh. In the first phase, participants were assigned the tasks specified in Table 4.1, which were specifically designed considering the core feature of the websites from Table 3.1. They were instructed to complete these tasks on the respected websites while their interactions, feedback, and challenges were observed. Following the task completion, participants were then asked to respond to the selected questions from the User Experience Questionnaire (UEQ) to evaluate their overall user experience. The name, gender, age, and previous usage of the website were also taken.

In the subsequent week, the second phase of the study took place. During this phase, participants performed the same set of tasks as in the previous week, but this time using a prototype of the e-government services instead of the live websites. The prototype was carefully developed to replicate the key functionalities and features of the live websites, ensuring a comparable evaluation. Similar to the first phase, participants' interactions,

feedback, and challenges were observed and recorded. Once the tasks were completed on the prototype, participants were again asked to provide their responses to the selected questions from the UEQ to assess their user experience.

This two-phase approach, with a gap between the weeks, was implemented to mitigate the potential influence of recency bias. By separating the evaluation of the live websites and the prototype, participants had an opportunity to engage with each version independently. This minimized the impact of the most recent experience on their evaluations, allowing for more reliable and unbiased feedback.

3.4 Data Transform

A data transformation process is applied after collecting the responses to derive meaningful values for statistical calculations and analysis. One aspect of the data transformation involves changing the order of positive and negative terms for each item in the questionnaire. Within each dimension, half of the items start with the positive term, while the other half start with the negative term.

Each item is assigned a value ranging from $+3$ (representing the most positive response) to -3 (representing the most negative response). These transformed values offer a standardized representation of participants' perceptions and experiences, enabling a more structured and comprehensive analysis of the user experience.

It is to note that these transformed values are provided specifically for statistical calculations and should be interpreted within the context of the UEQ dimensions and items. Additionally, the randomization of positive and negative terms ensures unbiased data collection and reduces response biases that may arise from item order effects.

Chapter 4

Results and Discussions

Our results include the statistical analysis of UEQ to evaluate the user experience of e-government services. The inconsistent data section shows how to identify suspicious answers and potential lack of seriousness by detecting significant differences in evaluations within each scale and consistent identical responses across multiple items. The statistical analysis compares the performance of live websites and prototype versions, indicating that the prototypes generally outperformed the live websites regarding user experience quality.

4.1 Inconsistent Data

In an online questionnaire, some participants may not answer seriously. To detect such suspicious answers, a heuristic is used as recommended by the UEQ tool [12]. It checks the difference between the best and worst evaluations within each scale. If the difference is significant (greater than 3), it suggests a problematic data pattern. However, a single scale with a large difference doesn't warrant response deletion. But if 2 or 3 scales show such patterns, it indicates a suspicious response. The UEQ tool [12] recommends removing answers with a "Critical" value of 3 or higher.

Another heuristic focuses on identical responses for multiple items. If a participant consistently chooses the same response (e.g., the middle category) for more than 15 items, it suggests a lack of seriousness. Such responses are likely due to rushing through the survey. These answers should be considered critical and potentially removed from the dataset. After removing data we had revised our final sample size for the experiment.

TABLE 4.1: Participants in each experiment

W1 live	37
W1 prototype	36
W2 live	38
W2 prototype	35

4.2   Statistics

After mapping the questions to the 23 aspects of UEQ (User Experience Questionnaire), the mean results indicate that the built prototypes generally outperformed the live websites. However, there is an exception with the live version of W2, which demonstrated better efficiency compared to its prototype version.
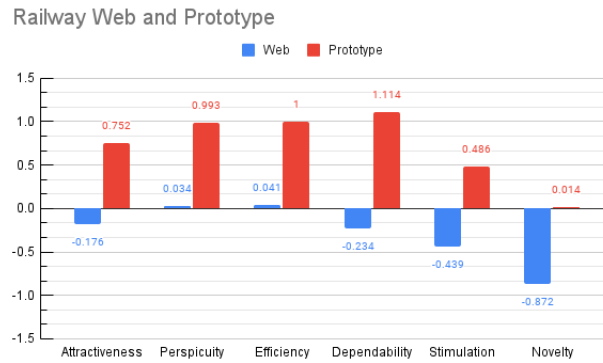
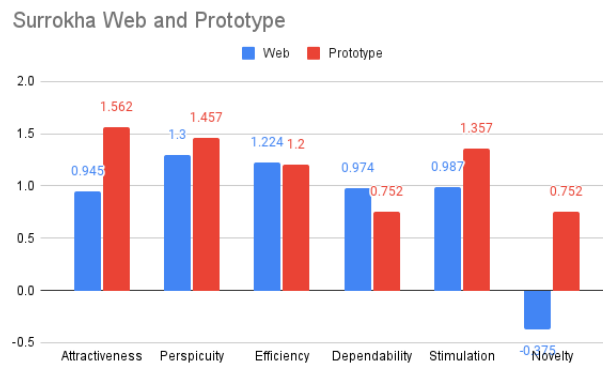

