



# **Usability Analysis for Online Railway Ticket Booking System Using SUS & NPS Matrix**

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
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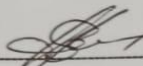
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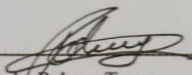
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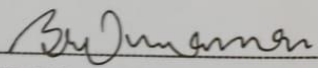
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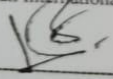
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**Usability Analysis for Online Railway Ticket  
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Bachelor of Science

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## SUPERVISOR'S DECLARATION

I hereby declare that I have reviewed this thesis entitled "**Usability Analysis for Online Railway Ticket Booking System Using SUS & NPS Matrix**", and in my opinion, it is adequate in terms of scope and quality for the award of the degree of Bachelor of Science in Software Engineering.

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## STUDENT'S DECLARATION

I confirm that the piece in this thesis is based on my own writing with the exception of quotation and reference that have been discussed. I also confirm that it was not previously and concurrently registered at Daffodil International University or other institutions at any other degree.

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# **Usability Analysis for Online Railway Ticket Booking System Using SUS & NPS Matrix**

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Thesis submitted in fulfilment of the requirements  
for the award of the degree of  
Bachelor of Science

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## **ACKNOWLEDGEMENTS**

First of all, I am immensely grateful to Ms. Tapushe Rabaya Toma, Assistant Professor, Department of Software Engineering for her constant support and valuable advice. Her constructive comments and counsel have contributed significantly to the successful completion of this research. I would also like it that all of who participated in survey and spent their precious time as well opinions and made this research Study 1: First year students possible. I am also grateful to the Department of Software Engineering, where I had access to resources and academic environment for doing this research. And last but not least, I would like to express my sincere thanks to all family and friends who have always support, motivate and be patient with me in fulfilling this study. They have been such great support; they motivate me and inspire me every day.

## **DEDICATION**

I owe this venture to my dear father and mother, my supervisor, my honorable teachers who are forever dear and near to me. It wasn't potential to come in the lead Clothed in Their patience, sympathetic, no pretend Strengthened by your passing attention Care always and love forever What could do.

## ABSTRACT

This abundance of digital media for transport services also impacts on the railway industry, notably with mobile ticketing solutions. The study aims to evaluate the usability of a railway ticket booking system and satisfaction of customers by using SUS (System Usability Scale) and NPS (Net Promoter Score). Using these two most popular and valid instruments, this study attempts to provide a comprehensive view of how users perceive overall satisfaction as well as the system's ease of use and usefulness. A questionnaire was used to examine the SUS method for measuring usability of the system and NPS for determining how loyal customers are based on their satisfaction when they reserve railway ticket booking app's users. The result of Sus score for Booking Railway Ticket System is 58.37 that means Was acceptable and there still some space for further improvement for the user. NPS 19.98 is also reflecting a blend of passive and pleased users along with large majority of Detractors indicating engagement related issues, functioning on system and customer service glitches. The results of this research are presented, and the key areas such as payment method able interfaces and real time update need to be further developed in order to give User Interfaces more genericity. Recommendations are also made for enhancing the user-friendliness of the system and increasing users' satisfaction so that they would have strong intention to stay longer and be more loyal. The contribution highlights the importance of MIC and NPS as reliable indicators for assessing transport-oriented digital platforms, which can be applied to help the development of an innovative railway ticket booking system.

**Keywords:** Digital Media, Railway Ticket Booking System, Mobile Ticketing, System Usability Scale (SUS), Net Promoter Score (NPS), Usability Evaluation, Customer Satisfaction, User Experience (UX), Transport Services, Loyalty Measurement.

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## LIST OF ABBREVIATIONS

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<b>SUS</b>	<b>System Usability Scale</b>
<b>NPS</b>	Net Promoter Score
<b>UX</b>	User Experience
<b>UI</b>	User Interface
<b>SD</b>	Standard Deviation
<b>CSV</b>	Comma Separated Values
<b>ID</b>	Identifier
<b>URL</b>	Uniform Resource Locator
<b>FAQ</b>	Frequently Asked Questions
<b>HCI</b>	Human–Computer Interaction

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The railway system in Bangladesh is a vital means of fast travel. With the constant need for both efficiency and convenience, the railway sector introduced digital systems to ease its users and enhance their experience, especially in booking tickets. Nowadays, the Railway Ticket Booking System in Bangladesh, which comprises several subsystems, has been maintained and upgraded and has been used by different generations, from traditional counters to online portals and mobile applications. The adoption of this digital platform has multiple advantages in the convenience and accessibility of getting rail tickets. In the quest to assess the system in line with users' satisfaction, the evaluation measures should be used to achieve the optimal system. The factor of interest in this assessment is usability, which plays a critical role in such systems, including how easy users access and perform tasks on the system. For the purposes of this study, I will use two metrics that are widely acknowledged in measuring the system, and that is the System Usability Scale and Net Promoter Score especially in the railway ticketing system. Other systems may have a different style of assessment based on the best metric to implement, but for this study, these systems were found to be the most appropriate. Bangladesh's railway booking system has been improving in terms of sophistication, although some aspects still require improvement, including the user-friendliness of the system, the stability, and customer satisfaction. This thesis aims to conduct a thorough usability assessment of a railway ticket booking system using SUS and NPS and recommend in-service delivery [3]. This assessment is useful to the policymakers, service providers, and system developers as it will guide them on areas of focus.

