

**Framework for Guiding the Design of Mobile
Collocated Interaction**

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Framework for Guiding the Design of Mobile Collocated Interaction

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**A project report submitted in partial fulfilment of the
requirements for the award of Master of Information Systems**

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December 2022

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

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ABSTRACT

The physical existence of collaborative activities can be improved with mobile application. Collaborative activities of “same time, same place” has the same meaning of collocated interactions. While collaborative activities requires trusts and social interaction, this paper aim to research on improving collaborative interactions with mobile collocated applications and propose a mobile collocated interactions guided design framework. The proposed attributes were based on past literature review and the proposed mobile collocated interactions guided framework were generated. The prototype of mobile collocated applications was created based on the proposed attributes and framework with the food ordering menu scenarios in a restaurant. The qualitative method was used through user interview survey, whereby the prototype was introduced and experimented by the users. The results were interpreted with positive feedback of having mobile collocated application of food menu ordering application whereby there are multiple functions related to collocated activities were introduces such as view your menu, table chat request, and able to view multiple users in which these functions are not yet seen in the current/traditional food ordering menu applications.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Everyone tends to be involved in collaborative activities, for example, sharing a photo using their own personal mobile devices to their family or friends. The current mobile functionality has extended the basic functionality of a traditional mobile phone.

Mobile devices are considered as personal to every individual owner, for it contains the personal and financial information, for instance, mobile e-wallet, mobile e-ticket reservations, and mobile travel check-in.

While collaborative activities require social interaction and the trust from both participating parties, if two individuals do not know each other, the collaborative activities will be most likely to be minimal or none, but the collaborative activities will be satisfactory if both individuals are familiar with each other. Social interaction is the action or communication between two or more individuals in the same social situation. The physical existence of collaborative activities with “same time, same place” can be improved with mobile application, as the current state of mobile interaction in social gatherings often caused the habit of ignoring people in surrounding that could not support social interaction. This leads to the importance of a guided design framework of mobile collocated interaction.

Collocated interaction refers to the interaction which has direct involvement with someone based on the same time and same place situation, this also includes properties of real-time where an activity occurs on the actual time. Social interaction refers to the community gathering with companionship, where trust and privacy is a property of social interaction.

1.2 PROBLEM STATEMENT

The problems identified was consolidated from collocated related literature review papers such as (Olsson *et al.*, 2020), (Lucero *et al.*, 2013), (Jarusriboonchai, Malapaschas and Olsson, 2016), (Olsson *et al.*, 2016), (Fischer *et al.*, 2016), (Mitchell and Olsson, 2017), (Lucero *et al.*, 2016), (Lundgren *et al.*, 2015) and generated *Figure 1* through Atlas.ti software application.

There were two main problems reported by Olsson *et al.* (2020) which was identified in the collocated social interaction which are the use of current technology interrupting on-going social interaction and the lack of social interaction in collocated situations when suitable. Olsson *et al.* (2020) outlined the enhancement of collocated social interaction concept which consists of encouraging, inviting, and facilitating that the technology of enhancement is targeted to produce behavioral result which could further enhance collocated social interaction. However, the aim of social enhancement is difficult to be developed, hence, the best ways for technology to take part in social interaction remain open questions.

Nevertheless, Lucero *et al.* (2013) mentioned that people tend to spend more time with mobile devices than with social networks physically, often avoiding eye contact with people around them. Jarusriboonchai *et al.* (2016) mentioned that a private “bubble” is generated when a person is occupied with activities on mobile devices and becomes distracted.

Olsson *et al.* (2016) reported that information technology based solutions could provide benefits of collocation interactions for social issues such as loneliness, social ignorance, exclusion, and discrimination that was not focused in past research. Fischer *et al.* (2016) reported that mobile devices brought up challenging issues of societal situation and should inspire further research of face-to-face interaction involving technology.

Mitchell and Olsson (2017) reported that in city areas, where collocated neighbours are together had increased the sense of disconnection and loneliness where people tend to feel “alone together”.

Lucero *et al.* (2016) explained the need to understand the importance of spatial relationship between the technology devices and people.

Lundgren *et al.* (2015) explained that the properties of the framework for Social can be difficult to be controlled and pull off successfully in specifying how system is being used.

This research is to propose guided design framework for mobile collocated social interaction by bridging the gap between the use of mobile technology in social interactions.

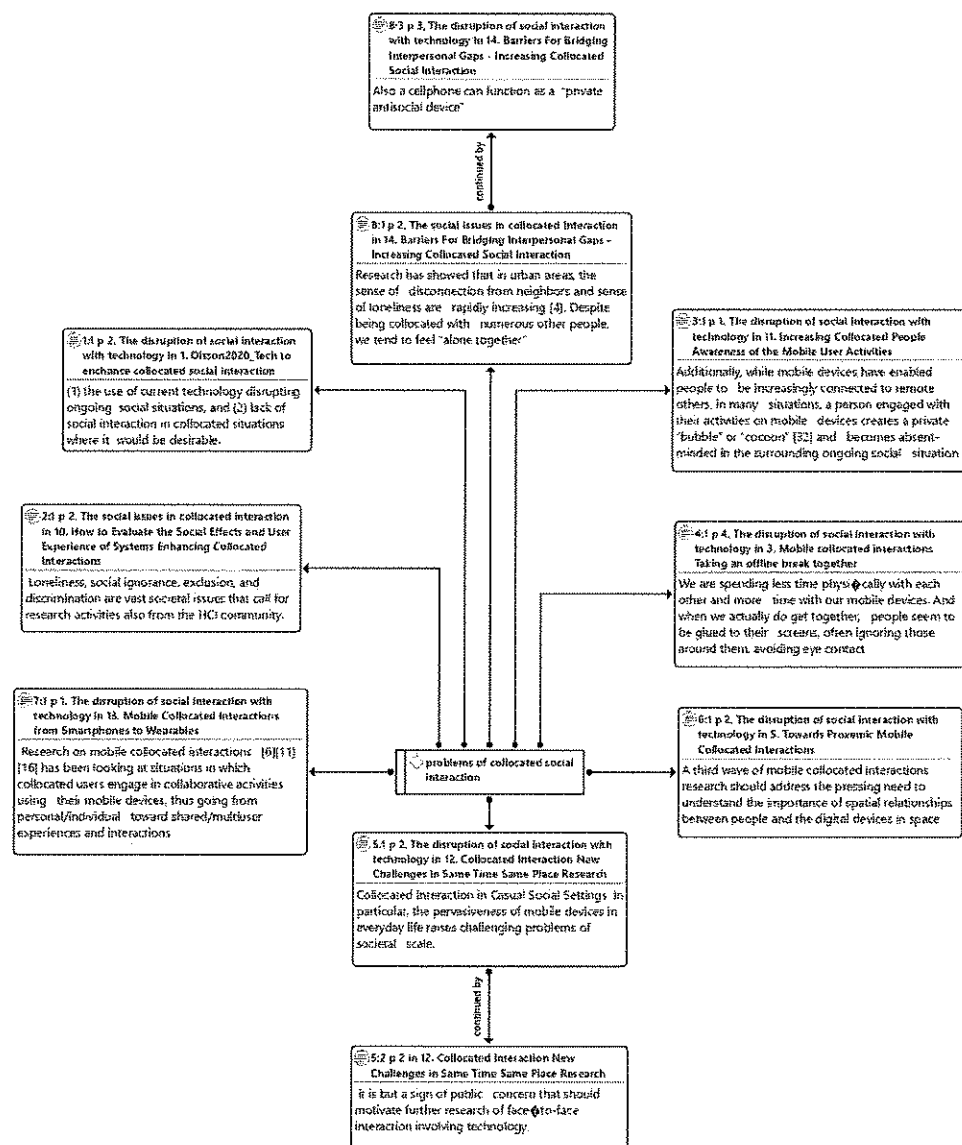


Figure 1.1: Network Diagram of Problem Statement.

1.3 OBJECTIVES

The purpose of this research is to propose a guided framework of mobile technology uses in collaborative activities. Objectives have been identified as below:

- (i.) To analyse existing design framework and theories related to collocated social interaction.
- (ii.) To propose guided design framework for mobile collocated social interaction.
- (iii.) To evaluate the proposed mobile collocated design framework.

CHAPTER 2

LITERATURE REVIEW

2.1 COLLOCATED SOCIAL INTERACTION

C.A., S.J. and G.L.(1991) explained that groupware can help to perform an activity in real-time with face-to-face interaction, while collocated social interaction focuses on scenarios of 'same time, same place', which is a synchronous interaction.

Lucero (2017) reported that proxemics is a research area focused on the use of space and physical measures to comprehend interpersonal interactions, as the human-computer interaction is moving towards to embrace and actualize the ideas of proxemics is being used to support mobile collocated interactions. Observations were carried in a public environment in Italy, where people were using their own devices in a very familiar way, as opposed to "experimental", which is often difficult to reproduce in the lab where devices were given to participants for a specific study, thus are new and unfamiliar to the participants. Most of the people observed seemed to be familiar with others around them, which led to very relaxed and unusual formations, such as, when people were lying next to others on a bench.

Mitchell and Olsson (2017) mentioned that there are different barriers for bridging interpersonal gaps to reduce the inhibition of interacting with unfamiliar people by creating interventions and systems. The focus on physical barriers by using filters that partially or fully separate people, for instance, restricting mutual abilities to make physical contact, 10 barriers from 9 different creators that has been clustered into three types of restrictions which are Opaque Barriers (Anonymous Hugging Wall, TouchMeDare, Smell Blind Date), Restrict Interaction Modalities (Table for Two, Pre-Handshake Device, Teeter Swing), and Temporary Linkups (Double Carousel, Take a Moment, Blender).

Lundgren *et al.* (2015) explained that collocated action is supported by the possibility of showing the screen or simply handle the device over to another person.

Olsson *et al.* (2020) reported that collocated interaction directs the synchronous and interaction between people in proximity. The motivation for interaction initiation as well as better understanding and appreciation between people can be increased through revealing details about another person.

2.2 MOBILE COLLOCATED INTERACTION

Olsson *et al.* (2020) reported that the most common proposed prototypes technologies are off-the-shelf mobile devices, “Pass-them-around” is a mobile application that shares photo in a collocated group, and “Who’s next?” connects collocated player’s mobile phones via Wi-Fi which is an ice breaking game.

Lucero *et al.* (2013) reported that mobile devices were originally utilized for individual use and in Western culture, people are not supposed to go into the mobile phone of another person. On certain occasion, people may share their phones for a look in the photos, and to fully benefited from mobile collocated interactions, individuals must communicate and start to perceive their personal devices as part of shared common devices, similarly to the concept of board games that combine the individual use of cards, tokens, and money with the shared use of dice and board.

Mobile collocated interactions offer a way to disconnect from the network for a while and take a break. One example of human activities supported by digital technology and especially for interaction that benefit from face-to-face communication is photo sharing. In mobile collocated interactions, individuals should ideally be able to make use of personal devices privately, the shared use will usually keep the device flat on a table or projecting information on the wall so that at least one person can comfortably see the shared content.

