

Preliminary Design Concept for Startups: Minimum Viable User Experience

by

Tanzimul Haque

18101297

Shauki Ibna Ibrahim

18101311

Maisha Sumaiya

22241183

Afreen Rahman Tithi

18101303

A project submitted to the Department of Computer Science and Engineering
in partial fulfillment of the requirements for the degree of
B.Sc. in Computer Science

Department of Computer Science and Engineering
Brac University
May 2023

© 2023. Brac University
All rights reserved.


Declaration

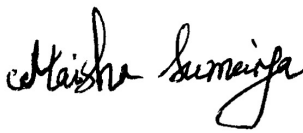
It is hereby declared that

1. The project submitted is my/our own original work while completing degree at Brac University.
2. The project does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The project does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

Student's Full Name & Signature:









Approval

The thesis/project titled “Preliminary Design Concept for Startups: Minimum Viable User Experience” submitted by,

1. Tanzimul Haque (18101297)
2. Shauki Ibna Ibrahim (18101311)
3. Maisha Sumaiya (22241183)
4. Afreen Rahman Tithi (18101303)

Of Spring, 2023 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science on May 20, 2023.

Examining Committee:

Supervisor:
(Member)

**Annajiat
Alim
Rasel** Digitally signed by
Annajiat Alim Rasel
DN: cn=Annajiat Alim
Rasel, o=Brac University,
ou=CSE Department,
email=annajiat@bracu.ac.
bd, c=BD
Date: 2023.05.22 08:05:23
+06'00'

Mr. Annajiat Alim Rasel
Senior Lecturer

Department of Computer Science and Engineering
Brac University

Co-Supervisor:
(Member)



Muhammad Iqbal Hossain, PhD
Associate Professor

Department of Computer Science and Engineering
Brac University

Co-Supervisor:
(Member)



Dewan Ziaul Karim
Lecturer

Department of Computer Science and Engineering
Brac University

Head of Department:
(Chair)

Sadia Hamid Kazi, PhD
Chairperson and Associate Professor
Department of Computer Science and Engineering
Brac University

Ethics Statement

We, hereby declare that this project is based on the result we obtained from our exhaustive research. Due acknowledgment has been made in the text to all of the materials that were used. This project, neither in whole nor in part, has been submitted by anyone to any other university or institution for the purpose of receiving a degree or any other reason.

Abstract

Small startups often develop websites or mobile applications without fully understanding what the users really want. However, obtaining trustworthy early feedback from customers can be challenging because they tend to focus on annoying design flaws rather than evaluating the overall product concept. To address this issue, we introduce the concept of Minimum Viable User Experience (MVUX) in this study to aid in assessing early product concepts. MVUX is an approach that helps startups assess their product ideas early in the development process by providing enough user experience for consumers to understand the desired product value (UX). Our goal is to offer a minimum viable user experience to the customers and build a system where user feedback can be used to identify areas for improvement. This system not only helps developers address gaps in communication but also enhances the user experience. By providing a minimum viable user experience, startups can evaluate their product concept, identify areas for improvement, and increase their chances of success in the market.

Keywords: user experience, startup, lean, user interface, design, FeedUX

Dedication

We are dedicating our work to our parents, without whom we could never come this far in our life. Moreover, we would like to express our gratitude to our supervisors for providing us with their utmost support.

Acknowledgement

Firstly, all praise to the Great Allah for whom our project has been completed without any major interruption.

Secondly, our supervisor, Mr. Annajiat Alim Rasel sir for his kind support and invaluable advice throughout our work. We would also like to extend our appreciation to our co-supervisors, Dr. Muhammad Iqbal Hossain sir and Dewan Ziaul Karim sir, for their guidance and support that helped us stay on the right track.

Finally, we would like to thank Mr. Ahsanul Mamun bhai, who works as a software lead in a renowned company, for his valuable feedback and suggestion on our system.

Table of Contents

Declaration	i
Approval	ii
Ethics Statement	iv
Abstract	v
Dedication	vi
Acknowledgment	vii
Table of Contents	viii
List of Figures	x
List of Tables	xi
Nomenclature	xii
1 Introduction	1
1.1 Research Problem	2
1.2 Research Objective	3
1.3 Project Structure	3
2 Literature Review	4
3 Background Information	6
3.1 A Tree Swing Story	6
3.2 Minimum Viable Product (MVP)	7
3.3 Minimum Viable User Experience (MVUX)	8
3.4 Lean UX	8
4 Website Analysis	10
4.1 Data Collection	10
4.2 Data Finding Method	11
4.3 Result and Findings	11

5	Methodology	14
5.1	Empathize and Assumptions	15
5.2	Verify through Feedback	15
5.3	Create an MVUX	16
5.4	User Testing	17
5.5	Creating Prototype	18
5.6	Final product	18
6	Implementation	20
7	Conclusion	32
7.1	Future Work	32
	Bibliography	34

List of Figures

3.1	Tree Swing Analogy	6
3.2	Minimum Viable Product	7
3.3	Typically Build Product	7
3.4	MVUX Framework	8
3.5	Lean UX build cycle	9
3.6	Agile methodology	9
4.1	Government websites evaluation	12
4.2	E-commerce websites evaluation	12
4.3	A Comparison of Government and E-commerce Websites	13
5.1	Work process of our model	14
5.2	Wireframe	16
5.3	A/B Testing	17
6.1	Requirements	21
6.2	Survey Data	22
6.3	User Persona	23
6.4	Affinity Map	24
6.5	User Flow	25
6.6	Low-fidelity Wireframes	26
6.7	Mid-fidelity Wireframes	27
6.8	High-fidelity Wireframes	28
6.9	A/B	29
6.10	Rent-gear	30
6.11	Prototype	31

List of Tables

4.1	government websites	10
4.2	e-commerce and other websites	11
6.1	Sample Questions	22

Nomenclature

The next list describes several symbols & abbreviation that will be later used within the body of the document

ARIA Accessible Rich Internet Applications

MVP Minimum Viable Product

MVUX Minimum Viable User Experience

TPS Toyota Production System

UI User Interface

UX User Experience

W3C World Wide Web Consortium

WCAG Web Content Accessibility Guidelines

Chapter 1

Introduction

User experience (UX) refers to the entire experience that a user has when interacting with a product, service, or system, including its usability, accessibility, or visual appeal. It involves all forms of a user's engagement, such as how easily the user navigates the system, how simple it is to use, how relevant the contents are, and many other things. The word "User experience" most likely originated when cognitive psychologist Donald Norman joined Apple's staff in the early 1990s. He popularized the term "user experience" to encompass what was previously known as human interface research. According to Norman, a comprehensive UX design is centered around understanding the needs of users and a designer must strive to meet those needs and enable users to interact smoothly with products without experiencing any negative emotions [1].

Startups are well-known for their limited resources and cutting-edge goods. Everyone with ideas and determination appears to have the ability to produce software products for worldwide marketplaces. Customers and users can be demanding, even when technology provides a wealth of sophisticated tools for generating these products and services. Delivering a strong user experience (UX) from the beginning of a product's life cycle may help generate positive word-of-mouth advertising and keep people interested as consumers for longer. The major business goal of a startup is to survive and gain customer satisfaction. As a result, in order to thrive, startups must maximize their limited resources. The Lean startup strategy and the customer development model both advise strong collaboration with potential consumers while experimenting frequently. Instead of producing a product and then trying to market it, such techniques strive to ensure that the end product is lucrative. This study aims to determine which UX components are critical while building the initial product version for startups. In order to comprehend the fundamental UX traits required for developing an initial version of a product, we present the notion of Minimum Viable User Experience (MVUX) in this study. The goal is to offer users a user experience (UX) that will assist them in comprehending the product from its initial stage. As a result, startups can collect feedback from customers and enhance their products at the earliest opportunity.

1.1 Research Problem

A startup is built on the belief that their product has the potential to address the specific needs and challenges faced by the target market. Founders usually anticipate a significant return on their investment from their product. According to [25], startups expect a certain market will welcome their product or service because it answers a pressing problem for the clients. Following in the footsteps of established businesses, entrepreneurs frequently build a strategy to develop a whole product based on their vision and market it. In many of these circumstances, there isn't as much traction as expected, leading to the painful revelation that either the product or the market was poorly picked, or both. Because of the high uncertainty of startup operations, constructing an entire product before testing an idea in the market is a destructive proposition. However, how can the market be evaluated if the product hasn't been properly conceived and implemented? To address this issue, entrepreneurs must operate in a way that allows them to experiment with their product versions against relevant metrics; which is the minimum viable approach.

The fundamental concept underlying the lean startup or the minimum viable approach is that the actual product of an early-stage startup is an experiment, or a series of tests, that contribute to minimizing the initial high uncertainty of the startup. The learning from these experiments can be used to measure the startup's progress. A positive user experience with the system can lead to increased productivity [20]. However, different clients can have different needs and their contexts of use may differ in such a way that it is difficult to replicate a strategy for all clients [2]. In this scenario, it is difficult to implement MVUX as it is not possible to satisfy all clients with the same UX. According to [7], communication plays a huge role in developing a good UX. While building the project, the more time it takes to transfer the knowledge throughout the team, the more context is lost. Poor communication always led to the misinterpretation of the feature requirements or user context, resulting in the team not performing as effectively as possible. As a result, it becomes a huge barrier to getting the optimal outcome while building the MVUX. Additionally, when implementing MVUX in large client organizations, the process of decision-making is often challenging. As more stakeholders are involved in the process, it becomes more difficult to apply the startup mentality and shift the business model, as the client organizations may have their own expectations [24]. Furthermore, customers are always uncertain about their actual desires or needs. Often they can't come up with a proper conclusion about their end product. As a result, designers are forced to work from their assumptions. However, it becomes extremely difficult for developers to create a decent product when the product is built on some assumptions due to a lack of data [14].

As mentioned above, it is crucial to recognize that clients may have different needs and their context of use may differ in such a way that replicating a strategy for all the clients can be challenging. Consequently, this study aims to explore the underlying principles of Minimum Viable User Experience (MVUX) to identify the potential changes that may be necessary to meet the diverse requirements of customers and provide a model to bridge the communication gap between users and developers.

1.2 Research Objective

Our research aims to develop proper guidelines for startups or any company that wants to experiment with a Minimum Viable Product (MVP) or Minimum Viable User Experience (MVUX), which is a product version that is as minimal as possible and allows them to validate their product idea as well as find the best way to implement it. The typical significant upfront user research and design that aims at a comprehensive product design is not suitable for the demands of startups when it comes to user experience (UX) design. We want to identify ways to leverage the MVUX method to assist startups or companies in avoiding spending resources, time, or money on unwanted designs that will leave a negative impression on users. The objectives of this research are as follows:

1. To understand what MVUX is, and how it functions.
2. To deeply understand different approaches for identifying user needs in the development of any interface or product.
3. To identify the crucial aspects of how humans interact with the product.
4. To provide a model that ensures sufficient communication between users and developers.
5. To analyze and put our strategy to the test.

1.3 Project Structure

In Chapter 1, an overview and introduction were discussed along with the research problem and objectives. In Chapter 2, related work on this topic is mentioned. Then, in Chapter 3, background information related to the topic has been reviewed. In Chapter 4, a web analysis regarding the topic has been presented. Chapter 5, explains our research methodology. Chapter 6, shows the implementation of the model. Chapter 7, marks the end of the paper containing the conclusion and future work.

Chapter 2

Literature Review

This section tries to critically review the previous relevant research regarding the use of minimum viable user experience in startups. The goal of MVUX is to test a product with real users as early as possible, in order to gather feedback and improve the product design. It helps to create a user experience that is just good enough to validate the product or service with early users while minimizing production cost and time to market. Hokkanen et al. [23] proposed that several UX components are essential for building an early product version of any product in software startups. They conducted a semi-structured interview study with eight Finnish startups where the participants were asked to write about the certain elements of UX in their earliest product version intended to be deployed to users. The interview data were analyzed using thematic analysis, which identified four essential elements for building an early version of any product. These are attractiveness, approachability, professionalism, and effective selling of the idea. According to Tripathi et al. [15] most startups fail within two years of their market launch because of inadequate problem-solution fit and failure to prioritize the learning process during the development of their minimum viable product (MVP). They also stated that an ideal startup ecosystem can assist in the development of MVP by providing vital entrepreneurial education, financial support, and technical skills to the founders. This will help them identify the optimal problem-solving fit for their product idea, leading them to a better product market fit. However, existing knowledge of how different elements of the startup ecosystem impact MVP development remains limited. Therefore, their research identifies the effects of six ecosystem factors that are essential for MVP development. The elements are entrepreneur, technology, market, supporting factors, finance, and human capital.