### 1.2 Background Study

The rail network is an important means of transportation for both passengers and cargo in Bangladesh. One of the longest in South Asia, BR's network spans 3,682 kilometers and carries millions of passengers each year. As per latest statistics, Bangladesh Railway operates some 1,800 trains daily which is a lifeline for the country's economy

as well as commuting of people. Though significant, the current practices of railway reservation have been fraught with accessibility issues, convenience for users and service provider operational efficiency. To tackle these issues, a digital transformation has been introduced in the way of online and mobile ticketing systems. BR started computerized ticketing system in the early 2000s, where major stations had this facility first. Eventually this system spread through the country providing ready access to railway services. The online railway ticketing system was opened to the public in 2008, and enables users to book train tickets over the Internet using official website as well as via mobile phones. At present, Bangladeshi railway ticket purchase system provides multiple website-based facilities for passengers to book their tickets by visiting official nginx: [www.eticket.railway.gov.bd](http://www.eticket.railway.gov.bd) and the Rail Sheba mobile app. The website enables customers to access train schedules, make reservations and pay using a variety of credit cards. This move on online ticketing has considerably decreased the lines at stations and made booking much easier. Yet, however the usability and user satisfaction of the system still poses challenges of how to ensure that it works as a whole. Railway ticketing system's usability is an issue across the system as users still find it hard to use the interface, come across payment failures and are unable to get real-time information. In order to guarantee that these systems are easy to use, it is necessary to perform usability evaluations with validated metrics as SUS and NPS. SUS is commonly used to measure how efficient systems are by analyzing users' perceived ease of use, and NPS acts as a gauge for customer loyalty and satisfaction. Even though it is 21st-century where there is the development of railway technology there still seems to be continual improvement required in the process of booking railway ticket. Some of the feedback from the users particularly in context of mobile applications and online portals indicates certain areas that need work, navigation buttons and system strength during peak hours. It's also important for ticketing platforms or customer support systems to be easily connected, because you don't want the disconnect when users try to access your sites through them. In this paper we have intended to measure the usability of Bangladeshi Indian Railway ticket booking system by using SUS and NPS. The outcome of this study will shed light on the performance of the current system and, thereby, it can locate possible pitfalls that need for improvement. The objective is to make such digital platforms for ticket booking on railway more user friendly, faster and customer focused that will increase the usage of these services thereby benefitting the users.

### **1.3 Motivation**

The digital technology revolution has profoundly changed the relationship of people with services in a number of domains. Bangladesh Railway, a crucial organ of the transportation sector has been digitally transforming to provide enhanced services and better operation. With the rise of online ticketing and mobile apps, booking a rushing ticket has become convenient, however there are still usability issue present behind scenes from user's side, reliability of system and user satisfaction. In case of Bangladesh, the railway ticket reservation system is a life-supporting factor for millions of passengers who are habituated on train travel every day as short distances and long routes. With the rapid growth and modernization of the railway network, it is crucial for virtual platforms that peruse ticket purchasing to be effective, easy-to-use simultaneously catering to varied user profiles. The recent surge in use of mobile and Internet access points has brought a host of opportunities and challenges that need ongoing evaluation to maintain high quality usage experience. This research motivation is based on the observation that, there are some unanswered questions to evaluate the usability and customer satisfaction of railway ticket booking system in Bangladesh. The current system is serviceable but has received negative reviews due to poor UI, payment failures, slow processing times and the absence of real-time updates. These problems have caused frustration among users and have negatively impacted their experience and satisfaction with the service. Considering all these issues and also to enhance system efficiency systematically evaluating its usability is must. The adopted system for assessing the usability and satisfaction of users using the system is based on (SUS) and (NPS). SUS provides a quantitative score reflecting the ease and efficiency of use experienced by users while NPS measures general customer satisfaction and loyalty. Combining these tools with the other will allow insight into component of system that needs improvements and to highlight focal points that affect the users. Furthermore, the results obtained in this study will add to existing literature on usability testing and customer satisfaction in transportation industry, particularly in developing countries such as Bangladesh. The outcomes of this study will help policy makers, railway bodies and developers in enhancing users' interaction, serve the railway ticket booking system more efficiently, provide more accessibility & user-friendly interface and match with the requirements of passengers.

## **1.4 Problem Statement**

Bangladesh Railway online and Mobile ticketing in BD Railway Bangladesh's railway or so to say, rail ticket booking system has for some years now been digitized up by an extensive digital network which includes website-based, mobile app based etc. However, the system still faces a number of challenges which impact its general usability and effectiveness as well as user satisfaction. Although the availability of online ticketing has simplified booking for many passengers from the convenience of their place, however it fostered various issues particularly on usability part. Numerous users have said the website and mobile apps are difficult to use, credit card payments can be problematic, pages load too slowly and folks have a hard time getting real-time updates on train schedules or even seat availability. These issues can result in user dissatisfaction and tarnish the railway's image and customer satisfaction. Usability, the extent to which a product can be used by users with actual usability problems based upon 20 years of research is the System Usability Scale much like NPS for quantifying user satisfaction and loyalty. Notwithstanding this increasing significance of these metrics, little research has been undertaken on the usability and customer satisfaction of the Bangladesh Railway ticket booking system. There is little evidence on how users are utilizing the platform, and thus it is hard to know the specific areas in which the usability is problematic and develop solutions in relation to them. This paper will address this gap by conducting a comprehensive usability analysis of train ticket booking system in Bangladesh in terms of SUS and NPS. The evaluation study will explore the user perception with respect to the perceived ease of use of the system, identify usability problems and receive overall customer satisfaction. The research will give practical recommendations on how to improve user experience, customer loyalty and fulfill the needs of the users by identifying the weaknesses and where improvements can be made.

## **1.5 Research Objective**

Measuring efficiency The System Usability Scale (SUS) is a popular tool used for testing usability, and the NPS (Net Promoter Score), measures customer satisfaction and loyalty. But researches concerning usability and customer's satisfaction on Bangladesh Railway Reservation system are not much large though it has emerging out like

popularity.

However, no empirical data on users experience of the platform exists and hence it is difficult to identify particular usability problems and how they might be addressed. This gap is sought to be fulfilled by performing a broad usability study of the railway ticket booking system in Bangladesh with assistance from SUS and NPS. The system's ease of use, usability problems found, and general customer satisfaction will be evaluated using the study. Through pinpointing sticking points and opportunities for improvement, the study will suggest concrete recommendations for improving the user experience, increasing traveler retention and ensuring that the system serves rider needs.

In particular, this work will attempt to solve the following issues:

- Usability problems in train booking system: Tough to operate, wasting of time and poor interface design.
- Customers angry of payment not going through, poor support and unclear instructions or features on the platform.
- There is no quantitative user experience information, which blocks development work towards evidence-based system improvements.
- The system performance should be constantly monitored in order to guarantee its efficiency, user friendliness, and adaptability for the passengers' requirements.

