Remembering Future Tasks: A usability study of reminder apps

Wesam Abusaber

A thesis submitted to
Auckland University of Technology
In partial fulfillment of the requirement for the degree of
Master of Computer and Information Sciences (MCIS)

2015

School of Computer and Mathematical Sciences

Supervisor: Dr. Philip Carter

AUT UNIVERSITY POSTGRADUATE

FORM PGR15   DEPOSIT OF THESIS/EXEGESIS/DISSERTATION IN THE AUT LIBRARY

PLEASE NOTE
- *This form must be typed. Handwritten forms will not be accepted.*
- *The completed and signed form should be bound into the copy of the thesis/exegesis intended for the AUT University Library*
- *If the work is to be treated as confidential or is embargoed for a specified time, form PGR16 must also be completed and bound into the thesis/exegesis.*

Student ID No	0828475	**Name**	Wesam Abusaber
Faculty	Faculty of Design and Creative Technologies	**School/Dept**	Computing and Mathematical Sciences
Programme	Master of Computer and Information Sciences (MCIS)	**Year of submission** (for examination)	2015

Research Output   Thesis ☒   Exegesis ☐   Dissertation ☐   **Points Value** 120

Thesis Title   Remembering Future Tasks: A usability study of reminder apps

DECLARATION

I hereby deposit a print and digital copy of my thesis/exegesis with the Auckland University of Technology Library. I confirm that any changes required by the examiners have been carried out to the satisfaction of my primary supervisor and that the content of the digital copy corresponds exactly to the content of the print copy in its entirety.

This thesis/exegesis is my own work and, to the best of my knowledge and belief, it contains:
- no material previously published or written by another person (except where explicitly defined in the acknowledgements);
- no material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

CONDITIONS OF USE

From the date of deposit of this thesis/exegesis or the cessation of any approved access restrictions, the conditions of use are as follows:

1. This thesis/exegesis may be consulted for the purposes of private study or research provided that:
   (i)   appropriate acknowledgement is made of its use;
   (ii) my permission is obtained before any material contained in it is published.

2. The digital copy may be made available via the Internet by the AUT University Library in downloadable, read-only format with unrestricted access, in the interests of open access to research information.

3. In accordance with Section 56 of the Copyright Act 1994, the AUT University Library may make a copy of this thesis/exegesis for supply to the collection of another prescribed library on request from that library.

THIRD PARTY COPYRIGHT STATEMENT

I have either used no substantial portions of third party copyright material, including charts, diagrams, graphs, photographs or maps, in my thesis/exegesis or I have obtained permission for such material to be made accessible worldwide via the Internet. If permission has not been obtained, I have asked/will ask the Library to remove the third party copyright material from the digital copy.

Student's Signature   Date   11/11/15

Abstract

This research is a usability study of reminder apps that are available on smartphones and tablets. Reminder apps are used by people to remember their future tasks and also manage their schedules. Interviews, co-inquiry, observation and diary methods were used with several students to understand user experiences. An initial set of guidelines were formulated covering interaction and graphic design. Awareness is raised about gender differences and religious preferences. The study also offers researchers and practitioners the comparative advantages of the different methods that can be used to get user experiences and preferences.

Keywords: reminder apps, usability study, think aloud, co-inquiry, diary study

Declaration of Originality

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed _____ Date   11/11/15

Acknowledgements

Contents

List of Tables

List of Figures

ix

Chapter 1: Introduction

Reminder apps (applications) have played an important role in my life by supporting my academic career. I have been using reminder apps since I started my postgraduate study at the Auckland University of Technology. They have helped me to remember assignment deadlines, group meetings, classes and exams. In addition, they remind me of other activities, such as meetings and making purchases at shops.

This study examines the usability of reminder apps that are available from the Apple Store® and Google Play™. Reminder apps have a number of advantages, as people now use their smartphones and tablets to be reminded of future tasks. This study examines how and why users use reminder apps, including whether they use them for study, sport and other tasks or whether they just use it for one type. It also examines the functions and content that users need in reminder apps.

The choices people have for spending time and the multiple pressures on time have increased the interest in tools for helping people to schedule and manage their tasks and remind them when tasks are due. With the ubiquity and constant proximity of personal mobile devices, many people are using electronic reminder apps to assist them. There is a proliferation of such apps with a diversity of interfaces, features and theoretical foundations. Clearly there is no one answer to fit all user needs. This begs the following questions: Which features are the most useful? How are users appropriating reminders apps? How can a user select from this snowballing diversity of apps to find one that suits them? This research addresses these questions by focusing on the usability of a set of common reminder apps and how people use them. Insights from this usability study will provide a basis for selecting reminder apps, and it will guide the design decisions of future apps.

1.1 Aim and Approach

The main focus of this research is a usability study of the reminder apps available on smartphones and tablets that facilitate better app development, including better design and features that can address users' needs. It is anticipated that the results from this research will help in creating guidelines for the design of reminder apps, as well as identify the contents and functions that users need to remember their future tasks.

This research utilises three combinations, each consisting of a triangulation or quaternion of usability methods. The usability testing helps to identify which contents and functions work and do not work in reminder apps. Usability testing is the best method for this purpose because it directly studies the behaviour of users at the time of use.

1.2 Structure of Thesis

This introductory chapter aims to describe the researcher's motivations, as well as the objectives of the research. Chapter 2 reviews five reminder apps to identify the features that are available in this type of app. The chapter also compares the reminder apps to identify their common and uncommon features. Chapter 3 conducts a literature review of the usability techniques used in this research. Chapter 4 presents information about the methodology used, participants and data analysis. It also includes the results of the pilot study and the questions for the research. Chapter 5 presents a summary of the results from the three combinations used in this research. Chapter 6 provides guidelines for reminder apps and displays other factors found throughout the research. Chapter 7 discusses the advantages and disadvantages of the usability methods in this research. Finally, Chapter 8 discusses the limitations of the study, directions for future work and a conclusion.

Chapter 2: Reminder Apps

Reminder apps are useful when people need to remember tasks such as events, deadlines and other routine obligations. The main purpose of this study is to assess the usability of five types of reminder apps. This chapter provides an overview of reminder apps and their features.

People often forget to perform everyday tasks, and they may find it difficult to recall details related to the tasks they have already completed (Hodges et al., 2006). For example, people may fail to remember, or 'forget', future intentions such as buying milk or visiting the dentist. Recent technological innovations, such as smartphone-based reminder apps, can help users to remember future tasks.

The widespread use of smartphones is a defining feature of modern life. The growth of smartphones has continued unabated. Nearly half of all adults in the United States (US) own a smartphone, with nearly 1.8 billion units currently in use. Smartphones are used for much more than phone calls. The average user spends two hours per day using the device, of which only around 11 minutes are spent making phone calls (Miller & Monaghan, 2013). The popularity of smartphones has led to a significant increase in the popularity of smartphone applications (or apps). According to Apple, more than 50 billion apps have been downloaded from Apple's online App Store since it opened in 2008 (Miller & Monaghan, 2013). Reminder apps are available in the App Store's Productivity category; a recent study found that this category contains 1687 apps (Kim, Park, Kim & Lee, 2014).

Apple and Google offer many reminder apps, which can be divided into two categories: specialist apps and general apps. Specialist reminder apps help users to perform one task. For example, 'Plant Nanny' and 'Daily Water' remind users to drink water regularly, 'Birthday Cards' reminds users of their friends' birthdays, 'myPill' reminds users

to take their pills and 'Fasting Reminder' alerts Muslim users to the start and end times for fasting. General reminder apps allow users to add tasks of various types, such as sport, business, study and health. This study will focus on general reminder apps. To remember future tasks, users may have different roles or identities based on where, when and why they use the app (Kim et al., 2014). They can use reminder apps for shopping lists, remembering homework assignments or even waking up.

Not all reminder apps in the Apple Store® or Google Play™ are free. Reminder apps can be divided into three levels:

- Level 1 apps are free but have limited features. Users need to pay to upgrade the app and use more features.

- Level 2 apps are not free. Users need to pay to download the app.

- Level 3 apps are free.

Five reminder apps have been selected in this study in order to examine their most common features and identify any unique features that may differentiate them. The study will identify the dimensions of, and criteria for, the reminder apps and reveal their key features.

2.1 App Features

The five apps selected for this study are considered general reminder apps, and all of them were free apps (level 3), although if they were partially free, the free version (level 1) has been used. The apps chosen were RTM, RE.minder, Todoist, Alarmed and Any.DO.

2.1.1 RTM

RTM, or Remember the Milk, assists users in managing their tasks. The app is available for the iPhone, iPad, Android-based smartphones, BlackBerry, Evernote and as a web application. RTM has many features that enable users to manage tasks from any

location. It can send reminders via email, instant messaging (IM) or short message service (SMS). When using SMS, no internet connection is required. Google Calendar and iGoogle can also be used to add tasks to the app, and users can share their tasks via Twitter. RTM can display all tasks for one week or for the current day.

To add a task (see Figure 2.1), users select the 'Add Task' button and:

1. write the task name

2. select the task type from the list (Inbox, Personal, Study, Work)

3. select the task priority (None, High, Medium, Low)

4. select the due date for the task.
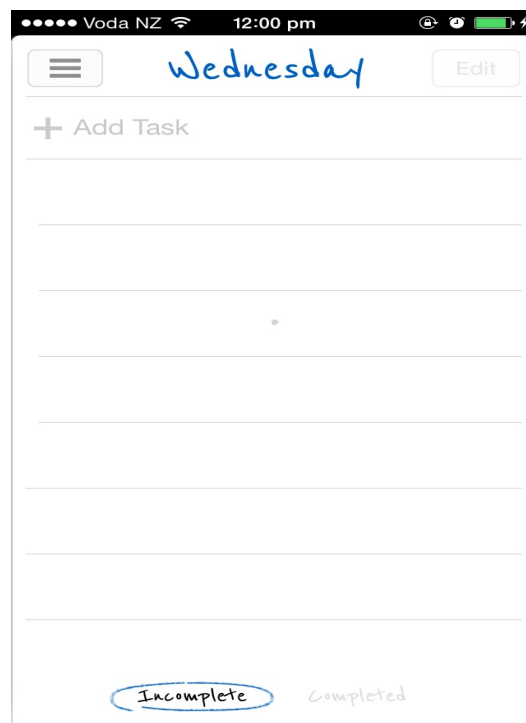
Figure 2.1. RTM (list page).

The application allows users to select from three due-date types:

- Basic: users simply select the day (e.g., Today, Tomorrow, Tuesday).

- Picker: users can select the date, hour (am or pm) and minute for the event (e.g., Sunday, 27 July 2014 @12:00 am).

- Custom: users can customise the due date (e.g., next Friday, the end of this month, in three weeks).

After a task has been created, it can be repeated at specified intervals (e.g., every day at the same time, every week until 1 January 2016). Users must enter a time estimate for the task, indicating its duration (e.g., two minutes, 10 minutes, 1.5 hours). Users can also add tags, locations, notes and URL links to the task. Thus, they can be reminded of details associated with the task, such as 'book a room' or 'wear a suit to the meeting'.

By selecting the 'Completed' button on the app's homepage, users can view all completed tasks. From here, users can edit the tasks and mark them as incomplete if necessary. By selecting 'Incomplete', users can view all uncompleted tasks and edit them by selecting the task and changing the due date, priority, list or tags; they can also choose to postpone the task. All completed and uncompleted tasks are listed in ascending order by due date.

2.1.2 RE.minder

RE.minder is an intuitive app designed by Handelabra Games. It is available in the App Store for the iPhone, iPad and iPod. RE.minder displays tasks in ascending order by due date.

To add a task (see Figure 2.2), users select the '+' button and:

1. Write the task name: the app provides users with 'Quick Picker' icons for adding tasks. Users can select from multiple icons, including Laundry, Fix, Call and Medicine.

2. Select the time: users can select the time by using the 'Quick Picker' to select, for example, 5 or 10 min, or select the date and time of day. After users select

the time for the task, it is displayed on the homepage along with the estimated time, in minutes, until the next task.

3. Edit the task by selecting the priority level (Low, Medium, High): users can also delay the task by adding time to the due time.
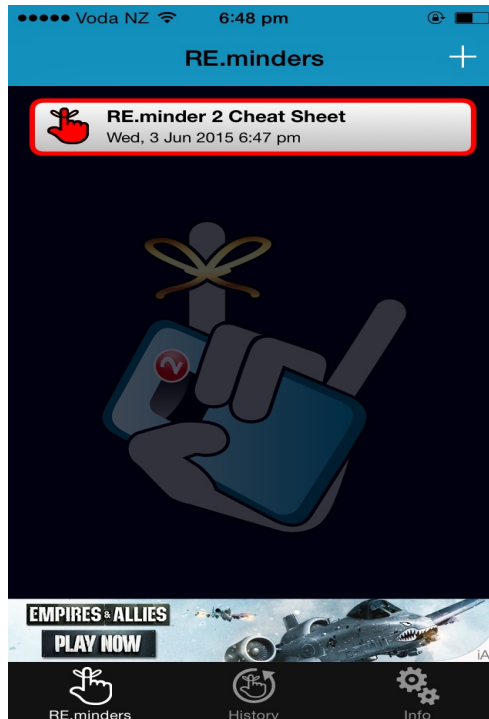
Figure 2.2. RE.minder (list page).

After the task has been completed, users can click on 'Task Completed' to remove it from the homepage. The history page displays all completed tasks in either alphabetical or newest-to-oldest order. The app also allows users to delete completed tasks from the history.

2.1.3 Todoist

Todoist is designed to help users manage various tasks from any location, and it does not require internet access. The app is available for iPhone, iPod touch, Android

(phone and tablet) and as a web application. Todoist displays all tasks for a particular day

(e.g., today, tomorrow). It displays tasks for the next seven days on the homepage.

After users select the '+' button (see Figure 2.3), a new page opens to add the task.

Users can then:

1. add the task name

2. categorise the task (e.g., Personal, Work, Errands, Health, Shopping, Movies to

   Watch, Books to Read).
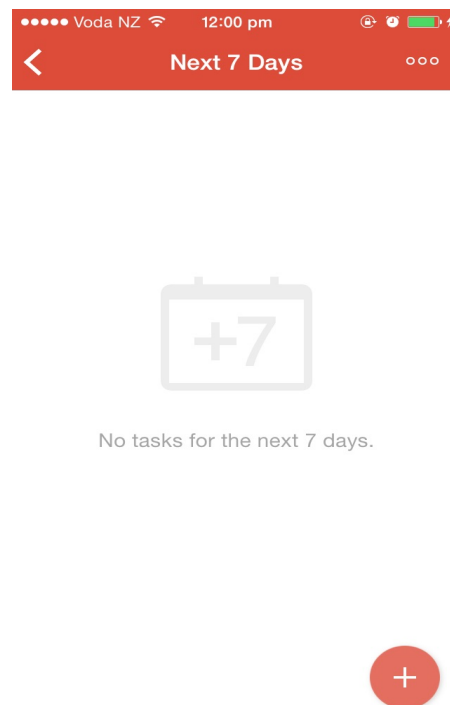
Figure 2.3. Todoist (list page).

In addition, users can complete the following optional fields:

1. select the due time for the task (date, hour, minute, am or pm)

2. select from three types of reminders: time and date, before another task or at a

   location (users can select all of them)

3. select a colour and label the task to specify how it is displayed on the homepage

4. select task priority (1, 2, 3 or 4)

5. divide the task into subtasks by selecting Level 1, 2, 3 or 4.

After the task details have been entered, users can select 'Done' to post the task. Users can also share the task with friends by adding their phone numbers. After posting the task on the homepage, users can display tasks according to a daily, weekly or monthly schedule. Users can also add notes to the tasks and edit the reminders and content of the tasks. After the task has been completed, users can select the 'Task Complete' option to move it from the homepage to the completed tasks page. Users can also filter tasks by priority, labels and projects. On the competed tasks page, users can clear the tasks from the page.

2.1.4 Alarmed

Alarmed is a reminder and timer app that helps users to schedule repeating tasks. It is available in the App Store for iPhone, iPad and iPod touch. The app displays all tasks scheduled for the following seven days, and it also features countdown and count-up timers.

After users select the '+' button (see Figure 2.4), a new page opens to add the task. Users can then:

1. Add the task title.

2. Add the task time by clicking on one of four 'hot' buttons: 7:00 am, 12:00 pm, 5:00 pm or 9:00 pm.

3. Users can also select the date and time of day from the date box. There are four options to change the date or time: now, +3 hours, +1 week and +1 month.
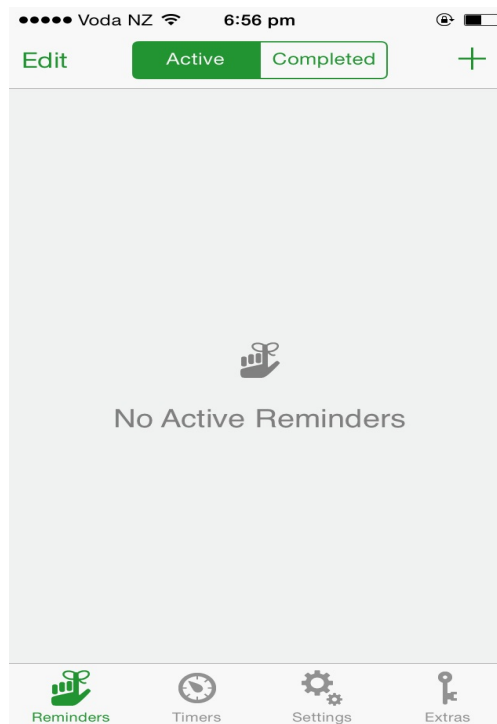
Figure 2.4. Alarmed (list page).

In addition, users can complete the following optional fields:

- 'Super Reminder' allows users to add a message to the task and configure the task to repeat daily, weekly or monthly

- select the reminder days by checking the days (e.g., Monday, Wednesday, Friday)

- repeat a task (e.g., every Monday from 1 February 2015 until 1 March 2015).

Users also can edit tasks by clicking on them. From here, users can select the 'Nag-Me' option, which prompts users every minute or every hour. After the task has been completed, users simply need to click the 'Complete' button next to the task to mark it complete. The 'Active' and 'Completed' buttons at the top of the app display all of the active and completed tasks, respectively. Users can set a particular melody for reminders, and they can also select from four hot buttons—Count Up, +5 minutes, +15 minutes and +30 minutes—to set the timer. After posting the timer, users can click on the pause and

play buttons next to the task. In addition, the estimated time is displayed in minutes and seconds at the top of the task.

2.1.5 Any.DO

Any.DO allows users to manage their tasks from any location. The app is available for iPhone, Android and as a web application. Any.DO displays tasks in folders such as 'Personal' and 'Work'.

To add a task, users select the '+' button next to the folder; this displays a new page that prompts users to enter the task name with either the keypad or microphone. After users enter the task name, three options are displayed that allow users to perform the following steps:

1. Select the date and time and click the 'Set' button.

2. Select the location by entering the address. After entering the address, users can label the location as an arrival or departure location.

3. Post the task on the homepage. This can be done if the user does not want to set the time, date or location.

●●●●● Voda NZ 🗢   6:56 pm   🔋

⋮⋮⋮   ⌄ +

ALL

TODAY   +
TOMORROW   +
UPCOMING   +
SOMEDAY   +

≡
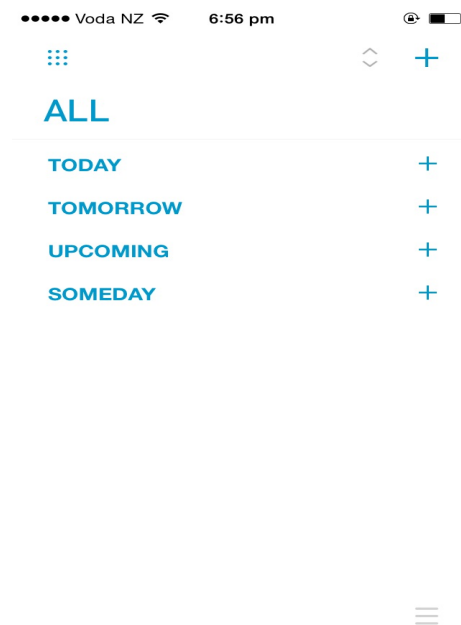
Figure 2.5. Any.DO (list page).