Startups can confront several challenges while implementing minimum viable user experience in their design. To find out how startups address UX challenges, Silveira et al. [6] surveyed 88 startup professionals who work in software start-ups in Brazil. From their findings, the authors proposed six user experience challenges in startups: integrate UX design using agile methodology, minimize the cost of UX development, integrate UX in a highly reactive environment, understand customer preferences, implement the necessary UX research techniques, and perform current customer surveys. Moreover, they emphasize the significance of conducting in-depth UX research on early-stage software businesses and startups.

Lean practices are also similar to the minimum viable approach in the product development life cycle. Lean is a systematic production approach that aims to generate value by actively removing waste from the manufacturing process [3]. According to Yamamoto et al. [17] lean practices are derived from the Japanese car manufacturing company Toyota. They introduced the lean principles as Toyota Production System (TPS). The primary objective of TPS was to eliminate waste while maintaining just-in-time production. In addition, the implementation of TPS and lean practices resulted in significant improvements in efficiency and product quality by reducing the waste. TPS has been widely embraced by numerous companies globally.

Lean practices are based on some fundamental principles. Blank [19] stated that lean method has three key principles. First, founders should present their hypotheses in a framework called “business model canvas” instead of drafting a detailed business plan for months. Second, to test their hypotheses startups should ask potential users and customers for feedback on all elements of the business model, including product features, pricing, etc. Third, startups should follow the agile development method to build their product, as agile approach eliminates waste and reduces expenses by building the product gradually and iteratively. Additionally, Shepherd and Gruber [5] in their paper proposed that there are five primary building blocks of a lean startup framework: (a) find the market opportunity in startups, (b) design the business model, (c) validate their model, (d) build the MVP, (e) pivot the business if necessary. They further emphasize the need for scholarly investigation to enhance our understanding of the lean startup process.

A lean start-up is essentially a set of tools for experimental entrepreneurship that prioritizes experimentation over formal planning, with a focus on minimizing effort and maximizing value for the organization [9]. Before conducting experimentation, a careful analysis of customer requirements is necessary. Once requirements have been analyzed, a minimum viable product (MVP) can be developed. To make the process more efficient, Lee et al. [4] introduced a systematic approach to determine a minimum viable product (MVP) using the Kano-based approach, which is a technique to classify quality attributes of products or services into three primary categories: must-be requirements, attractive requirements, and one-dimensional requirements. The Kano Model was developed by Dr. Noriaki Kano in 1980 [13]. In the must-be requirements, the consumers will be extremely disappointed if the product does not satisfy the requirement. Moreover, in the attractive requirements, customers would not express dissatisfaction even if the requirements are not fulfilled. However, if it is fulfilled, it will cause delight in customers. Nonetheless, there must be a balance between the two requirements, as customers may take the product for granted.

According to Bocken and Snihur [8], lean startups offer considerable potential for business model innovation that is both novel and has a high impact. However, despite the existing research on lean startups, it may not be sufficient to meet the needs of all customers. To identify the advantages and disadvantages of lean startups Ghezzi [12] surveyed 227 digital startups. In his article, we find that while many digital entrepreneurs have adopted a lean startup approach, they are only moderately satisfied with its outcomes. This indicates that further modifications to lean startup methods may be necessary.

Chapter 3

Background Information

This section mainly discusses the overall philosophy behind Minimum Viable User Experience (MVUX) and other correlated concepts. Following that, it explores the commonly used phrases and theories that contribute to our understanding of MVUX and finds the relation between them.

3.1 A Tree Swing Story

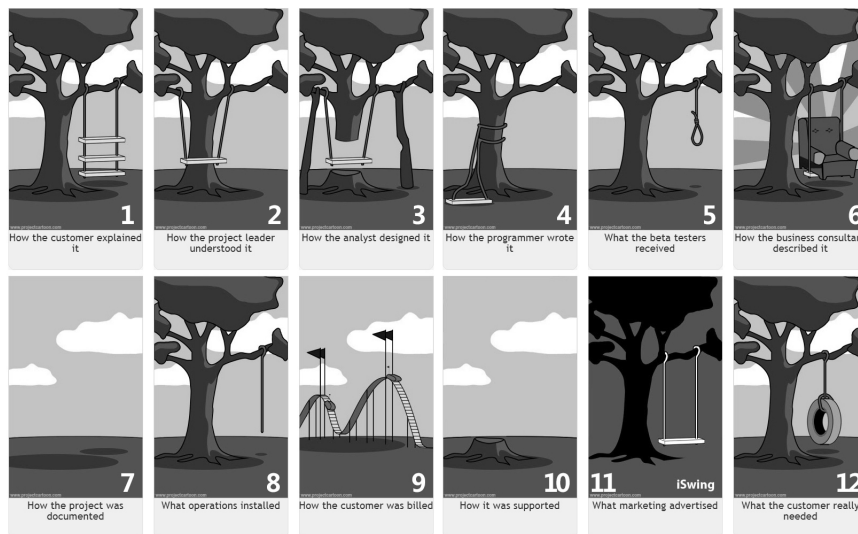


Figure 3.1: Tree Swing Analogy

The tree swing analogy is a popular way for management to explain and perform the requirements of a project. When a project's requirements are not correct or don't match up, miscommunication is often to blame. This can lead to questions about the product and anyone who gave the task. For example, creating a swing requires the customer to explain their vision to the creator. The engineer then shortens it to make it workable, and the programmer determines if it is possible. Finally, the product is presented to the customer. However, if the final product doesn't match the customer's vision, they will request a review. This is where the helpdesk comes in to resolve the issue and ensure that the customer's actual requirements are met. The tree swing analogy is useful in illustrating how project teams collect customer

requirements by focusing on relevant explanations. However, project management is a complex process, and communication can fail as information moves between departments that may not always have a clear understanding of the requirements.

3.2 Minimum Viable Product (MVP)

A Minimal Viable Product (MVP) is a product that contains only the elements that are necessary to draw early adopters. It aims to evaluate the business idea early in the product development cycle with minimal time and resources. This iterative process is based on continuous feedback obtained from early adopters [22]. The primary goal of MVP is to release the product in the market sooner and obtain early feedback, which helps to minimize the market risk, accelerate learning, and increase the chances of success for entrepreneurs.

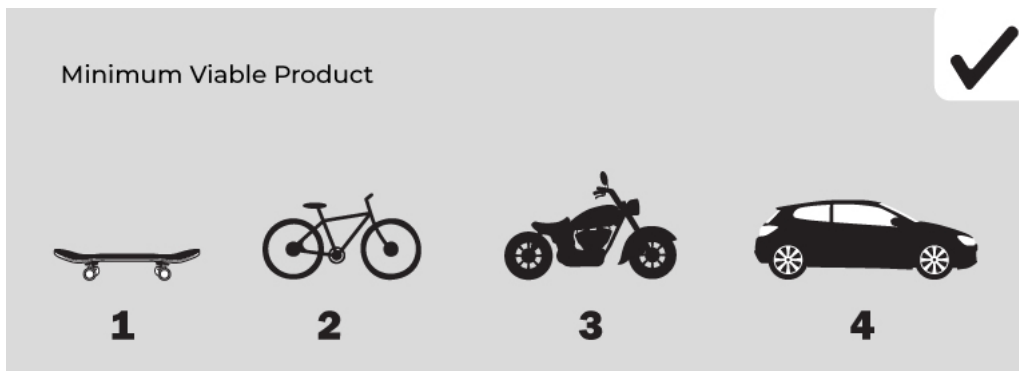


Figure 3.2: Minimum Viable Product

According to the concept of Minimum Viable Product (MVP), a product is usable from the very first iteration of the product development cycle, as shown in Figure 3.2. However, if the product does not follow the MVP approach, users may have to wait until the final phase of the development cycle to obtain the fully functional product, as illustrated in Figure 3.3. Therefore, several companies around the world have built their business model based on the concept of MVP, such as Airbnb, Amazon, and Foursquare.

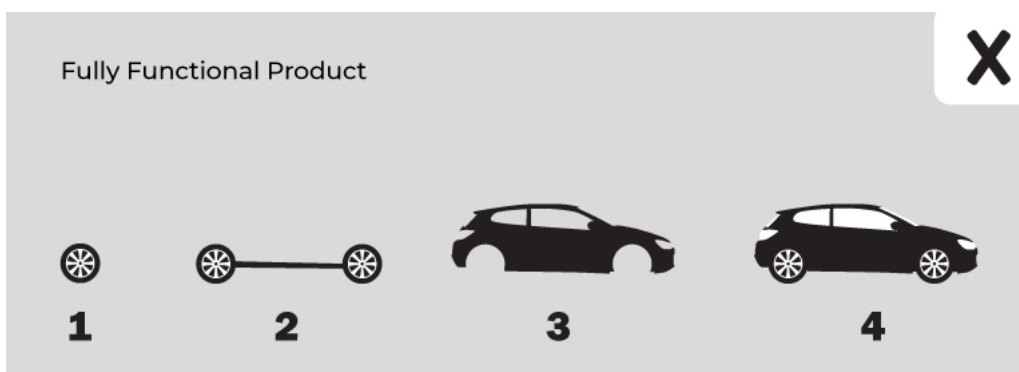


Figure 3.3: Typically Build Product

3.3 Minimum Viable User Experience (MVUX)

Minimum Viable User Experience (MVUX) is a product development approach closely related to MVP or Minimum Viable Product. The strategy focuses on testing a product with real users as early as possible to gather feedback and improve the product design. The goal of MVUX is to identify the core features and functionalities that are essential for providing value to users. It helps to create a product that delivers a positive user experience while minimizing the product cost and time to market. MVUX consists of 12 possible UX goals grouped into 4 categories, as shown in Figure 3.4 [10]. The main elements are: attractiveness, approachability, professionalism, and effective selling of the idea.

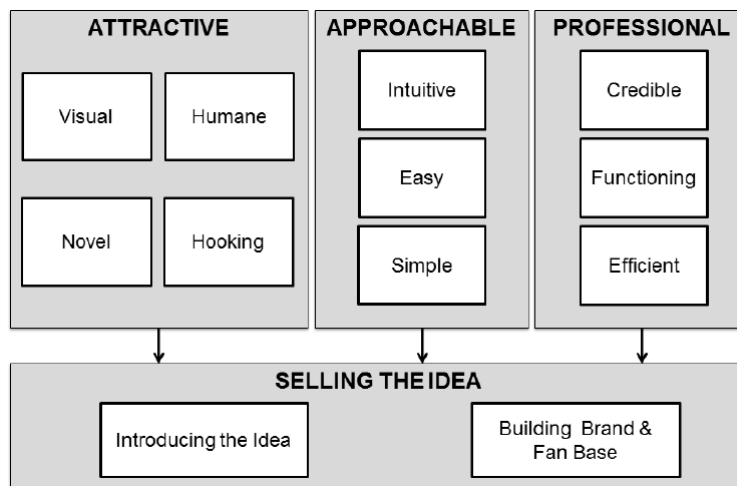


Figure 3.4: MVUX Framework

At the bottom of Figure 3.4, is selling the idea, which is the central objective of MVUX since it allows the startup to obtain feedback from users who evaluate their product concept [23]. The three additional elements provide a foundation for the users to be engaged. The product creates a good impression only if the early product version is attractive. The approachable elements, make the product easy to use. The professional elements, provide the startup with a professional image, leading to a well-functioning, and effective product. Finally, when these requirements are fulfilled, the startup has a better potential of selling the idea to the customers.

3.4 Lean UX

Lean UX is a design and development approach that focuses on experimentation, customer feedback, and iterative product development that effectively meets user needs with minimal waste of time and resources. It is based on the principles of lean startup and agile methodology. Agile development is an iterative software-development methodology that includes splitting a project into several phases called “sprints”. These sprints are performed in short time periods, as shown in Figure 3.6. The key concepts of lean UX are team collaboration and experimentation over formal planning. Team collaboration ensures that every member of the team is responsible for product design. On the other hand, experimentation over formal planning means the product is built upon hypothesis, rather than detailed design specifications. The

goal is to build a system of continuous experimentation and feedback, allowing the team to learn and improve the product over time.



