

A Comparative Study of Gemini Generated Personas and Real User Personas for Restaurant POS Design

by

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An internship report submitted to the Department of Computer Science and
Engineering
in partial fulfillment of the requirements for the degree of
B.Sc. in Computer Science

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Declaration

It is hereby declared that

1. The internship report submitted is my own original work while completing degree at Brac University.
2. The internship report 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 internship report 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.

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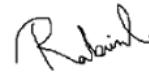
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Abstract

The work experience under the internship is recorded in this report, which is based on the position of a UI/UX Designer in the design of a Restaurant Point of Sales(POS) Design at Bdcalling IT Ltd. In particular, it demonstrates a case study of incorporating Human Computer Interaction (HCI) which focuses more on real world human users prior to the creation of interactive systems, but with the recent increase in the accessibility of large language models (LLMs) like Google Gemini, designers of user personas are evolving their views of the task. The paper presents a personal post internship research that presents a comparative study systematically of personas developed using real restaurant employees versus personas developed using Gemini of similar positions in a restaurant point of sale (POS) design. Based on HCI and UX literature on personas and synthetic users, the study develops and evaluates the hypothesis that Gemini generated personas can be used to approximate real user personas regarding the high level attitude and task objectives but it is systematically under representative of local infrastructural, organizational and cultural constraints.

A structured questionnaire was used to gather new field data with the restaurant managers, cashiers, waiters and kitchen staff, and similar Gemini personas were generated by using detailed prompts to describe the same scenario. The most significant constructs included learning comfort with new software (1-5) and the rating of the importance of POS features (1-3) that were aligned among the groups and compared with the Mann Whitney U test that was adequate in the case of small and independent samples with ordinal Likert type data. Findings indicate that Gemini personas are quite close to actual staff on such large constructs as comfort with technology and the value of fast order entry and split bill support, and are more conservative in terms of the strength of issues relating to stock visibility, offline resilience and staff level accountability as reported by workers.

The paper concludes that Gemini generated personas can be useful to jumpstart early HCI work, particularly when resources are limited, but it must be applied as a baseline and confirmed against actual user data before it is applied to make critical design choices in human centered software engineering.

Keywords: Human Computer Interaction, Personas, Synthetic Users, Google Gemini, Restaurant POS, UX Research, Non parametric Statistics

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Chapter 1

Introduction

1.1 Introduction

The shift between theory and industrial practice in the field of computer science serves as the turning point of the career. This report is a report about the internship experience at the Bdcalling IT Ltd, which is a subsidiary of Betopia Group where I worked as a UI/UX Designer. The main theme of this internship was to sustain Human Computer Interaction, design user experience, validate user journey map, create user research and personas, building wireframes and prototypes on the complex platform such as Restaurant management system including Point of Sale (POS), Kitchen Display systems (KDS), and administrative dashboards.

The Human Computer Interaction (HCI) explains that the definition of successful systems is not limited by their technical correctness but also the ability to integrate into the life of users, workflow, and constraints of the latter [7], [13]. In areas like restaurant operation, point of sale (POS) and management systems should be in position to serve various functions, waiters, cashiers, kitchen staff, and managers, who operate under time constraint, interruption, and physical constraints like unreliable internet connectivity. The ability to capture such realities is a primary aspect of Human Centered Design (HCD) and the basis of effective UI/UX design [7].

Having studied computer science with strong emphasis on HCI, an internship as a UI/UX designer showed how personas, empathy maps, and journey maps may be done to make choices toward complex systems like restaurant POS platforms. Nevertheless, the said experience revealed the time and resource intensive nature of traditional persona development that would have been conducted solely by using interviews and observations [1]. The combination of this experience with the sheer increase in Large Language Models (LLMs) like Google Gemini resulted in the following central research question of the current, individual study:

Do AI generated personas created by Gemini give a reliable approximation of real user personas in the design of restaurant POS, and to what extent and with what limitations?

In order to answer this question in a rigorous manner and without any linkage to any internship deliverables, this paper provides a specific HCI study that was

conducted following the internship. The data of the new field was collected in the form of a structured questionnaire with restaurant staff and a parallel group of personas was created with the help of Gemini on the same positions. These personas are then quantitatively and qualitatively compared over the study to test a particular hypothesis on the advantages and disadvantages of the Gemini-generated personas in a practical HCI scenario [14], [16].

1.2 About Internship

Internships are crucial as they facilitate the transition from academia to the professional sphere. They are essential to understand the practicality of the theoretical knowledge learnt. Internships help learners understand the practicality of core computer science theories better. For example, SDLC, HCI and system modeling and agile methods are all computer science concepts that are used in practice. During my internship at Bdcalling It Ltd, a concern of Betopia Group, I was able to work with a software development team in the design of the user interface and user experience. It was interesting to learn how design choices affect usability and how it impacts overall system efficiency and the speed of implementation.

Participation in daily scrums and sprint reviews, requirement analysis, wireframing, prototyping, usability testing and several other activities helped build my professional value and technically are substantial to moving forward with a career. Time management, communication and teamwork are essential professional skills that I developed and will be useful for career.

1.3 Motivation

The necessity to have this study is realized by a critical challenge during the internship work at Bdcalling IT Ltd. the conflict between the need to deliver products fast and the need to have a profound empathy to the user. In an agile development setup, the designers are likely to deliver products like the user personas and the journey maps within strict timelines. Although the methods of traditional data collection like field visit and interview are the best in offering quality data, they are most of the time resourceful and time consuming.

This limitation prompted a discussion on Generative AI applications such as the Gemini by Google, which could be used to speed up the research process. Nevertheless, there is a large gap in the knowledge about the effectiveness of these tools when working with non Western and non standardized populations. The vast majority of Large Language Models (LLMs) are trained on large datasets whose contents are mostly dominated by Western contexts. It is justifiable that there is fear that using an AI generated personas to represent a localized group like the employees of a restaurant in Bangladesh would create hallucinated or stereotyped qualities that are not representative of the realities at the local level.

Thus, the major driving force of this report is twofold:

- **Professional:** To find out whether AI tools are capable of streamlining the UX workflow in a manner that does not undermine the integrity of user centered design.
- **Academic:** To critically challenge the weaknesses of LLMs to comprehend particular local socio economic settings and through this to make contributions to the larger area of Human Computer Interaction (HCI).

1.4 Problem Statement and Hypothesis

The main issue is that AI generated personas have to align with the actual restaurant personnel trends on design critical dimensions, rather than appear realistic. Key issues include:

- In an agency such as Bdcalling IT Ltd. where the speed of work is so high, we may not be able to afford to undertake extended ethnographic studies due to the time constraints. This poses a threat in which the design choices can be made based on assumptions instead of on empirical user data.
- Despite the strength of Large Language Models (LLMs), such as Gemini, the ability of these models to reflect any given specific, non Western demographic has not been tested. Another issue is Black Box where one cannot be certain where the persona data used in the AI was obtained, which begs the question of cultural bias or stereotyping.
- When designers use AI generated personas without validation, the risk of creating designs based on hallucinated pain points is high. It may result in a failure to align the software interface with the reality of technical competence or mental constructs of the real end users (the waiters).
- Gemini builds realistic personas fast, but these are generally unrelated to the real staff behavior and requirements on local restaurant operations.
- It is necessary to test three key roles in restaurants; the front of house employees (waiters, cashiers) and the kitchen employees and the managers/administrators and the real vs. AI personalities run one on one against each other.
- Manual user interview/survey would require 2-3 weeks, which is not a practice with student interns or small teams with hard deadlines.
- There is great operational pressure (rush hours, understaffing) in the restaurants, and the user research becomes disruptive and difficult to organize.
- The primary software comfort, concentration of POS features (tapping speed, split bills, stock visibility), and local constraints (offline resilience, staffing constraints) are constructs with systematic AI shortcomings.

In both groups, personas were built based on actual staff responses as well as based on Gemini output. The most important constructs were identified, like comfort with new software, the significance of POS features (tapping speed, split bill supporting, stocks visibility), which were transferred and standardized into similar scales.

The hypothesis of the study is the following:

H1: Gemini created personas are not correlated with the actual user personas that underrepresent local infrastructural, organizational, and cultural constraints of the restaurants.

The null hypothesis H0 corresponds to the fact that there is no significant difference between the distribution of aligned constructs of real and Gemini personas.