The 'Display' button near the bottom of the page allows users to display all tasks in

a new page, in their respective folders. Each task presents users with four options: Today,

Later, Done and Delete. The 'Today' option lists tasks that are due today, while the 'Later'

option is used to display tasks set in the future, such as tomorrow, in two days, next week

or a certain day in the future. The 'Done' option is used to mark the task as completed, and

the 'Delete' option is used to remove tasks from the list. From the homepage, users can

filter tasks by date (today, tomorrow, upcoming or a date in the future) or folder ('Work' or

'Personal'). In addition, users can add new folders and filter tasks by the folders they

create.

2.2 Comparison of Apps

This section compares the features of the different apps, as outlined in Table 1.1. A

tick indicates that the app includes the feature, and a cross indicates that the app does not

include the feature.

Table 1.1

Common and Uncommon Features of Reminder Apps

	Reminder Apps				
	RTM	RE.minder	Todoist	Alarmed	Any.DO
Add tasks any time (no Internet required)	✓	✓	✓	✓	✓
Select date and time	✓	✓	✓	✓	✓
Task priority	✓	✓	✓	✗	✗
Reminder (alert)	✓	✓	✓	✓	✓
Reminder (mobile notification)	✓	✓	✓	✓	✓
Reminder (location)	✓	✗	✗	✗	✓
Reminder (email)	✓	✗	✓	✗	✗
Repeat reminders	✓	✓	✓	✓	✓
Schedule task (every day/every month)	✓	✗	✓	✓	✗
Add due date to task	✓	✗	✓	✗	✗
Time tracking for task (or estimated time)	✗	✓	✗	✓	✗
Add notes to task	✓	✓	✓	✓	✓
Share task with friends	✓	✗	✗	✗	✓
Use voice recognition to add task	✗	✗	✗	✗	✓
Display completed tasks in a list	✓	✓	✓	✓	✓
Select start and end dates for task	✓	✗	✗	✓	✗
Save the location for task	✗	✗	✗	✗	✓
Edit task after posting it	✓	✓	✓	✓	✓
Add URL to the task	✓	✗	✗	✗	✗
Postpone the task	✓	✓	✓	✓	✓
Use 'quick picker' buttons for task	✗	✗	✗	✓	✗
Delay interval for task	✓	✓	✓	✓	✗
Clear the completed task	✓	✓	✓	✓	✓
Project list	✓	✗	✓	✗	✓
Add subtasks	✗	✗	✓	✗	✗
Total	**20**	**13**	**17**	**15**	**15**

Table 1.1 shows the common and uncommon features of the five reminder apps selected for inclusion in this study. The apps contain eight common features:

1. No internet is required for some functions.

2. The date and time can be selected.

3. Reminders are provided via alerts and mobile notifications.

4. Reminders can be repeated.

5. Completed tasks can be listed.

6. Tasks can be edited after posting.

7. Notes can be added.

8. Completed tasks can be cleared.

In contrast, some features are only available in one or two apps; for example, reminder by email is only available in RTM and Todoist, whereas time tracking is only available in RE.minder and Alarmed. RTM and Any.DO have two common features: reminder by location and share with friends. RTM and Alarmed are the only apps that allow users to select the start and end dates. The use of voice recognition to add tasks and save locations is only available in Any.DO. The 'quick picker' option to select a task is only available in Alarmed. Todoist also has a unique feature in that it allows users to divide tasks into subtasks.

Each reminder app has its own characteristic design and features, and some apps have more innovative features than others. Users may perceive the interfaces of reminder apps differently. Therefore, designers should consider users' feedback when designing these apps.

Chapter 3: Usability Testing

This chapter examines the advantages and limitations of the of observation, interview, co-inquiry and diary study for inquiring into the usability of and user experiences with reminder apps.

Usability is a multi-disciplinary field that is grouped under the larger domain of human–computer interaction, which has two essential components: design and evaluation. Usability testing includes a set of techniques that helps one understand how users interact with a particular product or service. Usability testing can be defined as the evaluation of an information system that involves the testing of participants who are representative of the target users of the product or service because they use the respective product or service (Laurel, 2003). There is a difference between a person's individual experience of using a product and a usability test (Carter, 2007). Usability testing is the art of collecting users' experiences of a software product by getting the user to actually use the product (Carter, 2007).

During usability testing, all tasks performed by users are recorded. This approach is based on classifying users on the basis of their cognitive ability and then identifying the problems they face when they interact with the information system (Laurel, 2003). The technique of usability testing may involve: a) observing people while they complete a particular task, b) asking people to think when they complete a task, and c) asking probing questions regarding how they found the task (Collins, 2014). In technical terms, usability testing can be defined as the collection of empirical data by observing users as they complete a particular task with the product or application that is being evaluated (Borriello & Holmquist, 2002). Usability testing can be conducted in a field, but it is usually conducted in a laboratory setting where equipment for recording and observation are

available. The main aim of usability testing is to create a product or service that is easy to use and that provides adequate functionality to the target users (Borriello & Holmquist, 2002).

There are two main categories of methods used for usability testing. One set of methods, which does not involve the presence of users, is called analytical (Marcus, 2011). The other set, which involves users, is called observation (Marcus, 2011).

There are many forms of usability testing techniques, but most of them involve placing prospective users in front of an existing product or its prototype and asking them to perform one task at a time (Goodwin, 2011). This can be useful in the case of evaluating designs because it allows product developers to closely examine the problems that users may face when using a product or service. Testing may not be very significant in research, as the design may continue evolving according to users' feedback (Goodwin, 2011). Therefore, it is advisable to conduct usability testing during all stages of product development. Attributes that are used to measure the quality of the application include learnability, efficiency, memorability, user satisfaction, simplicity and comprehensibility (Zhang & Adipat, 2003). The four popular methods of usability testing are discussed in the next section.

3.1 Interview

The interview structure for usability testing follows a standard format. Interviews for usability testing begin with the most general information, which is followed by specific information to understand the larger perspectives, and conclude with a summary (Goodman, Kuniavsky & Moed, 2012). Individual interviews may be favoured over group interviews, as they provide a better understanding of users' perceptions and feedback. Simple interviews may be a good option for understanding users' views when evaluating a

product or service for usability testing (Goodwin, 2011). Self-reporting errors are a

common problem in the case of group interviews and can be minimised by asking different

sets of questions (Goodwin, 2011).

Stakeholder interviews are those that are conducted with key executives and subject

matter experts related to the product, and they are an efficient way of understanding the

strategic direction of the product (Laurel, 2003). These interviews help to identify potential

issues that may affect the product's development in the long run. User interviews help in

generating design-related feedback about a product or service (Laurel, 2003). In this case,

the product developer does not tell the user what to do, but instead collects feedback about

how users perceive the product or service and what problems they face (Laurel, 2003).

A standard interview process can be divided into six main phases:

1. Introduction: In the initial phase of an interview, all participants introduce

   themselves. When group interviews are being conducted, introductions are more

   important because it is necessary for people to know each other in a group so

   that they are comfortable interacting with each other (Goodman, Kuniavsky &

   Moed, 2012). The introduction phase in an individual interview establishes a

   comfort level between the interviewer and the interviewee.

2. Warm-up: In the warm-up phase, participants are encouraged to step away from

   their regular lives and thinking patterns and concentrate on thinking about the

   product and the task of answering the respective questions (Goodman,

   Kuniavsky & Moed, 2012).

3. General issues: In this phase, the initial product-related round of questions

   focuses on experiences related to the product, as well as people's attitudes,

   expectations and assumptions related to the product (Goodman, Kuniavsky &

   Moed, 2012). These types of general questions help the product development

team from altering people's perceptions about a product or service, and they allow people to express their true individual opinions about the product or service (Goodman, Kuniavsky & Moed, 2012). Further, to ensure the best response, the product is not named during this phase.

4. Deep focus: In this phase, the product or service is introduced and people focus on what it does, how it works, how they can use it and what they experience when using it (Goodman, Kuniavsky & Moed, 2012). In the case of usability testing, this phase constitutes the most substantial part of the interview process.

5. Retrospective: In this phase, participants review the product or idea in a broader sense (Goodman, Kuniavsky & Moed, 2012). The discussion in this phase may be similar to the general issues phase, but the focus is on how the ideas introduced in the deep focus phase may affect the issues that were discussed earlier in the interview process.

6. Wrap up: In this phase, the interview process is concluded and participants are directed to focus on the general topics once again so that the interview can end on a normal note (Goodman, Kuniavsky & Moed, 2012). This is usually the shortest phase of the interview process.

3.2 Co-inquiry

The technique of usability enquiry involves holding a conversation with users and observing how they use the product or service in a real scenario, as well as answering questions related to the product or service and discussing users' feelings and feedback (Filippi & Barattin, 2011). Typical usability enquiry methods include field observation, focus groups and surveys. Inquiry refers to the product of use, context of use, person of use and conditions related to use.

In a typical conventional laboratory method, the user is in the room alone using the application, and the facilitator and logger are in a separate room observing the user through thin glass (Carter, 2007). In many cases, the facilitator and logger are unable to understand what the user actually experiences and therefore need to clarify with the user about his or her experience while using the application (Carter, 2007). In the method of co-inquiry, a facilitator sits close to the user and the logger sits at an angle so that each person can see each other and the user sees the screen. Using a dual monitor can be useful because it allows the logger to follow the user's actions. Loggers find this method useful because there is no need to separately ask for a logging record from the user (Carter, 2007). Both the facilitator and logger can easily write descriptions that are appropriate for users. In addition, the work of post-testing enquiry is eliminated using this technique. The attitude of the facilitator plays a key role in this technique. First, the facilitator should have a commitment to the product or service. Second, the test user should be respected for his or her feedback and valuable time. A warm-up session may be used to help the user provide feedback about the product or service, and to learn how the research is progressing and in what direction (Carter, 2007). A good facilitator needs to be actively involved in structuring the direction of the research without interfering with the attitude of the test user (Carter, 2007).

3.3 Diary Study

A diary is a document that is created by an individual to make regular entries about events in one's life or the time at which these events occurred (Leung, Nkhoma & John, 2013). Diary studies are considered more advantageous because it is an accurate research method that collects information about individuals over a particular period (Leung, Nkhoma & John, 2013). In diary studies, the step-by-step method of research can be

tracked. Diary entry templates ensure that all data collected for users are consistent. Diary studies help product developers to understand how the product or service is useful to the user over time (Cooper, Reimann & Cronin, 2007).

3.4 Observation

Observing people as they complete their tasks is one of the best techniques for removing self-reporting error (Goodwin, 2011). However, there is still a possibility of the observer affecting users' behaviour. Observation helps in developing a better understanding of the problems that people may face while using a product or service (Goodwin, 2011). This usability testing technique has some challenges, including the amount of time needed to closely observe the participants as they use the product or service. An observer may have to spend several days observing the participants, which may not be practically possible (Goodwin, 2011). In addition, unless the participant is observed from beginning to end, the observer may fail to register important phases (Goodwin, 2011). For example, in a case where one is observing the tasks of an accountant using accounting software, unless the observer pays attention to how the accountant uses the software to generate reports, he or she may not be able to obtain a complete picture of the accountant's experience.

3.5 Drawbacks and Challenges in Current Research and the Utility of the Usability Method in the Current Study

Some of the drawbacks and challenges in this research study include a lack of synchronisation between the various types of reminder apps to evaluate their performance. Each type of reminder app has features that may not be present in other apps. A lack of similarity makes it difficult to evaluate the performance of each app. In addition, specific skills or devices may be needed to use these apps. Therefore, it is necessary to take on board the feedback of target users regarding how they rate each app. In addition, as users'

experiences may change as a result of changes made to each version of the app, usability testing techniques may be useful in understanding their experiences. It is often difficult for developers to identify the drawbacks and loopholes in their apps unless they are pointed out by the end users. Pilot studies or pre-launch studies are useful to a limited extent, as they cannot identify the challenges and limitations of apps in an exhaustive manner. Therefore, to address the challenges in identifying the limitations of various types of reminder apps, including their utility, features, drawbacks and users' experiences, usability methods can be quite useful.

The usability methods used in the current study include interview, co-inquiry, diary study and observation. As the main aim of usability testing in this study is to improve the usability of reminder apps, the interview method of usability testing has been chosen because it helps product developers to understand users' perceptions of reminder apps and learn about their experiences without altering users' perceptions. The structure used for the interview process follows the six steps mentioned earlier, beginning with an introduction phase and ending with a concluding phase.

The co-inquiry method of usability testing has been chosen because it allows one to obtain a better understanding of users' experiences with reminder apps. As the observer is in close contact with the user in this case, there is no need for probe questioning or inquiry at a later stage.

The diary study method of usability testing has been used in the current study because it provides an accurate record of users' experiences with reminder apps over a period of a few weeks.

The observation method of usability testing helps to remove self-reporting errors that may arise as a result of the effect of the observer on users' perceptions and thinking

processes. This method allows users to use the product without any interference from the observer.

The different methods of usability testing have their own advantages. Together, they allow the researcher to study the usability of reminder apps through direct interaction with, and observation of, participants.

Chapter 4: Methodology

This research aims to create usability guidelines for reminder apps. In doing so, it will benefit two fields: reminder apps and usability testing. Free general reminder apps available in the Apple Store® or Google Play™ were targeted as the initial focus because they are commonly available on smartphones and tablets. Five reminder apps were selected according to their high rating, high number of downloads and good feedback given by users (see Table 4.1). All of the apps' features were identified. This study has been conducted using free reminder apps in order to save costs and ensure that all participants could access the apps.

Table 4.1

Criteria Behind Selecting the Reminder Apps

Reminder App	Criteria behind selecting the app
Remember the Milk (RTM)	Downloaded by more than five million people. https://www.rememberthemilk.com/about/
RE.minder	Good reviews and feedback from users. https://itunes.apple.com/us/app/re.minder/id395529341?mt=8
Any.DO	Award-winning task app. Winner of Apple's intuitive Touch Award and Android's Best App of 2012. http://www.any.do/anydo/
Todoist	Average rating is 4.65 out of 5; it has good reviews and feedback. https://en.todoist.com/
Alarmed	Rated 4+ and has good reviews and feedback. http://yoctoville.com/alarmed-app-details/

There are many reminders apps available in the Apple Store® and Google Play™. Each type has its own features that may not be present in other apps. The lack of similarity makes it difficult to evaluate the performance of each app. In addition, users may need specific skills or devices to use these apps. This chapter outlines the main objective of the research and the steps that were taken before the test began.

4.1 Research Objective and Process

The objective of this study is to create usability guidelines for reminder apps used on smartphones and tablets. This research examines which usability methods work and do not work when testing reminder apps. To investigate their usability, the following usability testing methods were identified as having good potential:

1. Interviewing
2. Co-inquiry
3. Observation
4. Diary study

A pilot study was conducted with a small number of participants to test the effectiveness of these methods and to inform the application in the main study. Here is the outline of the research process:

- Interviewing pilot test
- Co-inquiry pilot test
- Observation pilot test
- Diary study pilot test

4.1.1 Interviewing Pilot Test

The first pilot test was conducted with a male who had previous experience with a reminder app. The participant was asked to download the reminder app and use it for one week. After one week, he would attend an interview. The interview method of usability testing was effective because it involved asking the participant about the various features of the app.

4.1.2 Co-Inquiry Pilot Test

The second pilot test was conducted with two males and one female, all of whom had previous experience with reminder apps. The participants were asked to use a reminder app for one week and then meet with the researcher to provide their opinions. The co-inquiry method of usability testing was effective because the interaction provided insights into the app's features and the issues faced by the users.

4.1.3 Observation Pilot Test

The third pilot test was conducted with a male who had never previously used a reminder app. The participant was asked to download a particular app and assign five tasks, which the participant would then complete while thinking aloud. The observation method was effective because the researcher could observe the participant's emotions and reactions while he completed the tasks.

4.1.4 Diary Study Pilot Test

The fourth pilot test was conducted with a male who had been using a reminder app for a long time. A diary form was given to the participant so he could write down the information for each task he completed during one week. The diary study method was challenging because the participant found it redundant to mention all of the tasks in the diary form, so he did not write down all of the information.

4.2 Main Methodology

Given that all methods have advantages, three sets of combinations or triangulations, were formulated to provide a fuller coverage:

- Combination A (diary study—interview—observation) face-to-face
- Combination B (diary study—interview—observation) online

- Combination C (diary study—screen capture—co-inquiry—observation) face-to-face.

4.2.1 Combination A

A participant will write down all of the tasks they added to their reminder apps during one week in diary form. Afterwards, they will sit for an interview and observation.

4.2.2 Combination B

A participant will write down all of the tasks they added in their reminder apps during one week in diary from. After one week, they will email their diary form to the researcher and sit for an interview and observation through Skype.

4.2.3 Combination C

Three participants will join this study. Participants will take screen captures (screenshots) and write down all of the tasks they added in their reminder apps in diary form. After one week, the participants will send both the diary and the screen captures to the researchers via email or the WhatsApp app.

4.2.4 Participants

All of the participants who joined this research were friends and acquaintances of the researcher who owned a smartphone or tablet. Part of the research was conducted face-to-face with participants in Hamilton, New Zealand. Another part was conducted vertically (or online) through Skype with a participant from Sydney, Australia. The participants were students aged 20–35 years; six of them were male and one was female. However, they were not differentiated according to age.

4.2.5 Procedure

Before conducting the study, each participant read the Participant Information Sheet and signed the Consent Form (see Appendix B and C). The interview and co-inquiry methods were audio-recorded with the researcher's iPhone 5. The observation method was

video-recorded using the researcher's Sony NEX-5N camera. The diary form was given to the participants by hand and was also submitted by hand in Combination A and Combination C. For Combination B, the diary form was sent by email to the participant. For the screen capture (or screenshot) method, participants sent the screenshots to the researcher's email or WhatsApp app (IM application).

The interviews and co-inquiry took place in public places in Hamilton City, and the observations were conducted between 10 am and 5 pm.

4.2.6 Data Analysis

- The interviews and co-inquiry were transcribed into a Word Document.

- Significant points in the observations were transferred into an Excel spreadsheet and a Word Document.

- Data from the diary forms were transferred into an Excel spreadsheet.

- Data from the screen captures were transferred into a Word Document.

4.3 Reminder Apps Evaluation: Pilot Study

Pilot studies are a crucial element in effective study design. Although conducting a pilot study (also known as pre-testing) does not guarantee success in the main study, it can reveal the possible advantages and disadvantages of the study's methods (Teiilingen & Hundlev, 2002). The goal of this pilot study is to identify the most appropriate methodologies for the usability testing of reminder apps.

There are many well-established techniques of usability testing. They usually involve studying users' interactions with the product, interviewing users, co-inquiry, diary study and observation, with the goal of building an understanding of how users experience interactions with the artefact (Carter, 2007).

4.3.1 Procedure

The pilot study was conducted with friends and acquaintances of the researcher to find out how much information could be obtained using interview, co-inquiry, observation and diary study methods. The pilot study aimed to determine whether the selected methodologies would work appropriately in the real world by testing them with a small group of participants (Teiilingen & Hundlev, 2002). Table 4.2 describes each method used in the pilot study.

Table 4.2

Pilot Study Procedure

Method	Participant	Descriptions
Interviewing	T1	Participant was asked to user reminder app for one week and then sit for interview.
Co-inquiry	T2, T3 and T4	Participants were asked to use reminder app for one week and meet together with the researcher to provide their opinions about their selected reminder app.
Observation	T5	Participant was asked to download particular reminder app and assign five tasks that they would perform while thinking aloud.
Diary study	T6	Diary form was given to the participant to write down the information for each task done through one week.

Six participants were included in the pilot study. Three participants joined the co-inquiry method, one participant did the interview, one participant did the observation and the last participant did the diary study. The interview and co-inquiry experiments were used to answer the questions generated in Chapter 2. Observation experiments were used to answer the questions generated from the Liberating Usability Testing article. Lastly, diary methodology was used to answer questions about when, where and how users used the reminder apps.

4.3.2 Interview and Co-inquiry Results

The results of the pilot study from the interview and co-inquiry experiments suggest that users use reminder app for different reasons. For example, T1 used it to remember the due dates of assignments, where T4 used it to remember friends' birthdays. User behaviour differed from one user to another. For example, T2 checked the reminder app every day, whereas T4 only checked the app on Sunday to add up all of the tasks for the week. Participants also used one or more reminder app. For example, T1 used one reminder app for study-related tasks and another for shopping, so he could share the tasks with his girlfriend.