Figure 3.5: Lean UX build cycle

Lean UX involves working closely with users, team members, and stakeholders throughout the design process to gather valuable feedback as early as possible to make quick decisions that meet the business goals. Overall, lean UX is a collaborative and agile approach to design and development that aims to create a better product that fulfills the needs of the user.

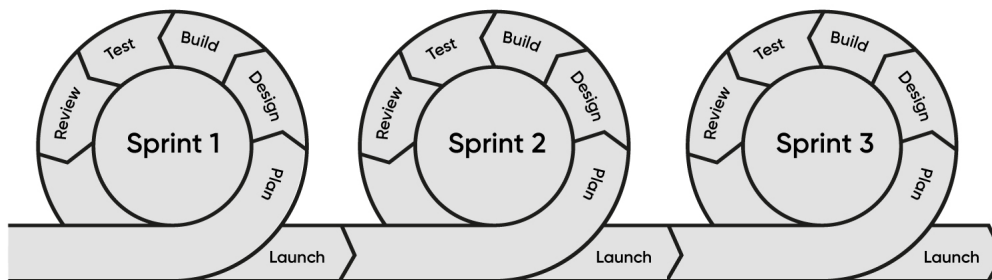


Figure 3.6: Agile methodology

Chapter 4

Website Analysis

4.1 Data Collection

The primary resource in predictive analytics is data. A dataset is a structured collection of raw statistics and information generated by a research study [11]. In this section, we explore the challenges users face while visiting a website, focusing on usability and accessibility. Usability is the quality attribute that measures the easiness of an interface. While web accessibility ensures that a website is usable and accessible for people with disabilities. Poor UX can result in various challenges for users while navigating a website. Thus, we gathered various orders to develop a benchmark for evaluating web usability and accessibility of users. For our research, we randomly selected twenty websites from various categories. Table 4.1 presents the data collected from different government organizations like- Finance, healthcare services, and educational institutes, while Table 4.2 presents data from five e-commerce, two universities, and three online news portals. Each column in the tables represents a distinct variable.

Website	Broken ARIA reference	Contrast Error	Empty Link Error	Redundant title Error	Unordered list error
WS01	5	20	11	6	33
WS02	7	19	15	22	30
WS03	11	50	17	3	11
WS04	3	18	18	14	6
WS05	4	15	12	3	12
WS06	2	13	10	2	4
WS07	5	10	8	4	9
WS08	6	14	13	7	3
WS09	9	13	14	10	7
WS10	7	27	11	6	5

Table 4.1: government websites

Website	Broken ARIA reference	Contrast Error	Empty Link Error	Redundant title Error	Unordered list error
WS01	3	11	1	5	9
WS02	5	9	8	3	11
WS03	9	12	3	1	2
WS04	2	14	9	7	4
WS05	0	8	2	1	5
WS06	1	15	7	2	1
WS07	5	7	10	11	10
WS08	4	10	12	13	14
WS09	2	9	5	2	6
WS10	1	5	3	0	2

Table 4.2: e-commerce and other websites

4.2 Data Finding Method

To check the web accessibility of these websites, we followed the guidelines proposed by WCAG (Web Content Accessibility Guidelines). According to [21], The accessibility standards are maintained by W3C (World Wide Web Consortium) and are currently on Version WCAG 2.1. Several metrics can be used to evaluate the accessibility of a website. The most commons are validity, reliability, sensitivity, and adequacy. However, more advanced metrics are required to measure more complex attributes, such as the presence of alt attributes for images, task completion time, and contrast balance. There are many tools that are used to evaluate the assessability of a website. For instance, WAVE [16]. This is a site in which we can check the accessibility of a website. Moreover, to check the usability of a website we used a tool called powermapper. Additionally, CynthiaSays and FAE are a few more websites that are utilized to find our data from the web.

4.3 Result and Findings

By evaluating the websites, we find many fatal errors. For instance, the linked image missing ALT text or broken ARIA (Accessible Rich Internet Application) reference. ARIA [18] is a set of attributes that makes the website more interactive and accessible to people with disabilities. For example, blind people can use a screen reader to understand the content of a website easily. However, many websites lack the basic features of ARIA, which can be problematic for users with impairments. In addition, contrast error is also one of the reasons for faulty websites, and we found many websites with low contrast visibility. Based on our evaluation of government websites in Figure 4.1, we found that 34.1% of them had contrast errors, making it difficult for users to read the website content. Additionally, more than 10% of the websites had broken ARIA references, which can create navigation difficulties for users with disabilities. Approximately 22% of the websites had empty link errors, where there were clickable links but no content, leading to confusion for users.

Furthermore, we observed unordered list errors, which can make the user experience more difficult and confusing.

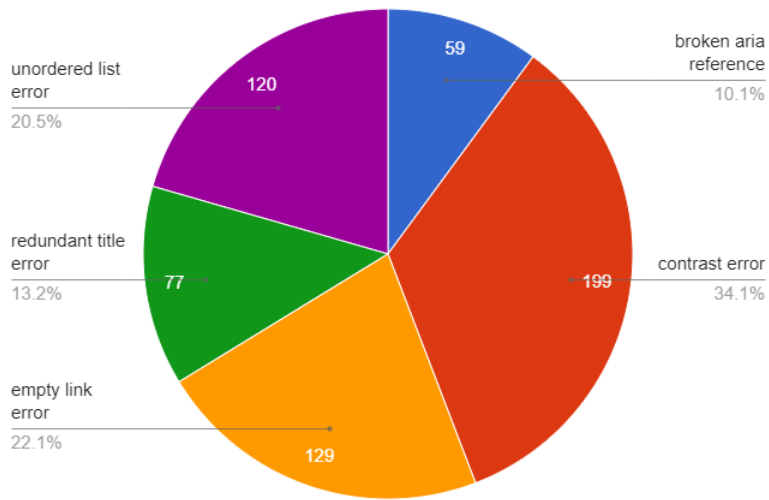


Figure 4.1: Government websites evaluation

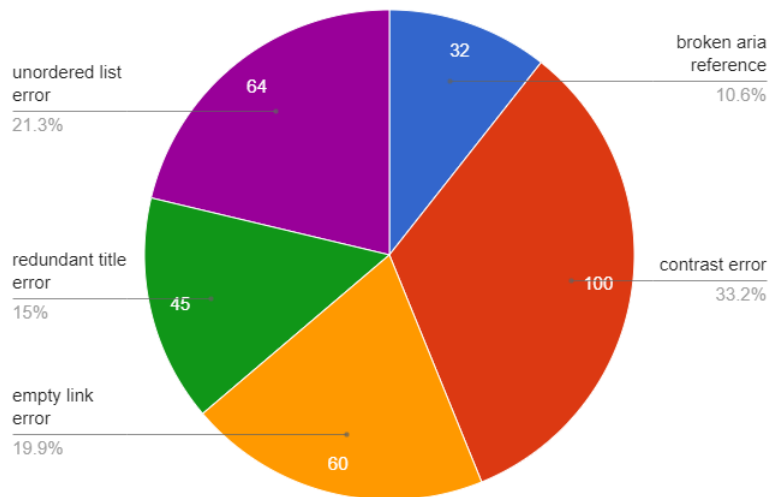


Figure 4.2: E-commerce websites evaluation

In e-commerce websites, we can see there are several flaws in Figure 4.2. The websites are incomplete and there are many features missing. However, the flaws are relatively fewer compared to the government websites, as shown in Figure 4.3. Government websites exhibit a higher number of empty link and contrast errors when compared to e-commerce websites. Moreover, all these flaws and errors point to inadequate communication between the users and the designers during the product development cycle, resulting in bad UX design.

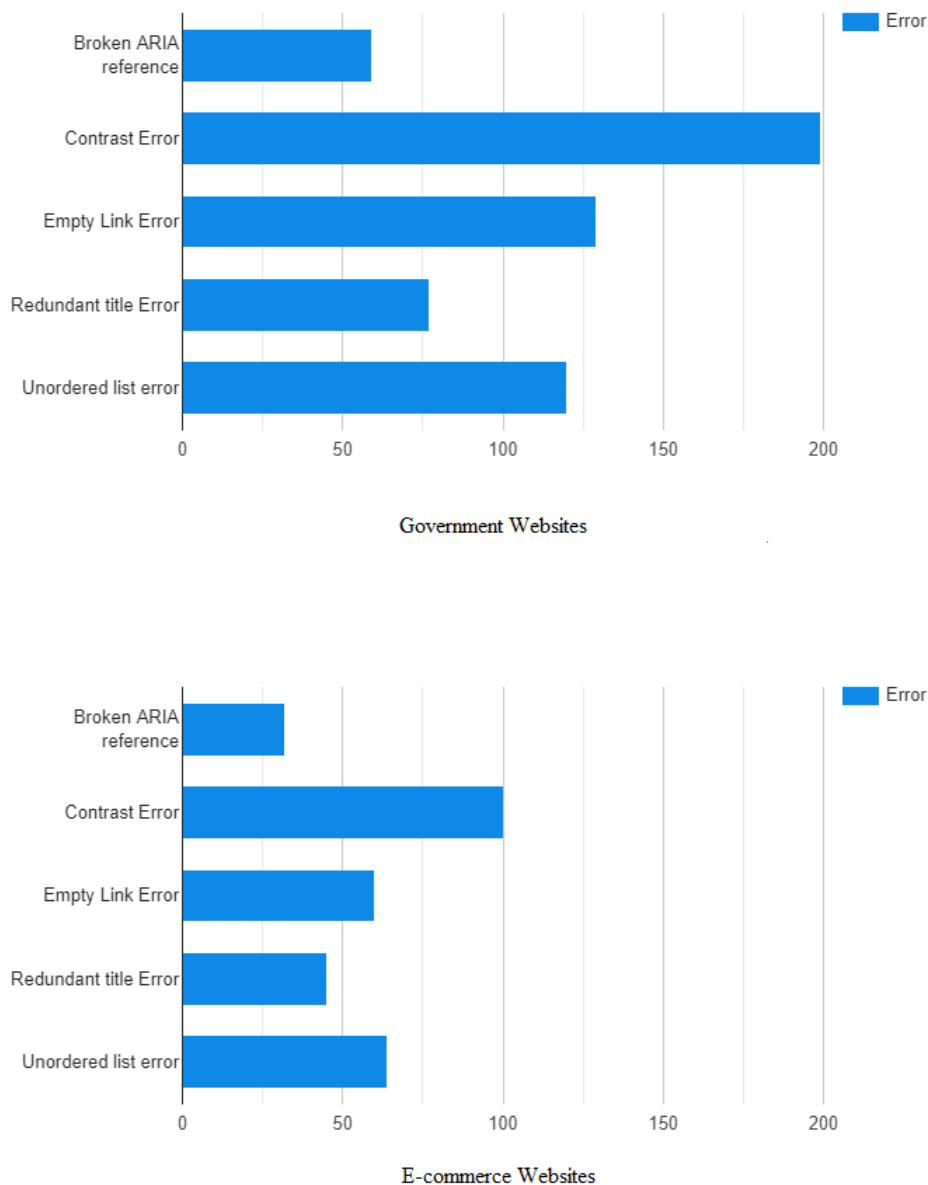


Figure 4.3: A Comparison of Government and E-commerce Websites

Chapter 5

Methodology

The goal of our research and study is to fill the gap between the client and the developer/designer. We expanded on the previous UX design technique and included some more ways that can increase the odds of producing a better product without having to start developing any software or interface. Figure 5.1 depicts the entire process of developing an MVUX.