Patel *et al.* (2010) argues that taking mobile photo and sharing has been in favour from the Western world but it is not as interested as in South Korea. Mobile collocated photo sharing technology design will be evaluated to determine the ways in which photo capture and sharing can affect and enhance face-to-face interaction in a social group. The photo sharing was conducted with Mobiphos (Clawson *et al.*, 2008) a mobile application prototype to determine the collocated photo sharing in different groups of culture between Koreans and Americans to support photograph capture and sharing for collocated users in a

group, such as friends participating in social activities with automated sharing of real-time photos within the group.

Lucero (2017) reported that mobile collocated interaction has been explored in situations where personal mobile devices were used from individual/personal towards multiple/shared experiences.

2.3 EXISTING DESIGN FRAMEWORK

Olsson *et al.* (2020) described the overview of social design objectives of enriching means of social interaction, which refers to adding new elements to collocated interaction. The design approach is “Introducing constraints” where the prototype is design with an intention to encourage social interaction by guiding the users how to enact on collaborative activity. Collaborative activities is the activity of exchanging information, and one of the activities where strangers can get to know each other is through certain barrier.

Mitchell and Olsson (2017) formulated different inspirational patterns, for example, “Closer Through Not Touching” which restricts interpersonal touching through other senses to reduce inhibitions for interacting, “Closer Through Not Seeing” provides interaction through other senses to reduce shyness of contact, and “Minimize Encounter Duration” which provide mechanism that separate and allow people to connect with no control of the duration of an encounter, as openness and transparency are widely considered to be the desirable qualities to develop interpersonal relations.

Lundgren *et al.* (2015) presented the framework of mobile experiences for collocated interaction, and it consists of four interrelated design perspectives: Temporal, Technological, Social, and Spatial. The Temporal Perspective expresses to the time-related experience of system users, involving the momentum of user activity to happen at the same time. The Technological Perspective expresses to how the software makes use of existing hardware. It involves the flow of information, the ability to interact and the trigger progress by certain actions. The Social Perspective expresses to the social characteristics of collocated situations, like the outline of the face-to-face environment, the person who acts, and the connection inside that environment. The Spatial Perspective expresses to all sense of physical situation, space, and the location.

The drawback of the current framework is that the control versus outcomes, for example, (Spatial) property of the framework are more controllable where proximity between people such as enforcing group of users to meet up at a specific location, whereas (Socially) specifying how system use is formulated can be difficult to execute successfully.

The strength of the current framework is that the properties proposed in the framework is focusing to the genre of mobile collocated interaction design.

The design attributes under Social is focus, coordination of action, and framing. Focus describes what users do together and has the states of collaboration, communication, and competition. Coordination of action describes how actors perform coordinate actions together and has the states of timing actions and combining actions. Framing describes the activities carried out in which main social activities.

2.4 LITERATURE REVIEW COMPARISON

Based on the literature review analysis on collocated related journals, there are three main categories identified which are collocated interactions, social interactions, and role of technology, it identified the three main elements required in the proposed design framework for mobile collocated interactions. The different authors and proposed terms were marked in Table 2.1 below.

Table 2.1: Journals identified with proposed terms.

Journals / Proposed Term	Collocated Interactions	Social Interactions	Role of Technology
(Olsson <i>et al.</i> , 2020)	✓	✓	✓
(Lucero <i>et al.</i> , 2013)	✓		
(Jarusriboonchai, Malapaschas and Olsson, 2016)	✓	✓	✓
(Olsson <i>et al.</i> , 2016)	✓		
(Fischer <i>et al.</i> , 2016)	✓		✓
(Mitchell and Olsson, 2017)	✓	✓	✓
(Lundgren <i>et al.</i> , 2015)	✓		

The comparison of the literature review helps in identifying relevant papers that contributes to the research of the proposed attributes and proposed design framework related to the mobile collocated interaction based on past research papers which are related to the research topics.

2.4.1 PARTICIPANTS COMPARISON

The number of user evaluation has also been compared in terms of the papers related to mobile collocated journals which were reviewed in the abovementioned. For example, Lucero, Holopainen and Jokela (2011) conducted a total of 20 participants with five groups of four friends so that they feel comfortable with one another on the photo sharing situation.

While Olsson *et al.* (2016) conducted a ten day field trial with 13 participants using the prototype of Social Display which provides a light-weight cue of a user's current activity that are displayed on a secondary screen attached to the backside of a mobile device. Patel *et al.* (2010) recruited a total of 14 participants on the real-time sharing photo capture activity using Mobiphos application. Lastly, Clawson *et al.* (2008) recruited 9 males and 4 females for their studies in the Mobiphos application photo sharing.

Hence, the proposed number of user evaluation for this paper is calculated based on the total participants divided by the total number of papers which is 15 participants.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 INTRODUCTION

This chapter aims to present the methodology on the progress of each stage for the framework of guided design for mobile collocated interaction to achieve the objectives outlined in Chapter 1.

The research design is introduced, followed by the stages of research explained in detailed, including research design, phases, and the work plan.

3.2 RESEARCH DESIGN

Research design is the plan, structure, and the overall research scheme which provides an outline on what a researcher will perform, the fundamental objective of this research is to provide a guided framework for mobile collocated social interactions.

Preliminary phase is to identify initial design framework and analysis, prototype development is to develop the prototype based on proposed design attribute, and last phase is to perform review and evaluation.

The different phases have been illustrated in the next sections, as well as the expected work plan.

3.3 RESEARCH QUESTIONS

The problem statement which was identified in collocated social interaction are the existing technology disrupting social interactions, the habit of ignoring people around them and spending more time with mobile devices in social gathering.

This research aims to answer the following research questions defined:

- (i.) Is the proposed guided framework sufficient to create a mobile collocated social interaction system?
- (ii.) How does the proposed guided framework help the designer to create a mobile collocated social interaction system?

3.4 PRELIMINARY PHASE

The methodology of the research includes performing literature review related to the journals, articles, and framework of mobile collocated.

Problem statements were identified with literature reviews to identify the existing gaps and problems of the mobile collocated in social interaction. Problem statement network diagram were generated with thorough understanding of different papers and journals from different authors.

Next is to perform the literature review analysis by identifying the existing design attributes, design approach and proposed the guided framework related to mobile collocated in social interaction.

The proposed design attributes were gathered to solve the gaps identified in the problem statement and the proposed guided design framework was proposed together with the prototype.

The literature review analysis and problem statement were conducted through ATLAS.TI application and the Harvard referencing citation was cited with Mendeley desktop.

3.5 PROTOTYPE DEVELOPMENT

Based on the proposed design attributes, the mobile collocated prototype in social interaction will be created to provide the experience of mobile collocated in social interaction to different users.

The proposed design framework was conducted by identifying the common attributes from the literature review of mobile collocated in social interaction. Through the current existing design elements and design attributes identified from the different authors, the proposed design attributes will be used as the initial guided design framework for mobile collocated in social interaction.

3.6 REVIEW AND EVALUATION

Once the proposed design framework and mobile prototype has been created, observational study on the user experience in the mobile collocated prototype will be performed with different targeted user groups for detailed analysis, trial and error of the guided design framework will be evaluated.

Targeted users are mobile application smartphone users, as mobile application smartphone user performs daily usage of calls and messaging and have the knowledge of mobile functionality. Based on the result from the evaluation of prototype, the design framework will be redefined.

3.7 WORK PLAN

The timeline of the research will be separated into one minor section and two major sections. The initial research proposal timeline requires 7 weeks to be completed, and the two main sections of the research project will officially require 24 weeks to be completed. The work plan is expected to be as follows:

Table 3.1: Work Plan Task.

TASK NUMBER	TASK TITLE	START DATE	DUE DATE	DURATION	SEMESTER
1	Definition and Planning			(Days)	(Week)
1.1	Research	5/23/22	6/10/22	15	1-3
1.1.1	Literature Review	6/13/22	7/1/22	15	4-6
1.2	Problem Statement	7/4/22	7/8/22	5	7
1.2.1	Identify gaps and problems	7/11/22	7/22/22	10	8-9
1.3	Methodology & Initial Design Framework	7/25/22	8/12/22	10	10-12
2	Launch & Execution				
2.1	Mobile App Prototype	8/15/22	9/19/22	25	Sem-break
3	Performance/Monitoring				
3.1	Observations	9/19/22	9/30/22	10	1-2
3.1.1	Data Collection	10/3/22	10/14/22	10	3-4
3.2	Evaluation	10/17/22	10/28/22	10	5-6
3.2.1	Data Analysis	10/31/22	11/11/22	10	7-8
3.3	Monitoring	11/14/22	11/18/22	5	9
4	Closing & Reporting				
4.1	Conclusion	11/21/22	12/2/22	10	10-11
4.2	Final Report Submission	12/5/22	12/9/22	5	12

CHAPTER 4

PRELIMINARY ANALYSIS

4.1 PROPOSED ATTRIBUTES

Design attributes define a quality, characteristics describing someone or something, it can also be an object which is closely related to specific person or thing.

The existing framework of mobile experiences for collocated interaction were presented by Lundgren et al. (2015) which consists of the Social Perspective that describes the design properties related to the social features of collocated situations. The design attributes are focus, coordination of action, and framing with description below in Table 4.1.

Table 4.1: Social Interactions Attribute Description.

Attributes	Description
Focus	states of collaboration, communication, and competition
Coordination	states of timing actions and combining actions
Framing	main social activities carried out

The focus attribute where states of collaboration, communication, and competition will be detailed down where collaboration means two or more people can have a shared object, then everyone can make amendment, for example, in the menu ordering mobile application, each person will have a name, when the first person selected a menu, and the second person selected the same menu, there will be a message popped out to inform that the first person has selected the same menu.

Communication should allow two or more people to communicate through dialogue, for example, in a mobile collocated application which is messaging.

Competition can be made into games as mentioned by Jarusriboonchai, Malapaschas and Olsson (2016) that a cooperative role playing games – Operation Sting is to improve collaboration efficiency.

Next, coordination defines the process of organizing people or groups that they can work well together, where the state of timing actions and combining actions in the scenario for mobile collocated situation is such as, in a menu ordering mobile application, everyone in the table can select their own menu and add to the cart at different timing.

Lastly, the framing attribute where main social activities were carried out in mobile collocated situation that make people to focus on single activity, for example, in a menu ordering mobile application where every user can add menu to the cart, if one user would like to share a particular menu to everyone, he/she can take control of the menu display, and once showed the particular menu to all, the user can end the control or menu display.

While trust and privacy were a property of social interactions, and mobile collocated is part of collocated interactions based on Figure 4.1 below. This helps in identifying the relevant papers with mobile collocated in social interactions issues. The meaning of trust refers to the believe in a person to perform an action. The meaning of privacy refers to the rights to be let alone and the freedom from interference.

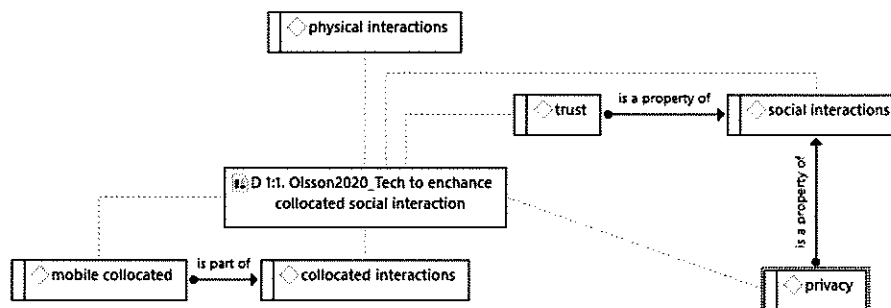


Figure 4.1: Number of Proposed Attributes In A Paper.