The design and name of the reminder app played a role in selecting the app. T2 selected the app because it had an attractive name, whereas T1 selected the app because it looked professional and easy to use. T1 also deleted his old reminder app because it only had icons, which caused confusion. Users have different methods when deciding which reminder app to use. T1 read the reviews, comments, feedback and how many stars each app had before making a choice, whereas T2 selected his because it was free, had an attractive name and more than one million downloaders (number of people who have downloaded this app). Moreover, the users came from different backgrounds and had different ways of remembering things before using the app. For example, T2 wrote things down and texted the information to himself, T3 texted herself information and wrote down tasks in her agenda, and T4 used sticky notes and put them on his desktop.

Thus, the interview and co-inquiry methods provided insights into how individuals use reminder apps, as well as the strengths and weaknesses of the apps.

4.3.3 Observation Result

The results of the pilot study from the observation experiment suggest that participants should follow their tasks by using their reminder apps. T5 was asked to

download a particular reminder app and assign five tasks to be completed while thinking aloud. T5 read through the tasks many times, as he had not used the app before. The researcher was able to observe the participant's facial signs (frowning and wrinkling brow) and body language, which revealed information about what he thought about the app's usability while using it.

4.3.4 Diary Study Result

The results of the pilot study using the diary study methodology suggest that participants use reminder apps for different priorities and tasks. T6 added two tasks to the reminder app. The first task was personal and had a high priority, while the second task had medium priority. This method enabled the researcher to understand the average times of using reminder app. In addition, it showed which time of the day the reminder app is usually used, as well as where it is used. For example, T6 added one task in his friend's house at 1 pm, while the second task was added at his house at 12 pm.

4.4 Research Questions

Critiques of reminder apps and usability study techniques helped to generate the questions for this study, and they revealed how these questions can be answered based on the pilot study. The questions were separated into three categories: (1) questions about reminder apps, (2) questions about users' behaviour when using reminder apps, and (3) questions about the experiments/methods. Throughout the pilot study, the researcher realised that important questions about interaction and visual design can be answered by the participants. These questions were added to the diary study, interview and co-inquiry.

From the critiques of reminder apps, we devised 12 questions. Ten questions will be used in the interview and co-inquiry methods, and two will be used in the diary study method (see Table 4.3).

Table 4.3

Questions Generated Based on Critiques of Reminder Apps

No	Questions	Interview	Co-inquiry	Observation	Diary
1	Do you list your tasks using voice recognition?	✓	✓	✗	✗
2	Do you share your tasks with friends?	✓	✓	✗	✗
3	Do you add the task's location when you list your tasks?	✓	✓	✗	✗
4	Do you list your tasks under folders (e.g., study tasks, gym tasks)?	✓	✓	✗	✗
5	Do you add URLs or links to your tasks?	✓	✓	✗	✗
6	Do you set ringtones for the reminder application?	✓	✓	✗	✗
7	Do you use time tracking (or estimated time) for tasks?	✓	✓	✗	✗
8	Does the reminder application repeat your tasks?	✓	✓	✗	✗
9	How does your reminder application remind you (e.g., alert, notification, location, email)?	✓	✓	✗	✗
10	Do you delete your task lists after completion or you keep and reuse them?	✓	✓	✗	✗
11	What task priority do you typically use in the reminder application (High, Medium, Low)?	✗	✗	✗	✓
12	For what type of tasks do you use the reminder application (e.g., personal, sport, study, business, other)?	✗	✗	✗	✓

The next set of questions was generated based on usability testing techniques from the *Liberating Usability Testing* article written by Phil Carter at the Auckland University of Technology (Carter, 2007). Four questions were generated from this article; these will be answered using the observation method (see Table 4.4).

Table 4.4

Questions Generated Based on Liberating Usability Testing Article

No	Questions	Interview	Co-inquiry	Observation	Diary
1	What were you thinking when you used the reminder application?	✗	✗	✓	✗
2	Do you wrinkle your brow when you use the reminder application?	✗	✗	✓	✗
3	What were your feelings when you used the reminder application?	✗	✗	✓	✗
4	Do you frown when you use the reminder application?	✗	✗	✓	✗

The last set of questions was generated based on the pilot study. The total number of questions is 21. Eight questions can be answered using the diary study method, whereas 13 questions can be answered using either the interview or co-inquiry methods (see Table 4.5).

Table 4.5

Questions Generated Based on Pilot Study

No	Questions	Interview	Co-inquiry	Observation	Diary
1	For which tasks do you use this reminder application?	✗	✗	✗	✓
2	What do you name your tasks in the reminder application?	✗	✗	✗	✓
3	Where do you usually use the reminder application?	✗	✗	✗	✓
4	When do you usually use the reminder application?	✗	✗	✗	✓
5	When do you add the task (e.g., five days before, two days before, one night before, on the same day, or as soon as you find out)?	✗	✗	✗	✓
6	What is the name of the reminder application?	✗	✗	✗	✓
7	What operating system does your device use?	✗	✗	✗	✓
8	How many reminder applications did you use this week?	✗	✗	✗	✓
9	Do you prefer using icons instead of words in the reminder application?	✓	✓	✗	✗
10	What method of remembering tasks did you use before using a reminder application?	✓	✓	✗	✗
11	What do you like about this app?	✓	✓	✗	✗
12	What don't you like about this app?	✓	✓	✗	✗
13	Why did you select this particular reminder application?	✓	✓	✗	✗
14	How did you learn about this reminder application?	✓	✓	✗	✗
15	What features do you like in this reminder application?	✓	✓	✗	✗
16	Does the reminder application cover all of your needs?	✓	✓	✗	✗
17	Does colour play a role in the reminder application?	✓	✓	✗	✗
18	What do you think is missing in this reminder application?	✓	✓	✗	✗
19	What is your opinion of the diary study and screenshots?	✓	✓	✗	✗
20	Did the diary or screenshots interfere with your day?	✓	✓	✗	✗

| 21 | Are the interview or workshop questions useful? How can they be improved? | ✓ | ✓ | ✗ | ✗ |

To summarise, the interview and co-inquiry methods were used to answer 23 of the 37 questions, while the diary study method was used to answer 10 questions and the observation method was used to answer four questions.

Further, 27 questions relate to users' behaviour, seven to the reminder apps and three to the method (see Figure 4.1).
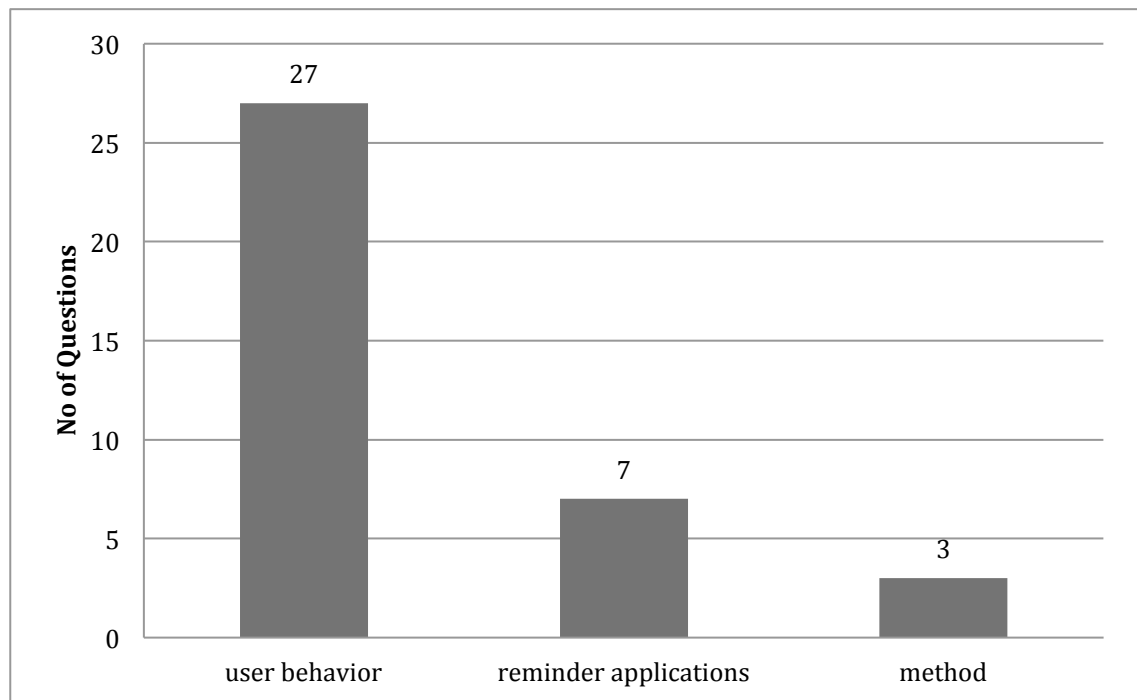
Figure 4.1. Number of questions in each category.

Twenty-three questions were chosen for the interview and co-inquiry, including 16 questions about users' behaviour while they used the reminder apps, four about reminder apps and three about their methods (see Figure 4.2).
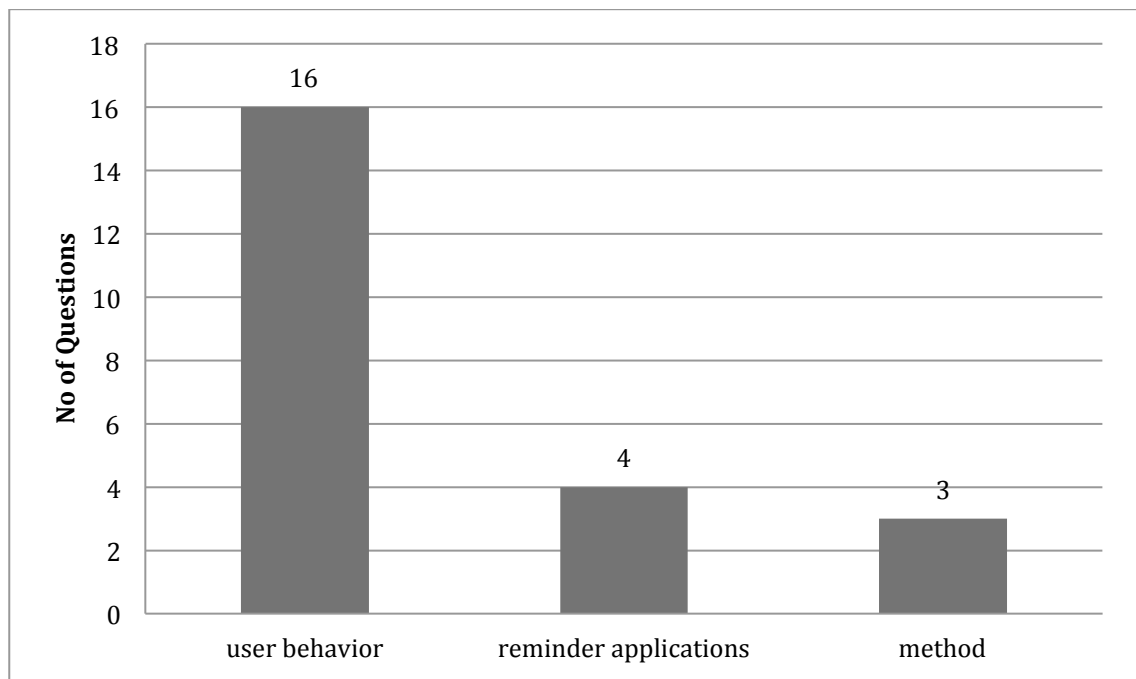
Figure 4.2. Interview and co-inquiry questions.

Four questions were chosen for inclusion in the observation. All four questions were about users' behaviour, with no questions from the apps and method categories (see Figure 4.3).
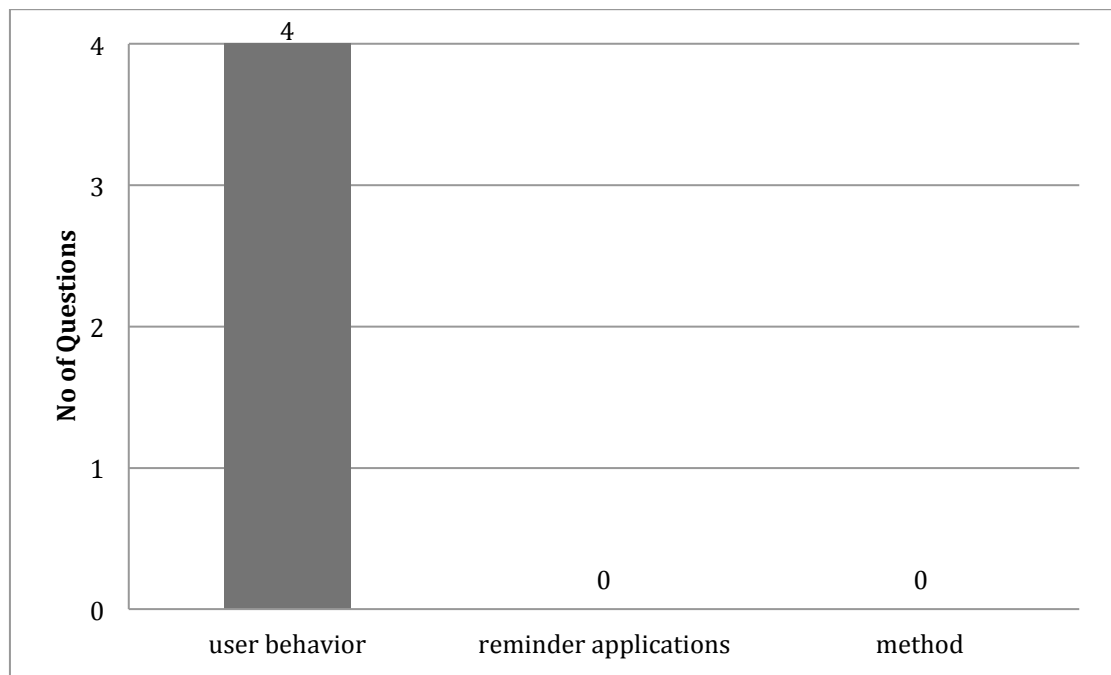
Figure 4.3. Observation questions.

     Ten questions were chosen for the diary study, with eight questions about users'

behaviour when using reminder apps, two questions about reminder apps and no questions

about the method (see Figure 4.4).
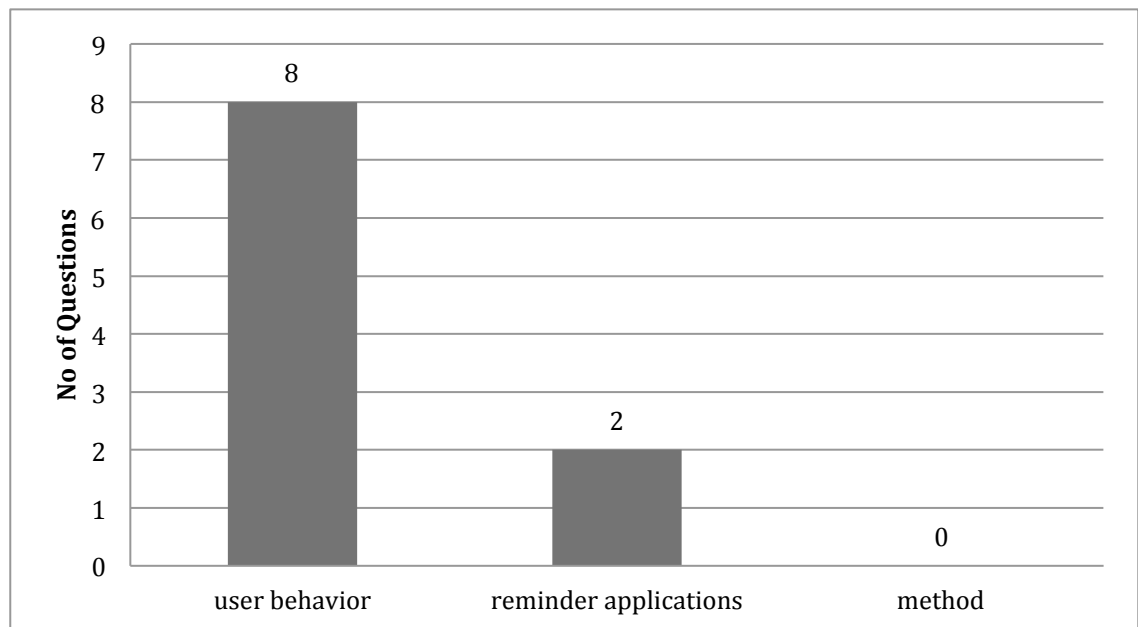
Figure 4.4. Diary study questions.

Chapter 5: Usability Tests of Reminder Apps

In this research, participants used multiple methods. Five participants (P1, P3, P5–P7) used the diary study method, three (P5–P7) used the screen capture method, four (P1–P4) used the interview method, three (P5, P6 and P7) used the co-inquiry method and six (P2–P7) used the observation method (see Table 5.1).

Table 5.1

Summary of the Usability Methods

	Combination	Diary study	Screen capture	Interview	Co-inquiry	Observation
P1		✓	✗	✓	✗	✗
P2	**A**	✗	✗	✓	✗	✓
P3		✓	✗	✓	✗	✓
P4	**B**	✗	✗	✓	✗	✓
P5		✓	✓	✗	✓	✓
P6	**C**	✓	✓	✗	✓	✓
P7		✓	✓	✗	✓	✓

This chapter summarises the results of each combination. Three participants were in Combination A, one participant was in Combination B and three participants were in Combination C.

5.1 Combination A

Combination A was the first methodology used in this research. It included three methods (diary study, interview and observation). Table 5.2 presents a summary of Combination A.

Table 5.2

Summary of Combination A

	Participant information	Diary study	Interview	Observation	Reminder app
P1	Male, 24 years old	Done	Done	Did not attend	Google Keep Google Calendar Evernote
P2	Male, 30 years old	Did not submit diary form	Done	Done	S Planner To Do Reminder
P3	Male, 25 years old	Done	Done	Done	S Planner To Do List

5.1.1 Participants

Three male participants were in Combination A. All three participants used a Samsung smartphone device with an Android operating system. All three participants were from Hamilton, New Zealand.

5.1.2 Procedure

The participants were asked to write down their tasks in diary form for one week. They were then interviewed and observed by the researcher in a public place after one week.

5.1.2.1 Participant 1

1. During the week, P1 completed 20 tasks. All tasks were added on one device (Samsung Galaxy S6).

2. P1 used three different reminder apps (Google Keep, Google Calendar and Evernote).

3. Sixteen tasks were added by Google Keep, three tasks were added by Google Calendar and one task was added by Evernote.

4. P1 wrote the current time of adding the task in 16 tasks, and the current time was left blank in four tasks.

5. P1 wrote the task title in all 20 tasks.

6. P1 wrote the current location when adding the tasks for all 20 tasks.

7. P1 wrote the due date/time of the task in nine tasks, and it was left blank in 11 tasks.

8. P1 selected the type of task in all 20 tasks.

9. P1 selected the priority of the task in all 20 tasks.

10. The interview was held in Waikato Library at 4 pm and took 17 minutes and 12 seconds. The participant answered all questions.

11. P1 did not take part in the observation.

5.1.2.2 Participant 2

1. P2 lost the diary form during the week.

2. P2 used two reminder apps (S Planner and To Do List) on one device (Samsung Galaxy S6 Plus).

3. The interview and observation were conducted in a public park in Hamilton at 2 pm.

4. The interview took 17 minutes and 25 seconds. The participant answered all questions.

5. The observation took 3 minutes and 14 seconds; the participant added three tasks in the S Planner app.

5.1.2.3 Participant 3

1. P3 completed eight tasks, which were added on one device (Samsung Galaxy S6).

2. The task name, current time, current location, due date time, task type and priority were written in all eight tasks.

3. P3 did not write the reminder app name in the task form.

4. P3 used two reminder apps (S Planner and To Do Reminder).

5. The interview and the observation were conducted in a coffee shop in Hamilton at 11 am.

6. The interview took 18 minutes and 56 seconds. The participant answered all questions.

7. The observation took 3 minutes and 25 seconds; the participant added two tasks in both reminder apps he used.

5.1.3 Results of Combination A

P1 found the diary form annoying because of the repetition, but P3 did not have a problem and said it did not interfere with his day. P1, P2 and P3 in this combination answered all questions in the interview and did not have any objections regarding the interview. After the interview, I asked each participant about it. P1 said 'the questions in the interview were clear and easy to understand'. P2 said, 'It's useful and collects a lot of information about reminder apps'. P3 said, 'it is useful because you can get a lot of information'.