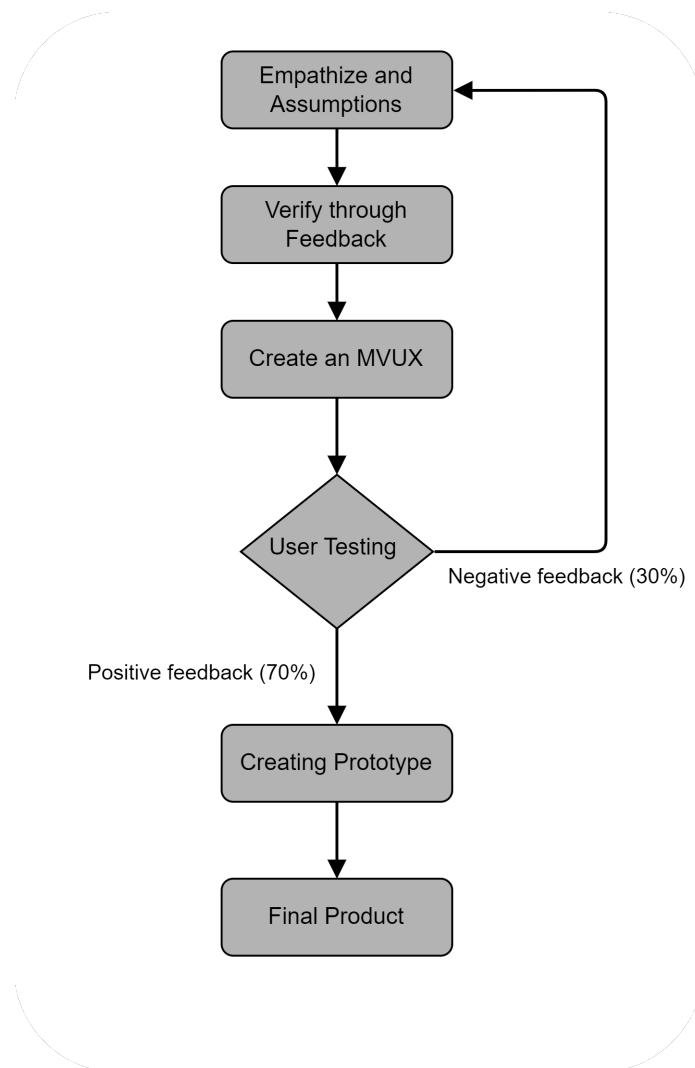


Figure 5.1: Work process of our model

5.1 Empathize and Assumptions

In the process of developing software or a website, understanding the user experience is crucial. The first step in this process is to empathize with the user and make assumptions about their needs and preferences based on the client's requirements. This initial stage sets the foundation for the entire development process and can significantly impact the success of the final product. Our aim is to explore the importance of empathizing with the user and making assumptions about their needs and preferences in the initial stages of software and website development, and how it can impact the overall user experience.

The initial stage of software and website development involves understanding the client's requirements and creating assumptions about the user experience. This process requires developers to put themselves in the shoes of the user and consider their needs and preferences. By empathizing with the user, developers can create a more user-friendly and engaging interface that caters to their needs.

Empathizing with the user and making assumptions about their needs and preferences in the initial stages of software and website development is critical to achieving a successful user experience. By prioritizing the user experience from the beginning, developers can create software and websites that are intuitive, engaging, and meet the needs of their users.

5.2 Verify through Feedback

Collecting input from users is crucial for developing products that meet customer demands. This input can be gathered through surveys that include questions tailored to the intended audience. After empathizing with the user and making assumptions, the next step is to collect feedback through surveys. The survey should be designed to elicit responses from the intended audience, addressing critical aspects such as the issue description, assumption periodization, hypothesis, results, persona, and primary product characteristics. By gathering feedback, developers can verify their assumptions and create a clear vision for the product development process. The persona created from the feedback helps in creating a product that aligns with the target audience's needs and preferences.

Collecting input from users through surveys is an essential component of the product development process. Surveys provide quantitative or qualitative data that helps designers understand user preferences, behaviors, and needs. When conducting user surveys, it's important to ensure clear and concise questions, offer response options that cover a range of possibilities, and maintain user privacy. Surveys help in verifying assumptions and creating a clear vision, framing, and outcome for the product development process. By prioritizing user feedback, developers can create products that meet the needs and preferences of the intended audience, resulting in a successful user experience.

5.3 Create an MVUX

Creating a Minimum Viable User Experience (MVUX) is essential for developing successful products. This can be achieved through collaborative design and prototyping, using techniques such as paper sketches and clickable wireframes. Lean UX is a recommended approach that emphasizes collaboration and common understanding in solving design challenges. This thesis emphasizes the importance of collaborative design and prototyping in developing a Minimum Viable User Experience (MVUX), using techniques such as paper sketches, clickable wireframes, affinity mapping, user flows, and other lean UX approach. Generally, UX designers start by drawing an affinity map, which is the practice of defining every action the user needs to perform to complete a particular task, then move on to creating user flows and wireframes, which are outlines or sketches of the desired product shown in the bellow figure.

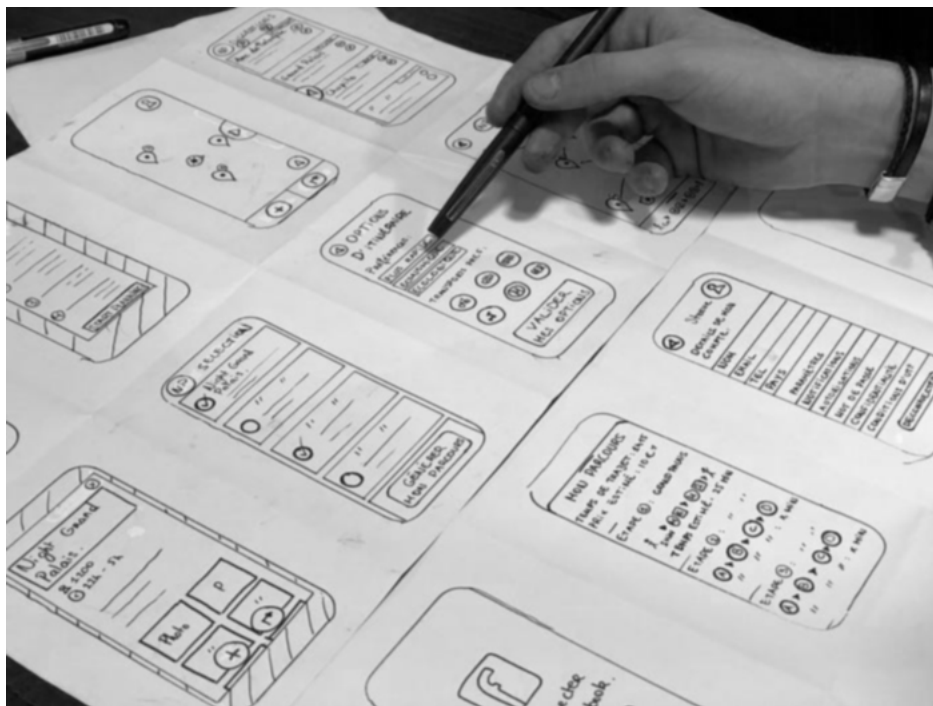


Figure 5.2: Wireframe

Creating user flow or clickable wireframes, is essential in developing a Minimum Viable User Experience. This allows designers to visualize and test the user interface and user experience, identifying potential issues and making necessary changes before the product is developed. The Lean UX approach recommends a collaborative design process for generating the MVUX, allowing designers to construct a product concept together and solve design challenges through a common understanding. This approach helps in early product development by minimizing the risk of costly redesigns or user dissatisfaction down the line.

Minimum Viable User Experience is a user-centric approach that iteratively refines the product by emphasizing on collaborative design and prototyping techniques. By prioritizing the user experience and using collaborative design processes, designers can create products that meet the needs of the intended audience and align with the project goals.

5.4 User Testing

User testing is a key element of UX design which involves gathering feedback and insights from real users in order to evaluate the usability and effectiveness of a product or interface. This involves observing users interacting with the product to identify usability issues, user behavior, and preferences. It helps to identify potential issues early in the development process, ensuring that the final product is successful. User testing methods in UX design can vary depending on the project goals and needs. Some essential user testing methods are written below:

(a) Usability Testing: This involves evaluating the ease of use of your design and identifying any usability issues that may affect the user experience. It can be conducted through methods such as heuristic evaluations, cognitive walkthroughs, and interviews.

(b) A/B Testing: This involves testing two or more versions of your design to determine which one performs better in terms of user engagement, conversion rates, or other metrics. It is a data-driven approach that helps to identify user preferences accurately.

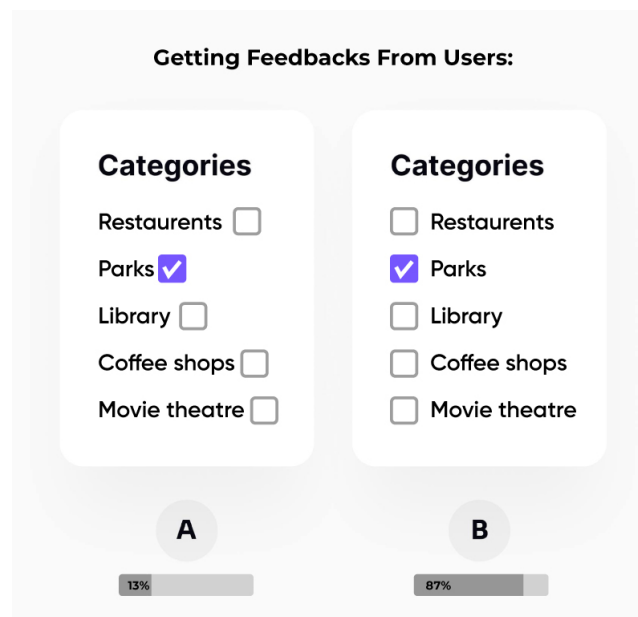


Figure 5.3: A/B Testing

(c) Eye-Tracking: This involves Using specialized equipment to track participants' eye movements and gaze patterns, providing insights into visual attention and usability.

In our project, we choose A/B testing to evaluate our design. After A/B testing, If the percentage of negative input is greater than 30%, the product should return to the first stage of development and continue through the loop until issues are addressed. This ensures that the final product meets the needs and preferences of

the intended audience. However, if 70 percent of customers give positive feedback, the program is ideal for them. Iterative design and continuous improvement allow developers to make necessary changes and improvements to the product based on user feedback.

By focusing on testing and experimentation before committing resources to full development, developers can identify potential issues and make necessary changes to ensure the final product meets the needs and preferences of the intended audience.

5.5 Creating Prototype

Following the user testing phase, the next significant step involves building a prototype based on the wireframes and designs that were created earlier. This requires refining the design details and creating a realistic model that accurately represents the appearance and functionality of the product. It serves as a simulated version of the end product, demonstrating how users will engage with it.

Prototypes are interactive and clickable, providing stakeholders and test users with the opportunity to interact with them as if they were fully functional products. However, it is important to keep the development to a minimum at this stage since the prototype is not the final product. This allows for testing and experimentation before committing resources to full development. By minimizing the development, developers can also keep costs and resources in check, while ensuring that the final product meets the needs and preferences of the intended audience.

The primary purpose of prototyping is to conduct thorough testing before investing resources in the development of a complete product. It allows designers to ensure that their solution is user-friendly and accessible, while also verifying that users can interact with it in the intended manner. Furthermore, it helps in identifying any usability issues or flaws early on, providing an opportunity to make necessary refinements and improvements. By obtaining feedback early from users and stakeholders, designers can validate their design decisions, enhance the user experience, and align the product with its intended objectives.

5.6 Final product

Once the testing and prototyping are complete and all the necessary changes have been made, the product is prepared for transfer to the development team for implementation. At this stage, the design has undergone rigorous testing and refinements to ensure optimal usability and user experience. The necessary adjustments based on user feedback and testing results have been incorporated into the user interface, making it ready for the next phase of the development process. By handing over the refined user interface to the development team, it ensures a smooth transition between the design and implementation phases.

Collecting and analyzing user feedback is essential for any product or software development process to ensure that the final product meets the needs and preferences of the intended audience. User feedback provides valuable insights into user behavior, preferences, and expectations, which can be used to refine and improve the product. Positive feedback not only indicates user satisfaction but also helps to build customer loyalty and a positive brand image. On the other hand, negative feedback highlights areas for improvement and can prevent potential issues in the market. Therefore, it is important for developers to collect and analyze user feedback throughout the development process to create a successful and widely accepted product or software.

Chapter 6

Implementation

To develop a product using the minimum viable approach, we gathered our requirements from an online freelancing platform shown in Figure 6.1. The client wanted us to develop a user interface and experience for a mobile application that will offer a studio equipment rental service. The primary goal of the application is to serve as a platform for users to search for and rent a wide range of studio equipment such as cameras, lenses, boom lights, and soundproof studios. Additionally, the app will allow users to rent out their equipment to others.

After analyzing the requirements, we found that the application will have four distinct user roles. Firstly, there will be the gadget renters who will use the app to list their equipment and make it available for rent. Secondly, gadget tenants will be able to search for the equipment they need and make bookings through the app. Thirdly, the app will have a section dedicated to freelance photographers who can list their services and showcase their portfolios. Lastly, the app will also offer a platform for people who require photography services to find and hire photographers.