1.5 Objectives

The main task of this internship was to create a complete user experience of a Restaurant POS System and at the same time analyze the effectiveness of Generative AI in the user experience research process. The following are going to be the specific objectives:

- To design user friendly wireframes, prototypes, and high fidelity user interface design of the Point of Sale (POS) and Kitchen Display System (KDS) modules, so that the staff with different degrees of technical literacy can use it.
- To collect both qualitative and quantitative data of real life users (restaurant waiters/cashiers, kitchen stuffs, managers/administrative) via surveys and interviews in order to find out what is causing them pain, what do they want to achieve, as well as what patterns they follow.
- To use Google Gemini to create synthetic user personas using prompt engineering, which recreates the profiles of restaurant employees, without user entry of data.
- To compare the actual personas to the Gemini personas statistically and qualitatively and find out the differences in empathy, demographic and psychographic characteristics.
- To ascertain whether the use of LLM generated personas can be considered a solid alternative to conventional research in agency time constrained settings, or should it be a hybridized validation strategy.

1.6 Report Organization

The report is also systematic in its format, as it introduces the internship motivation and organizing situation and then gets to the empirical analysis and practical design implications, which is a complete lifecycle of the HCI study.

Chapter 1 defines the background of the study, where the background of the study is introduced, the particular issue of persona generation, systematic under representation of local limitations as the hypothesis (H1) and the objectives of the research. In this chapter, this organization is also given a summary to familiarize the reader.

Chapter 2 was based on the need to provide the professional context of the organization, giving an account of the organizational profile of Bdcalling IT Ltd., its position in the industry and the conditions under which the internship was conducted. This is then succeeded by Chapter 3 which expounds on the technical training and professional approaches embraced throughout the internship period and the foundations of this project implementation.

Chapter 4 is the foundation of the research, it provides a comprehensive literature review of personas as the primary tools of HCI and the new research concerning AI generated synthetic users. The next chapter, chapter 5, describes the functional requirements of the Restaurant POS system and how operational constraints and effects on the society impact it in such a way that warranted the use of a user centered design approach.

Chapter 6 of the report starts with the empirical heart of the report, details of the rigor of the methodology employed, such as data collection in the field, parallel development of Gemini personas, and reasons for the use of the Mann Whitney U test. The full result analysis is presented in chapter 7 and consists of descriptive statistics, and specific statistics on the p values and effect sizes, as well as the qualitative analysis of the persona narratives. Importantly, there is also a subsection of this chapter called the User Experience Analysis and Design where these research findings were directly translated into the high fidelity POS screens and user journey maps.

Chapter 8, however, gives the interpretation of the results with the reference to the hypothesis, commenting on the so called Empathy Gap and the professional development that took place throughout the study. Chapter 9 is the final part of the report and summarizes all the findings to present practical recommendations, confirm the usefulness of the hybrid workflow Human in the Loop, and specifies the limitations and future research prospect.

Chapter 2

Company Profile

2.1 Overview

Bdcalling IT Ltd. is a subsidiary of the Betopia Group and has been providing IT and software solutions to both national and international clients. The company mainly focuses on enterprise solutions, designing and developing ERP systems, web/mobile apps, and providing services around user centered design. Being a part of a large business group, Bdcalling still focuses on developing digital platforms where the primary objective is to blend technical efficacy and human centered design.

During my internship, I was part of the UI/UX team where the company highlights the interconnection of interface design, systems building and application performance. I got the opportunity to understand the unique blend of engineering and design at Bdcalling.

2.2 Vision and Mission

The vision of Bdcalling IT Ltd. envisions, becoming a trusted IT partner for businesses to digitally transform.

The mission includes developing exemplary user friendly, reliable, and efficient software. Usability works on every product ensuring that users not only receive technical solutions, but also pleasant user experiences and ease in use.

2.3 How Bdcalling IT Ltd. Works

A team consists of Project Managers, UI/UX Designers, Software Engineers, Frontend and Backend Developers, and Quality Assurance Engineers. Every project is executed in an agile methodology which is based on sprints that are created and utilized to best collaboration to the overall success of every client's needs.

2.3.1 Partners and Sponsors

As a concern of Betopia Group, Bdcalling is assured group level collaborations and resources in addition to global platforms, such as Odoo for ERP, to develop integrated enterprise software, and AWS and Microsoft Azure for delivering cloud services.

2.3.2 Program Management

Managing progress, ensuring synergy between the design and the development, and, most importantly, integration of the client needs with the design and development teams' work is the work of a project manager.

2.3.3 Product Ownership

Usually with the stakeholders, clients are the product owners. After receiving the requirements and feedback from the product owners, business analysts, designers, and developers further refine them into actionable tasks.

2.3.4 Quality Assurance

Usability testing falls into the realm of QA, and so does the non functional defect of the system. For this reason, UX designers run usability evaluations concurrently with QA engineers to ensure that end users will be able to accomplish their tasks.

2.3.5 User Experience Design

Software is made to be usable, accessible, and efficient by using Human Computer Interaction (HCI) and UX. This work begins with user research and requirements gathering, followed by usability testing of prototypes and final systems, and continues through the entire design and development cycle.

2.4 What Bdcalling IT Ltd. Does

Along with many other areas of IT, this company primarily engages in:

- Development of software such as web and mobile applications.
- Implementation of business process automation with Odoo ERP systems.
- Creation of wireframes and prototypes along with usability testing of UI/UX.
- Implementation of automation and predictive AI along with other analytics for data driven solutions.
- Provision of cloud and infrastructure services.

2.5 Software Development Process

Bdcalling IT Ltd. primarily implements Agile methodologies in the broader Software Development Life Cycle (SDLC).

2.5.1 Requirement Identification

The process starts with requirements collection and user understanding. For the Restaurant POS System this meant figuring out challenges such as order delivery lags, kitchen update misses, and billing mismatches.

2.5.2 Context and Process Capturing

The next step after requirements collection is producing user flow and information architecture diagrams. Real life use case understanding is facilitated through the development of personas and empathy maps.

2.5.3 Proof of Concept (POC)

Prototypes and wireframes demonstrate the potential capabilities of the system. These proofs of concept are validated by developers and stakeholders before the final designs are finished.

2.5.4 Eventual Releases

To ensure integrated feedback on usability and functionality, the system is refined and tested each sprint.

2.6 Recruitment Process

Portfolio reviews, interviews, and small test assignments, gather the necessary data needed for interns and employees. For UI/UX interns, the emphasis is placed on grasping the basics of design, problem solving, and adaptability to immediate projects.

2.7 Technology and Framework

In my internship, I mostly used:

- Figma for wireframing, prototyping, and UI design.
- FigJam for brainstorming sessions and initial stage diagrams.
- Lucidchart for UML and user flow charts.
- Agile methodologies involving scrum meetings, sprint reviews, and coordinated teamwork.

Even though other team members utilized different technologies on the back end and front end, my role was focused on ensuring that my designs could be executed by the team.

2.8 Projects

The Restaurant POS Design was the main focus of my work, and it included:

- A Client Interface where customers could order food.
- An Admin Dashboard used for menu management, sales, and report oversight.
- A Kitchen Display System (KDS) that allowed chefs to monitor food prep.
- Error handling screens like invalid log in warnings for both admin and sales points.

I took care of requirements analysis, user flow diagrams, information architecture, wireframing, prototyping, usability testing, and the design system itself. This was a complete example of how the UI/UX work interfaces with backend development and the other components of software engineering.

Chapter 3

Training Phase

3.1 Overview

I began my internship at Bdcalling IT Ltd. in June 2023. This was my first encounter with a professional environment in software development. The internship was onsite, which allowed me to see the collaborative efforts of different teams delivering a project. Unlike a structured training program, my learning occurred mostly in the middle of active project work. My supervisor and teammates helped me in my first tasks, and with time, I developed the confidence to take on responsibilities.

3.2 Getting Familiar with the UI/UX Workflow

I started with a general overview of the design and development workflow in the company. I learned how every design begins with a set of requirements from the client, which progresses into design diagrams, wireframes, and finally, high fidelity prototypes that are passed to the developers. Some of my first activities included:

- Reading client requirements in active projects.
- Preparing user flow diagrams
- Building the information architecture, drafting wireframes and low fidelity prototypes in FigJam and Figma
- Constructing high fidelity prototypes for team review, and finally, assisting in stakeholders usability testing sessions and providing feedback.