In the interview I asked extra questions; for example, P1 talked about the handwriting feature he liked in Evernote, so I asked him why he liked that feature. He replied, 'Sometimes it is easy for me to write by using my finger on the phone's screen or underlining some notes that I want. For example, I took a picture of something like a business card and I just underlined the phone number or the email'. During the interview, he mentioned that he could bring something from a gallery file to the Evernote reminder app, so I asked for an example. He said 'I took pictures of a friend's and a shop's business card and underlined the things that I want to remember like the email or phone number by using the handwriting feature or sometimes I put an "e" on the image to remind myself to email someone'. An interview about reminder apps cannot be conducted with a fixed

number of questions, as there are common questions and uncommon questions that emerge during the interview.

All participants in this combination used two or more reminder apps, so I added extra questions, such as: When do you use one reminder app and when do you use another? For example, I asked P2 when he uses S Planner and To Do List. He used S Planner for study plans, group meetings and work groups, whereas he used To Do List for urgent tasks such as an appointment with a doctor or to pick up his friends from the airport. In another example, P1 used the Google Calendar app because it reminded him about his friends' birthdays and events happening in New Zealand (e.g., ANZAC day, Mother's Day).

An important part of this thesis is examining the comparative advantages of using different methods to gain insights into users' experiences. As reminder apps are global products, the researcher decided to test the methods using Skype.

5.2 Combination B

Combination B is the second methodology in this research. It includes three methods (diary study, interview and observation) that were conducted virtually through Skype. Table 5.3 presents a summary of Combination B.

Table 5.3

Summary of Combination B

	Participant information	Diary study	Interview	Observation	Reminder app
P4	Male, 34 years old	Did not send the diary form	Done	Done	Calendar

5.2.1 Participant

One male participant was in Combination B (P4). P4 was an iPhone user with an IOS operating system. The participant was located in Sydney, Australia.

5.2.2 Procedure

The participant was asked to write down his tasks in diary form for one week. The participant was then interviewed and observed by the researcher via Skype after one week.

5.2.2.1 Participant 4

1. P4 did not send the diary form.

2. P4 used one reminder app (Calendar) on one device (iPhone 5).

3. The interview and observation were conducted using Skype software at 2 pm in Hamilton and 12 pm in Sydney.

4. The interview took 29 minutes and 28 seconds. The participant answered all questions.

5. The observation took 8 minutes and 48 seconds; the participant added two tasks to his reminder app.

5.2.3 Result of Combination B

P4 said that the diary study interfered with his day because he had to set the reminder in the app and add the task to the diary study, so he had to do the task twice. He suggested taking screenshots of the tasks and sending them to the researcher by email instead of writing the tasks in the diary form.

For the interview and the observation through Skype, he said:

This is my second time I do online interview. I liked because I do not have to come to your place even if we are at the same city. I will waste more time if we do the interview face-to-face. I was doing my stuff until the beginning of this interview. I just have to open Skype and talk to you and I feel I'm at home. I do not care about what I have to wear or people in the street.

From the result of Combination B, we decided to add screenshots (screen captures) as part of Combination C. Participants will be asked to take screenshots of their tasks and

send them to the researcher. By doing this, we can compare the diary study and the screen

capture to see whether they give the same result.

5.3 Combination C

Combination C is the third methodology in this research. It consists of four methods

(diary study, screen capture, co-inquiry and observation). Table 5.4 presents a summary of

Combination C.

Table 5.4

Summary of Combination C

	Participant information	Diary study and screenshots	Interview	Observation	Reminder app
P5	Male, 23 years old	Done	Done	Done	Remind Me
P6	Female, 20 years old	Done	Done	Done	Planner Plus
P7	Male, 26 years old	Done	Done	Done	To Do Reminder

5.3.1 Participants

Three participants were in Combination C (P5–P7), including two males and one

female. P5 was a Samsung user with an Android operating system, P6 had a PlusOne with

an Android operating system and P7 was an iPad user with an IOS operating system.

5.3.2 Procedure

The participants were asked to write down their tasks in diary form and take

screenshots after adding tasks to the reminder app for one week. The participants attended a

workshop and were observed by the researcher in public places after one week.

5.3.2.1 Participant 5

1. P5 completed six tasks on one device (Samsung Galaxy S6).

2. P5 used one reminder app (Remind Me).

3. P5 added all of the required data in the diary form.

4. P5 sent three screenshots from his reminder app using the WhatsApp app. P5 sent the screenshots immediately after taking them.

5. P5 attended the co-inquiry at Waikato Library. The time spent in the co-inquiry was 41 minutes and 12 seconds.

6. The observation took 4 minutes and 40 seconds; the participant added four tasks to his reminder app.

5.3.2.2 Participant 6

1. P6 completed 12 tasks on one device (iPad).

2. P6 used one reminder app (Planner Plus).

3. App name, operating system, task name, type of task, priority and task due date and time were added for the 12 tasks in the diary form.

4. P6 wrote the current time and current location in two tasks, with the other 10 tasks left empty.

5. P6 emailed 12 screenshots from her reminder app to the researcher on the due date.

6. P6 attend the co-inquiry at Waikato Library. The time spent in the co-inquiry was 41 minutes and 12 seconds.

7. The observation took 3 minutes and 12 seconds; the participant added two tasks to her reminder app.

5.3.2.3 Participant 7

1. P7 completed four tasks on one device (PlusOne).

2. P7 used one reminder app (To Do Reminder).

3. P7 added all required data in the diary form.

4. P7 sent three screenshots from his reminder app through the WhatsApp app. P7 sent the screenshots immediately after taking them.

5. P5 attend the co-inquiry at Waikato Library. The time spent in the co-inquiry was 41 minutes and 12 seconds.

6. The observation took 2 minutes and 58 seconds; the participant added two tasks to his reminder app.

5.3.3 Results of Combination C

The participants had a few reflections about the diary study and the screenshots. P7 did not send all of the screenshots because some of them were personal, and he keep forgetting them for the diary study. P5 had no problems with doing the diary study and the screenshots. He said, 'to be honest I do all my tasks at night before going to bed, so it didn't take a long time for me'. P6 did not have a problem with screenshots, but she had a problem with the diary study. She said, 'I found it annoying by writing the same things again and again and I have to write every task in the diary study'.

For the co-inquiry study, all participants said that the co-inquiry was better than the tasks given to them (screenshot and diary study). For the questions in the co-inquiry, P6 said 'Some of the questions were confusing but you were able to explain them to us and it doesn't have to be improved' and P5 said 'I think overall it was good questions but some questions are not clear for non-computer guy, so I asked you to explain to me a lot'.

Chapter 6: Usability Guidelines for Reminder App

This chapter presents and discusses the main findings of this research in the form of usability guidelines. These guidelines can be used for developing efficient and usable reminder apps in the future. The chapter is divided into two sections: interaction design and graphic/visual design. Each section provides findings and suggests guidelines based on the results of the three combinations used in Chapter 5. Each guideline provided is accompanied by figures to illustrate the different types of functions, contents, pages and visual designs in different reminder apps. Recommendations from these guidelines are outlined in Chapter 8.

6.1 Interaction Design

This section explains the process from start to finish; that is, from the time a new task is added to the time the task is actually remembered. The process is divided into four parts, and each part is a subsection in this study. The first section discusses the 'Add Task Page' and its functions, contents and buttons. The second section discusses the 'Extra/More Page', which shows the other functions and contents that users normally use to remember their tasks. The third section discusses the 'List Page (or Homepage)', where all tasks are displayed. The fourth section focuses on how the task is displayed in the list page and which function is used with each task. The fifth section discusses the reminder functions and how the reminder app reminds users. The last section discusses the effect of advertisements in reminder apps.

6.1.1 Add Task Page

Each reminder app requires data from users; some of these data are common in the 'Adding task page', and some are unique. For example, RTM requires users to add the task name, select priority, due date/time, select the list (or type) and add field button for extra

date. Todoist requires users to add the content name (or task name), project (or type), select the due date/time, reminders (or remind me), assign to (share), select the priority of the task, labels and parent. Both of these apps have a cancel button to cancel the task, as well as a save (or done) button to save the task at the top (see Figure 6.1).
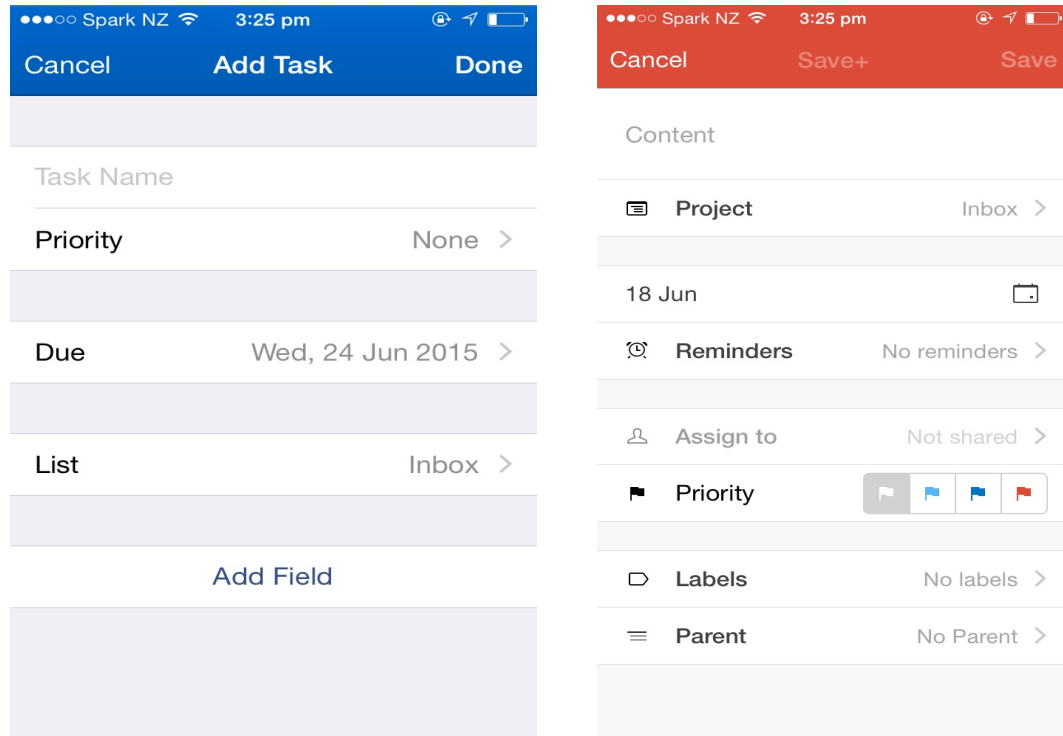
Figure 6.1. Different interfaces for adding task page.

Users in this research used different reminder apps, and we do not know what the 'Add Task Page' looks like in their reminder apps. However, one user in Combination C sent screenshots of the 'Add Task Page' (screen capture method). That user used Planner Plus, which requires users to add the task title, calendar, start and end date/time, repeat, notification, reminder, location and notes (or description for the task) (see Figure 6.2). The 'Add Task Page' in Planner Plus also has two buttons at the top: one for saving the task and the other for cancelling the task. This is similar to RTM and Todoist.

Figure 6.2. Add Task Page in Planner Plus.

The common contents and functions in previous apps (Todoist, RTM and Planner Plus) are the task name, select date/time function and save and cancel buttons. However, the different usability methods used in this research show that all users add the task name and select the due/date time for their tasks at the start. The 'Add Task Page' requires more study to check which contents and functions are important to users and to check whether these functions/contents are better displayed on the same page or a different page. In the usability guidelines, I only added the task title and date/time picker at the 'Add Task Page' because these two entries are a common requirement in all of the reminder apps used in this research. All participants in the observation started their tasks by adding the task title and

selecting the date/time. All other functions/contents will be discussed in the More/Extra section.

This section will discuss the task title (or task name), select date/time, done button, cancel button and extra/more button.

6.1.1.1 Task Title

Each reminder app has the task title content but displays the content with different names. For example, the content name is 'Task Name' in RTM, 'Title' in Alarmed, 'I want to' in Any.Do, 'remind me to' in RE.minder and 'Content' in Todoist.

The observation indicated that all users added the task title in the beginning for adding new tasks in their reminder apps. The diary, screenshots and observation methods show that users use longs sentences and keywords like 'group meeting for Comp324, visa collection from immigration, pay gift for mom birthday and etc.'. They also use small sentences like 'meeting, wake up, Gym and etc.' one user complained about his reminder app because the reminder only allowed him to add 16 characters. Another user in the interview said he wrote all information about the task in the title task (or task name); for example, he writes 'meeting my supervisor at her office'. Therefore, I suggest that this content should have unlimited characters, as we do not know what exactly users want to add in their task title.

6.1.1.2 Date/Time Picker

This function allows users to select the due date/time for future tasks. For example, in Alarmed, users can select the date and time, but the minutes display as doubles of five (5, 10, 20 … 55). In addition, Alarmed allows users to pick a quick time (see Figure 6.3).

Figure 6.3. Quick Time Picker Function (Alarmed).

Todoist has two different options to select the due date/time: selecting the date only or select the time and date (see Figures 6.4 and 6.5).
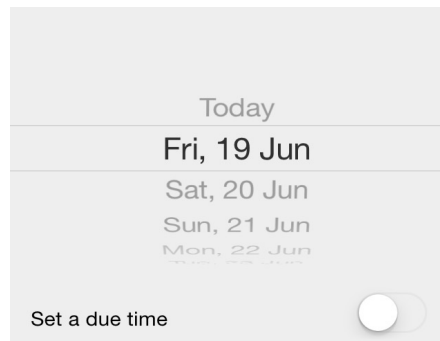
Figure 6.4. Select the Date (Todoist).
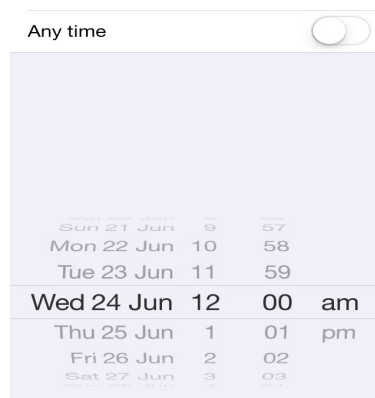
Figure 6.5. Select Date and Time (Todoist).

P6 used Planner Plus, which required her to add the start and end date/time for tasks. However, the screen capture did not show what kind of date/time picker is used in Planner Plus (see Figure 6.6).
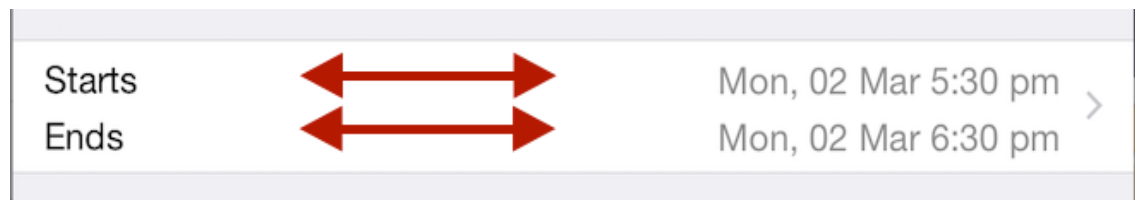
Figure 6.6. Start and End Date/Time for Task (Planner Plus).

The observation shows that users select the date/time after writing the task name (or task title), not all users select the time. For example, P2, P4 and P6 selected the date without the time. None of the users in observation did not select the date, but the think-aloud technique shows that users select date/time in different ways. For example, some users said the whole date/time together or the date first and then the time or just the date. For example P2 said 'Next Wednesday 23rd of December'. P3 said 'Tomorrow at 6 pm' and '7.45 pm, Friday' and P6 said '21st of March' without saying the time. This is for two reasons. First, the user might not say the time or forget to say the time in the observation (think-aloud) method. Second, users use different reminder apps in this research, and each reminder app has a different interface or style for selecting the date/time. One problem that was obvious when the participants selected the date/time, is that they were looking for their own watch, which meant the reminder apps they use did not display the current date and time.

This function requires further study to understand how users prefer to select the date and time for tasks, as there are many options for selecting the date/time. None of the usability methods in this research display the reminder app's interface when the users select

the date and time. However, the diary study indicates that users added tasks for short and long periods; for example, they added tasks in the same day, tomorrow, after one week or after months. Therefore, users need a date/time picker that displays upcoming months and year as well.

6.1.1.3 Done and Cancel Buttons

Reminder apps use different words or icons for adding tasks; for example, RMT, RE.minder and Alarmed use 'Done', Todoist uses 'Save', and Any.Do uses '+' (see Figure 6.7). However, all of them achieve the same result, which is adding the task in the list page.
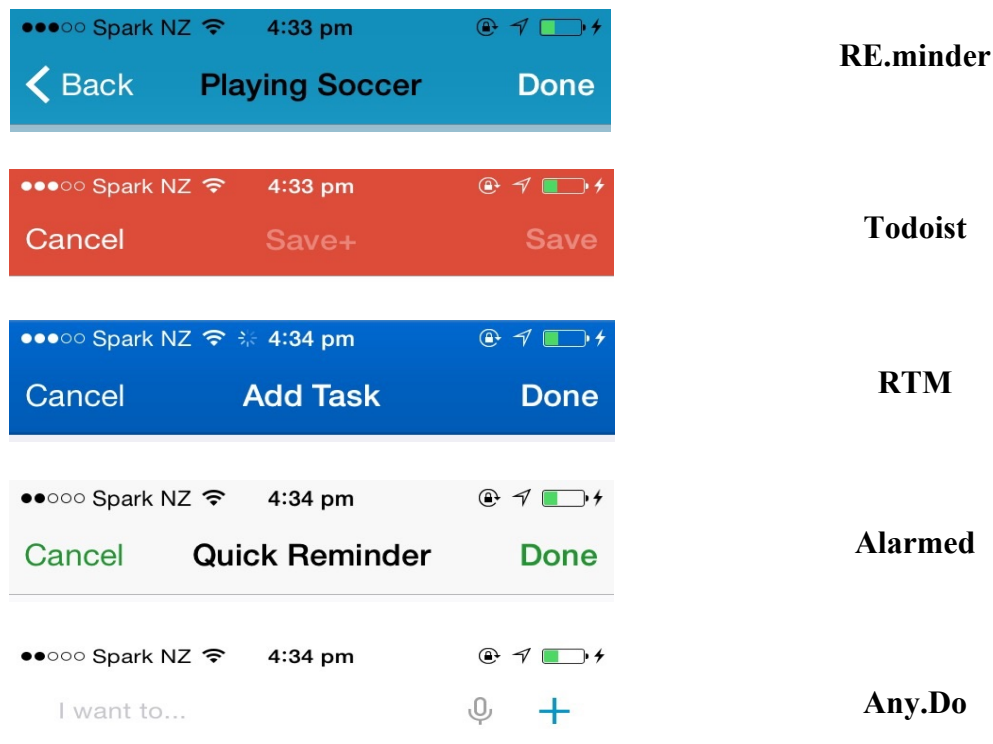
Figure 6.7. Different Buttons for Different Apps.

From the think-aloud technique in the observation method, three users said 'Done!!' after adding the task in the reminder apps. However, I am not sure if the button's name was 'Done', or whether they said that because the task was added to the reminder app. This is

because I did not see the interface of the reminder apps when users were adding the tasks. The cancel button is available in four of the reminder apps (RE.minder, Todoist, RTM, Alarmed) but in RE.minder named as 'Back' and Any.Do has no cancel button. When users click on the cancel button in all reminder apps (except Any.Do), they will return to the list page. However, for Any.Do, users need to click anywhere on the screen to go back to the list page. Thus, in this study, we cannot give a clear suggestion of what the done and cancel buttons should look like. This requires further study to obtain a better understanding of what style users prefer.