Olsson *et al.* (2020) identified the main technology roles and the attributes of the role of technology were explained in Table 4.2 below:

Table 4.2: Role of Technology Attribute Description.

Attributes	Description
Facilitate	To make something easier or possible
Invite	To request someone to do something together
Encourage	To make someone to do something or to make something more likely to happen

The attribute for facilitate means facilitating ongoing social situations, for example, in the user profile section, there is a photo sharing in each user profile, where the other users were able to view and get to know more about the user's interest.

Other than that, invite attribute means revealing common ground and avoiding cocooning in social silos, whereby in the food ordering mobile collocated application, each user has a profile and can share common interest, and the user A can request to chat to another user B, if the user A accepted the chat request, they can start the chat conversation.

Lastly, the attribute for encourage is to engage people in collective activity, for example, in the payment section of food ordering application, there must be only one person which should make the payment like traditional payment in a restaurant.

4.2 EXISTING DESIGN FRAMEWORK

The existing design attributes and existing guided design framework were outlined as below. The existing design framework presented by Lundgren et al. (2015) from the Social Perspective and Technology Perspective were shown in Table 4.3.

Table 4.3: Existing Design Framework.

Main Perspectives	Properties	Explanation
The Social Perspective	Focus	Sets the greatest interaction objective and overall social focus of the engaged activities by people.
	Coordination of Action	To make the teamwork of interaction on how people perform actions together.
	Framing	Social situation is defined where the main activities of social circumstances were carried out.
The Technology Perspective	Information Symmetry	To ensure that all users have the same kind of information.
	Interaction Abilities	System can interact and provide different function to different users.
	Information Distribution	The way users behaves depends heavily on the distributed information.
	Event Triggers	To stimulate an event that causes users or the system to perform something.

4.3 PROPOSED DESIGN FRAMEWORK

The proposed design attributes and guided design framework were outlined as below. There are three main elements in the mobile collocated interaction, the first main element is collocated interactions followed by the proposed design attributes based on the existing framework.

The second main element of the proposed design framework is social interactions, where the proposed attributes were explained in the abovementioned. The last element of the mobile collocated interaction is roles of technology, where the proposed attributes are mainly related to the mobile technology.

Table 4.4: Proposed Design Framework.

Main Elements	Design Attributes	Guided Design
Collocated Interactions	Focus	Sets the greatest interaction objective and overall social focus of the engaged activities by people.
	Coordination of Action	To make the teamwork of interaction on how people perform actions together.
	Framing	Social situation is defined where the main activities of social circumstances were carried out.
Social Interactions	Trust	Social trust is a belief in the integrity and honesty in people.
	Privacy	The capacity of people to express themselves selectively.
Roles of Technology	Facilitate	Open space for common activities and discover information about others.
	Invite	Introducing restrictions and self-expression.
	Encourage	To stimulate people to interact.

4.4 DIFFERENCES OF DESIGN FRAMEWORK

The differences of existing design framework and the proposed design framework were explained and outlined below.

The existing design attributes presented by Lundgren et al. (2015) from the Social Perspective were updated with Collocated Interactions where the focus of social perspective is part of the collocated interaction.

Table 4.5: Collocated Interactions Design Framework Differences.

Main Elements	Properties	Explanation
Collocated Interactions	Focus	Sets the greatest interaction objective and overall social focus of the engaged activities by people.
	Coordination of Action	To make the teamwork of interaction on how people perform actions together.
	Framing	Social situation is defined where the main activities of social circumstances were carried out.

Subsequently, the main elements of Social Interactions comes together with the proposed design attributes of the trust and privacy, where the proposed attributes were identified from Lucero et al (2013) as one of the main concern was the trust and privacy in mobile collocated activities.

Table 4.6: Social Interactions Design Framework Differences.

Main Elements	Properties	Explanation
Social Interactions	Trust	Social trust is a belief in the integrity and honesty in people.
	Privacy	The capacity of people to express themselves selectively.

The last differences of the existing design framework is the Technological Perspective which was replaced by Roles of Technology where the existing design attributes were presented by Olsson *et al.* (2020).

Table 4.7: Roles of Technology Design Framework Differences.

Main Elements	Properties	Explanation
Roles of Technology	Facilitate	Open space for common activities and discover information about others.
	Invite	Introducing restrictions and self-expression.
	Encourage	To stimulate people to interact.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 FINAL DESIGN FRAMEWORK

The final guided design framework were outlined in Table 5.1 with food menu ordering scenarios. Food menu ordering scenario was chosen to best suited and accommodate the mobile collocated scenarios with the design framework.

Table 5.1: Final Design Framework.

Main Elements	Design Attributes	Guided Design (Usage example)
Collocated Interactions	Focus	More than one user is accessing the same food menu in the same table, if two users were choosing the same menu, they were able to view each other.
	Coordination of Action	In the menu section, where users can select the food and know that which menu has been added to the food cart by which specific user.
	Framing	The only one main user can have control of the menu section and the other users will view the same menu controlled by the main user.
Social Interactions	Trust	Each user is required to register and login. In the chat section, users can chat once the chat request has been accepted.
	Privacy	In the chat request section, each table have a status of online, offline, busy, and do not disturb. This will determine if the table is having a meal or conversation which they do not wish to be interrupted.
Roles of Technology	Facilitate	In the user profile section, there is a photo sharing under user profile, where the

		other users can view the photos once the chat request were accepted.
	Invite	In the chat section, users can request to chat before they can start the conversation.
	Encourage	In the payment section, only one person should be chosen to make the payment.

5.2 PROTOTYPE TASK SCENARIO

Table 5.2: Prototype Task Scenario 1.

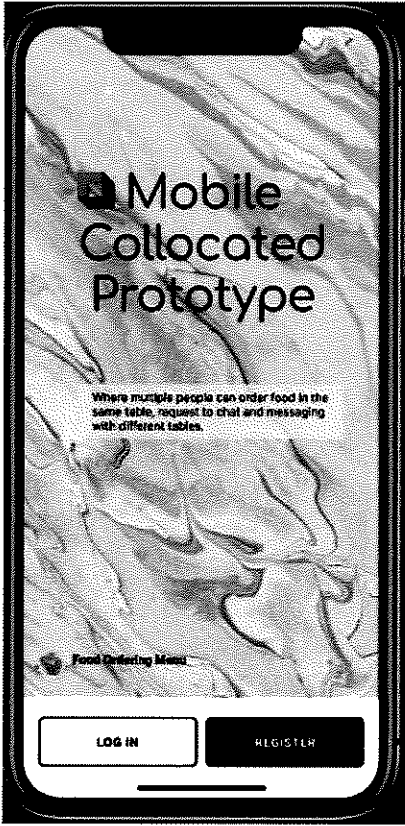
Scenario 1	Successful Register and Login with Valid User ID and Password
Purpose	To allow system to identify a person uniquely
Environment	Mobile with internet access in the restaurant
Scenario Outline	User can register and login to the food ordering application to identify the different users in a mobile collocated application. After logging in to the food ordering application, users are required to scan the QR code of the table to have the same table number.
Attributes	Trust
Prototype Screen	

Figure 5.1: Login and Registration Screen.

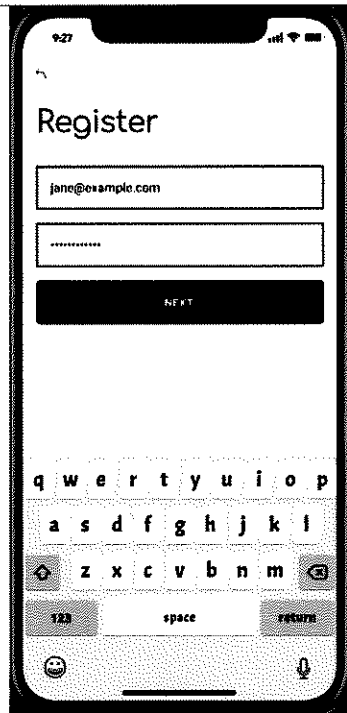


Figure 5.2: Register Screen.

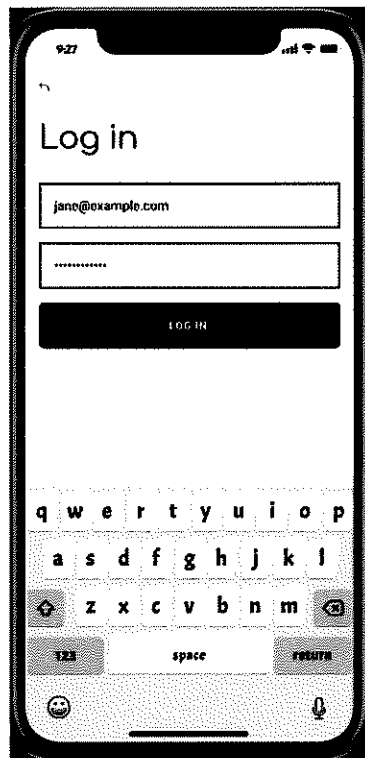


Figure 5.3: Login Screen.

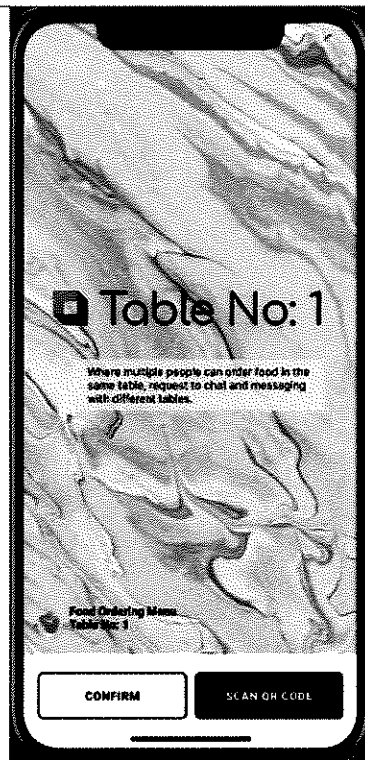


Figure 5.4: Confirm Screen.