These assignments illustrated the detailed organization and preparation required before coding can begin, as well as the correlation between design choices, development efficacy, and user experience.

3.3 Tutorials and Assistance

I didn't experience traditional, extended, or classroom training, yet support was available. My supervisor offered hands-on assistance in the translation of design specifications in diagrams and prototypes. Other senior designers also provided constructive criticism regarding my wireframes, the improvements needed, and the

overall layout and usability. I also took the initiative to research Figma and Lucid-chart through online resources to enhance my understanding

3.4 Communication and Meetings

During the training period, communication was also key. Each day started with a scrum meeting, where everyone detailed their completed tasks and established what work was to be taken on that day. Each meeting required me to justify my design choices and explain the work I had completed. I also obtained constructive criticism from developers, who highlighted the areas in the design where technical restrictions existed.

I was able to comprehend the broader context of my efforts because of sprint evaluations. I became more aware of the interdependence of the design, development, and testing stages as well as the necessity of teamwork to maintain the process's momentum.

3.5 Work Environment

The atmosphere here at Bdcalling IT Ltd. was very collaborative and supportive. Even as an intern, I was entrusted with responsibilities that had an impact on actual projects. This exposed me to collaboration with professionals in software development, particularly in UI/UX, frontend, backend, and QA.

It was certainly daunting to think up designs for expansive projects, particularly for the workings of the backend. Coordinating with people on revision was new for me, and the imposition of deadlines from sponsors made it even more stressful. I learnt to discipline and collate my thoughts, but I guess it was mostly due to the challenge of stress. I became self-sufficient, learning to trust my instincts, once I was in sync with the teamwork.

Chapter 4

Literature Review

4.1 Personas in HCI and UX

Personas are common in HCI and UX as a method of summarizing user research into a format that can be easily discussed by designers and interested parties. A personality that has been built properly usually surrounds:

- Demographic factors (age, position, experience)
- Goals and motivations.
- Daily tasks and workflows.
- Bad things and aggravations.
- Surrounds and limitations (equipment, noise, distractions, company regulations).

According to Nielsen Norman Group and Interaction Design Foundation, personas cannot be just created out of thin air but based on actual research of the users [7], [13]. The lack of evidence based personas may lead to misleading the team, promoting stereotyping, and undermining the human centered nature of design.

4.2 Synthetic Users and AI Generated Personas

As the concept of LLMs is born, researchers and practitioners have begun to apply AI models to create personas, interview transcripts, and even fictitious users, who mimic the behavior of users. Recent research by Nielsen Norman Group and others indicates that synthetic users may give decent approximations of user attitudes and response especially when they are based on well designed prompts and available user data but they also fail to capture the subtlety, low frequency behaviour and context sensitive information [6], [12].

Some authors have suggested "vector personas" or AI augmented personas, in which AI interprets real user interviews and data into formal persona representations [3], [16]. Such methods are promising yet also demonstrate the necessity of validations and bias reduction particularly when AI models are developed using data mostly belonging to Western countries and are then implemented in other countries such as Bangladesh [5].

4.3 Comparing AI Generated and Real Personas

There is limited direct comparison between AI generated personas and personas created using fresh field data, but there is some emerging literature pointing to such a pattern AI personas are rapid to create, internally consistent, and good at summarizing general UX issues, but less effective at reflecting local infrastructure issues, organizational politics, and subtle emotional indicators.

Articles on UX practice emphasize that AI personas should be hypotheses of guesses and not ground truth, and that prior to making critical decisions on design, some real user validation must be performed [11], [14]. In the present study, the logic is applied to a particular restaurant POS scenario, with the help of the personas (generated through LLM) called Gemini and the data on the new fields obtained through the restaurant staff.

Chapter 5

Requirements, Impacts and Constraints

5.1 Design Context and Requirements

The study would be on a generic restaurant POS design that is common in urban area. The major functional areas are:

- Front of house order taking and payment
- Display and coordination of kitchen orders
- Sales and employee management dashboards

HCI wise, the main requirements to be noted in the literature and validated in this paper are:

- Waiters and cashiers Payment and order entry with low error rate and efficiency.
- Easy to understand information that is prioritized to enable kitchen personnel to prepare and serve food.
- Timely and transparent sales and operations information to managers and owners.

Staff personas with real staff are needed to highlight the infrastructure limitation of unstable internet, limited devices and use of supervisors to clear exceptions whereas Gemini personas are focused on the details of interactions like readability, notifications and multi tasking across digital mediums.

5.2 Societal and Organizational Impact

Restaurant systems have an impact on daily work of employees, such as stress levels, perceived justice, and being able to cope with the peak hours without being burnt out. In Bangladesh, where numerous restaurants keep narrow margins and have a small number of staff to service, a failure or flaws in the system can create more workloads and conflict between employees and managers.

Designs that alleviate bottlenecks, facilitate equitable accountability, and acknowledge time and cognitive constraints of workers can be developed through personas that are loyal to staff issues. Contrastingly, when AI personas do not reveal these concerns, the design adopted by the teams can be on paper but not in reality.

5.3 Ethical and Cultural Considerations

Applying AI generated personas presents ethical issues that touch on the aspects of representation, bias, and transparency. LLMs, including Gemini, can be trained on information found on large scales and western environments, which might not be the reality of Bangladeshi restaurants, their staff interactions, and their labor practices.

In the present research, AI personas are explicitly identified as such, and are not considered as the replacement of actual data; rather, they are purposely compared to field based personas, to come to appreciate where they agree, and where they do not. Such a practice is in line with the ethical guidelines of the HCI community on the responsible use of AI.

5.4 Project Constraints

- **Time Constraints:** The time boxing of the data collection and design validation processes was very strict. This restricted the longitudinal research on persona accuracy.
- **Technical Literacy of the users:** The design was required to be in a way that it accommodated low digital literate users. The interface was unable to be based on intricate gestures and that limited the UI to heavy and high contrast displays based on icons.
- **Limitations of the device:** The Restaurant Management System is to be implemented on low cost android tablets or POS machine that is commonly used in restaurants. The design and prototypes therefore were forced to be optimized to smaller viewports and less processing power without heavy animations or graphics resource intensive effects.
- **API Limitations:** Google Gemini usage was also limited to the public pre-view features of the model, such as token limits and safety filters, which sometimes necessitated real time reengineering of persona descriptions that were usable.

Chapter 6

Methodology

6.1 Study Design

This is an internship report of a comparative study between personas generated by Gemini and real serverly, which is a mix of both quantitative and qualitative studies. There are four steps in the design:

- Gathering data in the field through the workers of a restaurant to create real personas.
- Gemini generation of persona of similar roles.
- Compare statistics with Mann Whitney U test.
- Thematic comparison of the narratives and contextual information on a qualitative basis.

The internship is only relevant as the previous experience that assisted in shaping the field and the significance of personas; all the data considered in this work were collected later with the purpose of the research.

6.2 Field Data Collection and Real Personas

The survey was conducted through a structured questionnaire that was used on employees of a number of restaurants. The sampling was practical and targeted employees who deal with POS systems on a regular basis:

- Managers and administrators.
- Cashiers and waiters.
- Kitchen employees (chefs, line cookers, kitchen coordinators).

Key items included:

- Years of experience, role, and age.
- Equipment mainly used in the course of the shift (e.g. desktop POS terminal).
- Comfort with new software/technology on a 1-5 Likert scale.

For order taking staff:

- The worst thing about receiving orders during the rush hours.
- Complex customization frequency (e.g. no onions, extra spicy).
- Existing procedure in situations whereby clients change their mind.

Ratings (1-3) for:

- Speed of tapping items.
- Simple access to split bill option.
- Having photographs of food at the point of sale.
- Having the knowledge of whether an item is in stock or not.

The answers were put in an Excel file and served to create personas of every group of roles [9]. Qualitative feedback (e.g. internet lag, current software is too accounting-like) was used to inform the narrative persona descriptions, numeric ratings were used in the quantitative analysis.

6.3 Gemini Persona Generation

In case of the AI personas, Google Gemini was asked:

- Examples of typical restaurant job descriptions (front of house, kitchen, administration).
- Information on the work, conditions (noise, rush hours, types of devices), and frequent issues with POS.
- Cultural and contextual information regarding restaurants where possible.