The study will add to the efforts of improving ticket booking system of railways, that is more user-friendly, trustworthy and enabling failsafe travelling experiences for millions in Bangladesh.

### **1.6 Scope of this Research**

This study is based on the usability evaluation of railway ticket booking system in Bangladesh, using standard measures System Usability Scale (SUS), and Net Promoter Score (NPS). The study will evaluate the digital platforms (official webpage and mobile applications) for ticket booking, in terms of general usability and user satisfaction.

### **1.6.1 Geographical Scope**

Scope The research is confined to the railway ticketing system in Bangladesh, reflecting only on the interfaces that are available for users within Bangladesh. Although Bangladesh Railway has a transportation network through the country by trains for people to travel from one part of the country to another, it will focus mainly on general who access the online booking system nationwide.

### **1.6.2 Platform Scope**

The study investigates the usability and satisfaction of e-ticketing sites, such as www. Bangladesh rail way.gov.bd (the official Bangladesh Railway site). ticket. railway.gov.bd) and a mobile app Rail Sheba. They include services to check train schedules, buy tickets and make the payment. The study limits itself to these two digital platforms and does not include the classic form of reservation at a railway station or an intermediary.

### **1.6.3 Usability Evaluation**

The research concern is explained by evaluating the usability of the train booking system. System Usability Scale (SUS) The SUS will be applied to quantify several aspects of usability of the system such as ease of use, efficiency, interface design and user satisfaction overall. The NPS also will be used to measure customer satisfaction and loyalty by determining how likely users are to refer the service to others. The study also attempts to discover usability problems, find out what improvements are functioning well and give an overview of the general user experience.

### **1.7 Research Question**

The objective of this study is to measure the usability and user satisfaction of rail ticket booking system in Bangladesh based on System Usability Scale (SUS) and Net Promoter Score (NPS).

To achieve the goals of this study, we have developed the following research questions:

**1. How usable is the current railway ticket booking system in Bangladesh, as measured by the System Usability Scale (SUS)?**

This question is designed to measure overall usability of the Bangladeshi railway ticket booking website. Using the SUS, the research will measure the usability (easy), efficiency and adding of using users with the system.

**2. What is the feedback of users on railway ticket booking system?**

The intent of this question is to determine what the good aspects users think about in the railway ticketing system and which particular features they face difficulties or frustrations. The examination will decipher experience of the users directly from their feedback.

**3. How happy are railway ticket buyers and how much would they recommend it to others? (using the Net Promoter Score -NPS)?**

This question will attempt to gauge overall user satisfaction and customer loyalty with the NPS. It will also aid in tracking how willing users are to recommend the system to others a critical measurement of overall satisfaction.

**4. What is the correlation between usability (SUS) and customer satisfaction (NPS) in a railway ticket booking system?**

This question will investigate how the usability interacts with customer satisfaction. By examining the SUS/NPS association, the research seeks to learn how a more user-friendly system contributes to better satisfaction of clients as well as higher levels of loyalty.

**5. How can we improve the railway ticket booking system to improve user's usability and satisfaction?**

From the results in SUS and NPS analysis, this question would give direction to refine the system. These enhancements will increase usability, minimize user frustration and improve satisfaction with the booking process.

# CHAPTER 2

## LITERATURE REVIEW

### 2.1 Overview

In this chapter, we present the review of previous work on the other aspects of usability evaluation for digital platforms railway ticket booking systems. The review encompasses research on SUS and NPS, the two primary metrics used in this paper to assess user experience and satisfaction. Furthermore, we review related works towards digital transformation in transport sector, focusing on the Bangladesh Railway ticketing system and other relevance systems worldwide.

### 2.2 Previous Study

Usability testing can play an essential role in deciding if the service allows users to interact with a digital environment effectively - or not. The current most widely used model is probably John Brookes System Usability Scale (SUS) from 1986. The SUS provides a fast and efficient way for evaluating only system usability (e.g., when task-efficiency effects, effectiveness or user satisfaction are relevant). A follower rating, such as the Net Promoter Score (NPS), is a common method of measuring customer satisfaction and loyalty. Such mechanisms are already established in numerous areas, e.g. railway ticketing system in which the models are on their way into the online and mobile sector with an increased convenience for users. Nithya et al. (2020) applied SUS to test the usability of an online ticketing system and found out that different aspects of usability like slow processing time and improper interface design significantly influence user's satisfaction. The studies showed that smooth functioning of the system is not enough and user-friendly interfaces play a crucial role in providing high usability ratings. According to Jenkins et al. (2019) in their study of the mobile railway ticketing apps used in the UK reported that SUS scores obtained by some platforms can differ quantitatively from those shown by other alternative options owing to troublesomeness relative to navigation complexity and system responsiveness as well. Findings revealed that while there was a general belief among users of the mobile app that it was easy to use; there were frustrations with slowness in loading times and crashing during peak times, supporting the importance of system dependability.

Similarly, Yang and Zhou (2020) have used the SUS method in a Chinese train ticketing system. Their survey showed that their targeting users received no negative comments while booking, but had problems with the payment gateway thus diminishing usability score. This signaled that their payment systems played a pivotal role in providing seamless customer experiences, which businesses ought to regularly scrutinize and update. In Bangladesh, Ferdous et al. (2022) found that users experienced some level of difficulty in using the sites and mobile apps and obtained an average SUS score of Bangladesh Railway e-Ticketing system with a score less than 50. The report suggested some UI/UX changes that, particularly in Ticket Selection and Payment would change Site Usability score. NPS (Net Promoter Score) is an effective measure of customer loyalty and satisfaction. Jenkins et al. (2019) also employed NPS to gauge the customers attitude from purchasing a ticket at railway ticketing system. They also found a strong relationship between high SUS scores and recommendation of the service, which correlated with higher NPS scores. Alternatively, those with slower machines or that had payment problems were likely Detractors and therefore a negative NPS score. Davis (2020) used NPS for the evaluation of a UK train ticketing app, with 60% of users being Promoters and reported ease-of-use and convenience as elements which allowed them to be recommended and the remaining 25% would be Detractors due to problems related to payment. The study provides the usefulness of NPS as a way to investigate customer satisfaction in related to improve service quality problems in the customers' points of view for further research in the study on loyalty.