FIGURE 4.1: Railway Analysis

FIGURE 4.2: Surokkha Analysis

Based on this, it can be inferred that the prototypes, as a whole, exhibited higher levels of user experience quality across the evaluated aspects when compared to the live websites. This finding highlights the potential benefits of the prototype versions in terms of
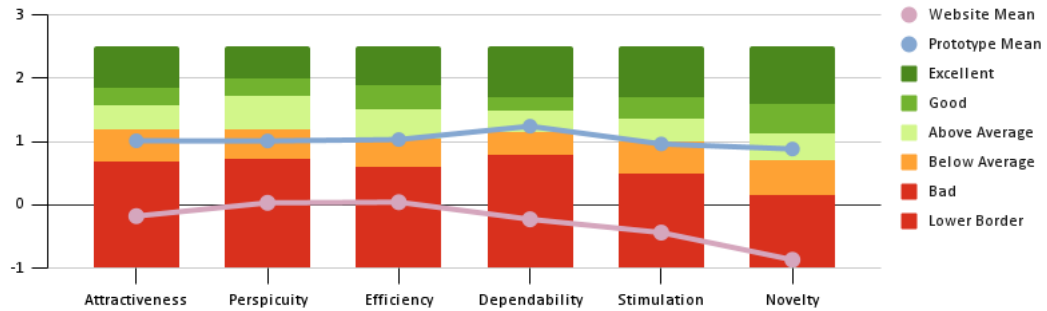
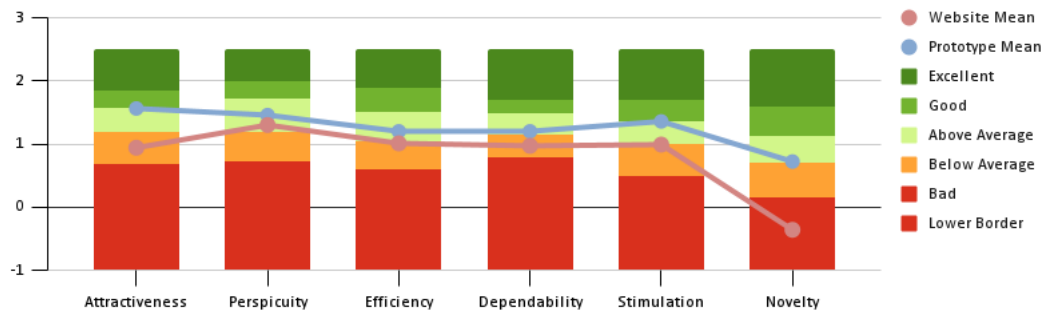user satisfaction and overall user experience.

FIGURE 4.3: Railway Benchmark

FIGURE 4.4: Surokkha Benchmark

The UEQ benchmark[12] suggests that there is a gap between the usability of the live version and the prototype version of W1 in the benchmark. However, despite this gap, the overall result for W1, both live and prototype versions, is perceived to be below average in comparison to the benchmark. On the other hand, the benchmark result for W2 is considerably better positioned.

From this analysis, it can be inferred that while there may be differences between the live and prototype versions of W1 in the benchmark, neither version is performing up to the desired level indicated by the benchmark data. In contrast, W2, both in its live and prototype versions, shows a more positive outcome and performs better in comparison to the benchmark.

These findings suggest that there is room for improvement in enhancing the user experience for both W1 and W2. It indicates that further attention and optimization may be required for W1 to bridge the gap observed between its live and prototype versions and

to reach a level of user experience that meets or exceeds the benchmark. Additionally, the positive performance of W2, in relation to the benchmark, highlights potential areas of strength that can be leveraged and further built upon to enhance the user experience for that specific aspect or feature.

4.3 Limitations

The limitations of this study can be identified in several areas. Firstly, due to time constraints, the scope of the research was confined to only two websites. This small sample size may not provide a comprehensive understanding of the user experience of e-government services in Bangladesh.

Secondly, the demographic of users involved in user research and usability testing was limited to undergraduate students. This restricts the breadth of perspectives and preferences which could have been obtained from a more diverse demographic of users, including different age groups, professions, and digital literacy levels.

Lastly, the research didn't include accessibility audits, potentially leaving out the evaluation of services for citizens with disabilities and special needs. The absence of exploration into emerging technologies like artificial intelligence and chatbots also marked a limitation, as these could offer new opportunities to improve user experience and efficiency.

Chapter 5

Conclusion and Future Work

The study concludes that there is room for improvement in the user experience of Bangladesh's e-government services. Prototype versions performed better overall, but both live websites and prototypes fell below the desired benchmark levels. Future work should focus on addressing usability issues, conducting broader investigations, and exploring emerging technologies to enhance user experience.

5.1 Conclusion

In conclusion, the evaluation of the user experience of Bangladesh e-government services has provided valuable insights into the overall user satisfaction of selected e-service websites. The study employed a two-phase approach, involving participants performing tasks on both live websites and prototype versions, to assess the user experience comprehensively. The findings revealed that, in general, the prototype versions exhibited higher levels of user experience quality compared to the live websites, except for one aspect where the live version showed better efficiency.

The results suggest that there is a need for improvement in enhancing the user experience of the evaluated e-government services. While the prototype versions performed better overall, both the live websites and prototypes fell below the good level indicated by the benchmark data. This indicates that further attention and optimization are necessary to bridge the gap observed between the live and prototype versions and to meet or exceed the benchmark levels of user experience.

5.2 Future Work

The findings of this research present several avenues for future work. To begin with, it's essential to enhance the user experience of the evaluated e-government services by addressing identified usability issues. This can be achieved through iterative design and development processes, user feedback, and best practices in user interface design, navigation, and content organization.

A broader investigation involving more websites should be considered to get a more comprehensive view of the user experience of e-services in Bangladesh. In addition to this, user research and usability testing with a more diverse demographic can provide a richer understanding of the user experience, making designs more user-centric and inclusive.

Continual monitoring and evaluation of the user experience of e-government services are necessary to ensure ongoing improvements. Usability testing, user surveys, and data analysis should be regularly performed to identify emerging issues and track the effectiveness of implemented enhancements.

Furthermore, future work should also involve integrating accessibility audits and compliance with accessibility standards, making e-government services accessible to all citizens. Moreover, exploration of emerging technologies, such as artificial intelligence and chatbots, can open up new possibilities for improving user experience and efficiency and should be investigated.

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