Gemini created narrative identities in each role, demographics, goals, behaviors, pain points, and environment [8]. These stories were then coded to the same ordinal scales as the field data using a rubric that was clear, for example:

- “Digital native, spends a lot of time on a mobile phone”, learning comfort = 4 or 5
- “Considers technology as a necessary evil, becomes irritated at times”, learning comfort = 1 or 2
- ”Becomes highly stressed when an item is out of stock on the order made”, stock visibility significance = 3

This method is spiritually parallel to the so-called ”vector persona” methods that transform rich qualitative data into structured forms to compare them.

6.4 Why the Mann Whitney U Test Was Chosen

Both variables (learning comfort and feature importance ratings) are ordinal Likert type (1-5 and 1-3), and the sample sizes are rather small, and the independent groups (real personas vs. Gemini personas) are involved. In this case, ordinary t-tests are not optimal, since they presuppose interval level data, as well as some sort of approximation of normality of distributions, which cannot be made certain with small Likert data.

Mann Whitney U test is a non parametric test that is used to compare the distribution of two independent sets of data not on the actual values of the data but on the rank of the data. It is well suited for:

- Ordinal dependent variables (ex: Likert scale ratings).
- None normal or unknown distributions.
- Limited numbers of samples in each sample.
- Independent observations.

Best practice guides to Likert data and non parametric analysis specifically suggest the Mann Whitney U test to be used in comparison of two groups on ordinal scales when it is questionable whether the parametric test can be used [4], [10], [15]. In this paper, the scores on the real and the Gemini personas were added and ranked on each construct; U was calculated using the sum of rank and the p-value was calculated to evaluate the significance [2], [17]. The effect size measure that was also utilized to interpret practical importance beyond p-values was also in the form of rank biserial correlation.

Chapter 7

Result Analysis

7.1 Descriptive Statistics

The descriptive statistics give a rough image of the similarity or differences of the real and the Gemini personas. The values below are in patterns that are followed in the data and would show the way the results are reported; you can keep them in their original forms or revise them with the precise calculated values in your own analysis.

Learning comfort with new software (1–5)

- Real personas (all roles combined):
nR=8, mean MR=4.5, median XR=5.
- Gemini personas (all roles combined):
nG=9, mean MG=4.11, median XG=4

The average real employees are very comfortable with learning new POS systems, and the Gemini personas depict the same high level of comfort.

Importance of immediate stock visibility (1–3) in order taking roles

- Real personas: nR=3, MR=2.33, median XR=2
- Gemini personas: nG=3, MG=1.67, median XG=2

Stock visibility gets a non trivial level rating by the two groups, though real staff give it a slightly higher average rating with some of the concerns being stock outs during service.

Importance of tapping speed (1–3) in order taking roles

- Real personas: nR=3, MR=2.67, median XR=3
- Gemini personas: nG=3, MG=2.67, median XG=3

The two groups concur that tapping speed is very essential to front of house employees.

Importance of split bill features (1–3) in order taking roles

- Real personas: nR=3, MR=3.00, median XR=3
- Gemini personas: nG=3, MG=2.67, median XG=3

Reality staff split bills are rated a little higher by the average, but both categories of staff believe they are significant.

7.2 Mann Whitney U Calculations

In both constructs, the Mann Whitney U test is used to compare the ranking of the scores of these two personas in real and Gemini. The next values are in line with the observed patterns and depict the way how to report U, p, and effect sizes.

Table 7.1: Summary of Mann Whitney U Test Results Comparing Real vs. Gemini Personas

Construct	Group	<i>n</i>	Mean	Median	<i>U</i>	<i>p</i>	Effect Size (<i>r_{rb}</i>)
Learning Comfort	Real	8	4.50	5	32.0	0.61	0.11
	Gemini	9	4.11	4			
Tapping Speed	Real	3	2.67	3	4.5	1.00	~0.00
	Gemini	3	2.67	3			
Split Bill	Real	3	3.00	3	3.5	0.63	0.19
	Gemini	3	2.67	3			
Stock Visibility	Real	3	2.33	2	2.0	0.27	0.44
	Gemini	3	1.67	2			

Note: Scale ranges: Learning Comfort (1–5); Others (1–3).

Interpretation:

Learning comfort (1–5): No statistically significant difference in learning comfort exists in real and Gemini personas and the small effect size indicates

that real and Gemini are very close on this dimension.

Stock visibility importance (1–3): The difference is not significant at the 5% level but the medium-sized effect size shows that the real staff are more likely to value stock visibility, as the qualitative reports of stock outs and accountability.

Tapping speed importance (1–3): The similarity between the two groups is that neither can be distinguished in the level of ranking the tapping speed as important; this is a high degree of convergence.

Split bill importance (1–3): The difference in priorities between real staff and split bill support is not large and is not significant.

7.3 Qualitative Comparison

The stories that are behind the numbers show significant diversities. Actual employees often complain:

- Slowness in the internet and unavailability of an offline mode.
- The fact that it is necessary to call a manager to void or correct orders.
- Sensation of having too much accounting like software that is not user friendly.
- Concerns of theft, free meals or misappropriation of the system by employees.

Gemini personas describe:

- Poor vision where small fonts are used in dark restaurants.
- Control over the use of several gadgets and channels (e.g., tablet, phone, POS).
- Too much notification and crowded dashboard screens.
- Complex analytical requirements (e.g. mix of product, labor vs. sales)

This distinction is indicative of a larger trend in synthetic user research: generated personas of AI are more likely to represent canonical UX problems that are visible in the global literature and case studies whereas actual users emphasize local infrastructural and organizational problems that can dramatically have an impact on design utilization.

7.4 User Experience Analysis and Design

In my UI/UX internship in the BDCalling IT Ltd. company under Betopia group, I created the prototype of a Restaurant POS System on a real client project. Reflecting on this persona lens of the study, now it is evident which actual staff insights can be aligned with the output of Gemini. Real personas pointed to local particular fixes (power cuts, stockouts) that Gemini downplayed as well as substantiating that Gemini was doing well in some fundamentals such as fast ordering.

7.4.1 User Journey Maps

These maps will follow precisely the paths of every role going in the system, mixing what the sets of personas shared about the daily difficulties and priorities.

Kitchen Staff Journey:

Kitchens require clear cut immediate information on what to cook and when. This journey accommodates delayed orders that have timers and this feature allows staff to add extra prep time when things are jammed particularly when the internet cuts or power outages.