To create a seamless user experience, the application's UI/UX design should be intuitive, visually appealing, and easy to navigate. The design should consider the needs of each user group and provide them with the necessary tools and features to accomplish their goals efficiently. The app should also have a robust search function that allows users to quickly find the equipment or services they require. Additionally, the app should have a payment gateway to facilitate secure and seamless transactions. Overall, the UI/UX design should focus on providing a user-friendly and enjoyable experience that encourages users to return to the app.

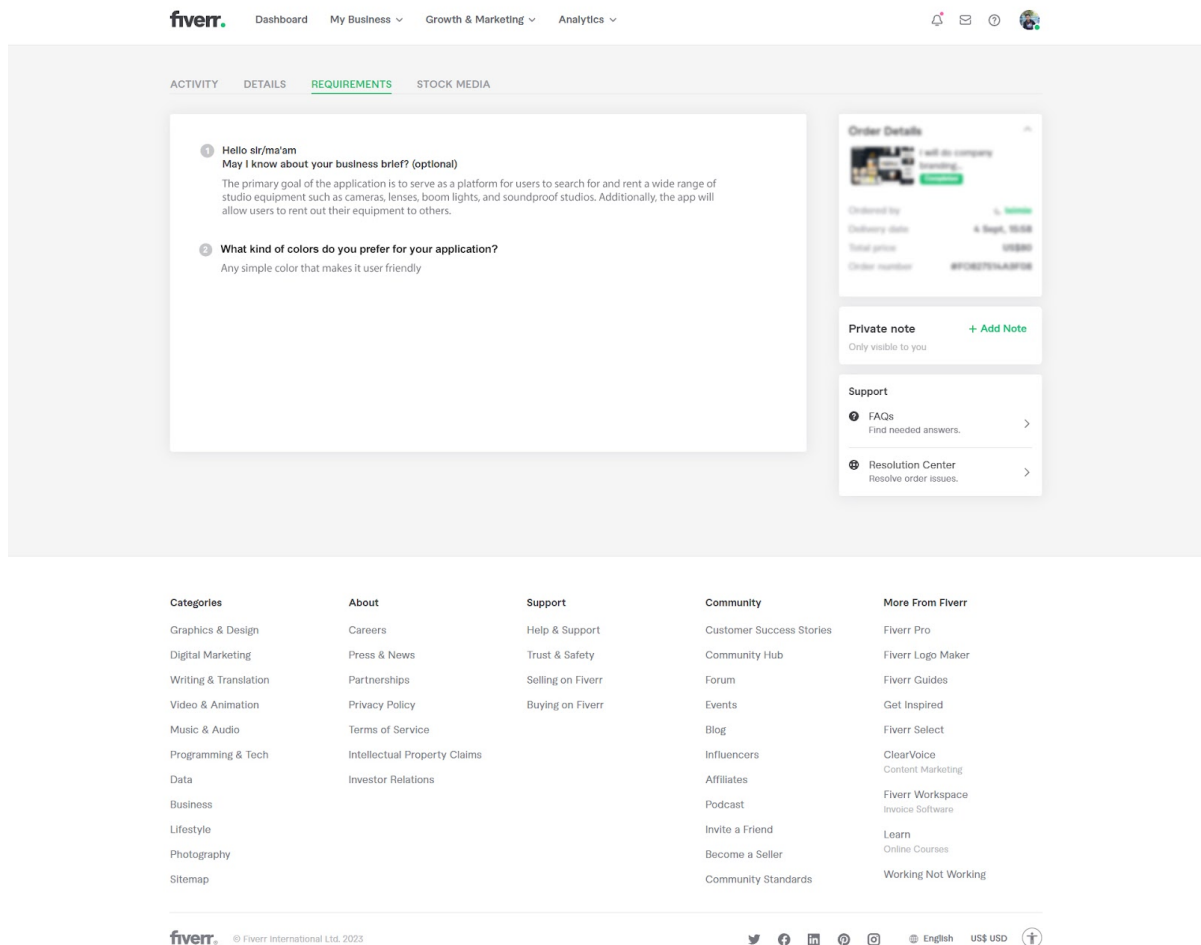


Figure 6.1: Requirements

As stated in the methodology now we need some responses from the targeted audience for this application. To gather responses from the targeted audience, we interviewed around 10 people who are actively or passively related to photography to find out what difficulties they face while completing their photography-related tasks. Moreover, we created a survey questionnaire consisting of option-based, short-answer, and brief-answer questions. As all the participants are from Bangladesh, we designed the survey in Bangla to ensure ease of comprehension. The questionnaire was designed to elicit feedback on various aspects of the application and was administered to a representative sample of the target population.

Here is the form preview: <https://forms.gle/HTqihs6J2dqvVAor7>

The data collected from the survey is presented in Figure 6.2. The results of the survey revealed that a significant number of individuals expressed interest in renting photography equipment and gadgets. However, a major barrier to accessing these services was the lack of a trusted platform for conducting transactions. To address this issue, the application must prioritize robust security measures to protect the interests of both renters and tenants.

Below is a sample of the survey questions that were asked:

1	What types of photography gear do you use? (e.g., camera, lens, flash, etc.)
2	Have you ever rented photography gear from any source? If yes, how did you acquire it?
3	Which methods would you prefer to use for renting out your photography gear?
4	If you have rented photography gear through a mobile app, what additional services would you desire?
5	Are you interested in renting out any unused or extra photography gear? If not then Why?
6	What is your thought on photographers being able to rent photography gear through a mobile app?

Table 6.1: Sample Questions

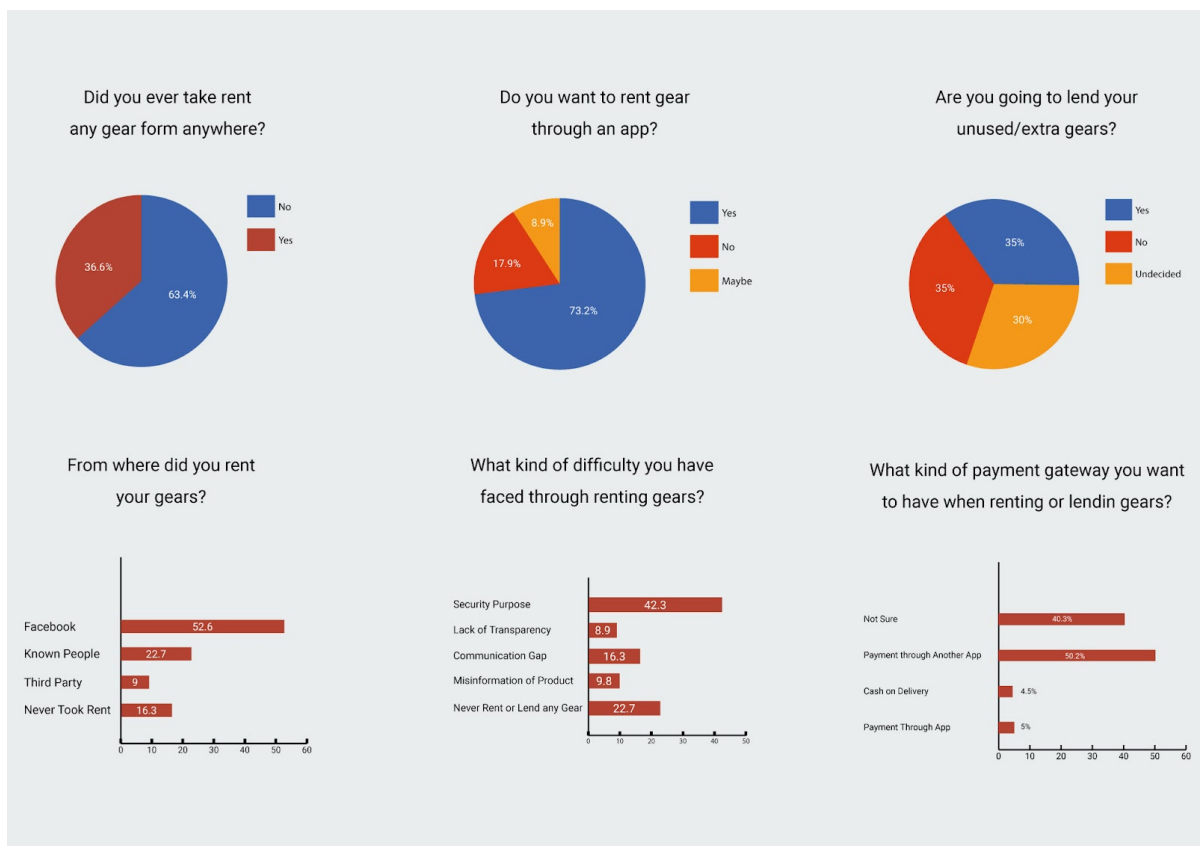


Figure 6.2: Survey Data

Following the survey, we need to build a user persona of the target customers to better understand their needs and preferences. A user persona is a fictional representation of the potential users. The persona typically includes a name, age, occupation, goals, needs, behaviors, and preferences shown in Figure 6.3. By creating a user persona, we aimed to develop empathy and understanding for the target audience and guide the design process accordingly. From our user persona, we observed that each participant was eager to rent camera gear but faced difficulties in accessing them. Additionally, the participants expressed concerns about security issues while renting equipment.

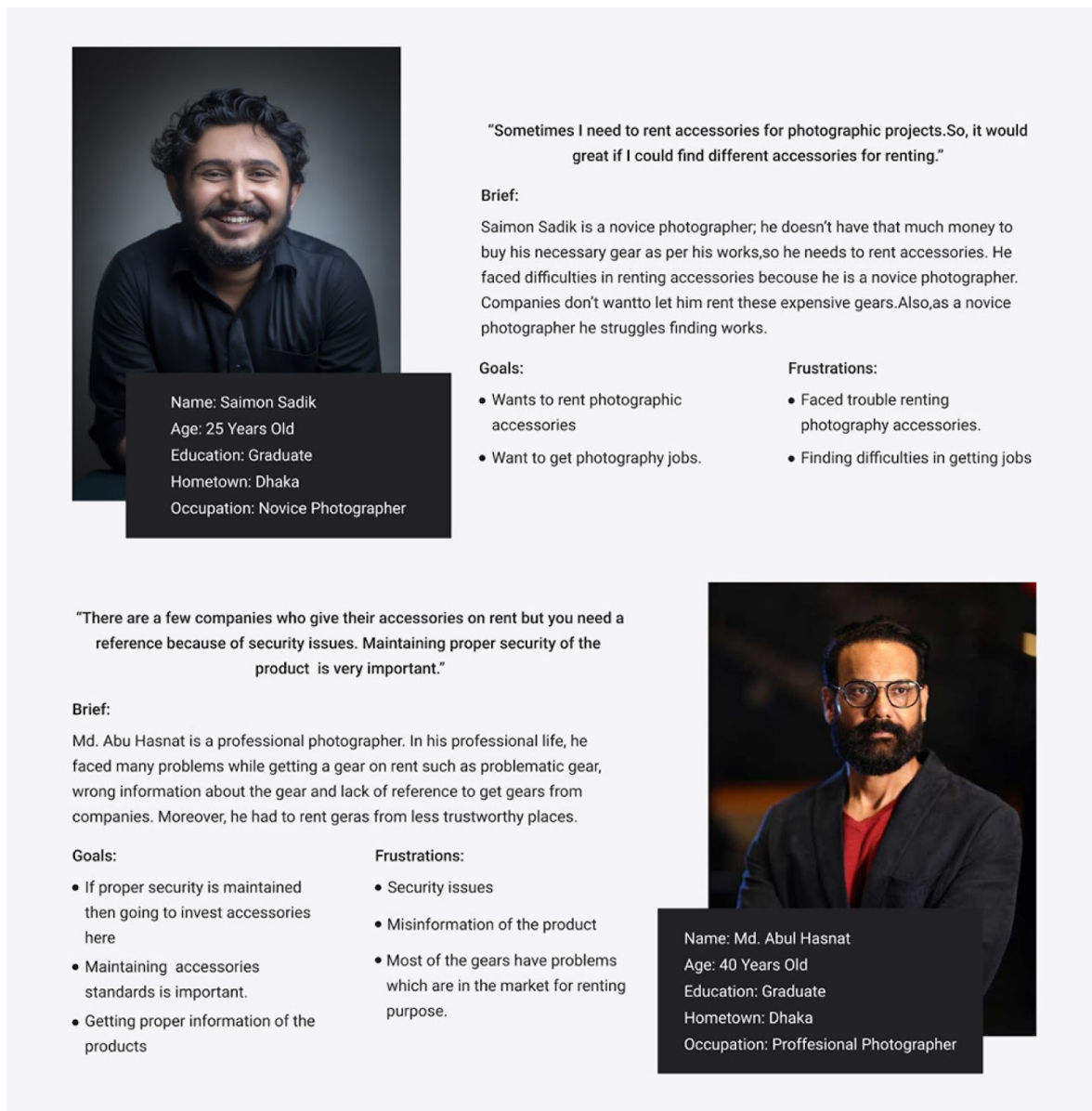


Figure 6.3: User Persona

After collecting all the requirements and creating a persona, now it's time to build the MVUX. To create the MVUX first we need to build the affinity map. Affinity mapping is the process of outlining all the steps a user will take to complete a task. By creating an affinity map, we grouped and cluttered ideas into similar themes and categories, shown in Figure 6.4. This clarifies some features such as users should be able to easily rent photography equipment and accessories through the platform, the application should be designed with a user-friendly interface and include a call option, the platform should prioritize security measures to ensure the safety of both renters and tenants, users should be able to choose from a variety of payment options, including credit/debit card, mobile banking, and cash on delivery, the platform should include a search filter that allows users to quickly and easily find the equipment, accessories, or photographers that they need based on their preferences and requirements.