Shahabuddin (2014) reported that NPS was good predictor of the likelihood to recommend railway services. The higher the SUS score, the more likely the users were to recommend that service, confirming again the linkage between usability and user satisfaction. There are widespread online booking facilities available for railway services across the world. Hossain & Islam (2013) have analyzed the digital transformation of Bangladesh Railway, where e-ticketing has been developed to be more efficient as well as customers did not get a smooth service so far from online ticket booking which is concluded very rapidly with “payment failure” or system crash.

Hoque et al. (2017) conducted an assessment of the UI in Bangladesh Railway's e-ticketing service, which users found to be quite devastating and lacking modernization, and while some like the facilities offered by it but embarkment to risk as payment gateway was not reliable. They also recommended for more friendly user features and strong backend systems to make the system reliable. Guan et al. (2020) reviewed train ticketing systems in several countries and reported that accessibility via online systems is convenience, but depends on design of service system, speed of system and reliable security. They emphasized that the systems with a higher SUS score and NPS rating were better at satisfying customer needs.

Usability and customer satisfaction of South Korean railway apps were investigated by Lee and Park (2018). They observed a strong correlation between SUS scores and NPS, demonstrating that an improved user-friendly and efficient system has a direct impact on customer loyalty and satisfaction. This was also explored by Sharma et al. (2018) that did an equivalent study in India. They discovered that replication AUs got higher NPS than users with positive SUS. The research specifically came to a conclusion that an advancement in usability through user-centered design and ease of use had the potential to raise customer satisfaction levels, as well as increase NPS. While we included a similar type of simplistic system in our analysis, namely the Bangladesh Railway ticket booking system (Uddin & De, 2014), where we found that users perceived moderate SUS scores but regularly experienced technical problems including payment errors and long waiting time which led to lower NPS. The study also underlined the need to address technical inadequacies in the device and as a result increase its ease of use and customer satisfaction. Some papers have pointed out common usability issues in the railway ticket system.

Perera and Bandara (2016) also reported that several specific User interface and Navigation problems were frequently observed in railway booking system of Sri Lankan. They added that clearer instructions, more user-friendly interfaces and faster processing times would enhance usability and satisfaction. Rahman & Rahman (2009) also emphasized the contribution of customer service towards improving usability. They said because if you need customer support to get tech help (If you were supposed to be able to do that) it would take away from the user experience.

It's also recommended that the level of quality helpdesk systems should be increased and improve customer's service interface. Putri & Liu et al (2024) Examining the popular online ticket buying site Ticket. com using the SUS method. Researchers collected data from 50 student users and the calculated average SUS is 55.55 (GradeD: "OK / marginal"). Usability was one of the concerns from authors, and they complained about not getting e Ticket after payment, long duration for refund process, bugs at frequent level, problems in user input. They note, however, that the app is practically usable at a minimum level but much work is needed for feature stability and UI clarity.

Lisana et al (2024) An experimental usability test was conducted on train mobile application in purchasing ticket in Indonesia. Effectiveness, efficiency and satisfaction were evaluated on 10 subjects. Performance and efficiency are great, but satisfaction index is so low that, there's a hint of UX or interface-design failure. The authors propose that the UI, as well as business process flows should be improved further to ensure end users are better catered for. You are correct, the paper is kind of unrelated to your train ticket apps and usability but it should be a good starting reference as you said. About the only thing missing from new paper is NPS again. Chen & Zheng et al (2022) have also analyzed the ticket vending machines (TVMs) in Taiwan Railways Administration. They recruited 36 system new users, and required them accomplish certain tasks with QUIS + SUS. The patterns showed a high error rate under the first use condition (click of Ticket method, Station/Time custom) and that usability and learnability should be more well designed. The study does not explicitly appear to consider the usage of NPS, though SUS is referred to. That is akin to a rail booking systems operation-context (and that also includes hardware - not just an online reservation system). on web Bangladesh Railway online ticket booking site. cite {Rakib2022}. Medium They had conversations with 8 users (5 new and 3 experienced) and found the pain points: Incomprehensive seat quality information, confusion in Labelling of 'coach' (Bengali written in English), Ambiguity of booking steps and Delayed OTPs. There is no SUS or NPS benchmark of the study, but the discussion provides interesting qualitative evidences regarding (i) factors of usability problem for railway online ticketing systems.

Ani et al (2010) Applies SUS (with uppermost value 56.13) to test online travel reservation system (not confining it railway particular but relevant enough) in Indonesia. Investigates the impact of usability (in terms of SUS) on purchase intentions relevant to transaction-based booking systems. There's some useful stuff to draw parallels from in your study: (Whilst it's travel booking, & not trains; the usability methods are directly transferrable). Sasmito et al (2019) This paper utilizes both SUS and NPS simultaneously in a software systems application context, not railway booking. Therefore, it is an interesting reference for you as far as the methodological combination of SUS and NPS is concerned and it even involves similar variables (usability (as measured with SUS) to loyalty/intent (as measured by NPS).

In another study, Ismail et al (2021) utilized the user-centered design approach to develop and test web and mobile travel booking prototypes through iterative usability testing. Their SUS-based evaluations revealed the early prototype to suffer from difficult task flows and unclear labels. After redevelopment, SUS scores were scored significantly ( $P < 0.05$ ), suggesting that a reiteration on provided user feedback directly increases the usability. The research highlights that using the users during the design phase enables less navigation errors and high rates of task completion. It proves the adequacy of UCD in online travel and ticketing systems. Ahram and Taiar et al (2023) reported a variety of studies between humans and machines related to usability, cognitive workload, and emotional feelings during the human-computer interaction. Their work demonstrates that most of the traditional SUS evaluations fail to capture underlying experiential aspects such as user stress, trust and perceived control. The authors maintain that usability and psychological measures can give a more realistic view of system acceptance when used in combination. The series also captures typical UX pain points in public service applications and highlights inclusive, user-centered design. This points at usability as an issue beyond efficiency in emotional and experiential terms.

Roy, L. et al (2020) performed full system analysis and design of an online railway ticket booking system and were able to identify functional shortcomings that are present in the interface and feature in e cadencies too. The study identified significant "usability issues" pertaining to information hierarchy, error handling and navigational flow factors shown contribute directly to reduced usability.