6.1.1.4 More/Extra Button

Reminder apps have different options of adding extra data after adding the title name and selecting the date/time. The first option is by displaying the contents and functions on the same list page, like Todoist (see Figure 6.8).
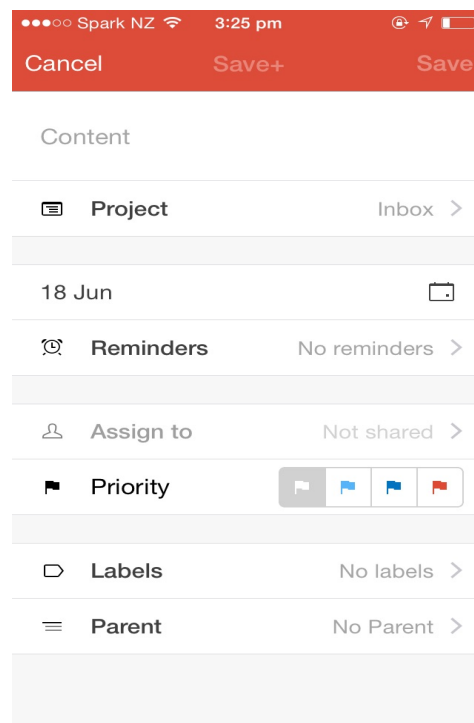
Figure 6.8. Add Task Page (Todoist).

The second option is adding an extra button in the 'Add Task Page' when the user clicks on the extra button that displays another popup page to add extra data, like RTM (see Figure 6.9).
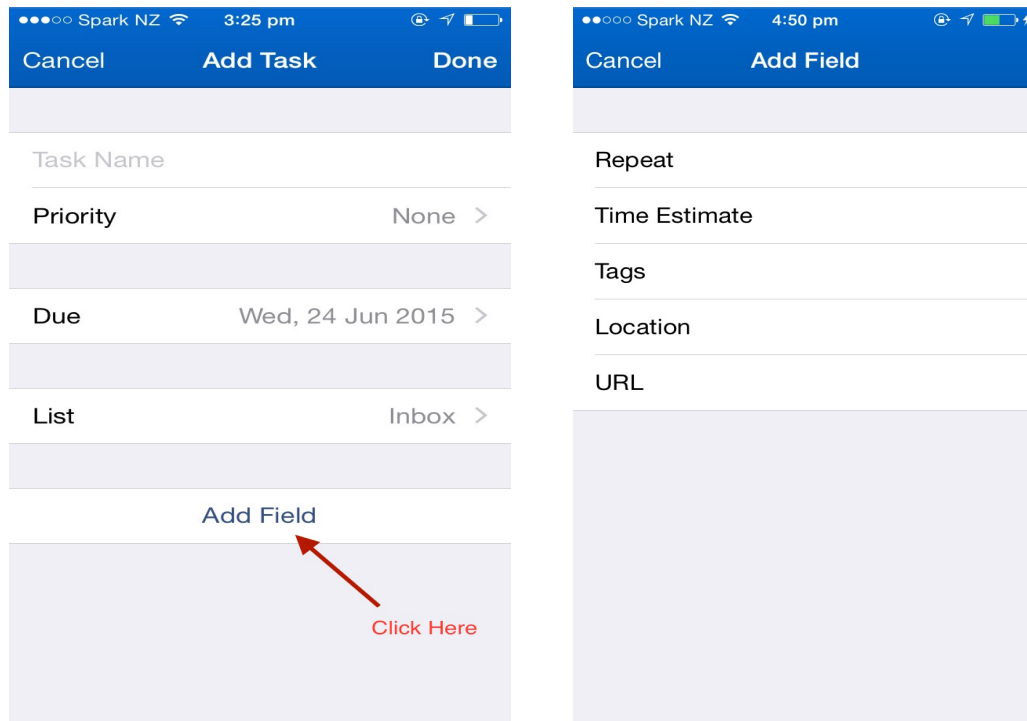
Figure 6.9. Add Field Button (RTM).

Reminder apps use different name for these buttons; for example, RTM calls it 'Add Field' and Alarmed calls it 'Super Reminder' (see Figure 6.10).
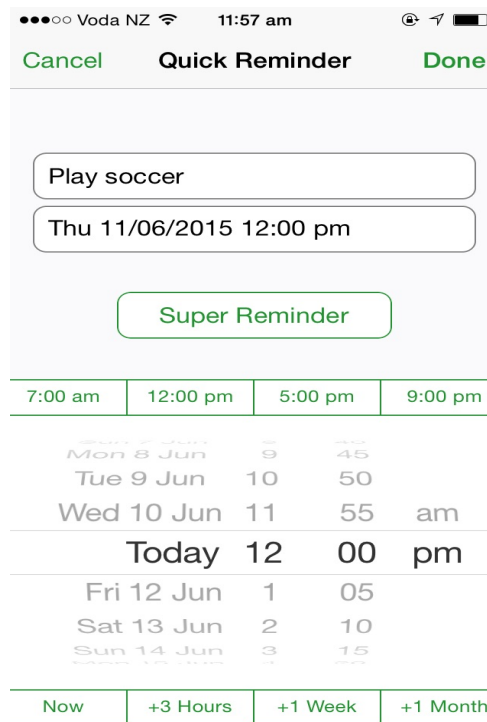
Figure 6.10. Super Reminder Button (Alarmed).

This part requires further study to understand whether users prefer to display all functions/contents on the same page as the task name and title, or whether they prefer them to be displayed on a different page.

6.1.2 More/Extra Page

After adding the name and selecting the date/time, users add more contents (or fields) for extra information for the task, including notes, URL/links, images and location. Users also use extra functions, such as selecting the task type, priority of the task, sharing the tasks with friends, wanting the app to remind them before the task's due time, and repeating or setting the ringtones for the task. This section discusses the extra contents and functions that users use in reminder apps, as well as their opinions about each one. The results were gathered from the interviews and co-inquiry, as well as the evidence from the diary studies, screen captures and observations.

6.1.2.1 Remind Me

This function allows users to choose when the app reminds them. If users do not select this function, the reminder app will alert the user at the time they selected for the due date/time for the task. However, if users want the app to remind them before the actual task time, they need to select the 'remind me' option, which allows users to select or enter the time/days before the due time/date. For example, remind me 15 minutes, one hour or two days before the task (see Figure 6.11).
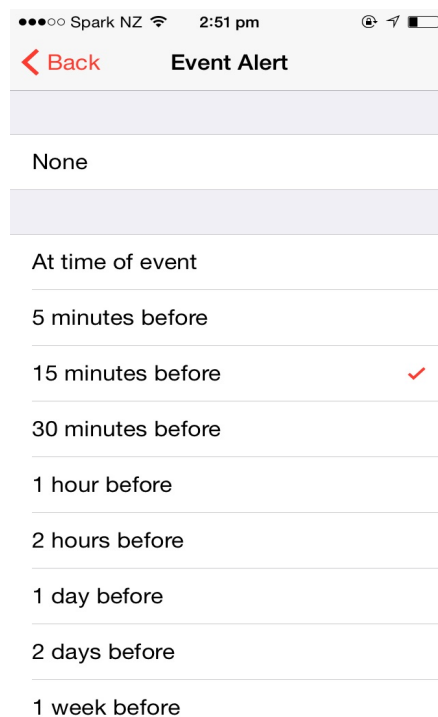
Figure 6.11. Remind Me Function (Calendar).

In the observation method, four users use this function. P2 used this function twice during the first task; he wanted the reminder app to remind him 15 minutes before the due time of the task. During the second task, he wanted the app to remind him 25 minutes before the task's due time. P4 wanted the app to remind him two days before the task. P5 wanted the app remind to him half an hour before the task, and P6 wanted the app to

remind her two days before the task. P4 and P6 added the tasks without selecting the time; they just selected the date, because they wanted the app to remind them two days before the task. This function was not covered in the interview and co-inquiry methods because none of the apps I critiqued in Chapter 2 had this function. I have discussed this function here because four users used this function in the observation when they were adding their tasks.

6.1.2.2 Repeating

This function allows users to select how many times they want the reminder app to repeat the tasks. For example, repeat the task every two hours, every day, every week or every month. Three of the reminder apps critiqued in Chapter 2 have this function, but each app has its own style of selecting the repetition. For example in RTM app users can select the repeat every day, every week and so on, or after a day, after a week, after a month and so on (see Figure 6.12).
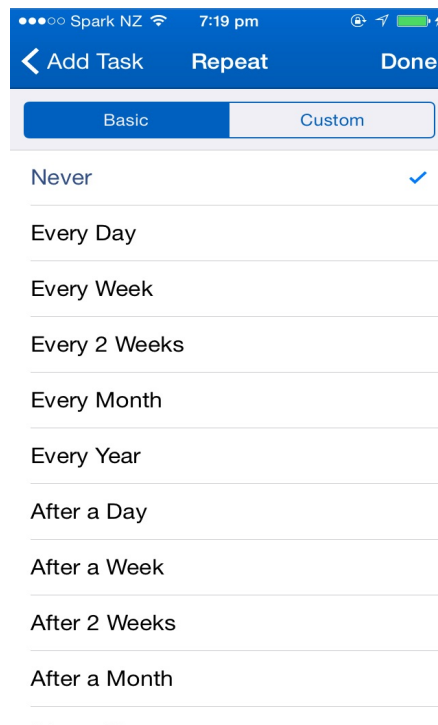
Figure 6.12. Repetition Function (RTM).

Alarmed has three options to repeat: (1) simple option, which allows users to repeat every day, week, month or year, (2) month option, which allows users to select the day and date, and (3) days option, which allows users to select the multiple days (see Figure 6.13).
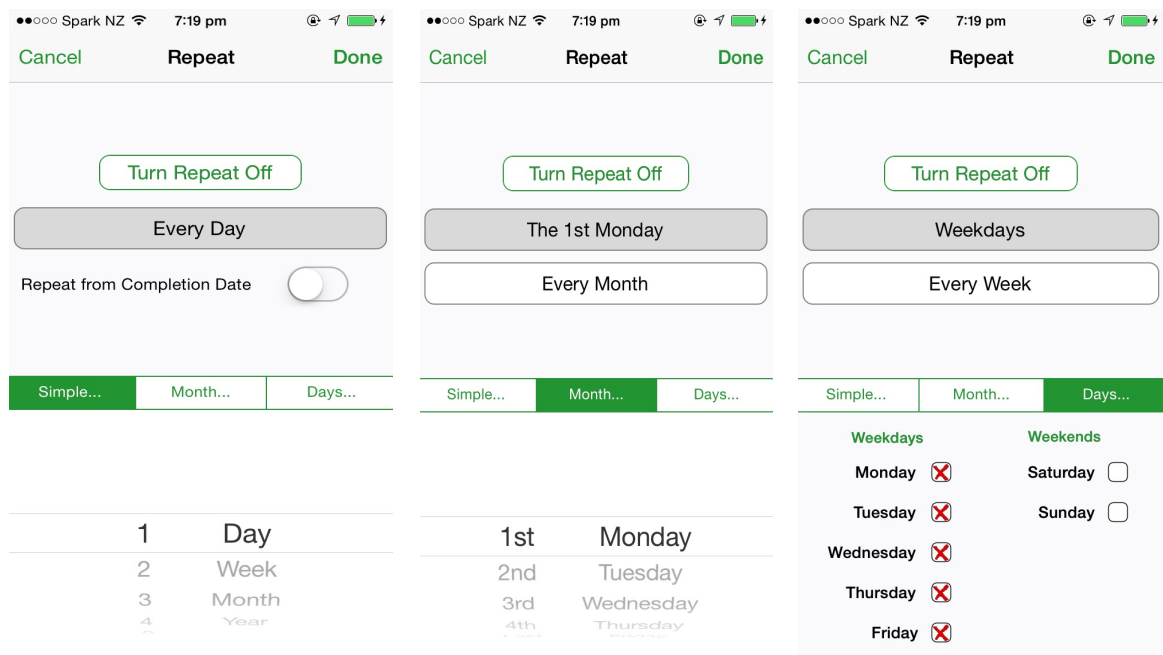
Figure 6.13. Multiple Styles for Repeating Function (Alarmed).

Any.Do has more detailed repeating, which allows users to select the start and end date/time, as well as repeating (daily, weekly, monthly or yearly; see Figure 6.14).
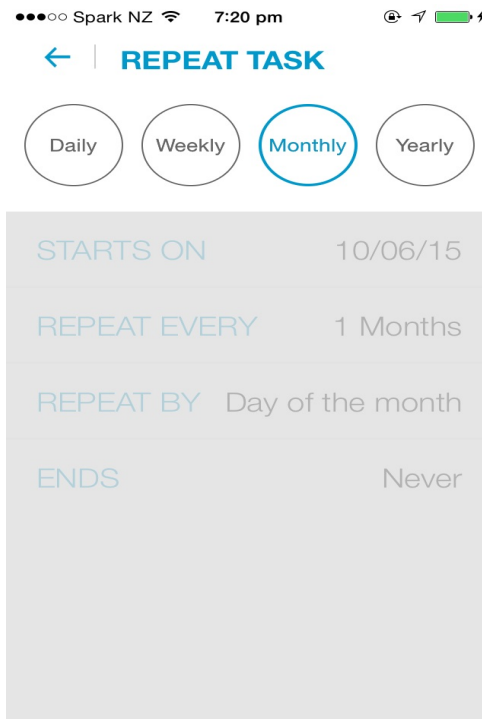
Figure 6.14. Repetition Function (Any.DO).

All users in this research have this function in their reminder apps. Two users did not like this feature. P1 said, 'I just want to remember the task on time'. P7 said, 'I have a problem with my reminder app because is selected the repeating once automatically and that means the task will alert twice' (see Figure 6.15).
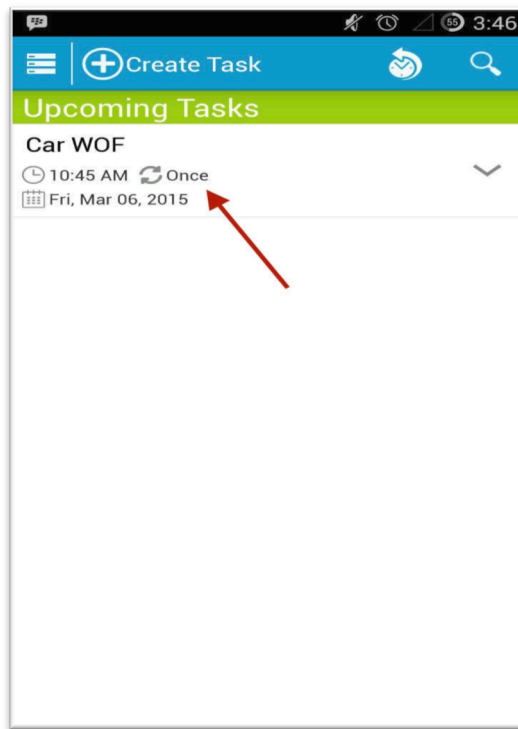
Figure 6.15. Repeating Once Automatically Error (P7).

P4 and P6 had this function, but they did not use it; they wanted the app to remind them only once. P2, P3 and P5 used this function for important recurring tasks.

In the observation, three participants used this function. P3 repeated one task he does every day, as the task title was 'Wake up'. P5 also repeated one task every day, and the task title was also 'Wake up'. P7 repeated one of the tasks weekly; the task title was 'Physiotherapy'. P7 was confused when he selected the repeat option, because it was not clear for him. He said, 'I'm not sure what does repeat weekly, every two weeks or every three weeks means'. Repeating is a large area, as there are many styles and functions to choose from. This function requires further study to understand what type or function of repeating users prefer.

6.1.2.3 Priority

This function allows users to select the priority of the tasks. Three of the reminders app we critiqued in Chapter 2 have this function, but each app uses its own style for selecting the priority of the tasks. RTM allows users to select between None, High, Medium or Low (see Figure 6.16).
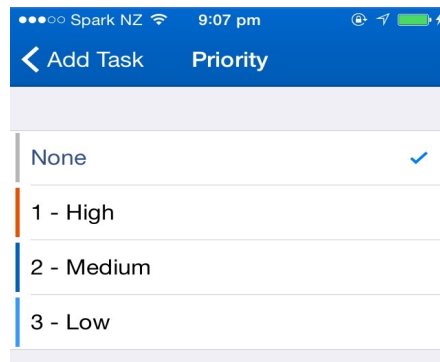
Figure 6.16. Priority Setting (RTM).

Todoist allows users to select the priority by selecting the flag colour (white, light blue, dark blue or red; see Figure 6.17).
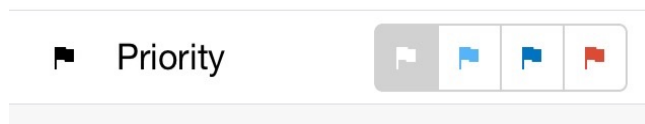
Figure 6.17. Priority Setting in Todoist.

RE.minder allows users to click on the 'Beetle' icon after adding the task to select the priority between low, medium or high (see Figure 6.18).
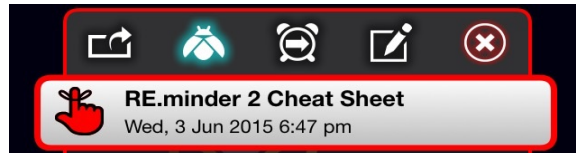
Figure 6.18. Priority Setting (RE.minder).

The diary study of five participants indicates that 33 out of the 45 tasks added in the diary forms had high priority, 11 tasks had medium priority and one task had low priority (see Figure 6.19).
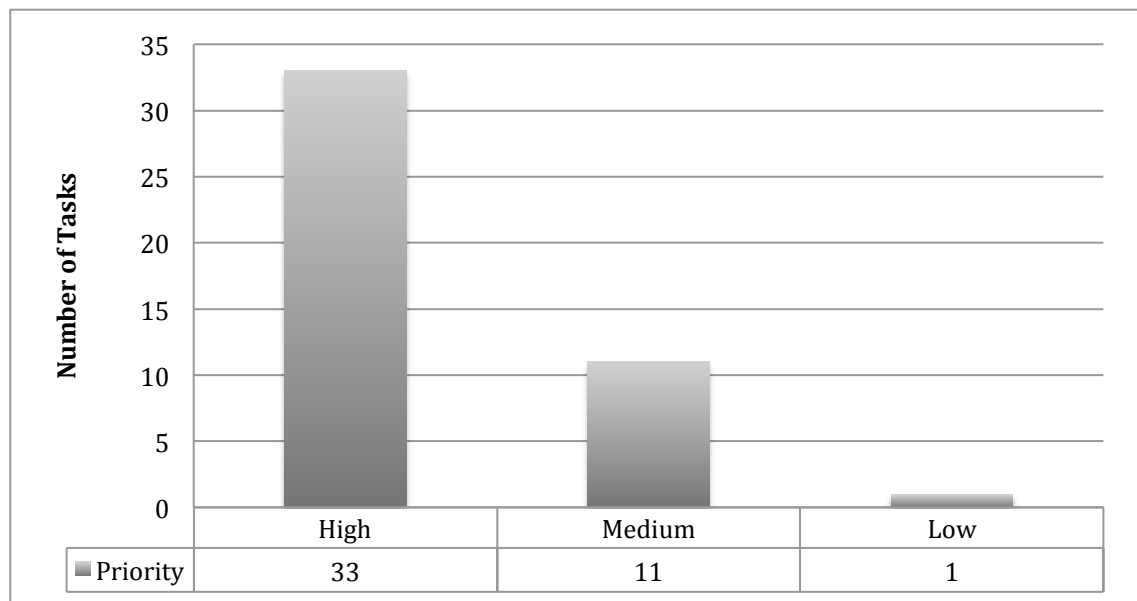
Figure 6.19. Task Priority Breakdown.