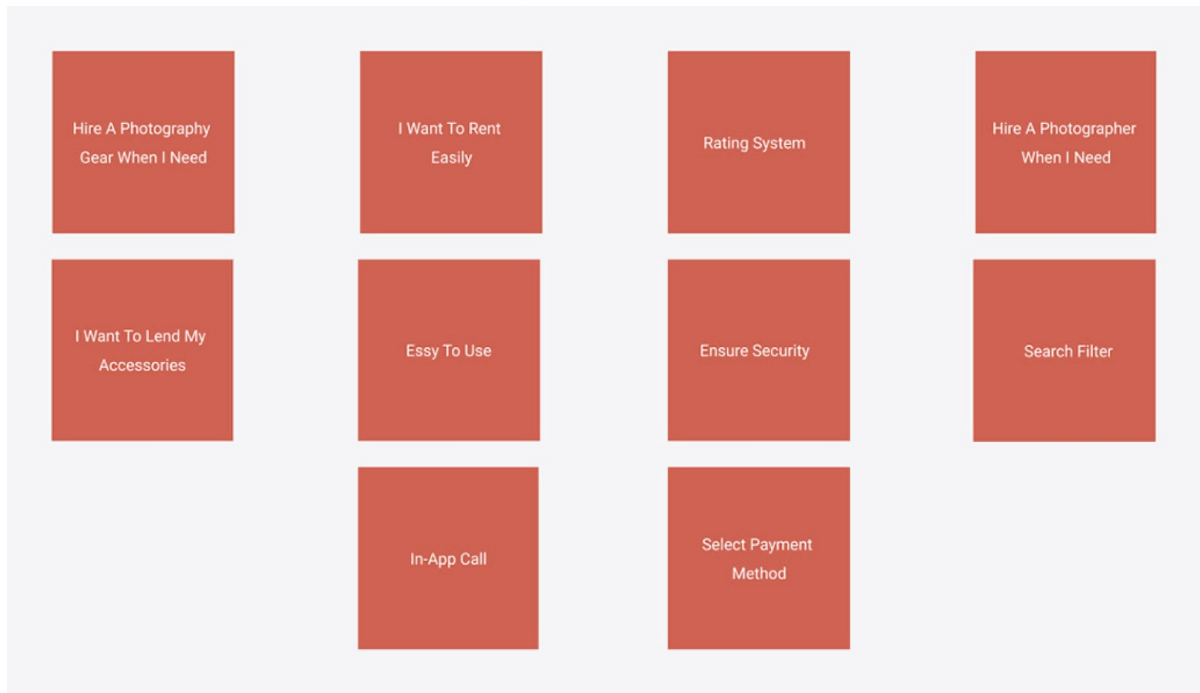


Figure 6.4: Affinity Map

Now, to showcase how a user would navigate through the application, we need to build a user flow. A user flow is a visual representation of the possible paths a user might take to complete a task. User flows are used to design and optimize user experiences by defining the user's goal, mapping out the sequence of steps required to complete a task, and identifying potential areas of improvement. Figure 6.5 illustrates the complete user flow of the application. Following the user flow, first, a user must log in to their account before using the application. After logging in, the user can choose from several paths to accomplish their desired task, such as renting or lending photography gear, hiring a photographer, searching for camera equipment, chatting with other users, or editing their profile. For example, If the user chooses to rent or lend gear, they will be directed to the corresponding pages where they can browse available equipment, select the desired item, and complete the rental or lending process. Again, If the user chooses to hire a photographer, they can search for available photographers, view their profiles and portfolios, and book the desired photographer. Additionally, If the user wants to search for camera equipment, they can use the search filter to find the desired gear based on their preferences and requirements.

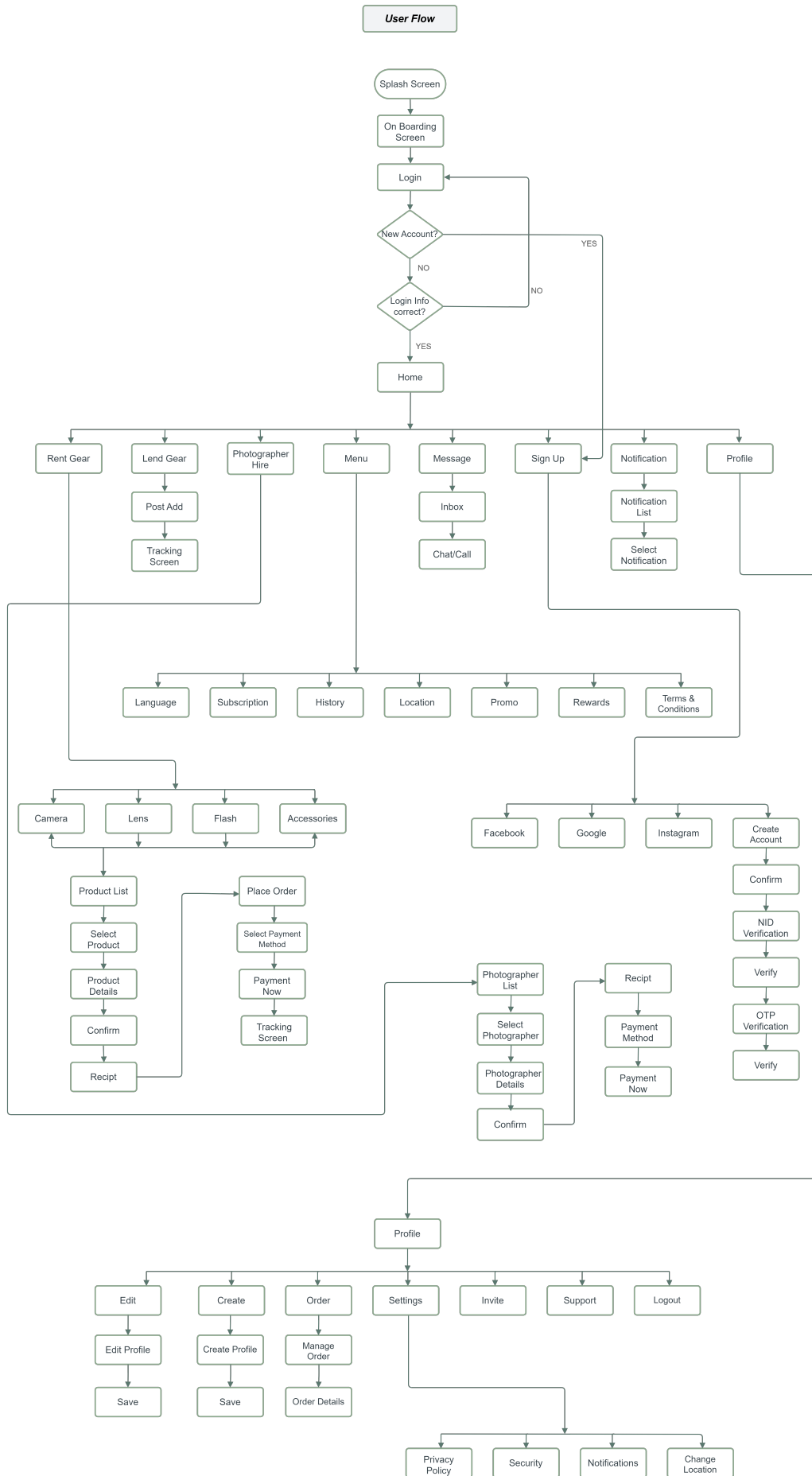


Figure 6.5: User Flow

After the user flow, now we have to build the wireframes of the system. Generally, wireframes are just low-fidelity sketches. They are used to give a sense of where elements will be located on the screen. It's just a skeleton for visualizing the actual app. Wireframes are basically three types. First is the low-fidelity wireframes where we did simple paper sketches and basic design shown in Figure 6.6. Low-fidelity wireframes can be done on a whiteboard and usually contains fewer details. Second, to make the design more visually appealing, we did mid-fidelity wireframing, shown in Figure 6.7. Mid-fidelity wireframes are moderately detailed with clickable areas which represent the navigation possibilities of the application. Lastly, to design a detailed in-app screen, we did high-fidelity wireframing using an app called Figma. A high-fidelity wireframe is the complete blueprint of the design which has more visual details shown in Figure 6.8.