The plan for the enhanced design is to have better menu structure and order ticket search activities and provide intuitive feedbacks. While it is not a formal usability study, the study serves as a guide for designing platforms that are less nonintuitive. It illustrates that strong system design is of crucial importance to good usability results. Larasati et al (2025) measured an online travel agent application by SUS with additional cognitive workload measures using EEG. Their findings revealed the high mental load of users during complex tasks like payment or filtering even if SUS scores turned out moderate. EEG data showed cognitive spikes at confusing layout structures and at option overloads. This two-pronged approach confirms that SUS in isolation could overlook the usability issues.

Further, the study indicates that combining physiological indicators with customary surveys will result in more reliable UX evaluation, especially in high-task-demand applications such as ticket booking. Usability and purchase intention on online travel booking platform: The study of Noprisson et al (2019). Their results revealed that there was a significant effect of usability on user trust, perceived value and customer willingness to patronize. Key usability concerns were lack of visual hierarchy, slow navigation, and inconsistent button locations. The more positive attitude (higher SUS score) towards using also implies the stronger intention for purchase, which suggests usability as a commercial matter. They concluded that usability is not only a technical quality dimension, but an important factor in customers' action and business success.

# CHAPTER 3

## METHODOLOGY

### 3.1 Overview

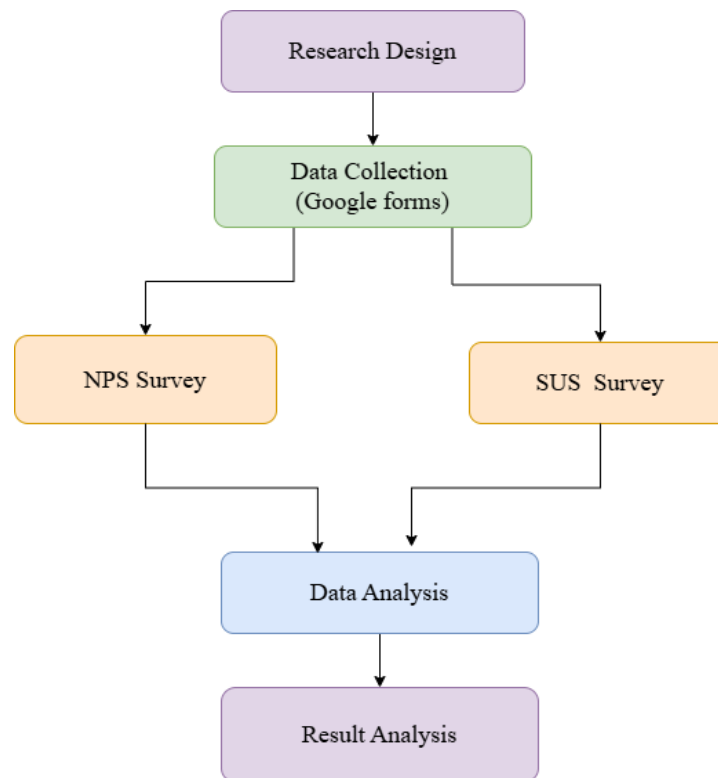
This chapter provides an overview of the research methodology, including data collection, tools used to assess and the equations utilized to compute these scores. This research uses a quantitative approach to evaluate the usability and user satisfaction of Bangladesh Railway Ticket Booking System. The surveys were administered using Google Forms, consisting of SUS and NPS. The SUS assesses usability by using a 10-item questionnaire, whereas NPS rates customer satisfaction and loyalty based on a single question. Descriptive statistical and correlation analysis was employed to compare SUS and NPS scores. Informed consent and confidentiality were strictly maintained in accordance with the ethical principles. The research is intended to guide potential interventions to improve system use for users.

### 3.2 Research Design

The research presented is quantitative and it aims to collect numerical information for measuring usability and customer satisfaction. Data is gathered with Google Forms that contains the standardized SUS and NPS questionnaires. SUS represents the usability of the Bangladesh Railway Ticket Booking System, whereas NPS is used to determine general customer satisfaction as well as loyalty. SUS A 10-question questionnaire, which is frequently used in usability studies, to assess the usability and effectiveness of a system. Participants' responses are used to determine the usability score of the system. NPS Ask a single question and you will find out how likely is your user to recommend the system. It is a measure to evaluate how loyal and satisfied the customer are. This study was intended to collect a snapshot of users' experiences and help identify the ticketing system's benefits and drawback.

### 3.3 Workflow

The flowchart you provided outlines the research workflow as follows:



**Figure 3.1:** Research workflow outlining design, data collection, and analysis.

- ❖ **Research Design:** The first step which is about setting the framework and goals for the study.
- ❖ **Data Collection (Google Forms):** Surveys are administered using Google Forms, allowing for the rapid accumulation of participant responses.
- ❖ **NPS Survey:** A survey created to gauge customer loyalty or satisfaction as per the Net Promoter Score (NPS) model.
- ❖ **SUS Survey:** A System Usability Scale (SUS) survey is conducted to evaluate the usability of the system.
- ❖ **Data Analysis:** Following data collection, a comprehensive examination is performed for insights.

- ❖ **Analysis of Results:** The data collected were analyzed for the purpose of arriving at conclusions and reporting the findings according to analysis on stated objectives.

### 3.3 Data Collection

The data in this study were gathered by Google form out of the different users from Bangladesh Railway ticket booking system. The questionnaire covered the respondent’s experiences with, and navigate of, a website and mobile app.

#### 3.3.1 SUS Survey

The System Usability Scale (SUS) survey included 10-items that users evaluated from Strongly Disagree (1), to Strongly Agree (5) using a Likert scale. The questions were targeted on diverse usability issues, including:

		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this website frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	I found this website unnecessarily complex.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	I thought this website was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	I think that I would need assistance to be able to use this website.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	I found the various functions in this website were well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	I thought there was too much inconsistency in this website.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	I would imagine that most people would learn to use this website very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	I found this website very cumbersome/awkward to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I felt very confident using this website.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I needed to learn a lot of things before I could get going with this website.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Figure 3.2:** SUS Questionnaire for evaluating website usability.