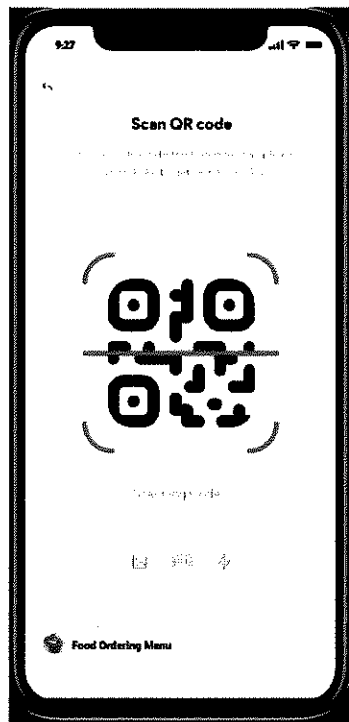
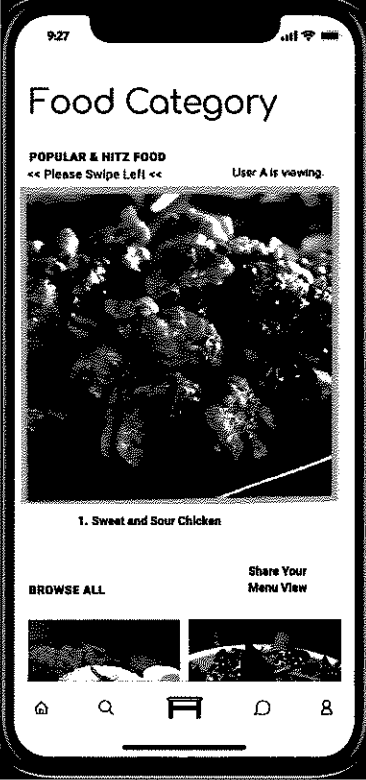


Figure 5.5: Scan QR Code Screen.

Table 5.3: Prototype Task Scenario 2.

Scenario 2	Menu Browsing with Multiple Users
Purpose	Users can browse the menu and identify if the menu has been added to the food cart by different users
Environment	Mobile with internet access in the restaurant
Scenario Outline	User can browse the menu, search the menu, and view if the other users has added the specific menu to the food cart. Other than that, only one user can take control of the menu and all the other users will be viewing the same menu until the main user release the control.
Attributes	Focus, Coordination of Action, Framing
Prototype Screen	 <p>Figure 5.6: Main Menu 1 Screen.</p>

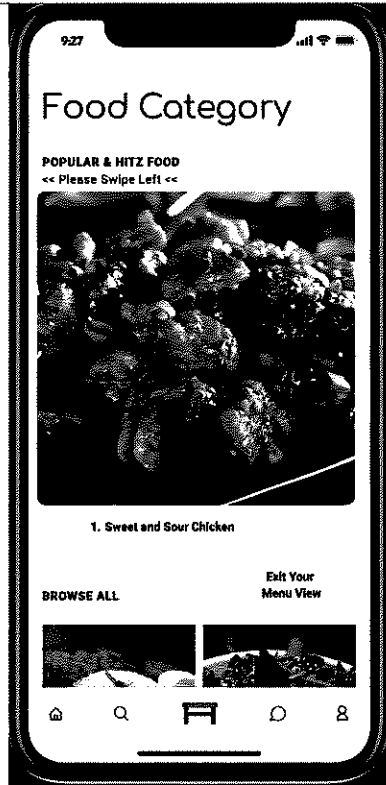


Figure 5.7: Main Menu 2 Screen.

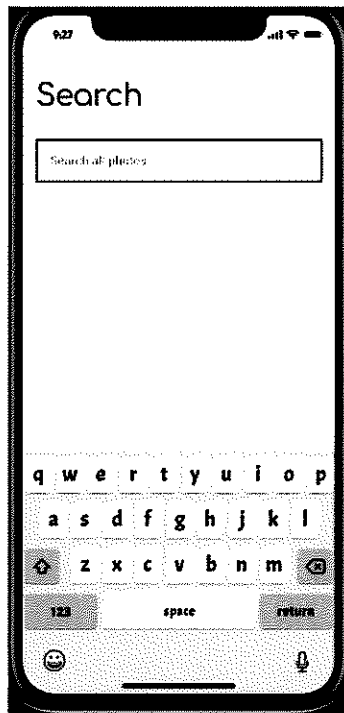


Figure 5.8: Search 1 Screen.



Figure 5.9: Search 2 Screen.

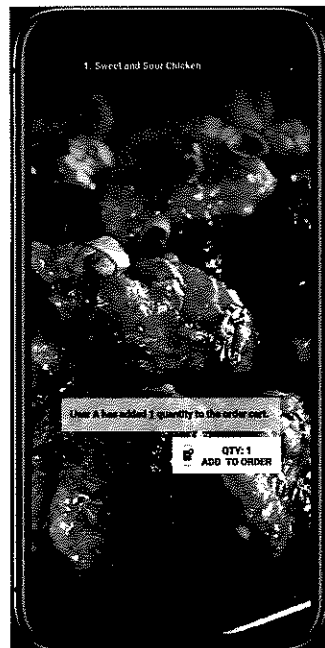


Figure 5.10: Add To Food Cart Screen.

Table 5.4: Prototype Task Scenario 3.

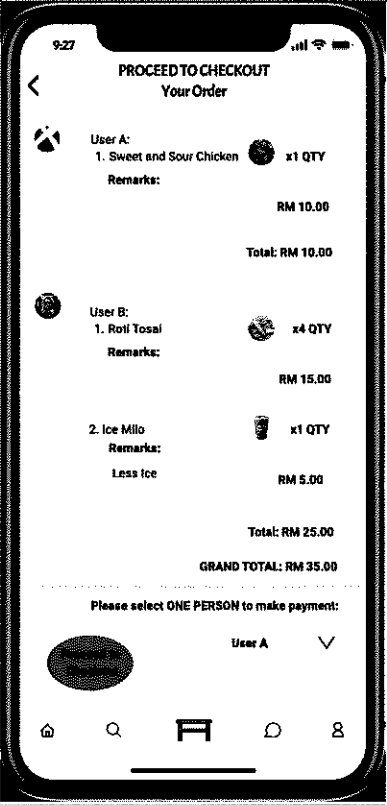
Scenario 3	Proceed to Checkout and Proceed to Payment
Purpose	Users can check-out the food cart and proceed to payment once confirmed with every user in the same table
Environment	Mobile with internet access in the restaurant
Scenario Outline	Users can proceed to check-out once the food is confirmed with remarks, and before they proceed to payment, they must decide one user to make the payment similar to traditional restaurant only one person to make the payment first.
Attributes	Encourage
Prototype Screen	 <p>The image shows a mobile application interface for a restaurant's checkout process. The screen is titled "PROCEED TO CHECKOUT Your Order". It lists two users' orders. User A has ordered "1. Sweet and Sour Chicken" for RM 10.00. User B has ordered "1. Roll Tosal" for RM 15.00 and "2. Ice Milo" with "Less Ice" for RM 5.00. The total for User B's items is RM 20.00, and the grand total for all items is RM 35.00. At the bottom, there is a prompt "Please select ONE PERSON to make payment:" with a dropdown menu currently showing "User A". The screen also features a back arrow, a home indicator, and standard mobile navigation icons at the bottom.</p>

Figure 5.11: Proceed To Checkout Screen.

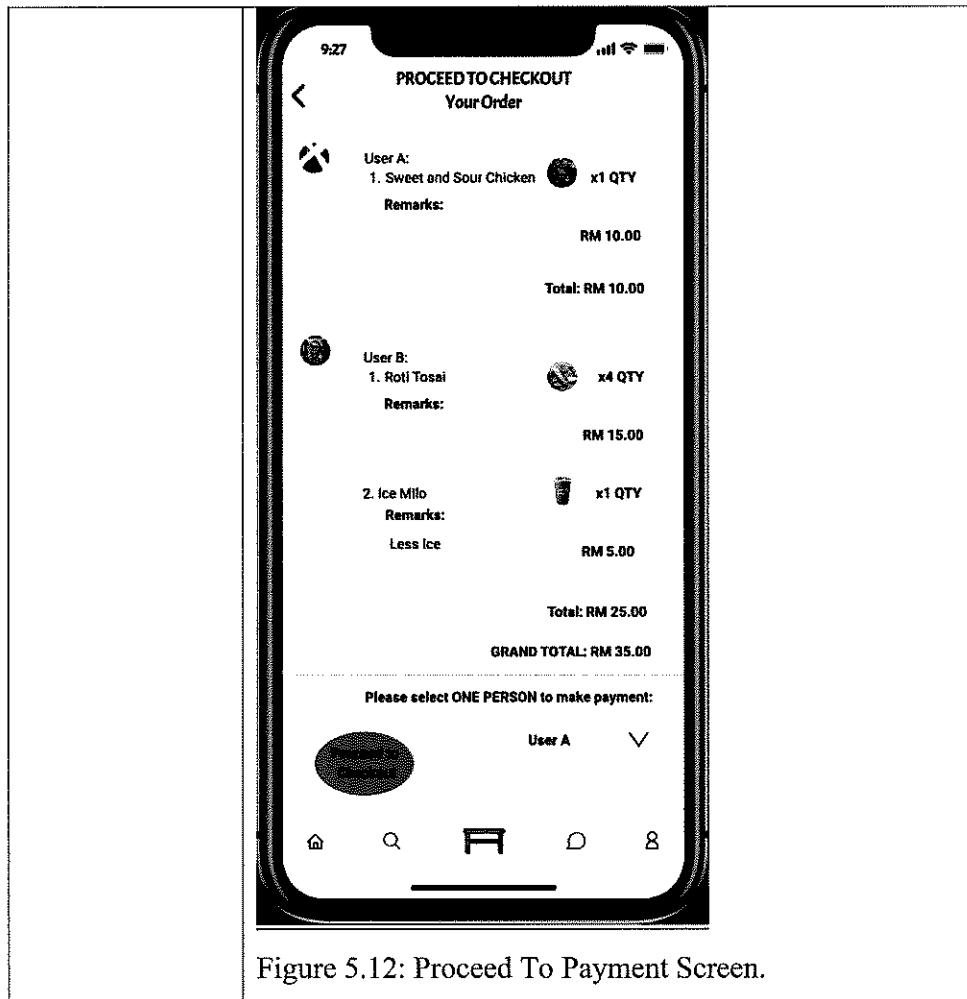



Figure 5.12: Proceed To Payment Screen.

Table 5.5: Prototype Task Scenario 4.