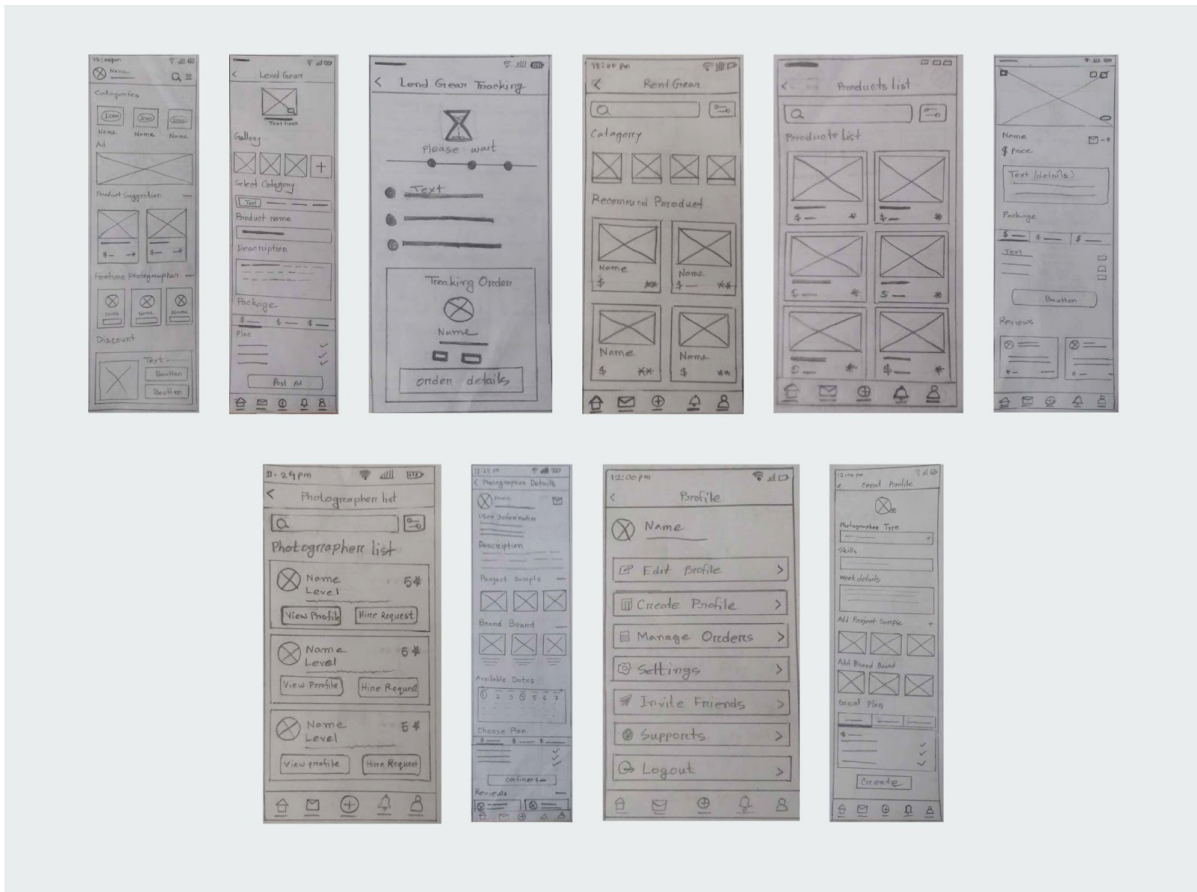


Figure 6.6: Low-fidelity Wireframes

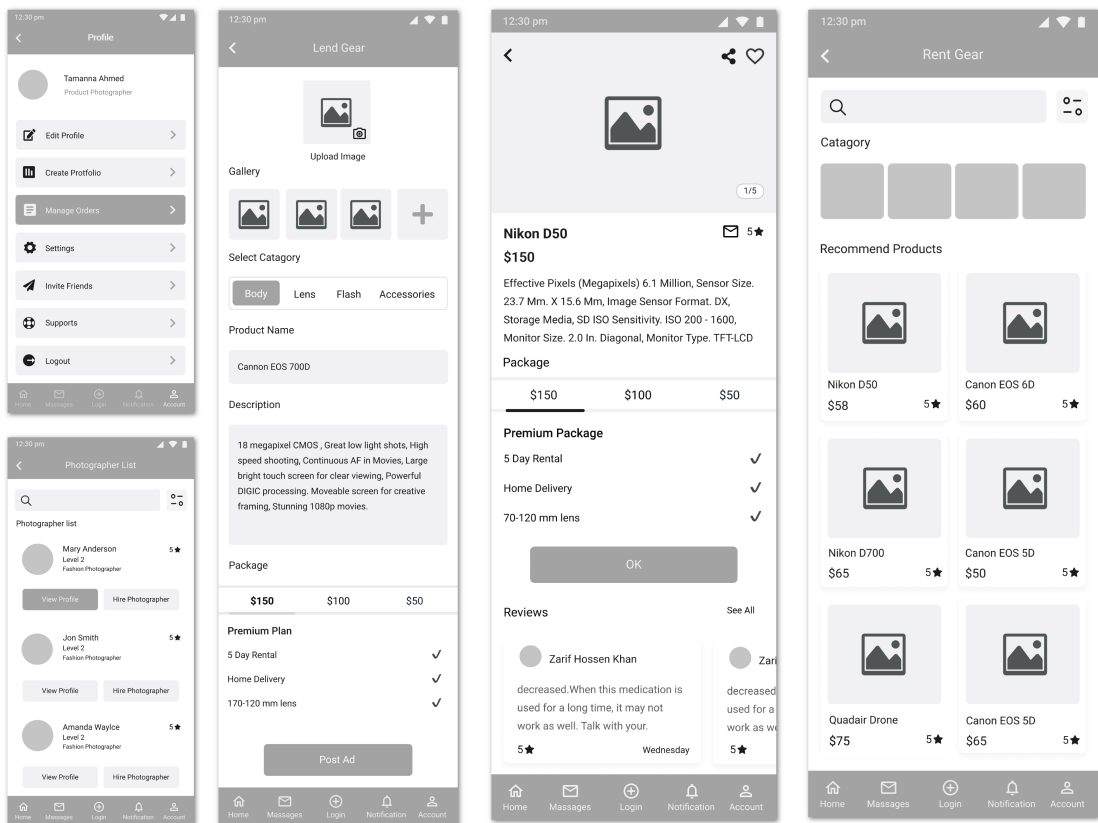


Figure 6.7: Mid-fidelity Wireframes

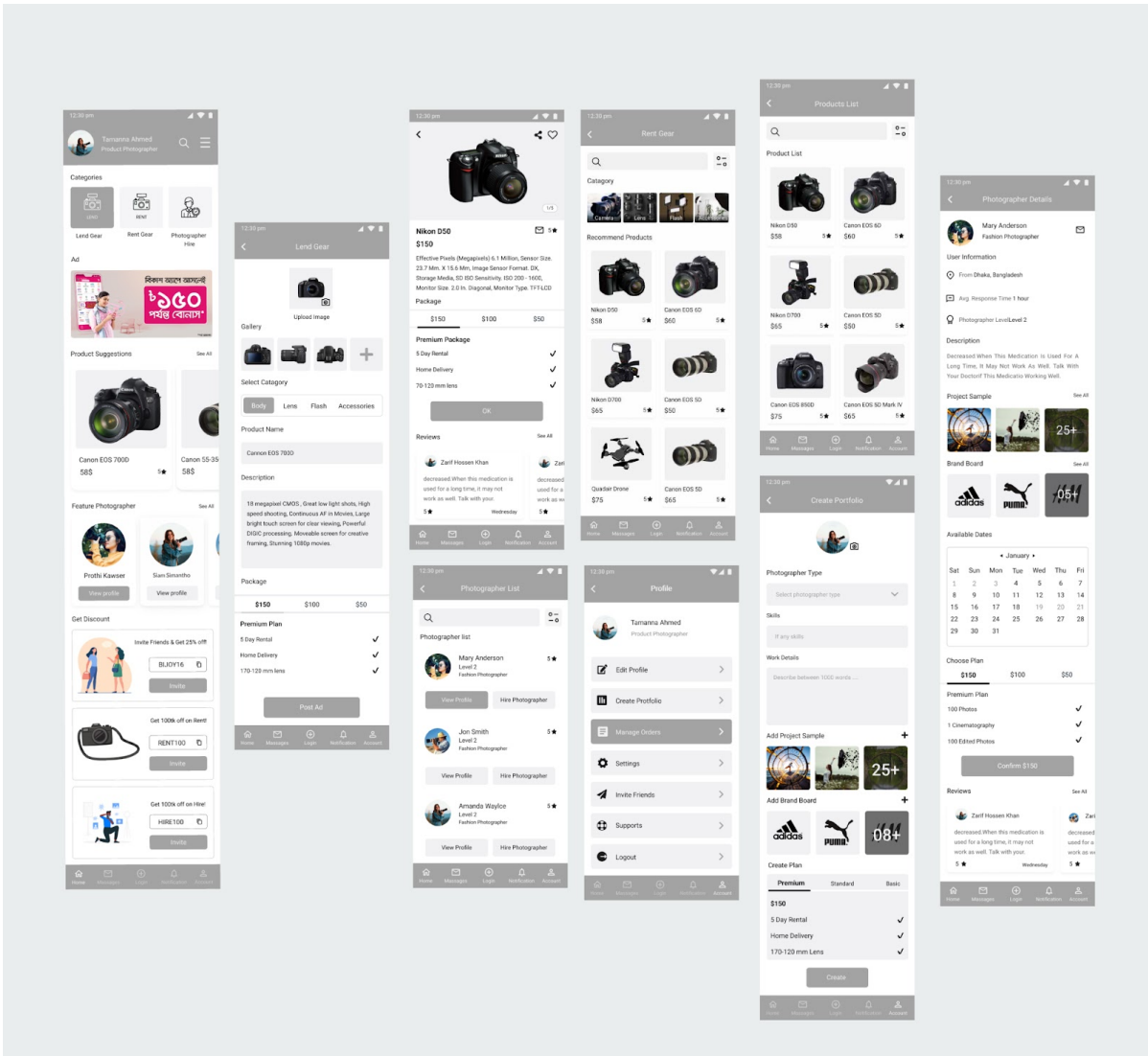


Figure 6.8: High-fidelity Wireframes

After completing the wireframes, it is crucial to gather feedback from the targeted audience to validate their usability and effectiveness. To achieve this, we conducted user testing using various classification methods such as usability testing, A/B testing, and First-click testing. Among these, A/B testing was selected as the preferred method to gather user feedback.

A/B testing involved creating two variations of high-fidelity wireframes, specifically focusing on the payment gateway page. The first variation presented payment options in a list format, while the second variation arranged the payment buttons in a row format. By conducting an A/B test, we aimed to compare user responses and preferences between the two variants shown in Figure 6.9.

Getting feedback from the Users

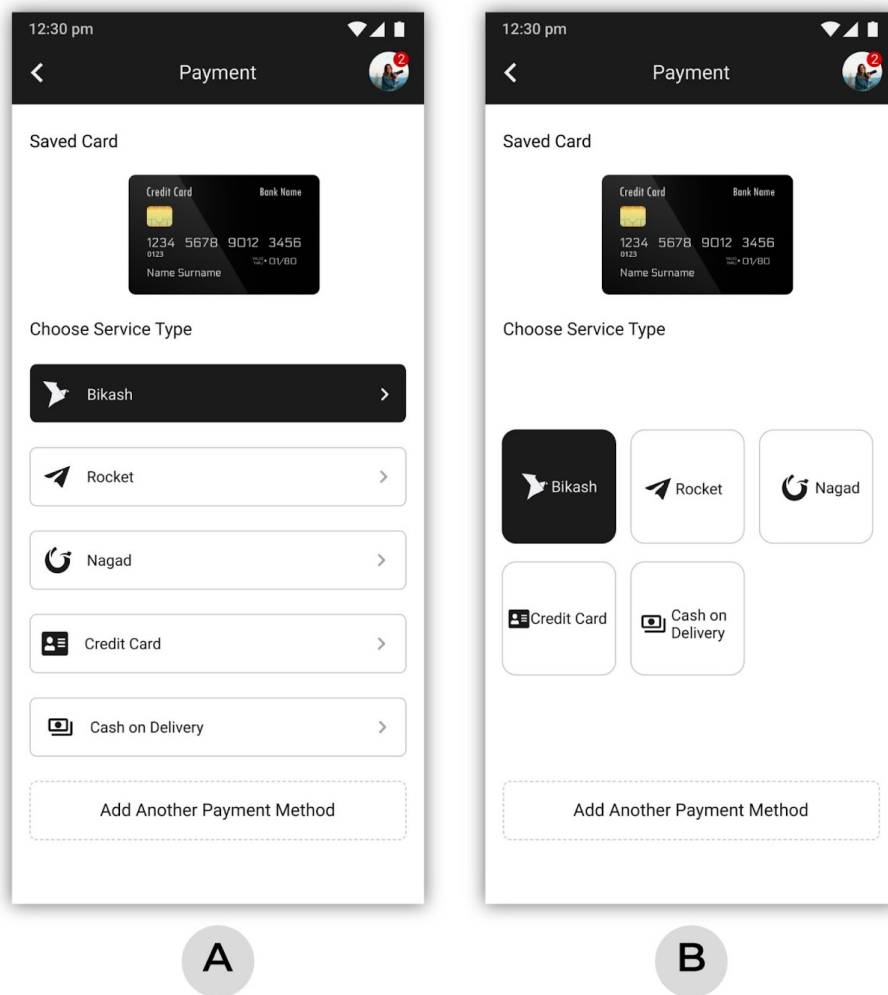


Figure 6.9: A/B

To conduct the A/B testing, we utilized a Google Form as a platform for presenting and collecting feedback on the two variants of essential application pages, specifically the “gadget renting” page, where users can browse available gadgets. The Google Form included the two variants, labeled as Option A and Option B, for participants to evaluate and compare.

During the testing process, participants were required to select one option from either Option A or Option B in the Google Form. The objective was to gather user preferences and determine which variant received the maximum number of selections. Based on the majority choice, the selected variant would be further considered for prototyping and subsequent development.

Here is the form preview: <https://forms.gle/UdT1fNm1s4CDQPYV9>

Now, we have to develop a prototype based on the previously created wireframes. A prototype is an interactive simulation that showcases how users will interact with the final product. By using interactive and clickable prototypes, stakeholders can engage with the prototype in a manner similar to a real product.

During the prototype creation process, the screens were interconnected using links or pathways. For instance, when a user clicks on the “RENT” button (depicted in Figure 6.10), it will redirect them to the page displaying all the available product lists. This interconnection between screens allows users to navigate through the prototype and experience the flow of the application.