#### 3.3.2 NPS Survey

We used one question to measure overall customer satisfaction: “How likely are you to recommend the Bangladesh Railway ticket booking process to someone else?” The probability estimation question ranged on a 0 (Not at all likely) to 10 (Extremely likely) scale. Participants were categorized into 1 of 3 groups based on their responses:

**Promoters (9-10):** Highly satisfied users.

**Passives (7-8):** Neutral users.

**Detractors (0-6):** Unsatisfied users.

The NPS score was generated by subtracting the percent of Detractor from that of Promoter.

### **3.3.3 Sample and Participants**

The research sample for this study is a group of 1100 users with using experience of Bangladesh Railway Ticket Booking System (web and mobile application). From the general population, a sample was chosen to be representative of a varied section of Bangladesh Rail users. Inclusion criteria Participants who had used the Bangladesh Railway online ticketing system in the preceding 6 months, via the official website or Rail Sheba mobile app. Those subjects who had never accessed the online ticketing system or those who have only had little experience in booking tickets in the platform Participants were recruited through the internet (social media and email invitations) in order to include responses from different demographic characteristics. This provides a wide range and representative data set.

### **3.4 Data Analysis**

After the data were collected, the analysis was performed by descriptive statistics and inferential statistics. The steps of the search are as follow. The SUS scores were determined using the participants' responses to 10 inter-questions. The total SUS score is determined in the normal way as just described. The SUS scores are subsequently interpreted with the usual SUS scale, which is scores of:

#### **3.4.1 SUS Calculation Method**

The System Usability Scale (SUS) has 10 items. When participants score the questions, their raw scores are converted to a standardized SUS score. The procedure to calculate the SUS score is as follows:

**Step 1: Convert the scores:**

For odd-numbered questions (Q1, Q3, Q5, Q7, Q9), subtract 1 from the user's response and multiply by 2.5.

$$\text{Score for odd questions} = (Q_i - 1) \times 2.5 \quad 3.1$$

For even numbered questions (Q2, Q4, Q6, Q8, Q10), subtract the user's response from 5 and multiply by 2.5.

$$\text{Score for odd questions} = (5 - Q_i) \times 2.5 \quad 3.2$$

Where  $Q_i$  is the user's response to the respective question.

**Step 2: Add the scores**

Once all scores are converted, sum them up.

$$\text{Total SUS score} = \Sigma(\text{score from all 10 questions}) \quad 3.3$$

**Step 3: Normalizing the SUS score**

The summed score is divided by 2 for the final SUS score.

$$\text{Final SUS score} = \frac{\text{Total SUS score}}{2} \quad 3.4$$

This score will range from 0 to 100, where higher scores indicate better usability.

Table 3.1: SUS Score Classification and Usability Evaluation

SUS Score Range	Usability Classification
85 or higher	Excellent Usability
70-84	Good Usability
50-69	Average Usability
Below 50	Poor Usability

**The SUS score is derived as follows:**

For the odd questions, the value is: (possible score – 1) × 2.5.

For the even questions, you have: (5 - answer) × 2.5.

The SUS score is computed by adding up the scores for each item, multiplying by 2.5

to find it on a scale of 0-100.

**System Usability Scale (SUS)** The System Usability Scale is an easy, reliable way to measure the usability of a system or product. It includes 10 questions, that users are graded upon to convert ratings into an overall SUS score. This rating ranges from zero to 100 and aids in determining overall usability a higher score indicates better usability.

### 3.4.2 NPS Calculation Method

The Net Promoter Score (NPS) was obtained from the percentage of Detractors and Passives.

NPS is calculated based on responses to a single question: "How likely are you to recommend the Bangladesh Railway ticket booking system to others?" The users provide a rating on a 0 to 10 scale.

#### Step 1:

Based on their response, users are classified into three groups:

- **Promoters** (score 9-10): Users who are highly satisfied and likely to recommend the system.
- **Passives** (score 7-8): Users who are satisfied but not enthusiastic enough to recommend.
- **Detractors** (score 0-6): Users who are dissatisfied and unlikely to recommend the system.

#### Step 2: Calculate the percentages

The percentage of **Promoters**, **Passives**, and **Detractors** is calculated based on the total number of respondents.

$$\% \text{Promoters} = \frac{\text{Number of Promoters}}{\text{Total Respondents}} \times 100 \quad 3.5$$

$$\% \text{Detractors} = \frac{\text{Number of Detractors}}{\text{Total Respondents}} \times 100 \quad 3.6$$

#### Step 3: Calculate the NPS score

The final NPS score is obtained by subtracting the percentage of **Detractors** from the percentage of **Promoters**.

The NPS score ranges from **-100 to +100**, with positive scores indicating more **Promoters** than **Detractors**.

$$\text{NPS} = \% \text{Promoters} - \% \text{Detractors} \quad \quad \quad \mathbf{3.7}$$

The NPS can range from -100 to +100, and all positive scores signify that there are more Promoters than Detractors in the audience

Table 3.2: NPS Score Classification and Usability Evaluation

<b>NPS Score Range</b>	<b>Usability Classification</b>
50 or higher	Excellent Satisfaction
30-49	Good Satisfaction
0-29	Neutral Satisfaction
Below 0	Poor Satisfaction

A company NPS of over 50 would represent extreme satisfaction, while a negative NPS indicates dissatisfaction. NPS score helps measure customer loyalty and word-of-mouth advocacy. Correlation A correlation analysis was performed to investigate the relationship between SUS and NPS scores. This research attempts to investigate whether the higher scores of usability also mean an increase in satisfaction and customer loyalty. The findings will contribute to the evaluation of the general usability and satisfaction with Bangladesh Railway Ticket Booking System.

# CHAPTER 4

## EXPERIMENTAL RESULT ANALYSIS

### 4.1 Result Overview

The experimental results and usability evaluations of the railway ticket booking system in Bangladesh are presented in this chapter. To evaluate the global usability and user satisfaction of the tool, we analyzed SUS and NPS scores. Data were collected through a structured online questionnaire, including demographic data and ten SUS items plus one NPS question. The experiential, perceptual and satisfaction levels that the users lived from the system were explored in a quantitative way. The results of this study are important in finding out usability problems, point out users' behavioral intentions and recommending potential improvements for better railway ticket booking system in Bangladesh.