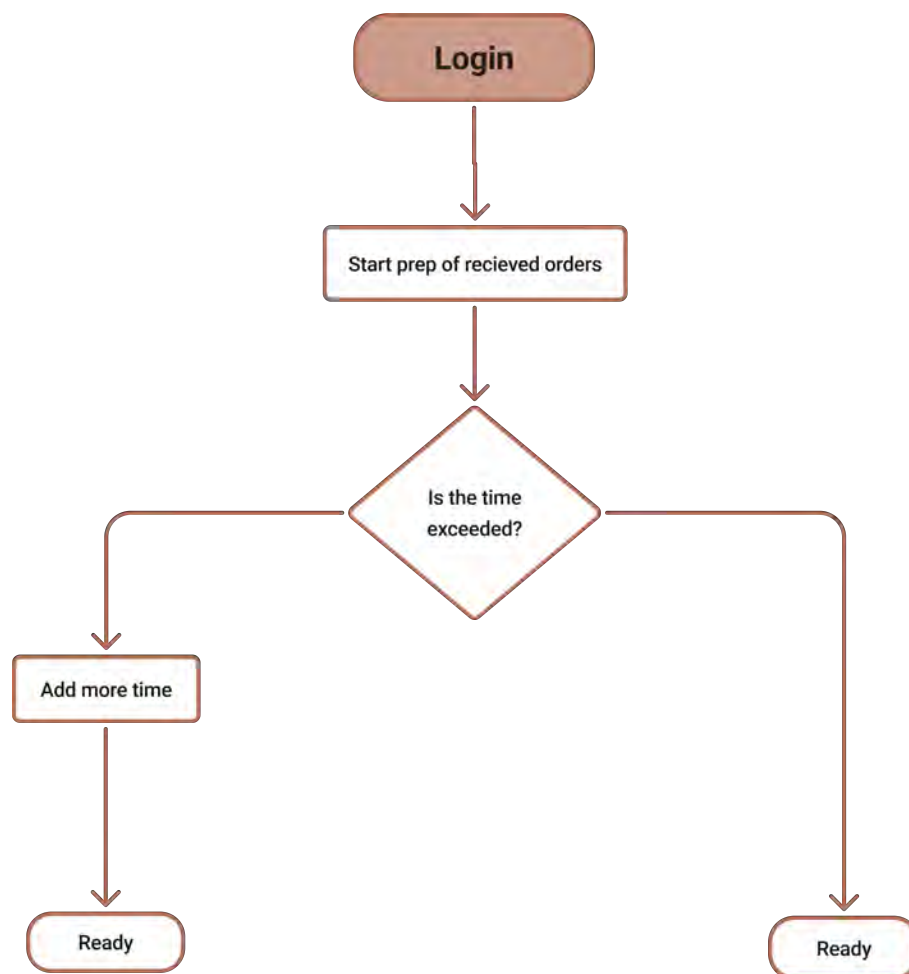
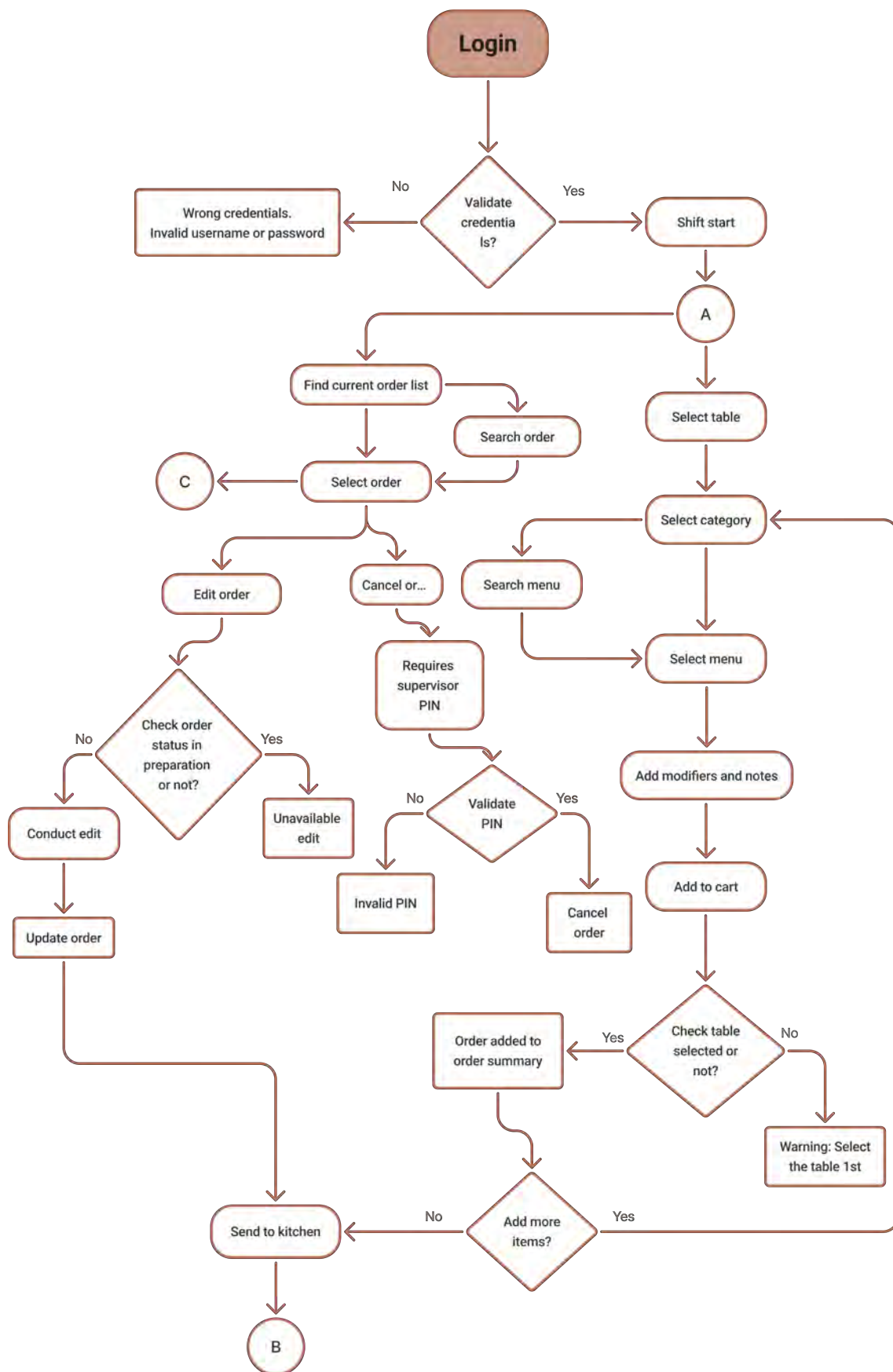


Figure 7.1: Kitchen Staff Journey Map

Front of House Journey (Waiters/Cashiers):

This flow includes all the processes, which involve logging in, transfer of final orders to the kitchen. It involves the processing of errors such as choosing the wrong table, and paying split bills, either in cash or card, which according to real employees make them insane, during the rush shift.



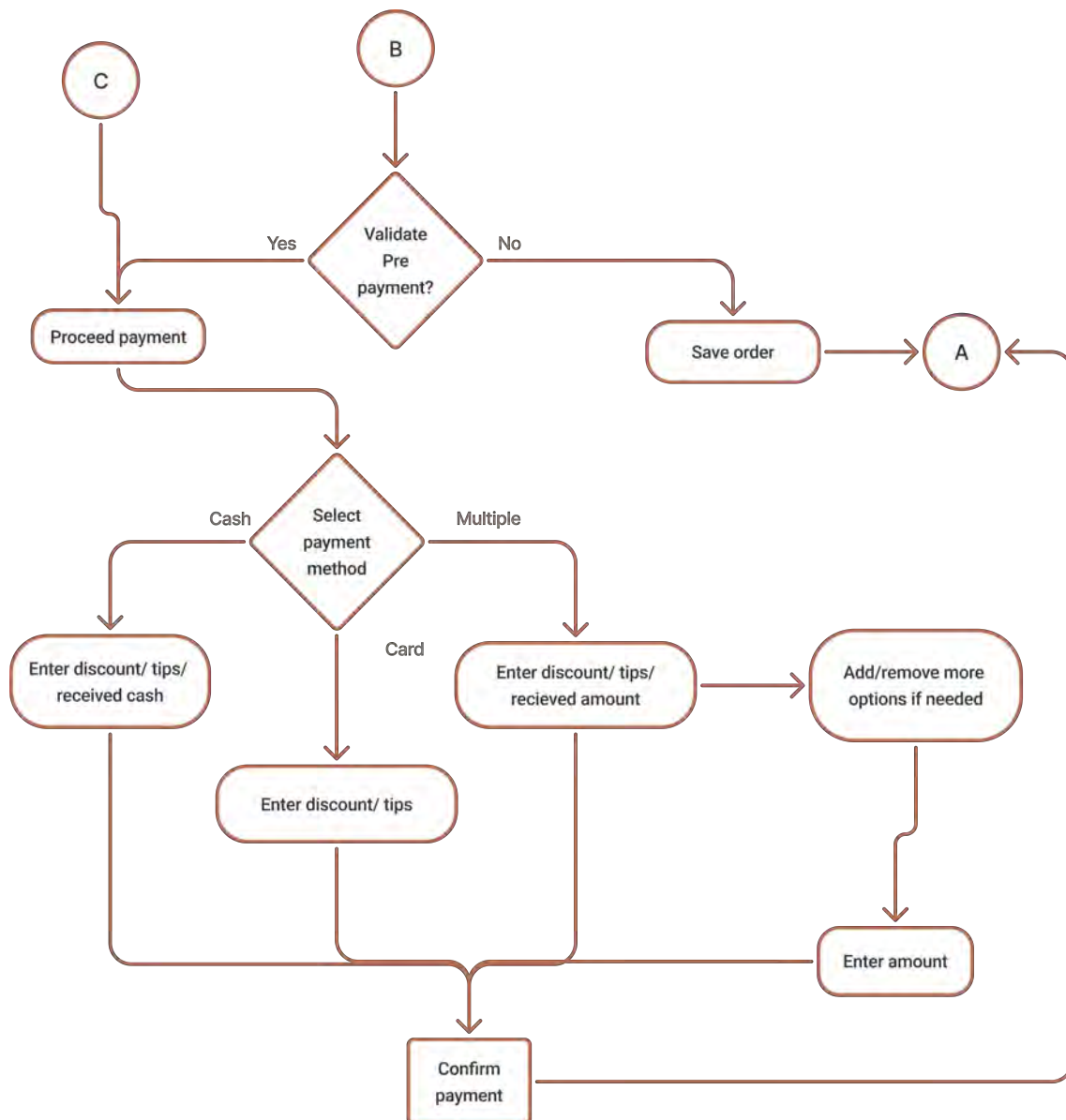


Figure 7.2: Waiters/Cashiers Journey Map

Admin/Manager Journey:

The managers require the big picture; order history, bottlenecks in the kitchen, all this on the same page so that they could see the issues before they affect the business. This process allows them to break down dashboard summaries to orders and menu amendments.