Thus, users used reminder apps for high-priority tasks more than medium- and low-priority tasks. In the interview and co-inquiry methods, P4 and P7 said that they only add important tasks (or high-priority tasks) in their reminder apps, but P1, P2, P3, P5, P6 and P7 use reminder apps for every task they want to remember. P1 said 'I like the five colours in Google Keep app (red, green, yellow, orange and purple) to select the priority of the task. Red is for urgent task, yellow for something not really important and so on'. None of the users in the observation method selected the priority of the task when adding tasks in their

reminder apps, but I am not sure whether they have this function in their apps. In the screen capture method, P6 sent screenshots for her reminder app showing the priority of the task. The reminder app she used also had different styles for selecting the priority (None, !, !! or !!!!; see Figure 6.20).
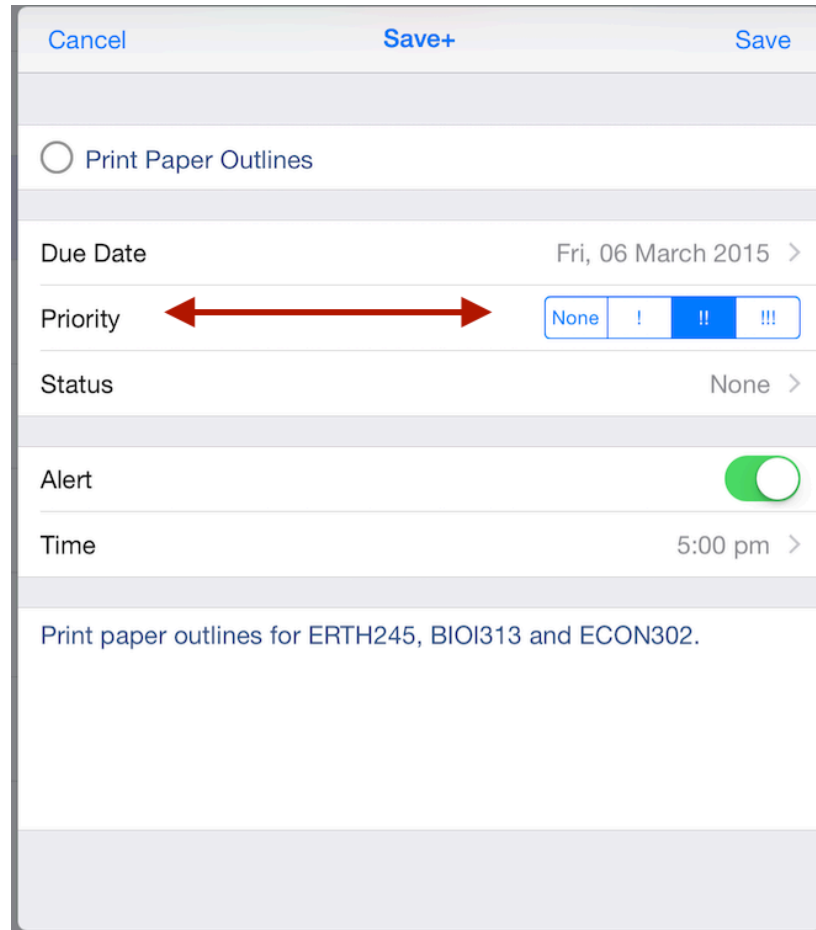
Figure 6.20. Setting Priority (Planner Plus).

Out of the four different reminder apps that have the select priority function, each app has a different style for selecting the priority. This function requires further study to understand which style is easy for users. I suggest that this function should be included in the reminder app because most users add tasks with different priorities. Therefore, the different priorities should be listed clearly so that the user can pick them easily.

6.1.2.4 Type

This function allows users to select the type of the task (e.g., personal, study, sport, work). Three reminder apps of those critiqued in Chapter 2 have this function. The function selection is different from one reminder app to another; for example, RTM has a fixed task type (Personal, Study, Work), where users can only select from these types. However, Any.DO and Todoist have their own types, and user can also create their own types (see Figure 6.21).
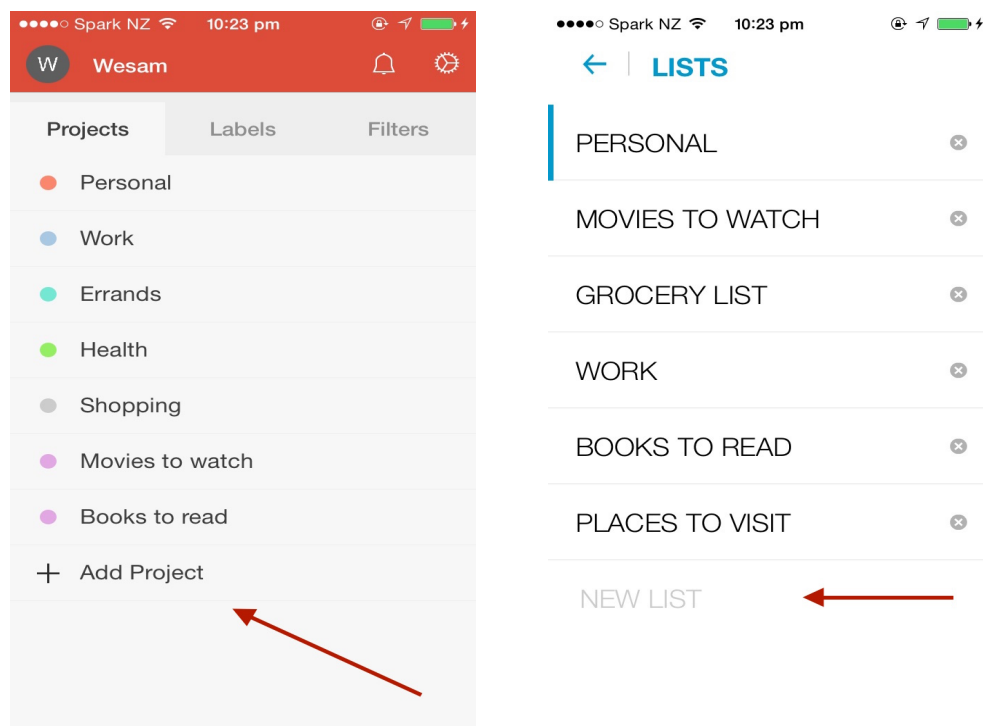
Figure 6.21. Users Creating Their Own Types.

The diary study indicated that most of the tasks (18 out of 45) were added under the personal type, 12 under study, nine under sport, four under business and two under other (see Figure 6.22).
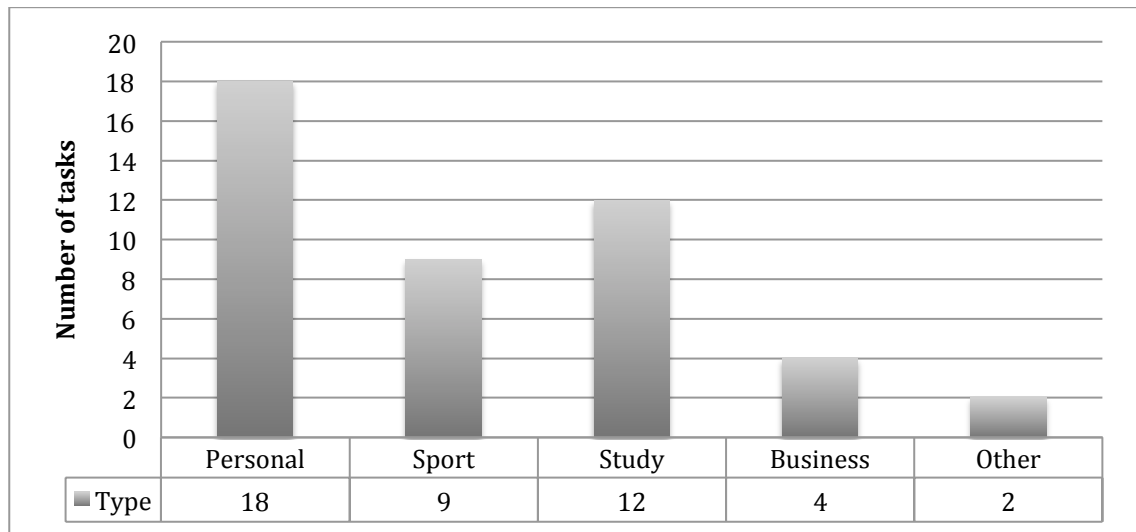
Figure 6.22. Task Type Breakdown.

In the interview and co-inquiry, we asked participants whether they list their tasks under folder or type. Two of the participants (P1 and P3) added their tasks under type; P5 has this function in his reminder app but he did not use it because he is not good with organising folder. Other participants did not have this function in their reminder apps, but they would like their reminder apps to have this function. None of the participants used this function in the observation. I suggest that this function be available for users so they can manage their tasks.

6.1.2.5 Location

This content allows users to add the location of the task. In this research, we asked the participants if they added location to their task. Five participants used this content for adding city name, street address and place name. Two participants did not add a location to their tasks, but P7 said 'it would be useful if the reminder app has this content', as his reminder app did not have location content.

Three participants in the observations added location to their tasks: P2 added 'Hillcrest' to the task's location, P3 added 'Hamilton Lake' in the first task and 'Uni sport

65

center' for the second task, and P6 added 'University of Waikato' to her task. P6 also added

the location in some of the screenshots she sent in the screen capture method (see Figure

6.23).

Figure 6.23. P6 Adding Location to the Task.

I recommend this content to be unlimited characters because street address requires

number, street name, suburb sometimes and zip code or postcode. The screen captures and

the observation shows that users add different type of location; some of them are a few

characters long, whereas others are significantly longer.

6.1.2.6 Notes

This field allows users to add more description or extra information about the task.

All five reminder apps we critiqued in Chapter 2 have this field; additionally, all of them

have this field with unlimited characters because users might add detailed information in

the notes content. We asked the participants whether they added notes to their tasks. Five

participants added notes to their tasks, and two participants (P1 and P6) did not. These

participants were satisfied with adding keywords or a title to describe their tasks. P6 said 'I

add some extra information about the tasks if I need' (see Figure 6.24).
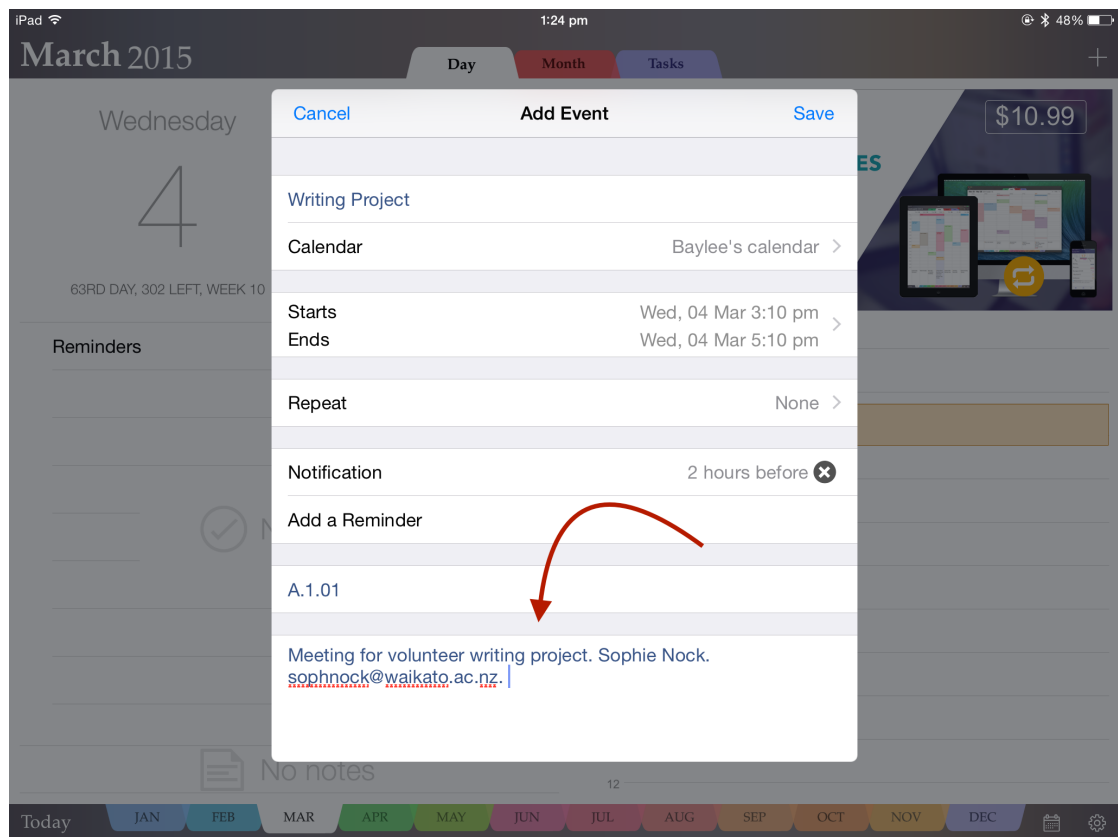
Figure 6.24. P6 Adding Extra Information to Task.

Five participants in the observation added notes to their tasks. P2 added a 'meeting

about work placements' note, with a task title of 'meet friends'. P3 added a 'dinner' note,

with a task title of 'group meeting'. P5 added 'mechanical engineering' to his 'first class' task. P6 added 'meeting at gate 9 in the University of Waikato' as a note for the task 'Philology trip', and P7 added 'Applying for visa' as a note for the task name 'immigration'. This shows that users use both short and long sentences for the notes content, but I am not sure whether their reminder apps allowed them to add longer titles. Thus, it is difficult to know why users use the notes field if they have title name content. From these results, I recommend the field to be of unlimited characters so users can add as much information as they want.

6.1.2.7 Sharing

This function allows users to share tasks with their friends, relatives, colleagues and classmates. From the five reminder apps critiqued in Chapter 2, two reminder apps have this function (RTM and Any.DO). This function requires the internet; moreover, other friends should have the same reminder app. In this study, we are not sure whether the reminder apps used by the participants were connected to the internet; in addition, we do not know whether their apps required the internet to work. However, the diary study indicates that 31 tasks out of the 45 tasks added in the diary form by five participants were added using their reminder apps in public places (see Figure 6.25). The participants might have used a 3G or Wi-Fi connection while they used the reminder app, or perhaps the internet was not required to use the app.

	Home	Coffee	University	Gym	Street
◼ Number of Participants	24	14	7	2	8
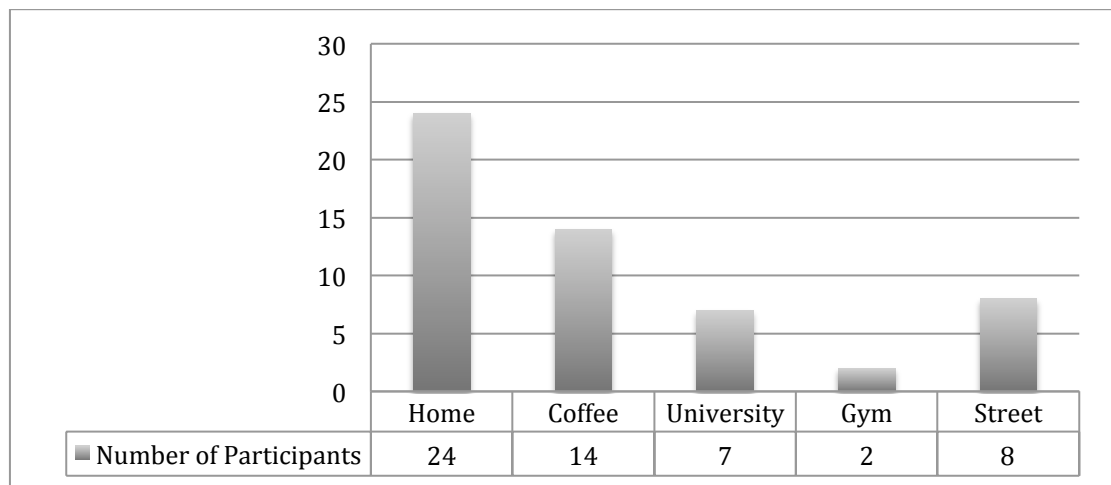
Figure 6.25. Current Location of Adding Tasks.

In this research, we asked the participants if they share their tasks with friends. Two participants (P1 and P4) had this function in their reminder apps, and five did not. Four of the five participants who did not have this function said that they would like to have this function to share tasks with their friends and relatives. P5 did not like the idea: 'I think this is a personal thing and I do not want to share them with friends'.

In the observation, P4 shared the tasks with his friend but said that his reminder app asked him to add the email address of the participant he wanted to share with. The participant was annoyed because he could not share the task by phone number. This function requires more study to understand the roles for sharing tasks with friends and what this function needs from users. Do users need to add friends' email addresses and phone numbers, or does the friend need to use same reminder app? In this research, P1 said 'I share the tasks with my friends in my cycle inner in Gmail account'. Thus, his reminder app is connected to his Gmail account. As the users used this function in this research, this function could be available for users who want to share their tasks with other people.

6.1.2.8 Ringtones

This function allows users to select the ringtones for each task, or select their own songs or ringtones from the smartphone or tablet they used. We asked the participants if they set the ringtones for the reminder app. Four participants set their ringtones for the alert of the reminder app, and two participants wanted this function to be available in their reminder app. One participant had this function in his reminder app but did not use it. P1 said 'I like the ringtones to be different from call or text ringtones to notice that the ringtone is for a reminder task'. P3 said 'I like to put songs as ringtones to remember my tasks'. In the observation, P3 set the ringtone before adding the task. As shown in the research, users set ringtones to make it different from another alert notification like text and phone, as it helps them to identify the alarm for the task and remember their tasks.

6.1.2.9 URL or Links

This content allows users to add URL or links to a task. Out of the five reminder apps critiqued in Chapter 2, only RTM has this content. In this research, we asked the participants whether they added URL/links to their tasks. One participant has this content in his reminder app and used this content once, whereas the other participants did not see this content before and they added this kind of information to the notes or to the title task. From these results, I suggest that this content could be optional. It requires further study, as this study was conducted on a group of students, but this content could also be used by more professional users.

6.1.2.10 Voice Recognition

This function allows users to add the task by their voices. Out of the five reminder apps critiqued in Chapter 2, this function was only available in 'Any.DO' (see Figure 6.26). Users need to click on the microphone icon and say the task title so that it can be added in the content.

Figure 6.26. Adding Task by Voice in Any.DO.

In this research, we asked the participants if they add their tasks by voice recognition. Three participants used this function. P1 said 'I use it when I'm busy or in hurry', P2 tried this function one time and he did not like it, so he prefers to type the tasks in the reminder app. P7 tried this function twice, but it did not work properly. He thinks it was because of his pronunciation. Speech or voice recognition is a new technology; as such, it will take some time before the interface can deliver a human-level performance (Deng & Huang, 2004). This function requires further study because users with problems in pronunciation or different accents might have difficulty when adding tasks.

6.1.3 List Page

The list page includes two views. The first view displays upcoming tasks (or uncompleted tasks) and the second view displays completed tasks. The upcoming tasks view displays tasks in order of the closest time to the current time. The completed tasks button displays all tasks that have been completed, so users can clear them from the list or edit them to use them again. All five reminder apps we tested in Chapter 2 have this style for the list page with two views (upcoming and completed) but with different names; for example, Alarmed uses active and completed, while RE.minder uses reminder and history (see Figure 6.27).
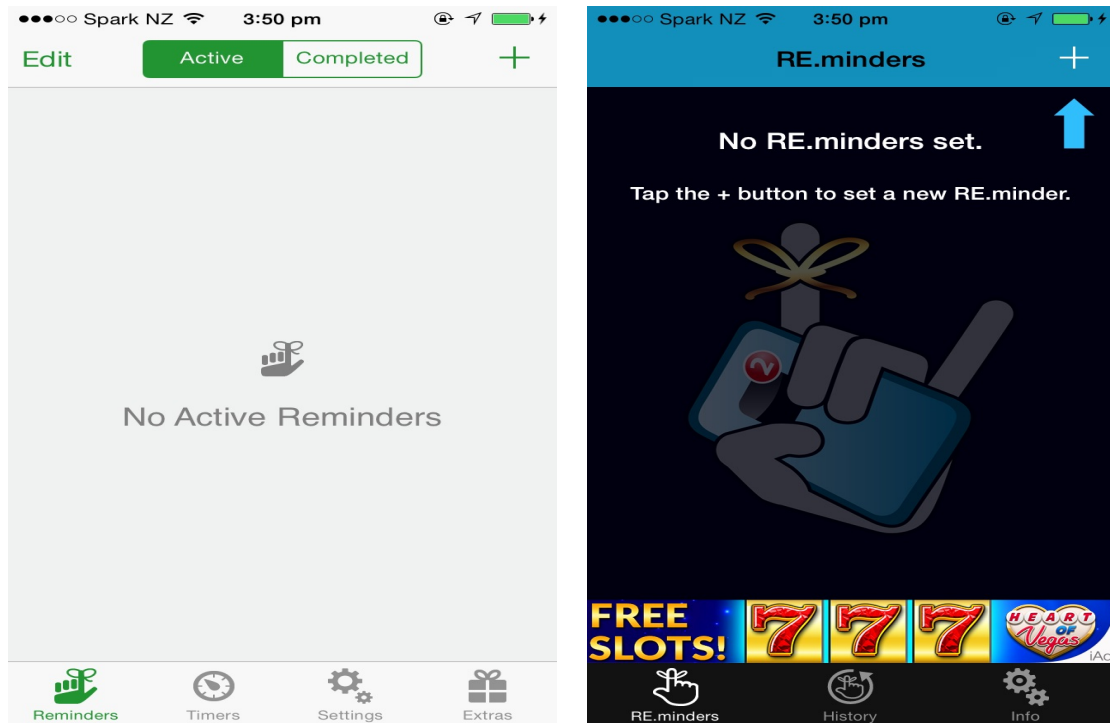
Figure 6.27. List Page (Alarmed and RE.minder).