### 4.2 System Usability Scale (SUS) Analysis Result

Table 4.1: Summary of SUS Results for the Ticket Booking System.

<b>Matrix</b>	<b>Value</b>
Mean SUS Score	58.37
Standard Deviation	7.88
Number of Items (SUS_Q1–SUS_Q10)	10
Scale Range	0 – 100
Benchmark (Average Usability)	68
Interpretation	Below Average Usability

A summary of the (SUS) for the train ticketing system is shown in Table 4.1. The average SUS score of 58.37 indicates less than average usability compared with the benchmark score of 68. This indicates that participants encountered quite a bit of frustration when interacting with the system, indicating areas for improvement in usability and user experience design.

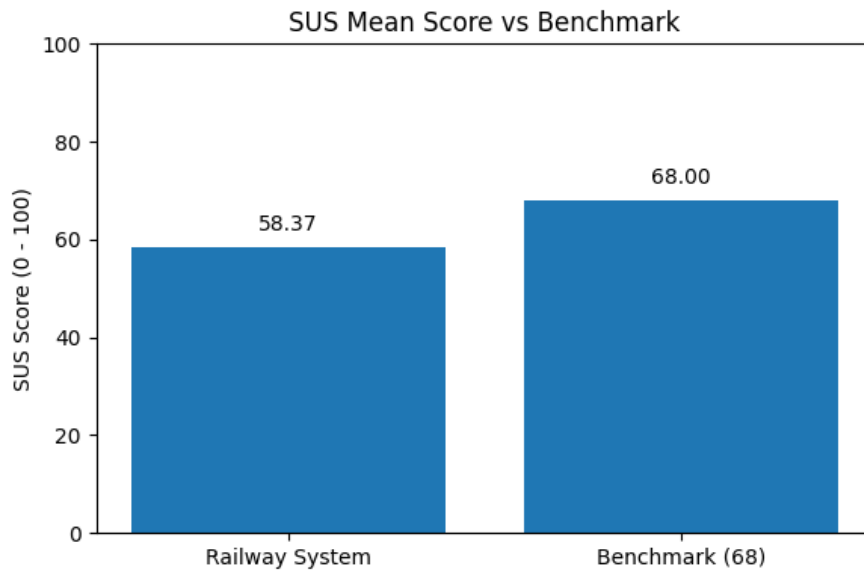


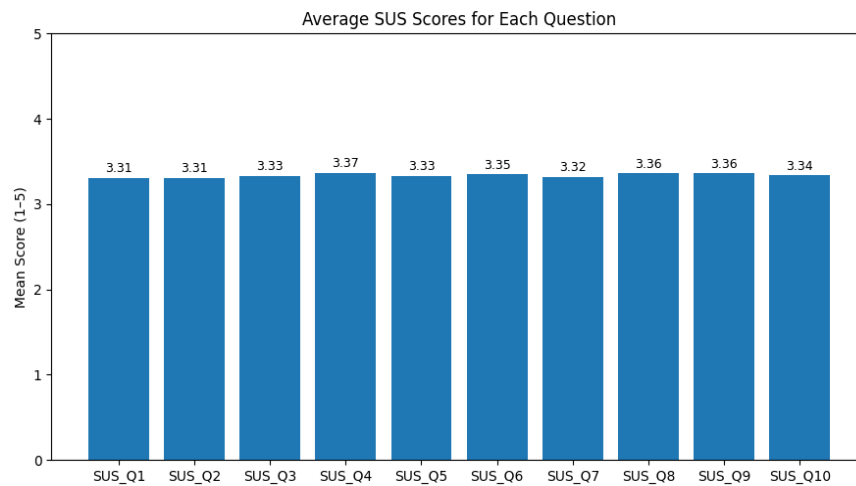
Figure 4.1: Visualization SUS Mean Score vs Benchmark

The Result of the SUS analysis indicates that railway ticket booking system has scored an average value of mean (M) is 58.37, which is considered as below standard by industry benchmark being 68. This result implies that the overall usability of this system is less than a satisfactory level. The low score implies that users encountered a number of difficulties while using the platform. Reasons for this fall short of performance may be complex interface, lack of clear instructions, slow response time and feedback for errors. The failure to achieve the target indicates that we have a system that works, but not one you would want to use. Most users would be able to accomplish what they set out to do, although perhaps with a bit more difficulty or confusion than intended. In respectively usability it is called reduction in time, result and satisfaction. A relatively narrow standard deviation (7.88) also points to inconsistency across user experiences some found the system acceptable; others did not fare well at all. This would ultimately necessitate enhancements in interface design, consistency and flow of tasks. The present finding provides key message for developers and policymakers to improve the usability. Solving these issues may entail increased satisfaction, trust and repeated use of the railway ticket booking system in Bangladesh.

#### 4.2.1 Question-Wise Evaluation of SUS Scores

Table 4.2: Average SUS Scores for Each Question

SUS Question	Mean Score
SUS_Q1	3.31
SUS_Q2	3.31
SUS_Q3	3.33
SUS_Q4	3.37
SUS_Q5	3.33
SUS_Q6	3.35
SUS_Q7	3.32
SUS_Q8	3.36
SUS_Q9	3.36
SUS_Q10	3.34



**Figure 4.2:** Bar Chart Representing the Average SUS Scores for Each Question

Question-wise Results Q1–Q2 (System Complexity & Ease of Use): Moderate System Complexity The relatively low average score 3.31 indicates that participants found the system to be moderately challenging or slightly complex in use. Q3 Q4 (Consistency & Learnability): The slightly higher means of 3.33 3.37 suggests that users somewhat agreed to the system being learnable and consistent, but not intuitive than can be used by a first-timer. Q5 – Q6 (Confidence & Error Handling): The users were somewhat confident to use the system with averages of 3.33 and 3.35, but could stumble across errors or misunderstand some procedures during booking process. Q7–Q10 (Support, Integration & Overall Satisfaction.

These scores (3.32–3.36) show neutral to slightly positive user attitudes, and suggest the system satisfies base-level functional needs of users but with interface design/feedback opportunities for improvement.