Scenario 4	User Profile
Purpose	Users have their individual profile to share on common interests
Environment	Mobile with internet access in the restaurant
Scenario Outline	Each user has an individual profile on the photos related to them so that their friends can view and start a conversation with common interest.
Attributes	Facilitate
Prototype Screen	 <p>Figure 5.13: User Profile 1 Screen.</p>

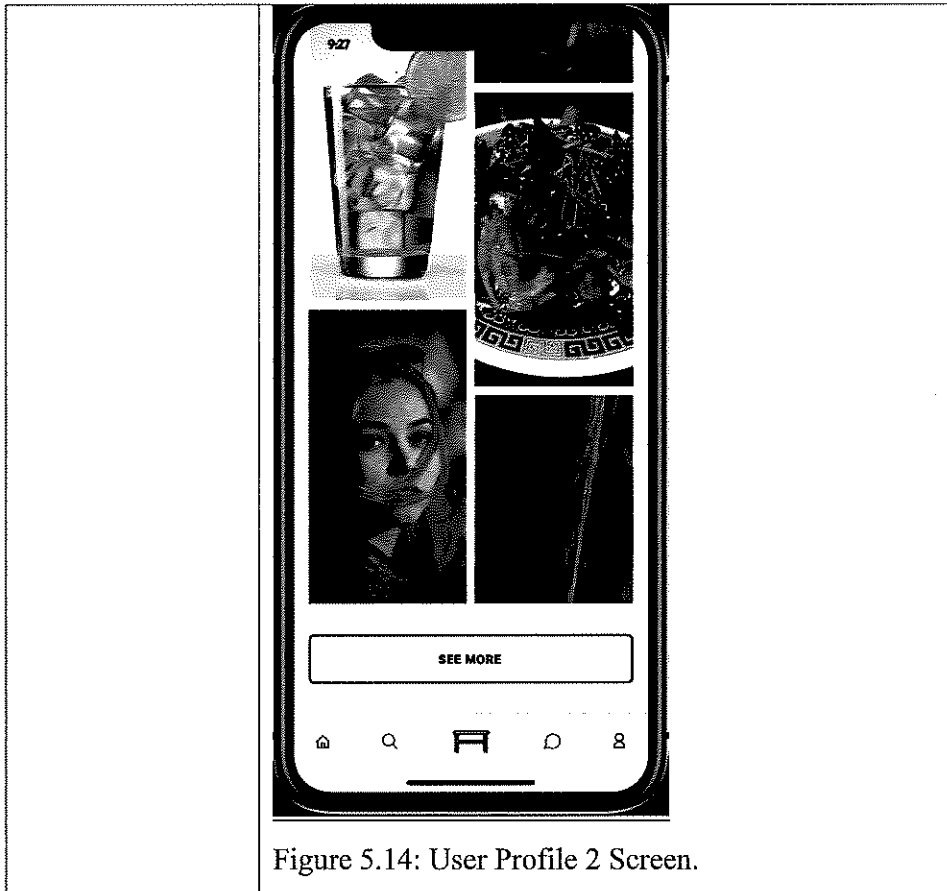
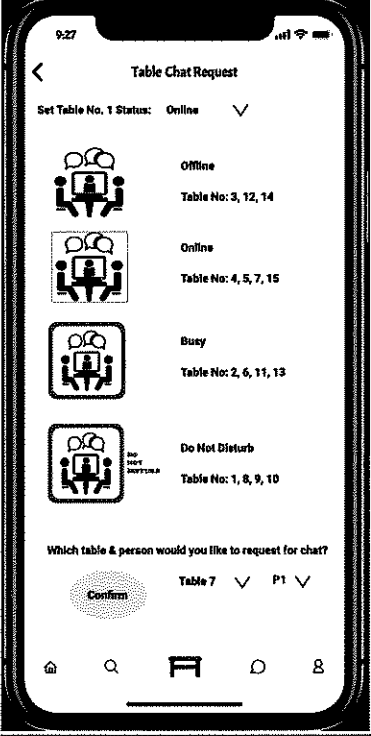


Figure 5.14: User Profile 2 Screen.

Table 5.6: Prototype Task Scenario 5.

Scenario 5	Table Chat Request and Confirmation
Purpose	Users can see the status of each table and request to chat
Environment	Mobile with internet access in the restaurant
Scenario Outline	Each table has a status of online, offline, busy, and do not disturb, the status allows users to send chat request to specific user in different table.
Attributes	Trust, Privacy
Prototype Screen	
	Figure 5.15: Table Chat Request Screen.

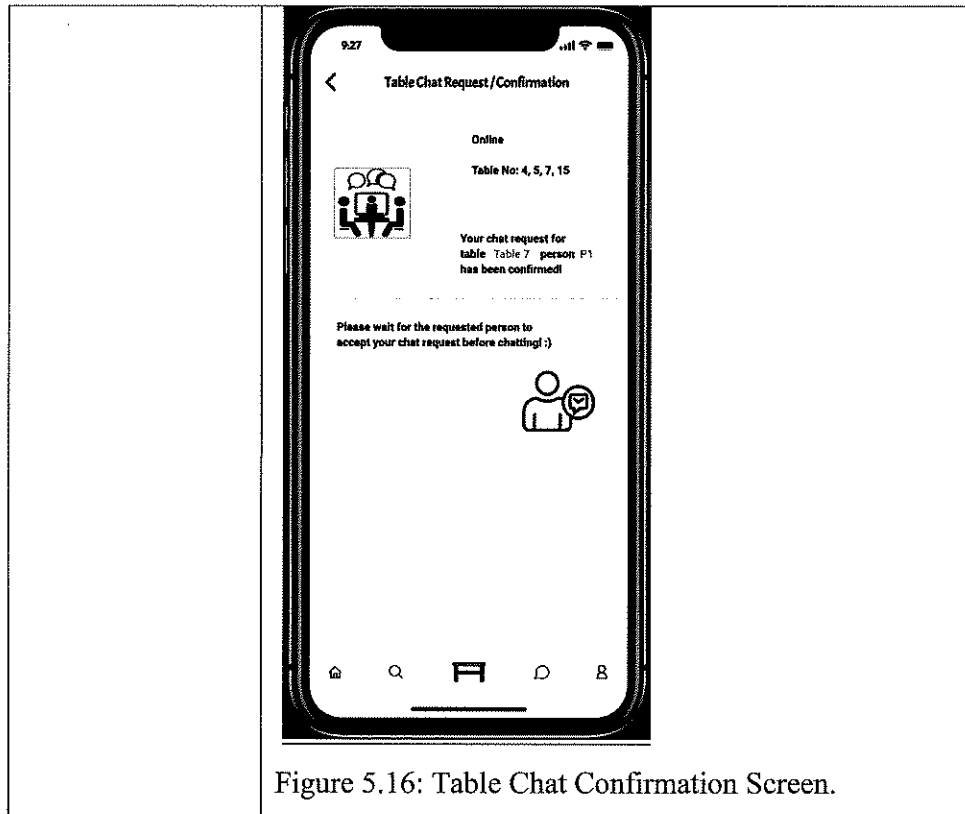
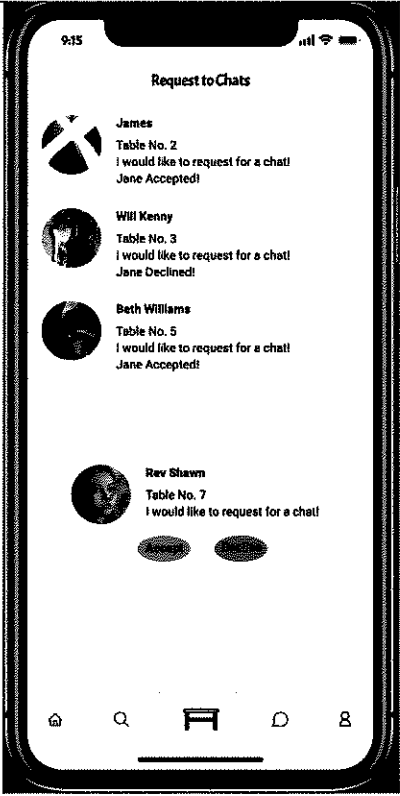


Figure 5.16: Table Chat Confirmation Screen.

Table 5.7: Prototype Task Scenario 6.

Scenario 6	Request to Chat
Purpose	Users can request to chat to the users from different table
Environment	Mobile with internet access in the restaurant
Scenario Outline	Users can have conversation with users from different table after accepting the chat request.
Attributes	Trust, Invite
Prototype Screen	 <p>Figure 5.17: Request To Chat Screen.</p>

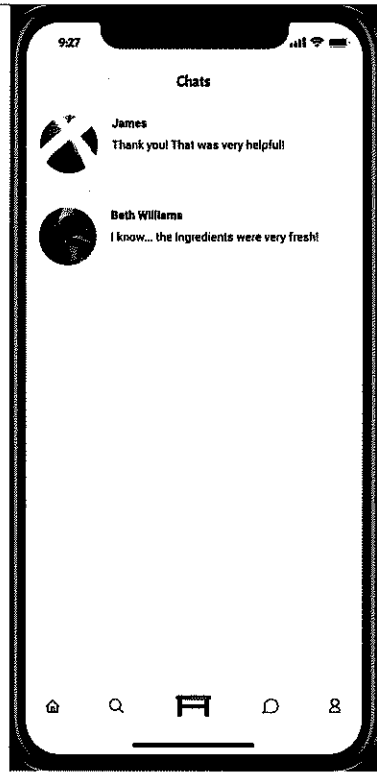


Figure 5.18: Chat 1 Screen.



Figure 5.19: Chat 2 Screen.

5.2.1 SUMMARY OF PROTOTYPE TASK SCENARIO

Based on the proposed design attributes gathered from proposed design framework, the prototype was designed to resolve the issues by bridging the gap between the use of mobile technology in social interactions.

The prototype was designed with Figma website application where the sections were outlined in the task scenario above to the extent of high-fidelity with functional button of the food ordering mobile collocated application. However, there are limitations of certain functionality such as camera scanning for the QR code, keyboard typing in the chat section, and the payment method.

According to the proposed design attributes, the food ordering mobile collocated application to scan the QR code of specific table and view the food menu on each mobile device.

Each person can make the order through the food ordering mobile collocated application, and proceed to checkout as well as payment, then the order will be sent to the kitchen. The tables and chairs of the restaurant must be setup as unique to allow different users in identifying which particular user to approach for social interaction.

5.3 METHOD AND PROCEDURE

The method of the evaluation is through qualitative data by having interview questions and the procedure is to create a Microsoft form with the interview questions provided in the forms as well as the food ordering mobile collocated application prototype link provided to the participants.

The interview survey and prototype session would take approximately 15 minutes of each participant and the interview questions should be filled in based on the participants' feedback and comments.

5.3.1 INTERVIEW QUESTIONS

- (i.) How would you describe the food ordering mobile collocated application?
- (ii.) What is the main difference of the normal food ordering mobile application and the current food ordering mobile collocated application?
- (iii.) How do you think of the food ordering mobile collocated application on the function to view different users in selecting the same menu?
- (iv.) What do you think of the food ordering mobile collocated application in main user of taking control the whole menu function?
- (v.) What do you think about the privacy of the chat request in the food ordering mobile collocated application?
- (vi.) Do you feel that you would approach the users from different table in a restaurant?
- (vii.) Which feature would prompt you to keep coming back in using the food ordering mobile collocated application?

5.3.2 PARTICIPANTS

Total of 15 participants were invited to participate in the prototype evaluation and they were friends and families which owned camera phones and regularly used their phones for food ordering as well as users which has information technology education background from the university.

Level of expertise were classified into four different levels which are not good (0%), neutral (13%), good (27%), and very good (60%) and the participants' user profiles were determined based on their experience level in using mobile applications were categorized into three different categories below.

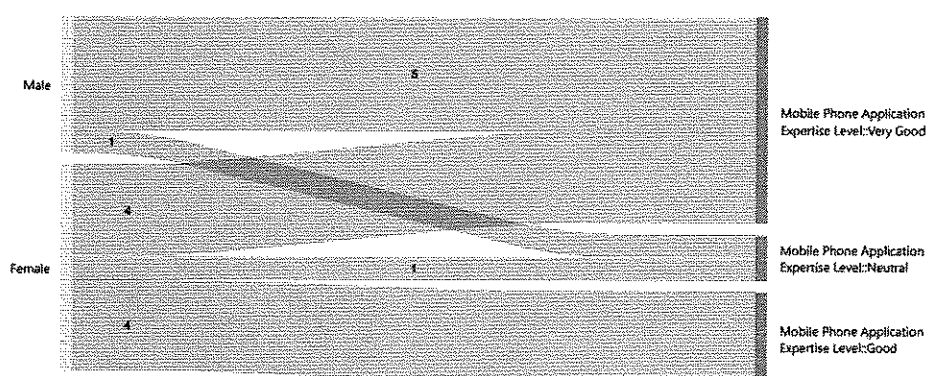


Figure 5.20: Mobile Phone Application Expertise Level.