This does not give a true result because other reminder apps have different styles and interfaces for the list page. Some reminder apps have calendar or file interfaces in the list page (see Figure 6.28).
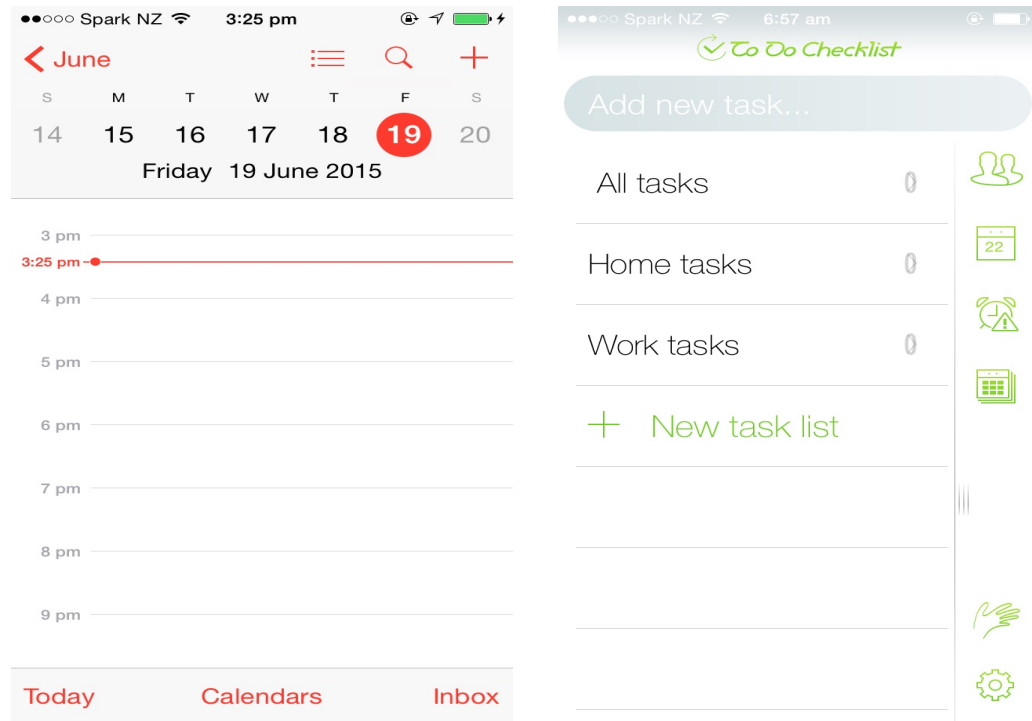
Figure 6.28. Presence of Calendar and File Interfaces.

In this research, we did not see the list page of the participants' reminder apps, which gives a weak result. None of the usability testing methods used in the study exposed the list page.

6.1.3.1 History

This page (or view) displays all completed tasks; users can clear the task from the list or reuse the tasks again. We asked users whether they deleted tasks after completion. Five participants keep their tasks in the reminder apps after they completed and use them again. P2 has not have this page in his reminder app to keep his tasks, P2 said, 'It is gone automatically' so his reminder app does not keep the tasks after its completed, and he is happy with that because he said, 'it is not important to me to see the past tasks. The important thing for me is the future tasks'. P3 has this page (or view) to keep his completed tasks in the list but he did not use it, he said, 'I like to add a new tasks and that helps me to

73

remember'. P7 did not has the history page in his reminder app, his reminder app delete the tasks automatically as soon as he slides the notification.

6.1.3.2 Time Tracking

This function allows users to see how much time is left for the next task (see Figure 6.29). We asked participants whether they used time tracking. Four participants did not have this function in their reminder app, but they thought it would be useful. Three participants did not care about the estimated time for the next task.
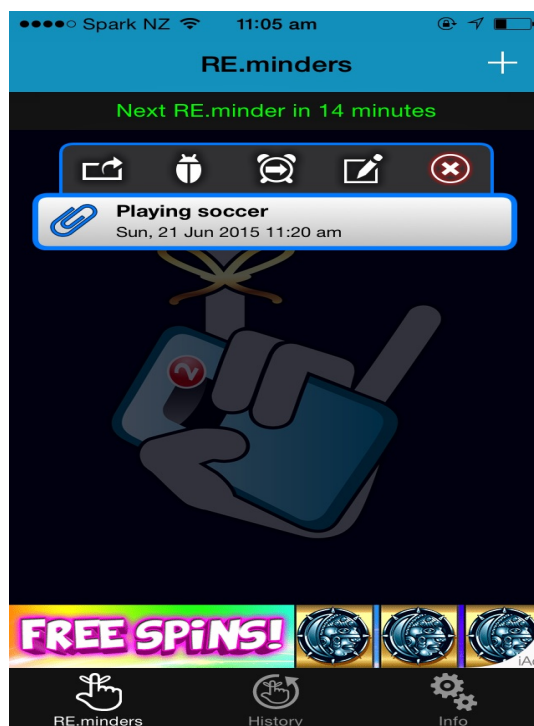
Figure 6.29. Time Tracking Function (RE.minder).

From these answers, we cannot give a clear recommendation that the list page should have a time tracking display next to each task. We also cannot recommend if the history view (or page) should display all completed tasks; however, the participants' answers indicate that the history page and tracking time function are important to some

users. Therefore, the list page requires further study, as this page has many functions and was not covered in this research.

6.1.4 Task Details and Functions

Each reminder app has its own style for displaying the task in the list page. Any.Do displays the task title and type of task, and other functions like mark the task to use it again, add notes, repeat, upload and share. There is also a pencil icon to edit (users click on it to edit the task) and delete (users need to slide the task to clear the task from the list) (see Figure 6.30).
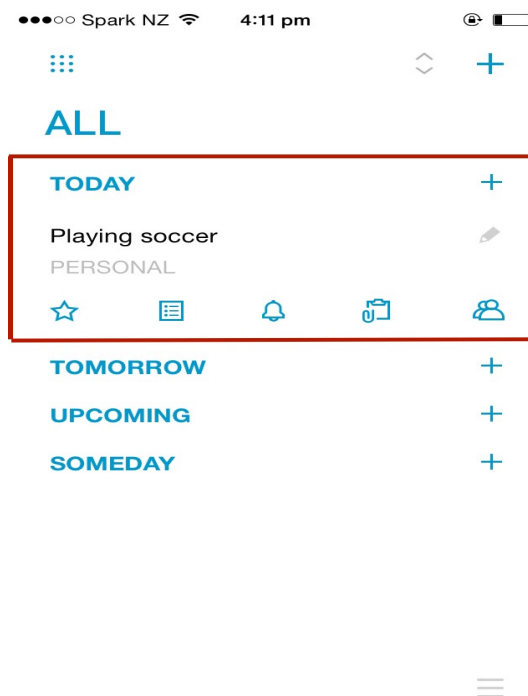
Figure 6.30. Display Task in List Page (Any.DO).

Todoist displays the task title and type of task and a correct sign to make the task complete and remove it to the history or a completed page. Calendar enables the user to postpone the task to a different time. A comment icon is used to write comments or upload

images or files to the task. A clock icon is used to edit the time of the task, and a pencil

icon is used to edit the task (see Figure 6.31).
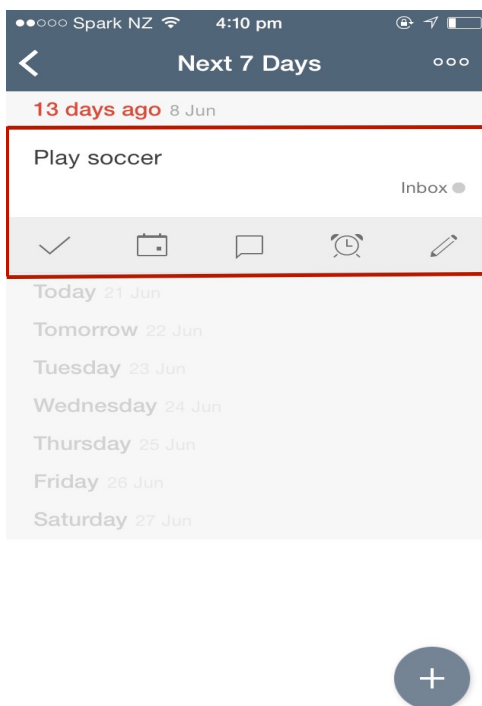
Figure 6.31. Display Task in List Page (Todoist).

In the screen captures method, two users sent screenshots for their task details in the

list page. Each screenshot give different details and information about the task. For

example, P7's reminder app displays the task title, due date, and time for the task along

with the number of repetitions. P5's reminder app displays the task title, due date, and time

for the task (see Figure 6.32).
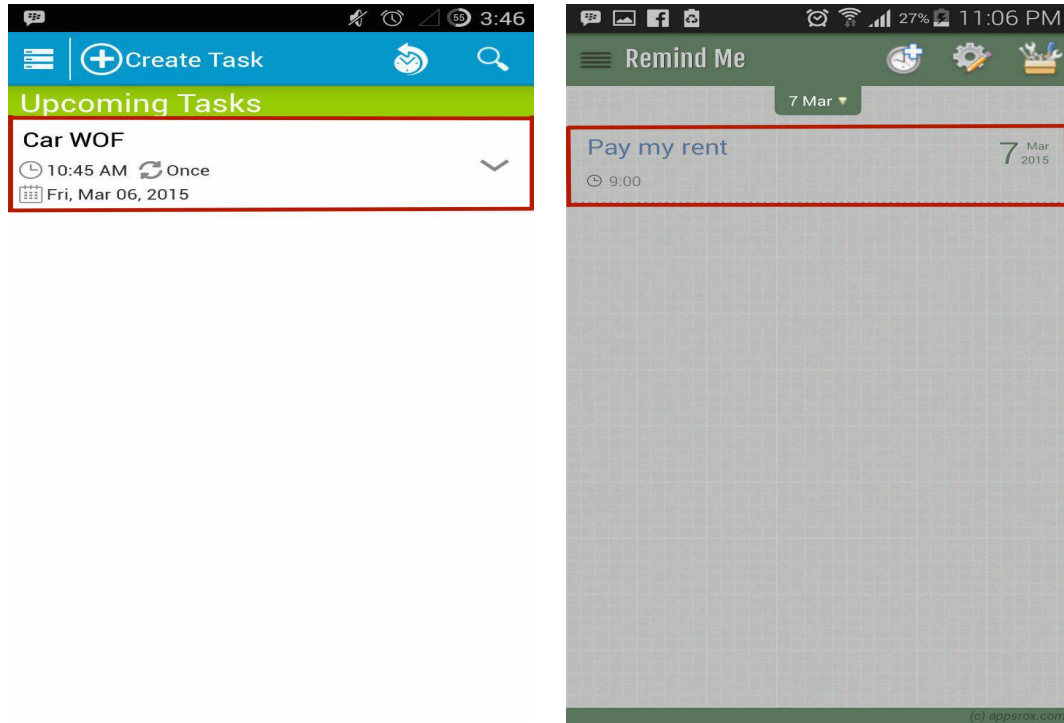
Figure 6.32. Screenshots from P5 and P6.

From these results, we cannot give a clear idea of how the task can be displayed (list page) and what functions and contents need to be displayed in each task as hot buttons or links. This requires further study, as each reminder app in the market uses different styles and icons to display the task's details and functions.

6.1.5 Reminder

Notification and alert services are a popular functionality provided by almost all modern smartphones and tablets (Xu & Zhu, 2012). These two services update users for receiving texts, messages or calls. Reminder apps also have these functions; when the task's due date/time arrives, the alert starts working and a notification is displayed on the screen (see Figure 6.33).
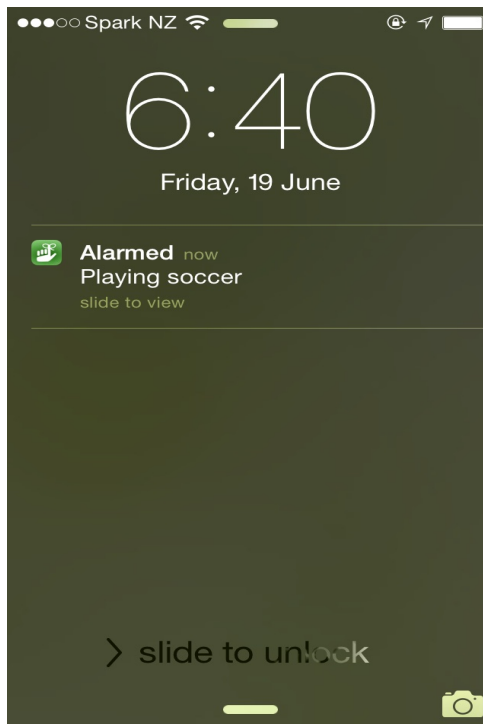
Figure 6.33. Display of Notification on Screen (Alarmed).

There is another option for reminder by an email; this functionality allows users to receive email notification on their email (Serenko, 2008). Two reminder apps have this functionality (RTM and Todoist) from the five reminder apps critiqued in Chapter 2 (see Figure 6.34).
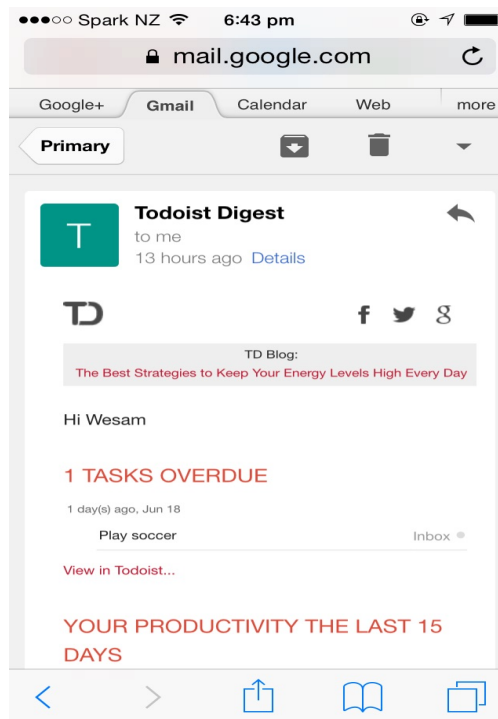
Figure 6.34. Remind by Email (Todoist).

In this research, we asked users how well their reminder app reminds them. All seven participants were happy with using alerts and notifications to be reminded of their tasks. Four participants said that their reminder apps sent them an email notification to remind them, but the other two participants did not find it useful. P7 said 'I do not like the email reminder', and P2 said 'email does not help me because I do not check my email always'. P1 and P4 found email useful for reminding them of their tasks.

Lastly, none of the users used reminder by location. This feature enabled the app to send a task reminder when the user walked past this location. For example, if a user wants to return a book to the library, the user would add the location 'library' while adding the task 'return the book'. The next time the user walks close to library, the application will remind him/her to return the book. Location-based services are becoming increasingly popular and prevalent in society (Krumm & Hughes, 2006).

79

From the results, it can be said that the users were happy in using the alert and notifications to remember their tasks, and email is an optional choice. If users want to receive an email as an alert for the task, they can choose that option. The location-based reminder service requires further study, as it is becoming more popular, but this research does not cover this area.

6.1.6 Advertisements

A few reminder apps have advertisements boxes in the interfaces for other products. When the user clicks in this box, another browser opens for the user. In this research, we asked users where they chose their reminder apps. Users answered divided into three responses (recommended from friends, looking for the review before downloading the app and reminder app came with the operating system). However, one user selected his app because it did not have advertisements. Another user in this research had a problem with his reminder app because he sometimes clicked in the advertising box by mistake, which took him to another browser or app. From the screenshot, we found the advertising box located at the bottom of the app (see Figure 6.35).
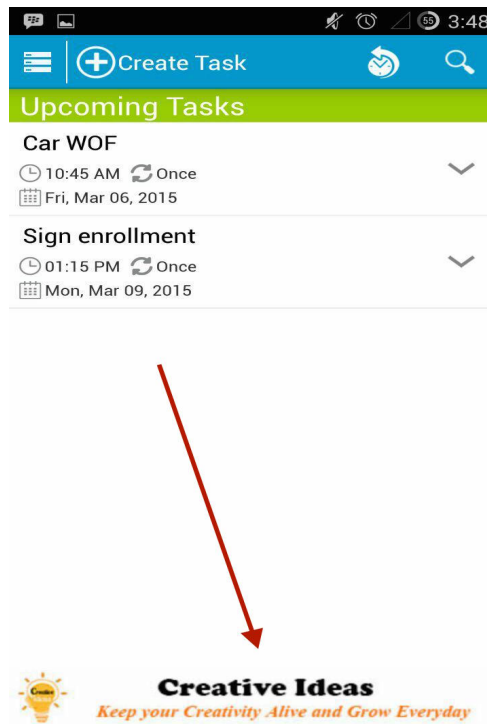
Figure 6.35. Advertising Box in P7 Reminder App.

Advertisements have a bad effect on reminder apps if they are located in the wrong place in the interface.

6.2 Graphic/Visual Design

The characteristics of hand-held devices presents challenges for effective user interfaces and certain design elements are needed to address the needs of users that are not necessarily software geeks and may have little knowledge about the apps. Apps used on mobile devices have very compact screens, which makes interaction very hard to observe (Uden, Oshee, Ting & Liberona, 2014). This section provides guidelines for designing a reminder app and includes five elements: colour, font, icons, language and buttons. Text and graphics guide users about how to use an app and perform the desired tasks (Welinske, 2014).

6.2.1 Colour

Colour is one of the key design features that has a strong influence on user evaluation and the perception of apps in general. In the current research study, we asked users about the colour of their reminder apps. Participants look for reminder app with limited colours, as apps with many colours are confusing. P3 and P4 suggest that two colours are enough for the reminder app. P7 said, 'White and black enough, with some colours shows the different between the tasks'. Colour is a vast area, as each colour can have different meanings for different cultures or groups of people. Reminder apps are global products and not meant for a specific group of people or age group. Reminder apps like 'Todoist' allow users to select the colour (or theme) of the app (see Figure 6.36).
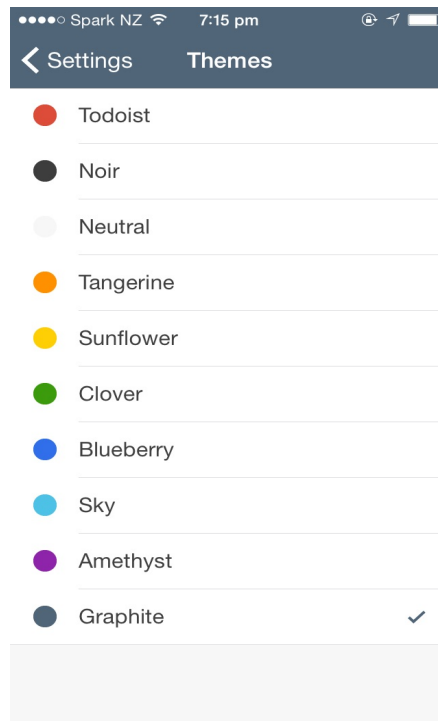
Figure 6.36. Theme Picker (Todoist).