### 4.3 NPS Analysis Result

The **Net Promoter Score (NPS)** was calculated based on users’ likelihood to recommend the system to others. The proportion of respondents was distributed as follows:

Table 4.3: Distribution of User Groups Based on NPS Scores

User Group	Percentage
Promoters (9–10)	39.96%
Passives (7–8)	40.05%
Detractors (0–6)	19.98%

$$\text{NPS} = \% \text{Promoters} - \% \text{Detractors}$$

$$\text{NPS} = 39.96 - 19.98$$

$$= 19.98$$

In the main +20 NPS is termed as moderate. It suggests that there is a modest level of satisfaction, but no enthusiastic push towards recommending the system. This is corroborated by the SUS score (58.37), indicating that the railway ticket booking system delivers an acceptable, but not delightful user experience as a whole.

### 4.4 Comparative Discussion

When comparing the obtained scores to established usability standards

Table 1: Benchmark and Evaluation of SUS and NPS Scores

Metric	Benchmark	Obtained	Evaluation
SUS Score	68	58.37	Below Average
NPS Score	0 to +30 (Moderate)	+19.98	Moderate

This indicates that the system has been effective in enabling users to book tickets but has poor usability and satisfaction. Users may be experiencing the following problems:

- Slow loading times during peak hours.
- Complex payment procedures or session timeouts.
- Limited feedback after actions (payment confirmation).
- Mobile interface inconsistencies compared to the web version.

Such issues can discourage new users and limit repeated use, directly impacting service adoption and customer trust.

SUS mean score (58.37) indicates that the system was rated as having poor usability hence system redesign and performance improvement. The standard deviation (7.88) indicates that there was moderate consensus among users meaning that some of the users were lucky and able to utilize the system, whilst others were unable to use the systems because of reasons that pertain to usability. Mean (meaning 3.3) rating on item-wise gives us evidence that the users did not find the system to be intuitive or satisfying, yet, they did believe the system to be usable. The NPS score (+19.98) means that there are no strong supporters or strongly disgruntled opponents. The integrated score between two measures indicate that BR-TBS can be applied but lacks elegance, effectiveness and satisfaction of feelings.

# CHAPTER 5

## CONCLUSION

### 5.1 Summary of Findings

This study hypothesized the prospective usefulness and user satisfaction of the Bangladesh Railway Ticket Booking system using two widely known tools of assessing usability SUS and NPS. The study aimed to analyze the extent to which, and the way, customers can utilize the system; their degree of contentment of the digital ticketing process. To design the survey architecture user responses were gathered by use of a structured one which comprised of both SUS and NPS questionnaires. Mean scores were then taken and applied to analyze the responses of the users statistically. The disclosed insights present an informed gut feeling regarding the real performance of the system in the perspective of the users. The usability data were used to identify and make essential findings regarding the user experience and interaction with the railway ticket booking system. The mean score of SUS achieved was 58.37 lower than the normal value of 68. It indicates that the usability of the system is not that bad, but average. They liked the site, but didn't find it intuitive or user-friendly. Analysis of SUS responses by question indicated that users rated most individual questions somewhere in the middle (average rating of approximately 3.3 out of 5), suggesting that satisfaction varied across different aspects of usability including ease-of-use, confidence while using, and system feature integration. The NPS score reached +19.98, suggesting that while many users were Promoters (39.96%) and Passives (40.05%), some 19.98% of users became Detractors who were dissatisfied. This NPS spread: suggests the train ticket booking system reached its goal of moderate to high customer loyalty with a gap between Promoters and Detractors that indicates areas the usability needs work. In general, the results of this study confirm that the railway ticket booking system reach minimum usability requirement while design poor in user experience design, interactivity and satisfaction.

## 5.2 Recommendations

**Redesign the Interact Integrate simplicity:** Reduce the fantasy, assist navigate processes through typography influences throughout a modular color system.

**Performance enhancement:** Minimize response time to the website and smoothen transition from page to another while booking the cab. Better feedback: Add more defined acknowledgment messages, error guidance and progress bars.

**User Support Features:** Add a FAQ chatbot or an in-app tutorial to speed up support. Mobile Responsive: The desktop and mobile versions must be a perfect match.

**Improve Accessibility:** You can make it multilingual or add the screen reader supported for everyone.

**Ongoing Testing:** Run regular user tests and gather feedback after every major update.

## 5.3 Future Work

Forthcoming research may be able to assess the usability of the web and mobile app versions, separately, and identify platform-related sources of difficulty. Researchers may consider combining qualitative techniques (such as think-aloud testing or user interviews) to receive deeper insights in behavior. Using metrics on eye-tracking and task completion time, efficiency may be evaluated quantitatively in future. Studies on AI techniques-based personalization could greatly increase the user satisfaction. A long-term study over different updates to the system could investigate on the effect of this improved usability, in terms both of user loyalty and users' willingness to use it.

## 5.4 Final Remark

Reflection Although the Bangladesh Railway Ticket Booking System has acceptable basic functional usability, it fails to reach an industry standard usability benchmark. It can be iteratively designed where user feedback and active monitoring is maintained, to make it an efficient, easy-to-use digital service for passengers throughout Bangladesh.

## **5.5 Final Conclusion**

Usability and user satisfaction of Bangladesh Railway Ticket Booking System were measured using the SUS (System Usability Scale) and NPS (Net Promoter Score) in this study. The results show that the system does meet its intended purpose of online ticketing system, though it did not attain overall world usability point low. The system has an SUS mean score of 58.37, and a NPS score of +19.98 (functional adequate, low user delight). The evaluation documents several planned improvements regarding interface consistency, system responsiveness, flow of navigation and clarity in feedback. Solving these problems will make the system more useable and will encourage trust and adoption from users. In addition, the research highlights the significance of user-centered design and ongoing usability testing for government digital services.

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- Student Profile
- Payment Ledger
- Registration/Exam Clearance
- Registered Course
- Result
- Routine
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- Teaching Evaluation
- Scholarship >
- Convocation Apply
- Certificate & Transcript >
- Laptop
- Mentor Meeting
- Transport Card Apply
- Student Application
- Logout

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## Dashboard

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### Semester Wise Result