The number of mobile application used were categorized based on different level of expertise for 53% participants (8 out of 15) from very good used 15 to 20 mobile applications, where 40% participants (6 out of 15) are from very good, good, and neutral used 10 to 15 mobile applications, and 1 participants used 0 to 10 mobile applications.

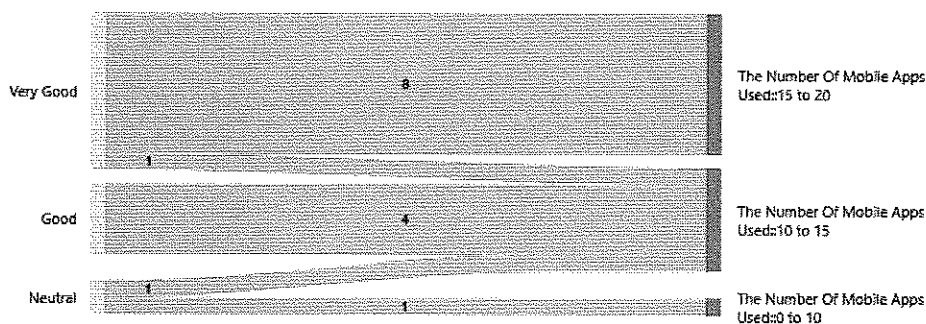


Figure 5.21: The Number of Mobile Application Used.

26% participants (4 out of 15) on daily basis spend 4 to 5 hours, 3 to 4 hours, and 1 to 2 hours per day, where 20% participants (3 out of 15) spend 2 to 3 hours per day on average on a mobile applications.

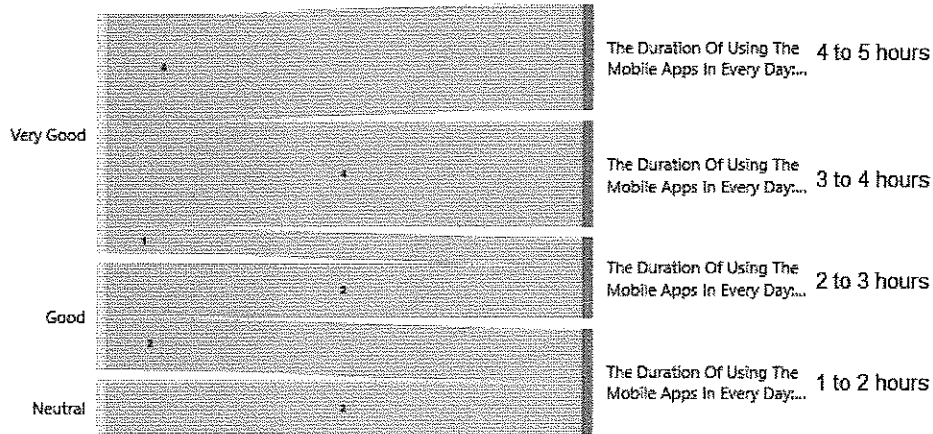


Figure 5.22: The Duration of Using Mobile Applications In A Day.

In Figure 5.23, 26% participants (4 out of 15) selected Beauty, Finance, Food and Social Media type of mobile applications, where 20% participants (3 out of 15) selected Beauty, Finance, Food, Social Media, and Games mobile applications, and lastly 54% (8 out of 15) selected Finance, Food, Social Media, and Games mobile applications.

	Beauty, Finance, Food and Social Media	The Type Of Mobile Apps Used:Beauty, Finance, Food, Social Media, and Games	The Type Of Mobile Apps Used:Finance, Food, Social Media, and Games	Total
Good	4		1	4
Neutral	2	1	1	2
Very Good	1	4	3	8
Total	4	3	6	15

Figure 5.23: The Type of Mobile Applications Used.

5.3.3 USER INTERVIEW

Question 1: How would you describe the food ordering mobile collocated application?

Table 5.8: Question 1 User Responses.

Participants	Responses
1	The Collocated Application concept is fresh and not seen in current dine in restaurant yet.
2	Concept wise is good for dating/ social lounge bars/restaurants to allow for interaction between different tables and within the table circle. Allows users to accept chats in according to their preferences.
3	The convenience of ordering from any place at any time & ways to increase communication.
4	Very simple, easy for user to understand and experience is good.
5	Simple to use, serves the purpose and attractive layout.
6	It is a combination of a social media application and a food ordering application to promote social interaction between customers of a restaurant.
7	Interesting food ordering app where people not only can interact at the same table, but they could interact with random people from other tables too. The app saves the hassle of one person screaming to the other end of the table to order the food they need.
8	Interesting, mixed in with some social elements
9	Fresh and creative and thoughtful
10	This is quite new to me, and it is interesting as it creates opportunities for interactions with strangers.
11	Interesting.
12	Is different from normal food ordering apps, it supports multiple users at the same time because of this feature it can reduce restaurant. Food shop can avoid table ordering with duplicate order and it good for guest to share view to each other order to

	get knowing each other would like to taste food can be avoid duplicate food ordering so that they can share food to each other.
13	New feature to current market as current market don't have such function.
14	It is an application with multiple major features such as table ordering, live chatting, user profile maintenance.
15	It's an application that provides extra features other than the common ordering features which are exclusive to the current dine-in customers of the restaurant, e.g., share menu view and chat request.

15 participants provided positive response on the food ordering mobile collocated application in social interactions, whereby the feature of having conversation with another table is interesting but not available or seen yet in the current environment.

They also perceived that the food ordering mobile collocated application can reduce miscommunication between multiple users in food ordering, as well as enhancing the social interaction between the customers in the restaurant. One of the participants also suggested that the food ordering mobile collocated application is best suited in dating restaurant or bars concept.

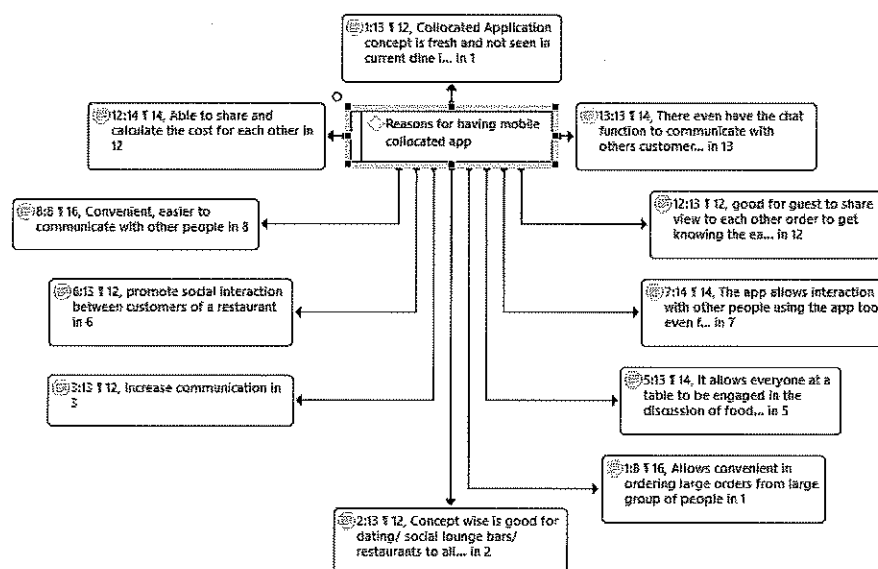


Figure 5.24: Reasons For Having Mobile Collocated Application.

Question 2: What is the main difference of the normal food ordering mobile application and the current food ordering mobile collocated application?

Table 5.9: Question 2 User Responses.

Participants	Responses
1	Normal Food Ordering Mobile Application only allows own view, meanwhile the current application allows me to have same screen viewing with my friends at the same table and seek for opinion from people of other tables. This would bring convenience to large group of people at the same table to get their orders done.
2	Allows for chats between tables and shared view of menu within the table.
3	The main difference is ways to increase communication.
4	I able to connect with other person even when ordering food.
5	It allows everyone at a table to be engaged in the discussion of food ordering unlike other applications whereby one's view is not shared with another. Another big difference is the ability to communicate with people from other tables whom you may want to find out from what they had ordered or ask for suggestions.
6	Many users can view the menu and order from the same table without the need of sharing devices and having the ability to view the items as well as the total amount for individual order's simultaneously.
7	The app shows the food that every single individual is ordering, saves the trouble of finding who ordered which food. The app allows interaction with other people using the app too, even from a different table.
8	Interaction with other people/ tables is possible with this current app.
9	Not able to communicate to other tables.

10	Normal food ordering application does not involve interaction with others.
11	Increase in both online and offline social interaction
12	Able to share and calculate the cost for each other... For traditional guest need to calculate one by one it when out for lunch/dinner for colleagues
13	New feature for everyone to review the order by using their own phone. There even have the chat function to communicate with others customer in same restaurant
14	It has more interactions between customers where existing food ordering is just food ordering with least interaction
15	It enables between interaction experience between the dine-in customers of the restaurant.

15 participants identified that the food ordering mobile collocated application could enhance social interaction with different tables as well as between the customers in the restaurant, while the traditional food ordering mobile application is only focusing on the food ordering section.

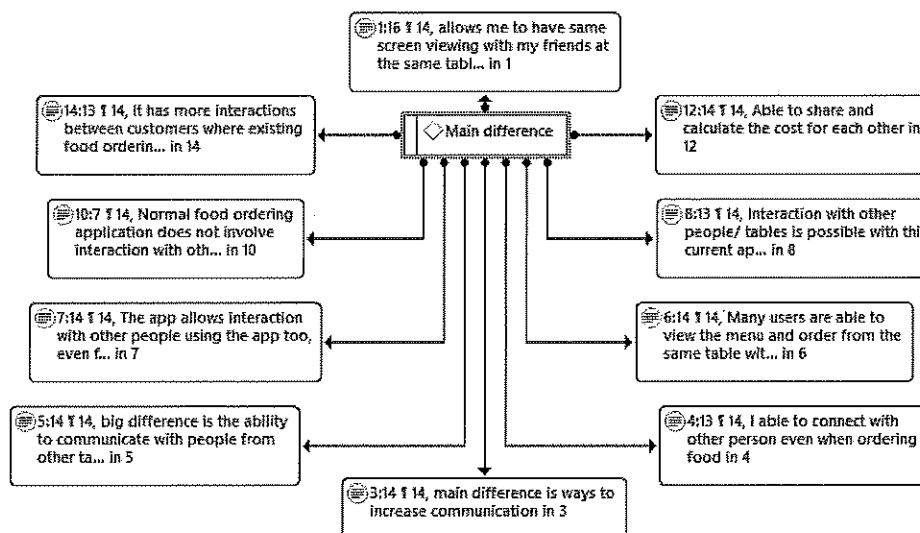


Figure 5.25: Main Difference of Mobile Collocated Application.

Question 3: How do you think of the food ordering mobile collocated application on the function to view different users in selecting the same menu?