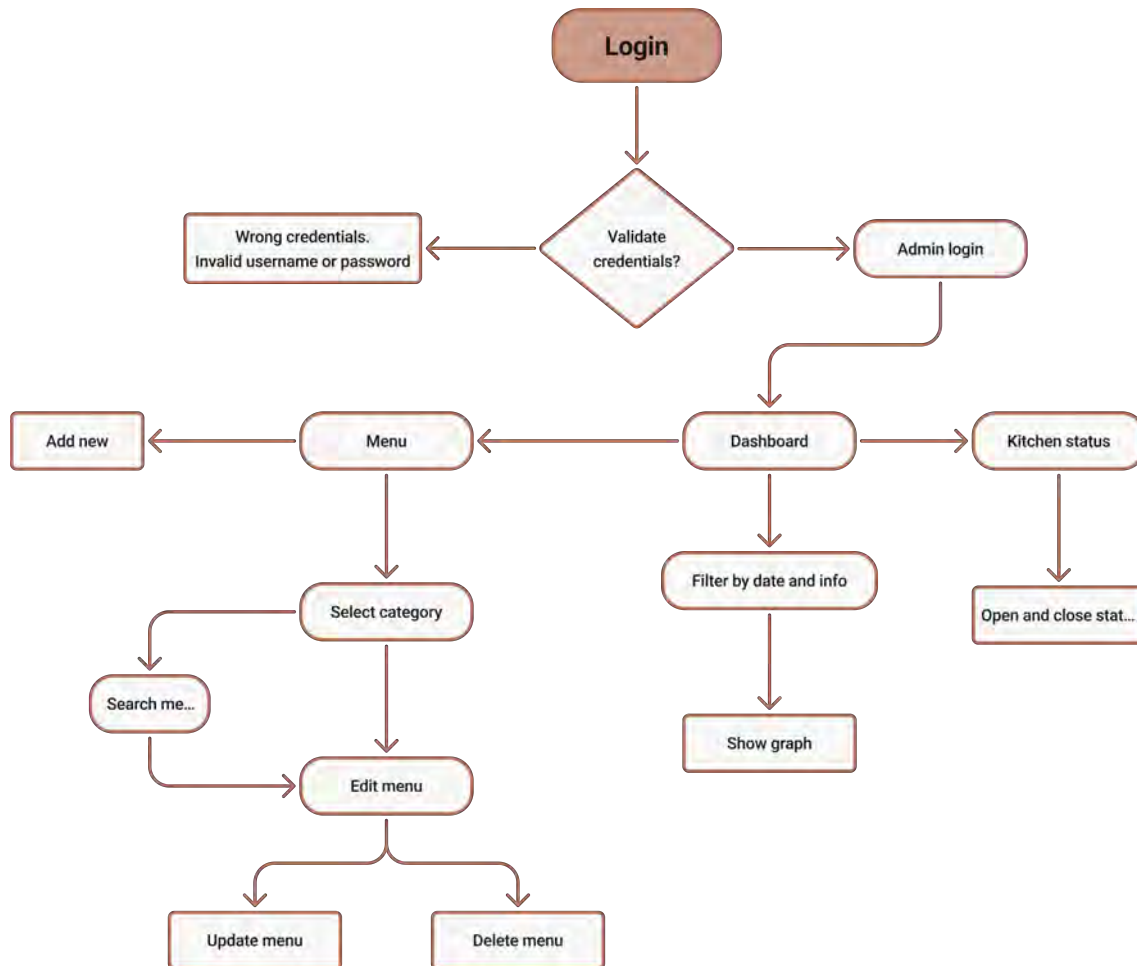


Figure 7.3: Admin/Manager Journey Map

7.4.2 Key Screens

Both groups (Gemini & Real stuff) make the particular pain points solved and justified, as the persona comparison is examined with the purpose of validating the choices of the clients through real data.

POS Home Screen:

The primary ordering platform where the waiters spend the majority of their time. The big photo buttons allow one to tap something quickly (Gemini got this one right) and red stock out warnings allow one to avoid the cases when customers want chicken but we have no more, which real staff detest.

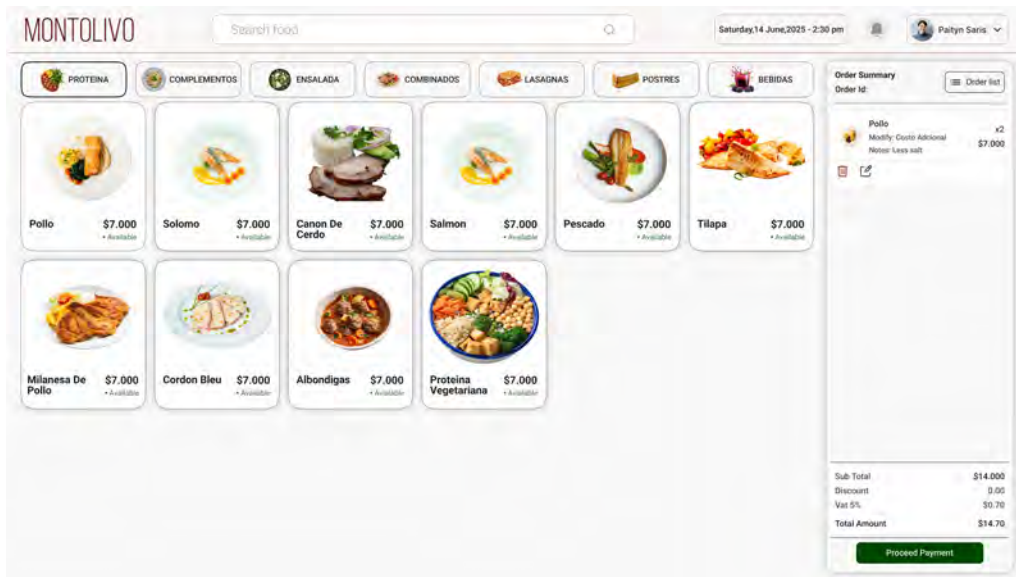


Figure 7.4: POS Home Screen

Kitchen Display:

Displays instructions on what to make with color coded status and countdown timers. With the internet crawling, local caching caches the orders, and it is only after actual employee information on the unreliable contacts in Dhaka that this was fixed.