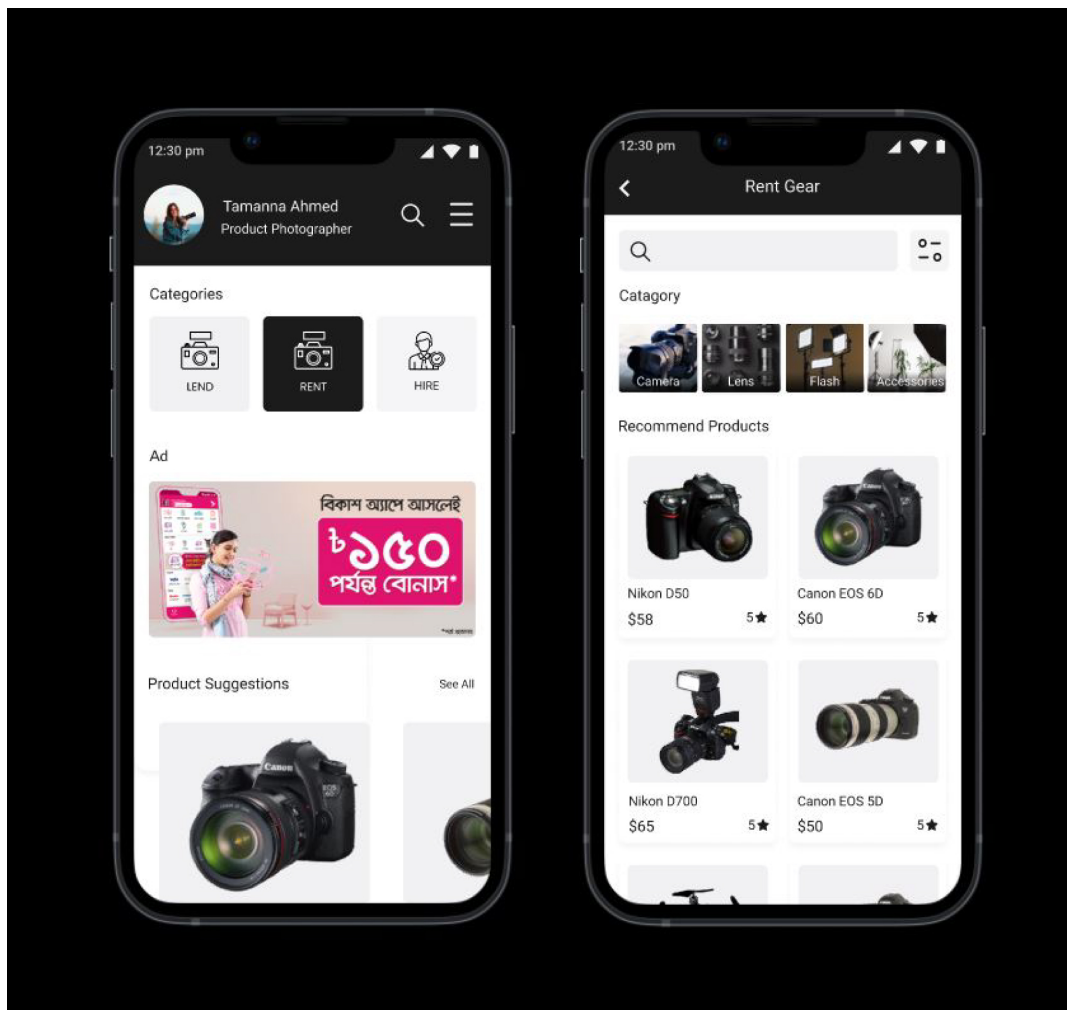


Figure 6.10: Rent-gear

Once all the interconnections between screens were established, the backend preview of the prototype was generated, as depicted in Figure 6.11. To effectively demonstrate the simulation to clients or developers, we created a video presentation of the prototype. In this presentation, an iPhone 13 Mini was utilized as a mockup to showcase the user interface.

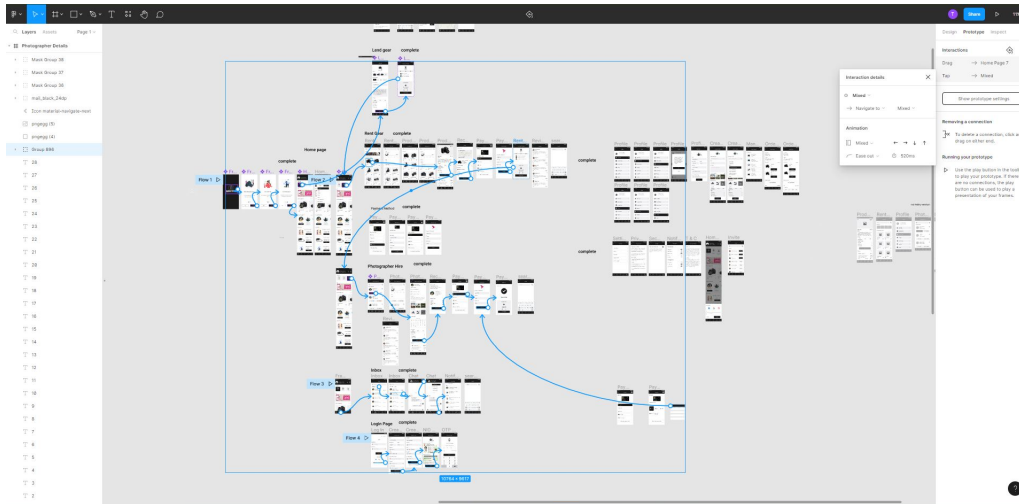


Figure 6.11: Prototype

After conducting A/B testing, if a specific screen of the application receives a 70% or higher majority vote, it is chosen as the basis for developing the prototype. The prototype creation process involves transforming the selected screen into a functional and visually appealing representation of the final product. In addition, to effectively showcase the functionality of the prototype in the development stages, a simulation was created. This simulation provides a visual representation of the application's functionality, allowing the client to experience its features and interactions in a simulated environment.

Chapter 7

Conclusion

In this paper, we develop the concept of MVUX (Minimum Viable User Experience) and its underlying principles. Our objective is to provide startups with a comprehensive framework for gathering user feedback and data to validate and improve their product concept. Through our research, we found that the lack of communication between clients and developers is a pervasive issue that can lead to a suboptimal user experience for all users. The tree swing story serves as a poignant reminder of this problem. Furthermore, we noted the contrast between a minimum viable product (MVP) and a traditionally built product, which reflects the present-day scenario of developed websites or applications. We also discovered that implementing MVUX in startups can be challenging due to major communication issues. However, by taking continuous feedback from both clients and users, we can improve the MVUX from the initial stage. Our research aims to help fill the communication gap between users and adjust the existing minimum viable strategy to benefit early startups. This paper serves as a guide for startups to navigate the complex landscape of user experience and gain a competitive edge in the market. By following the principles of MVUX, startups can develop products that are user-centric, viable, and successful in the long run.

7.1 Future Work

In the realm of user experience (UX), exploring the concept of MVUX is crucial for developing effective applications that cater to the diverse needs of users. However, due to the broad nature of MVUX, there is a limited amount of data available to work with. To further explore this idea, more data will be needed to enhance the current model and develop more sophisticated applications.

Bibliography

- [1] A. Berni and Y. Borgianni, “From the definition of user experience to a framework to classify its applications in design,” *Proceedings of the Design Society*, vol. 1, pp. 1627–1636, 2021.
- [2] M. Eriksson and B. Ferwerda, “Towards a user experience framework for business intelligence,” *Journal of Computer Information Systems*, vol. 61, no. 5, pp. 428–437, 2021.
- [3] L. L. Klein, M. S. Tonetto, L. V. Avila, and R. Moreira, “Management of lean waste in a public higher education institution,” *Journal of Cleaner Production*, vol. 286, p. 125 386, 2021.
- [4] S. Lee and Y. Geum, “How to determine a minimum viable product in app-based lean start-ups: Kano-based approach,” *Total Quality Management & Business Excellence*, vol. 32, no. 15-16, pp. 1751–1767, 2021.
- [5] D. A. Shepherd and M. Gruber, “The lean startup framework: Closing the academic–practitioner divide,” *Entrepreneurship Theory and Practice*, vol. 45, no. 5, pp. 967–998, 2021.
- [6] S. A. Silveira, J. Choma, R. Pereira, E. M. Guerra, and L. A. Zaina, “Ux work in software start-ups: Challenges from the current state of practice,” in *Agile Processes in Software Engineering and Extreme Programming: 22nd International Conference on Agile Software Development, XP 2021, Virtual Event, June 14–18, 2021, Proceedings*, Springer, 2021, pp. 19–35.
- [7] D. Aarlien and R. Colomo-Palacios, “Lean ux: A systematic literature review,” in *Computational Science and Its Applications–ICCSA 2020: 20th International Conference, Cagliari, Italy, July 1–4, 2020, Proceedings, Part VI 20*, Springer, 2020, pp. 500–510.
- [8] N. Bocken and Y. Snihur, “Lean startup and the business model: Experimenting for novelty and impact,” *Long Range Planning*, vol. 53, no. 4, p. 101 953, 2020.
- [9] R. Harms and M. Schwery, “Lean startup: Operationalizing lean startup capability and testing its performance implications,” *Journal of small business management*, vol. 58, no. 1, pp. 200–223, 2020.
- [10] F. Pino, “Minimum viable user experience: Developing a goal setting technique for start-ups,” M.S. thesis, 2020.
- [11] *Datasets*, Available at <https://resources.nu.edu/researchprocess/datasets>, 2019.

- [12] A. Ghezzi, “Digital startups and the adoption and implementation of lean startup approaches: Effectuation, bricolage and opportunity creation in practice,” *Technological Forecasting and Social Change*, vol. 146, pp. 945–960, 2019.
- [13] A. Joshi, I. Dandekar, M. Gaikwad, and C. Harge, “Pugh matrix and kano model—the significant techniques for customer’s survey,” *International Journal of Emerging Technology and Advanced Engineering*, vol. 9, no. 6, pp. 53–55, 2019.
- [14] D. McMurray, “The four most-commonly overlooked problems in lean ux,” Mar. 2019. [Online]. Available: <https://www.mudbath.com.au/insight/the-four-most-commonly-overlooked-problems-in-lean-ux/>.
- [15] N. Tripathi, M. Oivo, K. Liukkunen, and J. Markkula, “Startup ecosystem effect on minimum viable product development in software startups,” *Information and Software Technology*, vol. 114, pp. 77–91, 2019.
- [16] *Wave web accessibility evaluation tool*, Available at <https://wave.webaim.org/>, 2019.
- [17] K. Yamamoto, M. Milstead, and R. Lloyd, “A review of the development of lean manufacturing and related lean practices: The case of toyota production system and managerial thinking,” *International Management Review*, vol. 15, no. 2, pp. 21–90, 2019.
- [18] *Aria*, Available at <https://developer.mozilla.org/en-US/docs/Web/Accessibility/ARIA>, 2018.
- [19] S. Blank, *Why the lean start-up changes everything*, 2018.
- [20] C. Jooste, J. Van Biljon, and A. Botha, “A conceptual framework representing the user experience for business intelligence front-ends,” in *2018 International Conference on Advances in Big Data, Computing and Data Communication Systems (icABCD)*, 2018, pp. 1–8. DOI: 10.1109/ICABCD.2018.8465464.
- [21] *Web content accessibility guidelines (wcag) 2.1*, Available at <https://www.w3.org/TR/WCAG21/>, 2018.
- [22] V. Lenarduzzi and D. Taibi, “Mvp explained: A systematic mapping study on the definitions of minimal viable product,” in *2016 42th Euromicro Conference on Software Engineering and Advanced Applications (SEAA)*, IEEE, 2016, pp. 112–119.
- [23] L. Hokkanen, K. Kuusinen, and K. Väänänen, “Early product design in startups: Towards a ux strategy,” in *Product-Focused Software Process Improvement: 16th International Conference, PROFES 2015, Bolzano, Italy, December 2-4, 2015, Proceedings 16*, Springer, 2015, pp. 217–224.
- [24] L. A. Liikkanen, H. Kilpiö, L. Svan, and M. Hiltunen, “Lean ux: The next generation of user-centered agile development?” In *Proceedings of the 8th nordic conference on human-computer interaction: Fun, fast, foundational*, 2014, pp. 1095–1100.
- [25] D. R. Moogk, “Minimum viable product and the importance of experimentation in technology startups,” *Technology Innovation Management Review*, vol. 2, pp. 23–26, 2012.