Table 5.10: Question 3 User Responses.

Participants	Responses
1	Allows convenient in ordering large orders from large group of people.
2	If viewing of menu is not restricted while another user is viewing, is alright. But would be useful in a group setting or in large tables where communication is restricted.
3	This function is good can let other people know what food is viewing or already add to cart.
4	I think it is good to know what other people like to eat.
5	It also allows us to know who is potentially interested in what.
6	Very good as users can keep track of their own order as well as the total needed to pay individually if needed.
7	They can keep track of who ordered and who have not, no one's order would get accidentally left out.
8	Convenient, easier to communicate with other people.
9	I think it's fun. And can make more conversations and connection through looking at the same menu.
10	It is quite convenient to see what others are ordering.
11	Able to easily see what others are looking at without the hassle of asking around.
12	Although it can be shared to each other, but it not really will be use by one user.
13	Good because users can save the time when ordering as they no need to pass phone to share the menu.
14	It brings convenience to a group of people sharing the same order
15	I think is a good add on feature to better the order experience of the group.

15 participants provided positive responses on the feature of viewing different users in the food ordering mobile collocated application which could understand the interest of the different users to further kick-start or to spark the conversation between the users in the same table or in a large group.

This feature also provided convenience on the multiple orders by different users whereby miscommunication such as food ordering will be left out in a very large group.

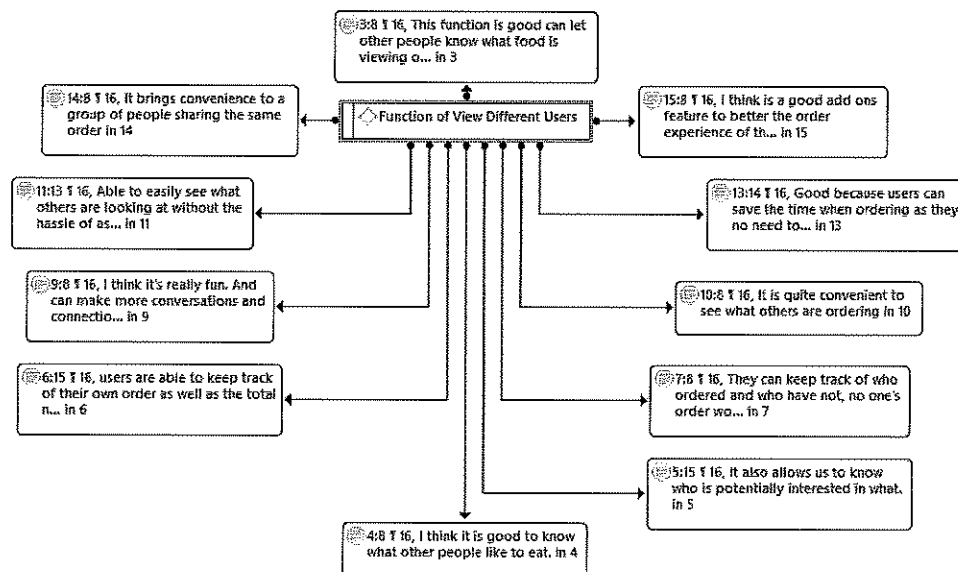


Figure 5.26: Function of Viewing Different Users.

Question 4: What do you think of the food ordering mobile collocated application in main user of taking control the whole menu function?

Table 5.11: Question 4 User Responses.

Participants	Responses
1	All users will be able to view the same page at the same time.
2	Interesting, however would be good to allow other users to have control as well. Would facilitate ordering in group settings/ ease ordering for older users who is not familiar with tech. However, interface is a bit complicated/ unless explained, users may not understand the function.
3	This function is good can let the customer to share what is the favourite food or drink in the restaurant.
4	It's easy for my friends to order food together.
5	It aids in the ease of communication and making sure that everyone is on the same page instead of having to pass the phone around the table.
6	Good, as there is no need to share one device to all users to view the menu but may not be really needed as all users are able to view the menu on their respective devices.
7	I think it's not necessary because they can just order and submit the food they want to order, and everyone can see it but according to their own time.
8	Simple, could help in communication.
9	I think it can be convenient to share to friends what I'm viewing instead of asking them.
10	It is convenient when being asked what we ordered as some food names can be quite weird and long.
11	Convenient.
12	Not really will be use.
13	Good because users no need to imagine the food when discuss the food to be ordered.

14	It brings convenience to a group of people sharing the same order.
15	I think is a good add on feature to better the order experience of the group.

20% participants (3 out of 15) mentioned that the feature of sharing whole menu view is not necessary as each user can view the menu on their own devices or might not even be used, where 80% participants (12 out of 15) explained that the feature could improve communication between different users while performing food ordering in the same table.

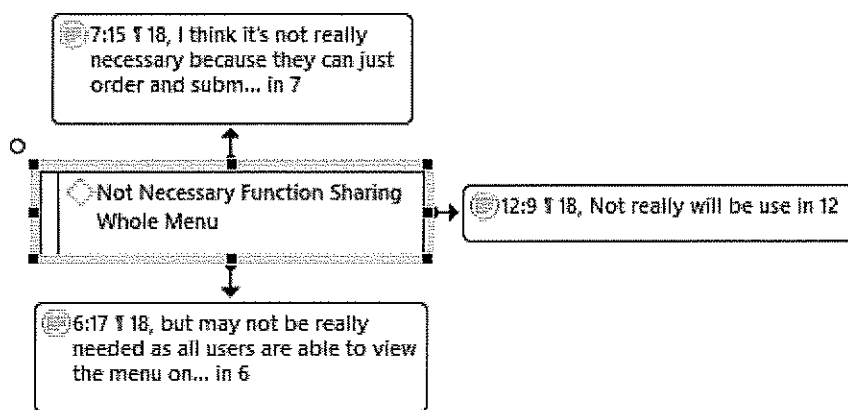


Figure 5.27: Not Necessary Function of Sharing Whole Menu.

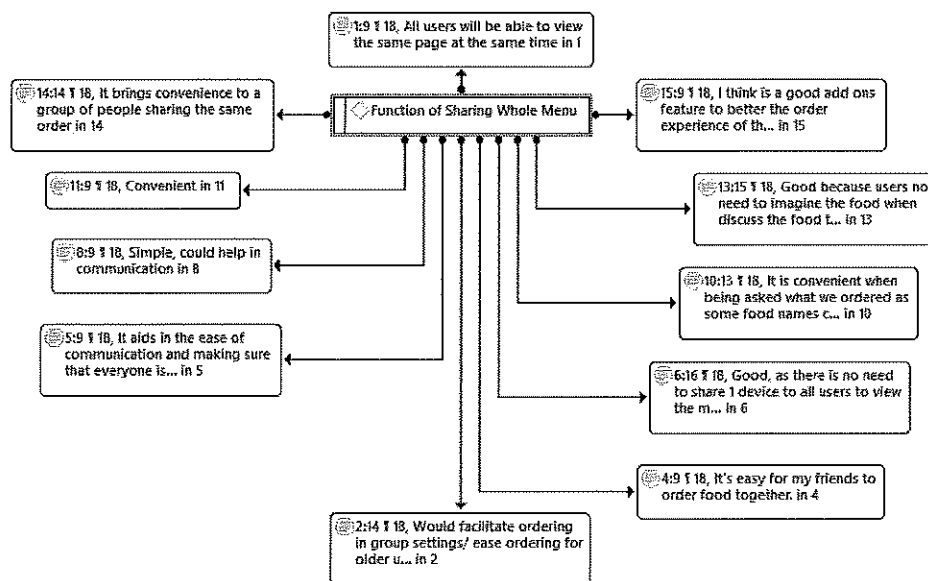


Figure 5.28: Function of Sharing Whole Menu.

Question 5: What do you think about the privacy of the chat request in the food ordering mobile collocated application?

Table 5.12: Question 5 User Responses.

Participants	Responses
1	Privacy is done well as people who do not want to be connected could opt to do so by setting the 'do not disturb' sign.
2	Creating an account may not be viable as most customers may be coming one time, allowing for anonymity is crucial, may consider allocating users identity by their seating placement and providing an overall layout the shop would be good. Would be good only in a social lounge type setting for individual to get to know each other before interacting physically.
3	This is function can let people know each other but not suitable for all the restaurant, for my opinion cafe is suitable only.
4	It's ok if there is a request so people won't spam. Yes.
5	It is a good feature as some people may not want to be disturbed when they are eating or engaged in a conversation with others.
6	Privacy is adequate as individual's permissions are needed before any identity is shared with others.
7	The chat request is good as it requires other's permission to interact.
8	Privacy is not compromised because it needs consent of both parties.
9	I think it's a good way to make friends as people nowadays can be too shy to make friends in real life. Just need to ensure the privacy and safety and information of the user will be kept private to a certain extend and about hackers hacking into the payment mode thingy.
10	It's good as there are different options, it allows people to choose whether they want to interact with others or not.
11	Privacy may be leaked when your identity can easily be identified since you're in the same premise.

12	It can be used for restaurant / cafe with dating / get new friend purposes but for normal use some one went out for lunch /dinner will not entertain someone you won't know.
13	Good.
14	It brings more personalised to the users however in the meantime it reduces the physical interaction.
15	I think is reasonable secured as it is based on intranet nature where it must be registered user to use the application.

15 participants identified that there is no privacy concern on being disturbed or spammed by others, however, there were concerns such as creating user profile for a food ordering mobile collocated application might be a hassle for one-time-customers, hence the food ordering mobile collocated application is only suitable for social lounge type of restaurant or bars. Other than that, concerns on private information being leaked within the same restaurant premises or payment were addressed by the participants which is categorized under security related.

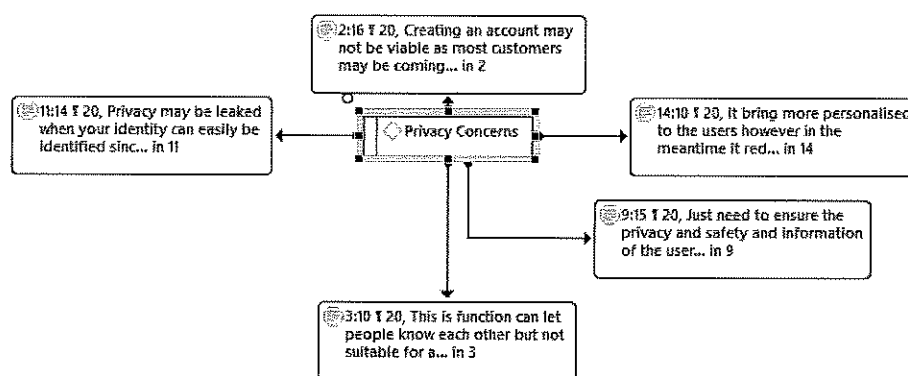


Figure 5.29: Privacy Concerns

Question 6: Do you feel that you would approach the users from different table in a restaurant?

Table 5.13: Question 6 User Responses.