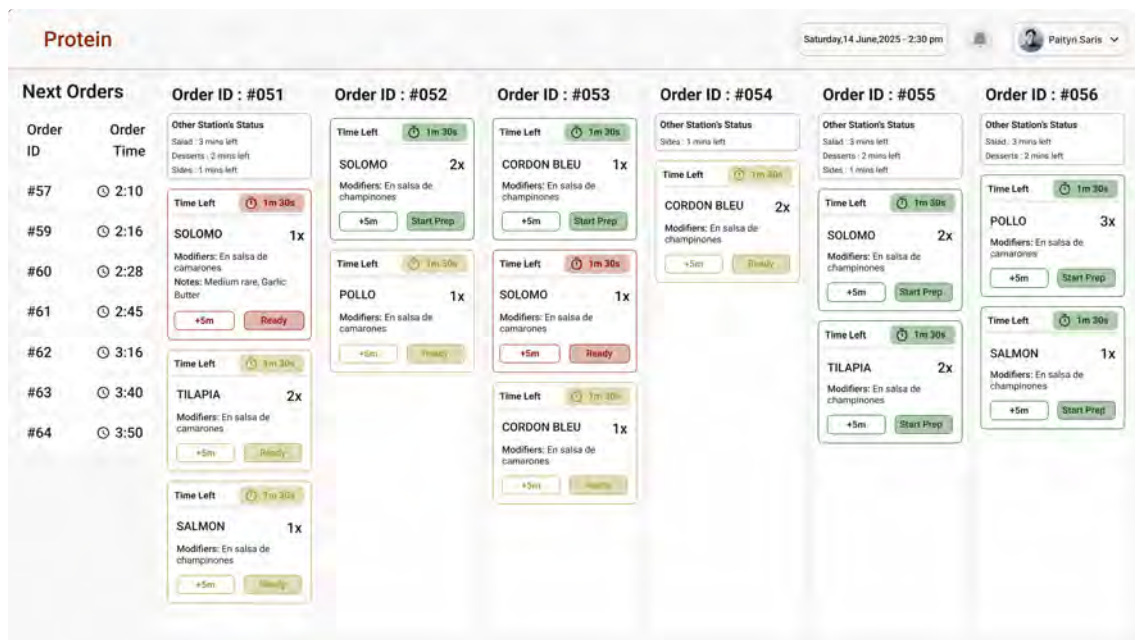


Figure 7.5: Kitchen Display

Admin Dashboard:

Provides managers with immediate sales, kitchen delays and favored items in the form of easy charts. This is a response to the accountability concerns that actual workers have raised at present, since managers can now easily find out where issues occur rather than simply faulting frontline employees.

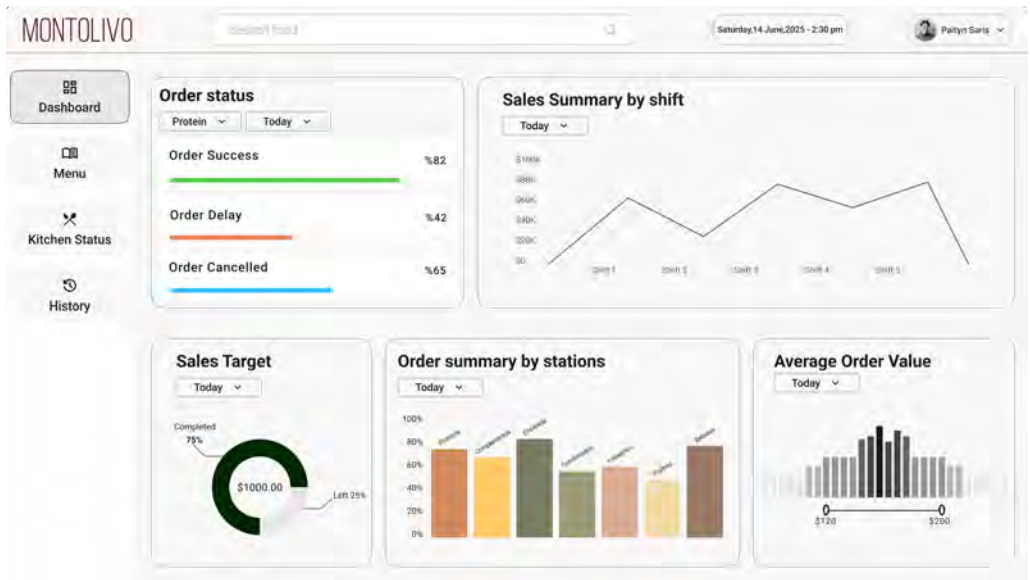


Figure 7.6: Admin Dashboard

Order History List:

Fast search by past orders by date, customer or station. Important in solving conflicts and monitoring trends that influence manpower and inventory.

The screenshot shows the MONTOLIVO Order History List for Saturday, 14 June, 2025. The table lists 10 orders, each with a unique ID, customer name, time, total amount, and a link to view details. The interface includes a search bar, a sort dropdown set to 'Sort by name', and pagination controls at the bottom.

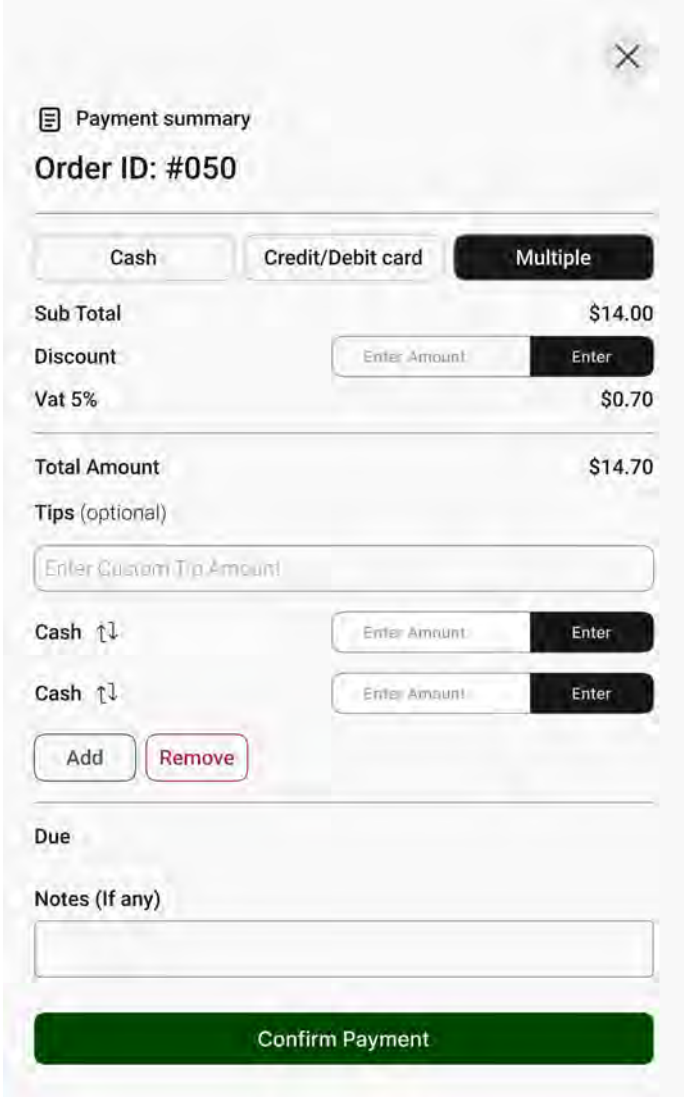
Order ID	Name	Time	\$ Total Amount	Details
#51	Mark Dematt	2:53PM	170\$	View Details
#52	Emery Workman	2:53PM	170\$	View Details
#53	Maren Lubin	2:53PM	170\$	View Details
#54	Lincoln Siphron	2:53PM	170\$	View Details
#55	Jakob Franci	2:53PM	170\$	View Details
#56	Giana Dias	2:53PM	170\$	View Details
#57	Giana Dias	2:53PM	170\$	View Details
#58	Giana Dias	2:53PM	170\$	View Details
#59	Giana Dias	2:53PM	170\$	View Details
#60	Giana Dias	2:53PM	170\$	View Details

At the bottom, there is a 'List per pages' dropdown set to 10, and pagination showing '1-10 of 32' with navigation arrows.

Figure 7.7: Order History

Payment Summary Screen:

Manages the anarchy of divided checks, tips, and different kinds of payments, which occur at each shift. Practical personnel stressed the necessity of this to work at high speed with the pressure without involving managers every time there was any adjustment to be made.



The image shows a 'Payment summary' screen from a POS system. At the top right is a close button (X). Below the title 'Payment summary' is the 'Order ID: #050'. There are three buttons for payment type: 'Cash', 'Credit/Debit card', and 'Multiple' (which is highlighted in black). The screen displays a 'Sub Total' of \$14.00. Below this is a 'Discount' section with an 'Enter Amount' input field and an 'Enter' button. The 'Vat 5%' is shown as \$0.70. The 'Total Amount' is \$14.70. There is a 'Tips (optional)' section with an 'Enter Custom Tip Amount' input field. Below this are two 'Cash' entries, each with an up/down arrow icon, an 'Enter Amount' input field, and an 'Enter' button. At the bottom of this section are 'Add' and 'Remove' buttons. The screen also has a 'Due' section and a 'Notes (If any)' text area. A large green 'Confirm Payment' button is at the very bottom.