Participants	Responses
1	Yes, I would, however I could also approach the waiter from the restaurant
2	Depending on the purpose of the restaurant. In normal circumstances, no.
3	Most different is have communication function
4	Yes, I would like to know more person.
5	I would engage with others to ask for recommendations.
6	Not necessarily for people who we may not know but it might be a good idea/method to be able to match menus or get an idea for what to order from others.
7	Not really, unless the food from another table really looked interesting.
8	No, because we're Asians and we don't do that.
9	Could be from the example above. Or attracted by the person that we want to make friends.
10	Yes, I would if the food on another table looks very delicious.
11	Yes
12	Nope
13	Maybe... if the food look like delicious
14	High chances of not approaching as there isn't any similar application now.
15	Personally, might not keen to do so however think this could be applicable to a specified use case of restaurants operates based on this.

10 out of 15 participants mentioned that they will not approach the users from different table in a restaurant unless necessary or they could ask the waiter instead, it is also mentioned that the social interaction would be depending on the purpose of the restaurant. Only 5 participants would approach the users from different table, perhaps due to the approachable participants' personality.

Question 7: Which feature would prompt you to keep coming back in using the food ordering mobile collocated application?

Table 5.14: Question 7 User Responses.

Participants	Responses
1	Share Your Menu View
2	Share Your Menu View
3	Share Your Menu View
4	Share Your Menu View
5	All the above, it's a great way to have everyone involved in the dish selection, especially when it is a big group of people.
6	Able to see each users total easily, eliminating the need of bill manual calculation when multiple friends eat together and need to split the bill.
7	Able to View Different Users
8	Table Chat Request
9	Able to View Different Users
10	Table Chat Request
11	Table Chat Request
12	Able to View Different Users
13	Share Your Menu View
14	Share Your Menu View
15	Able to View Different Users

46.67% participants (7 out of 15) selected the function of Share Your Menu View as the most voted feature in the food ordering mobile collocated application, while 33.3% participants (5 out of 15) selected Table Chat Request and Able to View Different Users, the explanation of able to have each user separated bill calculation for easy communication was pointed out as well.

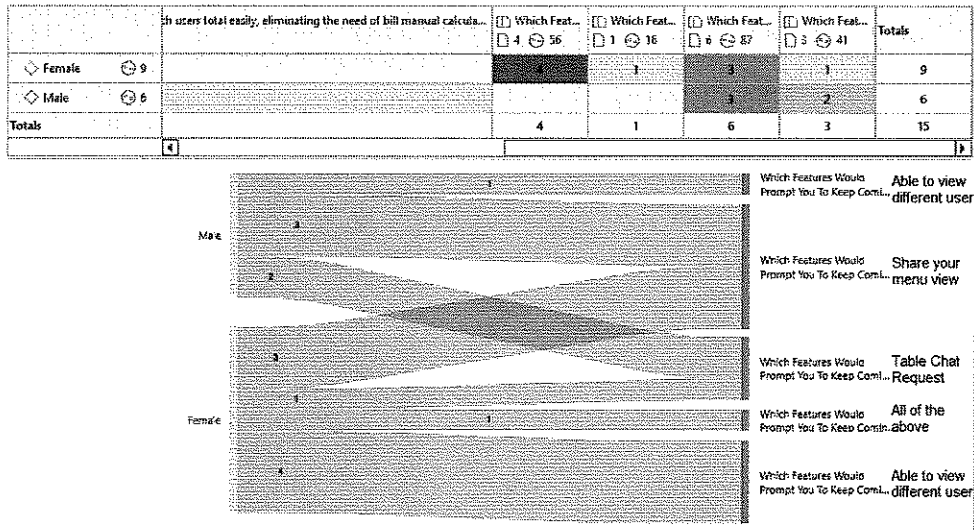


Figure 5.30: Feature to Come Back.

CHAPTER 6

CONCLUSIONS

6.1 CONCLUSIONS

In a nutshell, the research of social interaction in mobile collocated issues has led to the current framework of guided design in the mobile collocated social interaction.

The proposed design attributes were identified with reference to the past literature reviews, and the proposed design framework was presented. The final design framework was produced with the food menu ordering scenario, and the prototype was designed.

The user interview evaluation was also completed with different levels of user review to provide honest opinion and feedback. Participants has provided feedback on the food ordering mobile collocated application is a new and interesting concept whereby it is not available in the market, they also explained that the food ordering mobile collocated application could enhance the social interaction within the customers in the restaurant, where the meaning collocated of “same time, same place” has been fulfilled.

Although the culture of Asian is not open to interacting with strangers with the social platform provided, however, this can be overcome in the next generation of future dating restaurant or bars.

The research objectives were achieved by analysing existing design framework and theories related to collocated social interaction and the proposed guided design framework for mobile collocated social interaction. However, there were no expert review to evaluate the proposed mobile collocated design framework which will be included in the section of future works.

The first research questions of “Is the proposed guided framework sufficient to create a mobile collocated social interaction system?” has been fulfilled with the prototype design of food ordering menu mobile collocated application with 6 different prototype task scenarios.

The second research question of “How does the proposed guided framework help the designer to create a mobile collocated social interaction

system?” were achieved through the proposed guided design framework for mobile collocated interactions which consists of three main elements of collocated interactions, social interactions, and roles of technology with the respective proposed attributes.

6.2 FUTURE WORKS

There are definitely enhancement and improvements of the proposed guided design framework for mobile collocated interactions.

The proposed guided design framework should be further evaluated by expert review in ensuring that the guided design framework could guide the researchers to produce a mobile collocated interaction application in different scenarios, and to further enhanced the design guided framework for mobile collocated interaction.

The food ordering menu mobile collocated application prototype should be further surveyed in real life restaurants and bars to receive more accurate feedback and reviews that the idea of mobile collocated in food ordering menu scenario could be developed in the actual business environment.

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APPENDICES

Appendix A: Low-fidelity Prototype

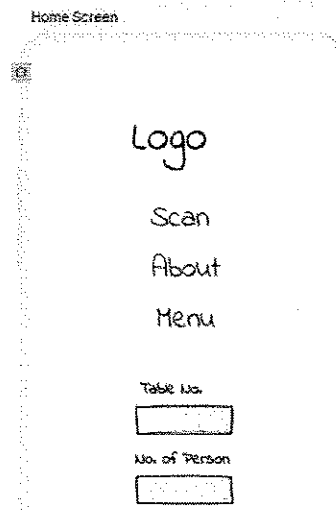


Figure 7.1: Home Screen.

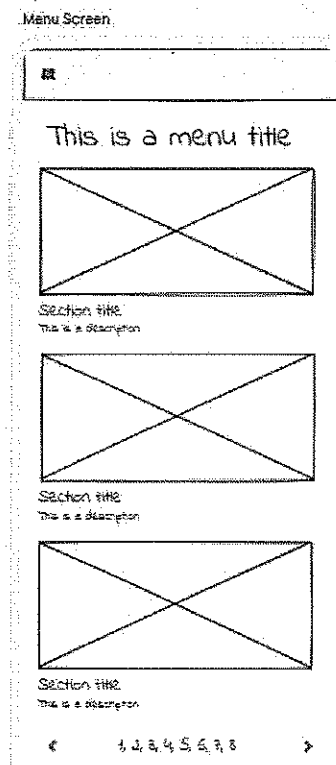


Figure 7.2: Menu Screen.

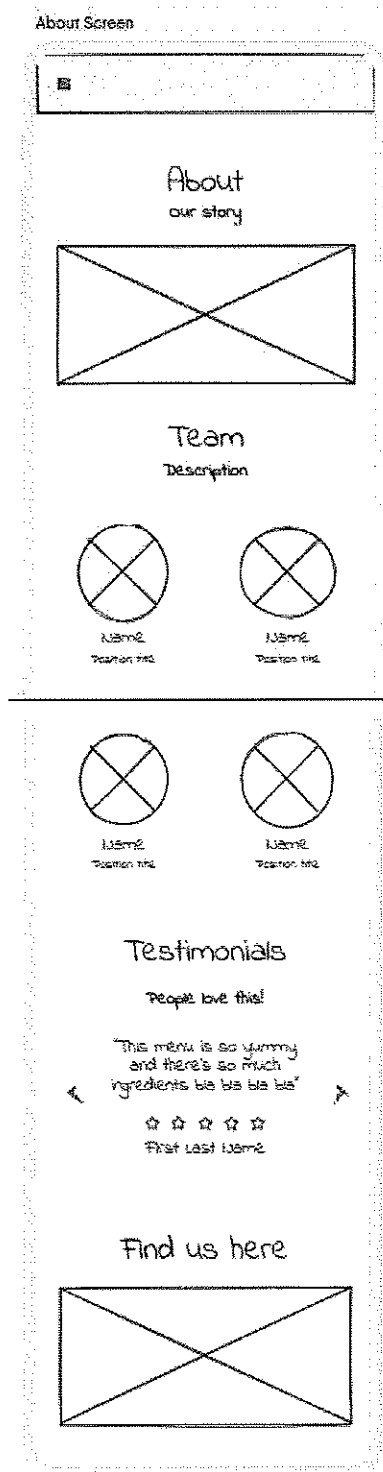


Figure 7.3: About Screen.

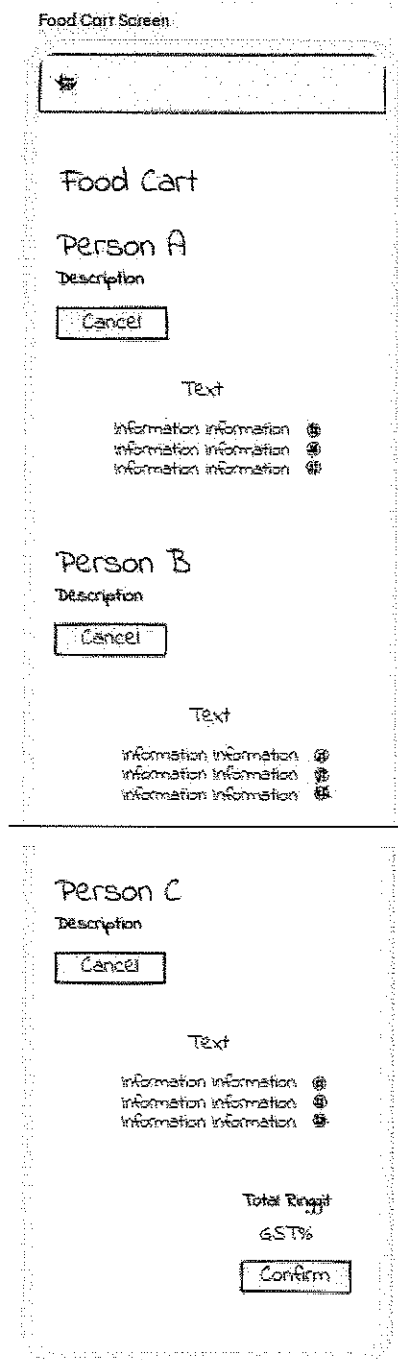


Figure 7.4: Food Cart Screen.

Checkout Payment Screen

☰

Checkout

Please select
ONE person
for payment

Person A/B/C

Person A's order
information information ⓘ
information information ⓘ
information information ⓘ

Person B's order
information information ⓘ
information information ⓘ
information information ⓘ

Person C's order
information information ⓘ
information information ⓘ
information information ⓘ

Total Ringgit
GST%

Figure 7.5: Checkout Screen.