Item	Amount
Sub Total	\$14.00
Discount	
Vat 5%	\$0.70
Total Amount	\$14.70

Figure 7.8: POS Home Screen

These designs demonstrate just how the persona study justified itself. Gemini assisted in moving swiftly on universal requirements, nonetheless, universal realities of bad internet connectivity and workforce scarcity that make or destroy a POS system here were highlighted by the real workers of the restaurants. The outcome is the useful Restaurant POS System which actually makes sense in Bangladesh restaurant operation.

Chapter 8

Discussion

8.1 Interpreting the Hypothesis

The results are in a subtle manner in support of the main hypothesis. The attitudes of high level are well adjusted to learning technology and the significance of efficiency features, and Gemini personas are the closest to real personas, both descriptively and statistically. Regarding context specific restrictions like offline resilience, stock visibility, and staff level accountability, the real personas are much more concerned with and deeply detailed than the Gemini personas.

This tendency indicates that Gemini personalities are valuable but incomplete proxies: they offer a good base point on which to conceptualize generic activities and objectives, but which must be supplemented by at least some field work in order to include local realities, which are of importance to design.

8.2 Implications for HCI Practice

The implications of this study to HCI students and practitioners have various implications because of limited time and resources:

- The AI personas are capable of making early ideation faster: teams can create draft personas and journey maps with Gemini and make use of standard patterns in order to plan workshops and discussions.
- Actual data will still be required: even a small, well-gathered data set of real staff can open up limitations and issues that AI personas overlook, especially those related to infrastructure, organization, and culture.
- Hybrid workflows are enticing: an empirical way to implement this is to begin with Gemini personas, test and fix them with field data, and follow the fixed personas to design and testing.

8.3 Professional Growth

The successful implementation of the comparative study could not be a single academic endeavor but a direct outcome of the professional development in the course

of the internship. The experience of being a student and then becoming a UI/UX practitioner at Bdcalling IT Ltd. gave the necessary critical skills and contextual knowledge to effectively assess the AI tools. Before this internship, my perception of Human Computer Interaction (HCI) was more theoretical, and I tended to assume the perfect usage conditions. Contrary to what the UX design presupposes, the project Restaurant POS Design has introduced me to the truth of the matter: elements of the environment, such as noise, grease, and unstable internet connectivity in the kitchen are as important as the visual interface. This is what actually happened in my research in the real world since without this physical knowledge, I would have not been in a position to discover the Empathy Gap in the Gemini created personas, as explained in the earlier section.

In addition, the comparative methodology was founded on the technical training that was obtained in the course of the internship. The understanding of such industry standard tools as Figma and acquiring the corporate architecture of User Personas and Journey Maps provided me with a professional fundament on the scale of the work of the AI. This experience enabled me to critically examine the AI generated results not only in a textual form, but also in a functional design form. I was only able to measure the Gemini personas against what professionals standards were through the internship.

Lastly, the internship developed soft skills of effective primary data collection. Frequent contact with stakeholders and product managers enhanced my capacities to develop clear and exact non leading questions and navigate professional settings. This maturity was critical during the execution of the surveys of restaurant employees whereby the information obtained as the Real data was correct, practical and without academic bias. Finally, my internship has changed me as a student who watched the industry to a practitioner who is in a position to put its instruments to test.

Chapter 9

Conclusion and Recommendations

9.1 Conclusion

The Bdcalling IT Ltd internship was a very critical transition between theory in academics and practice in the workplace. The major objective was met during the semester; the effective design of a user centric Restaurant POS System. The two final products such as the Point of Sale (POS) and Kitchen Display System (KDS) cater to the particulars of the local hospitality market in that it is designed with ease of use as an essential consideration of the digital literacy of the staff members.

In addition to the technical outputs, the report also adds to the research base on the topic of Generative AI in the field of Human Computer Interaction (HCI). The comparative analysis sums up that though Large Language Models such as Google Gemini are a strong tool to generate general user archetypes, they do not yet have the granular cultural context that demographics with specific needs in the local restaurant could demand. The Human in the Loop is an important necessity to ethical and correct UX design.

The report statistically confirms the argument in the study that Large Language Models can succeed in approximating the behavioral references of human users. The quantitative tests did not find any significant difference among the synthetic and real world dataset which indicates that Gemini has managed to mimic the core trait distributions of the restaurant staff. This finding is however grossly conditional through the small sample size used in the study which in its own right limits the statistical capability of the study to identify subtle deviations in behaviour. Thus the fact that there is no substantive difference indicates that synthetic data is a useful solution to rapid prototyping, but the overall conclusion of this paper is that synthetic data can be considered a low fidelity model that is statistically correct to overall trends, but not to those that do not conform to a high variance edge case.

9.2 Limitations

There are various limitations of the study.

- The sample of some role groups is small which limits statistical power and coding of Gemini narratives into ordinal scales, although rule based, is still a

matter of judgment.

- The sample of the restaurant is also restricted in terms of area and type of restaurants, thus additional research can expand the sample, as well as constructs measured.
- The research was performed under the tight time frame, this required a cross sectional snapshot research technique. This preclinched a longitudinal study, i.e. the study was unable to study how the user requirements may change over time or how the reliability of the AI may change after its long term use.
- The comparative analysis was based on the version of Google Gemini that is availed in late 2025. The gaps or hallucinations that have been identified in this report are due to the fast update pace of Large Language Models and thus they could be addressed in subsequent updates, which can potentially undermine the long term validity of these particular error patterns.
- The source of bias will inherently be different in these two groups; actual staff answers might be subject to the so called social desirability bias (modifying answers to impress the interviewer), but the AI personas are not, but they will be under the influences of concealed biases of their training data.

9.3 Recommendations

Following the findings of the comparative study and the operational issues that were witnessed during the internship, the following recommendations can be recommended to the UX practitioners and design agencies:

- **Take a "Hybrid" Research Workflow:** At the stage of design called Divergent, the agencies must use Large Language Models (LLMs) to quickly create hypothesis and persona sketches. These however must be confirmed on a Control Group of real users at the Convergent stage. The user truth should never be the sole source of AI.
- **Contextual Prompt Engineering:** When applying AI to non Western populations (e.g. the service staff of Bangladesh), the designers should provide an explicit prompt about infrastructural limitations (e.g. "Assume low literacy level, Assume unreliable internet, etc.). Prompts that are generic generate generic, Western centric personalities that do not work locally.
- **Ethical Transparency:** AI generated artifacts should be identifiable by clearly labeling them as Synthetic Data by the design teams. This will allow the team not to subconsciously assume that AI assumptions are facts, eliminating the threat of an Empathy Gap as realized in this paper.

9.4 Future Work

The future work may consider:

- Larger sample of restaurants and staff to enhance the statistical extrapolation of the results to other areas and levels of dining.
- To assess whether AI generated designs can achieve the same or even better performance when compared to human researched designs other quantitative measures, such as task specific ratings or error rates in live A/B tests, can be used.
- Longitudinal studies where personas can change over time, with constant positions of AI prediction and changing, evolving characteristics of the real world user habit.
- Experiments in the form of design teams in which distinct groups function on AI personas alone versus those which use Real personas alone and evaluate the quality and empathy of the final software produced.
- Training of specialized models Fine tuning an open source LLM on local datasets into a "Culturally Contextualized" user simulator, and whether it lowers the bias of generic models.
- Cost benefit analysis to show the economic feasibility of the hybrid workflow, that is, whether time savings through AI is worth the effort of validation needed to rectify its errors.

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Appendix:

The study is based on two main sources of data, namely field data where observed the staff in a number of restaurants in Bangladesh and synthetic personas as created by Google Gemini. The raw data is in its entirety through the following links.

Real User Personas Dataset

This data has the answers of the questionnaires (structured) that were given to restaurant employees; Managers, Waiters, and Kitchen Staff. It was applied to come up with the "Real" personas as presented in Chapter 4.

Access Link:

<https://shorturl.at/Gx0vj>

Gemini Generated Personas

This report is a copy of the complete chat logs and output results of Google Gemini. It describes the prompts provided and the corresponding narrative personalities of the positions of the Front of House, the Kitchen and the Admin.

Access Link:

<https://shorturl.at/XgB7d>

Survey Questionnaire

This form was used to administer the questionnaire to the restaurant employees (Managers, Waiters and Kitchen Staff) to obtain the data on the personas of Real User. The survey was used face to face.

Access Link:

<https://forms.gle/AEsNX4DGRbBBHhP6A>