Selecting the theme (or colour) for the reminder app can help users to avoid the problem of the colour. Colour use in reminder apps is critical as most of the devices using

reminder apps may be used outdoors and poor choice of colours can then limit their visibility (Uden, Oshee, Ting & Liberona, 2014). Colour contrast in mobile apps needs to be as high as possible in order to allow easy reading for users (Uden, Oshee, Ting & Liberona, 2014). Colours of applications related to hue, saturation and brightness of the foreground and background as well as contrast of foreground and background can have a substantial impact on the emotions, trust and behaviour of users towards the applications (Uden, Oshee, Ting & Liberona, 2014). A good contrast of colours between the foreground and the background and use of bright colours can push a higher interaction of users and the app interface (Uden, Oshee, Ting & Liberona, 2014). When complex designs are seen on various mobile devices, the limited colour depth on one device can lead to banding of the image (Fling, 2009). Using a consistent colour scheme throughout the mobile app allows comfortable experience for users as they feel that they are always in the same context (Cuello & Vittone, 2013).

Different colours have a different meaning in various cultures and may have different impact on people. For example, white represents purity, light, peace and hope; death in Eastern cultures and marriages in Western cultures (Fling, 2009). Similarly, black represents power, mystery, style, sorrow and death in Western cultures (Fling, 2009).

6.2.2 Font

Two key properties of text are font type and font size. Font equates to a set of characters that are printed or displayed in a specific style and size. Better font type and font size allows users to read clearly and make the reminder app better. The purpose of any text on the reminder app is to help users accomplish their tasks, so one should not use fonts that result in the user frowning and thinking about what is written in the app. In this research, only one participant had a problem with the font of his reminder app, which he said was 'hard to read'.

The main aim of fonts is to ensure that the app's text can be read easily (Cuello &

Vittone, 2013). In small sizes and low resolutions, usually cleaner, open and sans-serif

fonts are better; however, serif fonts may be used for titles when size is not an obstacle to

clarity (Cuello & Vittone, 2013). One of the best ways to ensure collect legibility is to test

the fonts on the mobile phones for it is being used (Cuello & Vittone, 2013). In the case of

Android phones, most common sizes are 12sp and 22sp. In Windows phone, small size of

20 PX and large titles up to 70 PX are used. The use of fonts also depends on hierarchy. For

example, titles have bigger fonts than rest of the text.

6.2.3 Icons

Good icons are fast recognised by users. Reminder apps with commonly used icons

that describe what the icons do help users avoid thinking a lot before clicking the icons. In

this research, we asked users if they prefer icons or words in the reminder apps. All the

participants agreed that icons look better in the app, but they could not understand all the

icons and so had to click on them first to know what the icon does. Four participants said

that the commonly used icons are easy to use. For example, the 'Plus sign' for adding, or

cycle pins for deleting or clearing, can be easily recognised. Icons also differ from culture

to culture. Muslims have different icons to Christians and Hindus. It is challenging for

application developers to specify an icon for each type of mobile device. Therefore, the best

solution for application developers is to use a common high-resolution icon for each type of

digital device. Apple recommends using well-understood icons for applications (Welinske,

2014).

6.2.4 Language

Using simple language allows users to complete their tasks. One participant in the

observation did not understand what was meant by repeating weekly, two weeks or three

weeks when he selected the repetition for the task. Language is very important, because if

users do not understand what each link does, they will take a long time to do the task. Words are as important as visual design because they provide information to users in case of important notifications such as error messages, titles, buttons and empty screen notices (Cuello & Vittone, 2013). How a phrase is integrated in a mobile app can directly affect the way users actually use an app. For example, labelling a button in an incorrect manner can lead to confusion among the mobile app users, and thus uncertainty and frustration (Cuello & Vittone, 2013). Technicalities and accusations should be avoided in texts for mobile apps (Cuello & Vittone, 2013). When an app is available in different languages, words should be carefully selected, as different phrases and words have different meanings in various cultures. Application developers should use terminology that is easy to understand for all users. A friendly and informal tone should be used. Most important information related to an app should be identified and expressed concisely so that people can read it quickly without spending too much time (Welinske, 2014).

6.2.5 Buttons

A button is an object that the user utilises to launch an activity in the app (Welinske, 2014). The text on the button is addressed as a title. Apps use various types of images as buttons for help on apps. Buttons make the click target areas (buttons, link) large to make it easy for users to complete their tasks. One participant clicked the wrong button during the observation and saw incorrect consequences.

The visual and graphic design requires more studies to understand what colour, font, icons, language and buttons users will like. In this research, we found that there are a potential problems with these five elements.

Chapter 7: Evaluation of Usability Methods

In this research, we used five methods to test the reminder apps. Some usability methods yielded the same results, whereas the other usability methods yielded different results. The important lesson learnt from the exercise was to compare the advantages of using various methods, and utilise a combination of methods in usability testing to achieve a better understanding of the user experience.

In this chapter, we display the advantages and disadvantages for each usability method. In addition, the challenges faced in these methods are also highlighted. At the end, we present the steps that can be followed in future to conduct this type of usability testing.
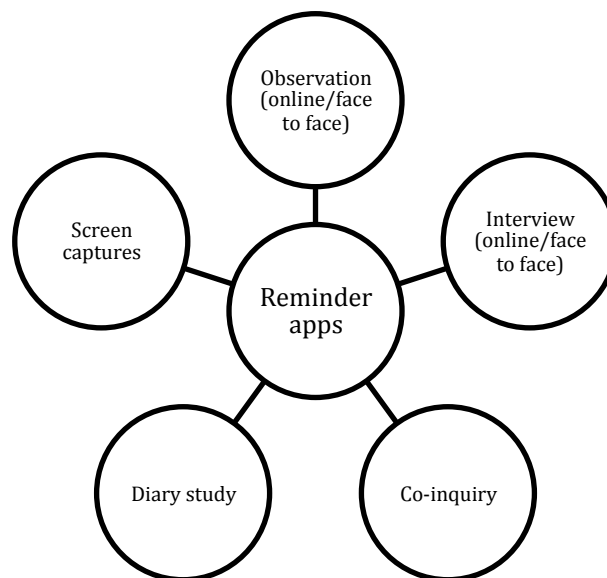
Figure 7.1. Usability Methods in Reminder Apps.

7.1 Observation (Think Aloud)

In this research, we used two kind of observation (online and face-to-face), with both giving the same results. While the participants added their tasks in their reminder apps, they were looking down to the phone or the tablet they were using. Therefore, I had to ask

them to make look up and make their faces visible, as the reaction on their faces was not visible when they were looking down; this problem was present in each observation.

Once their reactions were visible as they were using the reminder apps, it was easy to note their reactions. Subsequently, I noticed that when the participants take any actions on the app such as write task title, or select the repeating feature; they have reactions such as frown or wrinkle on their face. The facial reaction can show the mood of users while they are performing tasks; for example, when they are facing problem, are happy, and are looking for something but we cannot know what is the problem until they say what they are thinking by using; this is where the think-aloud technique is helpful (Nielsen, Clemmensen & Yssing. 2002). The think-aloud technique allows the researchers to tap into the thinking process while performing certain actions; thereby, it can be used to see if user is having trouble while performing these actions. Meanwhile, the sequence in which users perform the tasks can be determined. The think-aloud technique has recently been used by many researchers and companies to improve their understanding of users' experiences (Buur & Bagger, 1999).

During the observation, users were asked to think aloud while adding the tasks in their reminder apps. In this research, this technique helped to know the steps used by each user for adding the task. As such, the tasks users added in their reminder apps became clear; some of the tasks added by them were the title name, time, location and so on. This give a clear picture for what contents/features they using when they adding the task. On the other hand, think aloud assists to find the errors in the reminder apps, during the observation users said something that shows that they are in trouble for example, utterances of 'Ops, no no' show that they are having problems, whereas when they are confident, they say things like 'yeah, okay, done'. This technique also helps to see the visual design problems in the

87

reminder apps, users say something like 'I don't know what is that mean?' or 'what is written here!'

It does not matter if the user reactions are observed in a face-to-face or in an online situation. However, face-to-face observation needs to be done in a quiet place to hear the users thinking aloud. In this research, I conducted the observation in coffee shops and public parks. The noise from the road vehicles, people and music made it difficult to listen to the users. At the same time, it gave a more realistic picture of the users' experience, because users employ reminder apps in public places more than in their houses. This was also pointed out in the diary study in this research.

In an online observation, users do not need to travel or drive to meet the researcher; the observation can be done from their houses or wherever they are. As the reminder app is a global product, this allows the researcher to test the reminder apps with users from the world. However, one problem that is faced is that the user and the researcher can be in different time zones. In this research, the different time between New Zealand and Australia is just two hours; however, if the researcher wanted to test users from different country like users in Morocco or USA. Then, the time zone will be difficult for the researcher to manage. Another prerequisite for user observation online is that the internet connection needs to be robust and fast enough to see and hear the participants clearly. At the end observation method is useful and helps to see the steps of users when they adding the tasks and to find the ease of use, errors, and even functionality errors or visual errors.

7.2 Interviewing/Co-inquiry

In this research, we used two methods to ask the same questions to users about their reminder apps; the methods that we used were interview (online/face-to-face) and co-inquiry. The difference was in the technique and the fact that the interview took place

individually, while the co-inquiry was conducted in a group of users. Both of them gave the same result in the end. The interview/co-inquiry focuses more on how users use the artefact or the reminder app. One of the main problems I faced in the interview/co-inquiry methods was that not all features I asked about were available in the users' reminder apps. For example, I asked them if they added their tasks under folder/type. Some users had this feature in their reminder apps, while others did not have this feature. Therefore, they answered with 'no' or 'do not know the feature!' I had to explain the feature to those who did not have this feature, and then they gave feedback about whether they liked the feature or not. The main purpose of this exercise was to gain an understanding of how the user uses the product in the usability testing stage.

Both direct and general questions have their unique advantages; the ability or the lack of ability to answer the questions give a researcher an idea about which parts of the interface were obvious and operated as expected (Norlin & Winters, 2002). In the interview and co-inquiry, we asked direct questions like 'Do you add locations to your tasks? Why?' and general questions like 'What is missing in your reminder app?'. Direct questions enable direct answers; for example, so we can know if users add locations to their tasks and why. However, questions like 'What is missing in your reminder app?' are general; as a result, they generated different answers from different users. This is because each user was using different reminder apps, and was describing their individual experience.

Interviewing and co-inquiry methods are more helpful to know how users use the reminder apps and what features and contents in the reminder apps are easy to operate. However, these methods do not work when asking direct questions to find user experiences of design elements like colour, icons, fonts and so on. This is because users usually answer with short sentences—for example, 'Yes, I like colourful app'—but we do not know what he/she means by colourful. The user might answer: 'I like the font/or the commonly icons

89

in this reminder app', but we do not know the type of font (Arial, Times or Cambria) and the commonly used icons that the user is referring to. Therefore, the inquiry about the visual elements needs a different type of usability testing method.

Unlike the interview, the co-inquiry method allows users to discuss each question among themselves. In the interview, the user answers and waits for the next question, but in the co-inquiry users talk together about one point and at the end they might agree or disagree about features or contents in the reminder app. The co-inquiry allows users to give more information and share their opinion about the interface of the reminder apps. However, in this research, because each user used a different app, a user sometimes talked about a particular feature in his/her reminder app that was not available in the other users' apps. Users became confused and did not know what the first user was talking about.

Moreover, it was hard to manage the meeting with the other three users because I had to arrange the time with each user and correlate that time with the time available with the other users. In this research, we conducted the co-inquiry in a private room at the library, there was no noise and distraction; therefore, the library was good place for the co-inquiry.

At the same time, the interview method allows the user to speak freely without interruptions from other users like in the co-inquiry method. In the research, two types of interview were tested (online and face-to-face). The online interview was conducted though Skype: the user was hearing me and their voice was clear. There was no noise during the interview, except the when the user was moving their chair. The user was happy with conducting the interview online. They said, 'I did not worry too much about the interview because I was working online, and five minutes before the interview I opened Skype and waited for you'.

Similar to the observation method, time zones and internet connectivity can hamper the online interview. As such, it is advisable to adjust the time according to the prevailing time zones and having a robust internet connection. At the same time, like in most of the other methods, it is advisable to have the interview in a private place where there are few distractions.

7.3 Diary Study

In the interview/co-inquiry methods, we asked users two questions about the diary study: Can you provide your reflection on the diary study? Does the diary study interfere with your day? Five users gave both negative and positive reflections. The users found the diary study annoying because of the repetition and the added hassle of writing each task in diary form after adding it in the reminder app. The users also sometimes forgot to take the diary form with them and forgot to write tasks in it.

Clearly, the diary study method has some disadvantages that could affect the study. It requires strong commitment from the participants, and failure causes incomplete observations (Jacko & Stephanidis, 2003). For example, users might not use the reminder app or forget to write down a task during the diary study period (Jacko & Stephanidis, 2003). One user in this study did not add any tasks to the diary form because he did not use the reminder app through the week. Other users submitted diary forms with incomplete entries; for example, some did not write the current location or the due date/time for the tasks. Another issue was that sometimes it was hard to read the users' handwriting. The content could be hard to understand because the users used bright colours (e.g., orange) when they wrote the tasks in the diary. Another problem was that a user lost the diary form and said 'If you send the form by email that will be better'. Lastly, users were either unconvinced about the entries in the diary study or did not like the requirements of the

diary form. One user was not convinced about choosing the priority of the tasks in the diary

form and said 'I just use the reminder app for high priority'. As such, there needs to be

high-level collaboration between the researcher and the participant so that the participant

understands the importance of completing the diary accurately (Jacko & Stephanidis,

2003). Moreover, participants should have clear instructions and should feel comfortable

asking questions or seeking the researcher's help (Jacko & Stephanidis, 2003).

7.4 Screen Captures (Screenshots)

This method was not included in the pilot study, but was included in Combination C

to see if the screen capture method can produce the same results as the diary study. In

Combination C, we asked users to send a screen capture for each task they added to their

reminder apps; in addition, we conducted the diary study for a period of one week. We

found that the screen capture method gives different results because each user was using a

different reminder app, so each screenshot differed. Two users took screenshots after

adding the task (list page; see Figure 8.1).
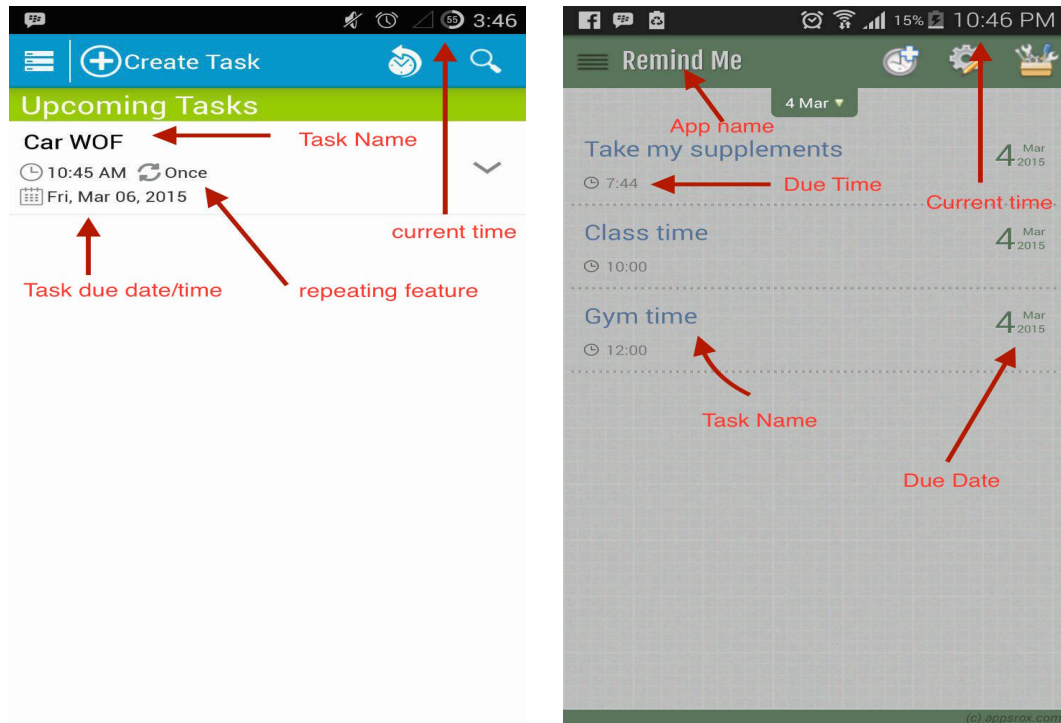
Figure 8.1. Screenshots from P5 and P7

The first screenshot in Figure 8.1 shows the task name, task due time, due date, repeating feature and the current time, but we do not know if the time referred to is 3:46am or 3:46pm. The second screenshot (which is for a different user) shows different details (reminder app name, task name, due time, due date and current time). However, in the second screenshot the operating system displays the time as 10:46pm, so we know the exact time. Figure 8.2 shows a screenshot sent by a third user before adding the task to the list page.
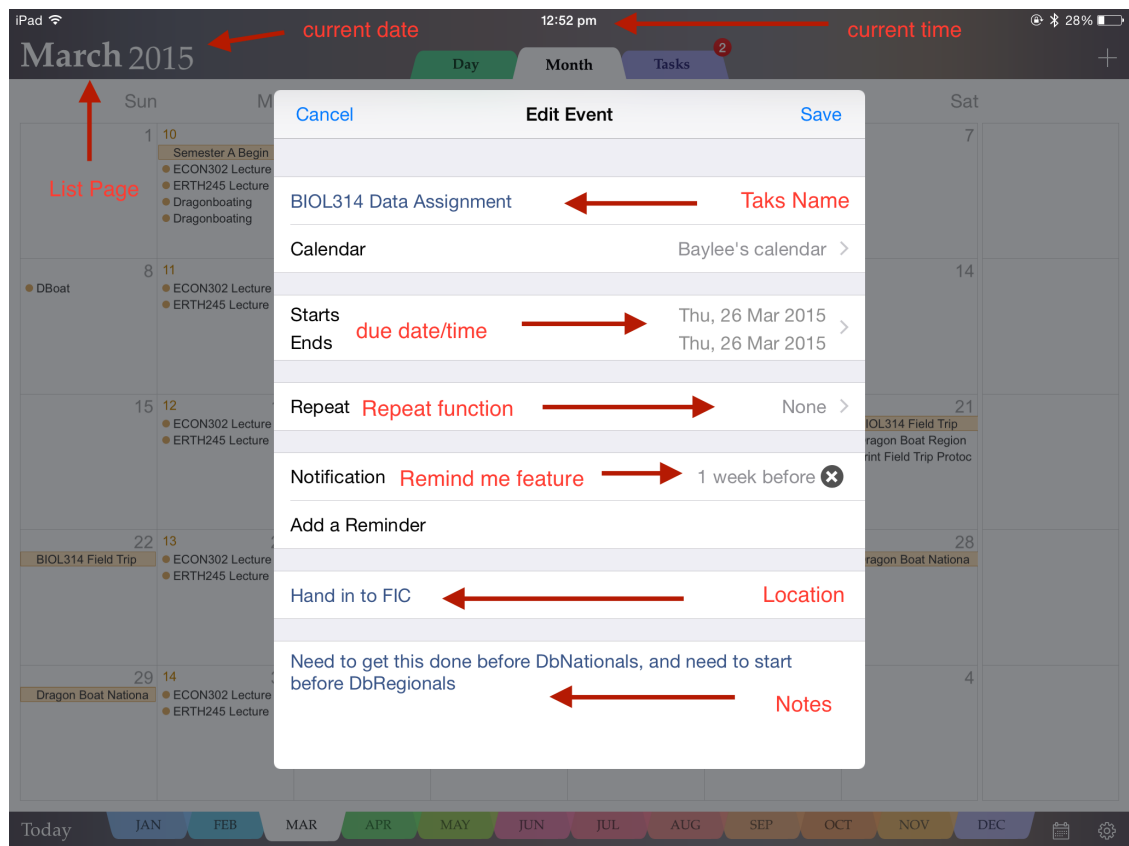
Figure 8.2. Screenshot from P6

The screenshot for the third user displays more information (current time, current date, task name, due date/time, repeating function, remind me function, task location, notes and the list page interface).

From Figures 8.1 and 8.2, we can see that screenshots cannot be used to replace the diary study, because they do not produce the same results in terms of current location, type of task and priority of task. In addition, the current date/time was not displayed in all screenshots consistently, but depended on the operating system and reminder apps being used. Screenshots could be useful for testing the pages of reminder apps; for example, if the researcher wants know what features and contents the users utilise when they are adding their tasks, then users can take screenshots of the adding task page after filling the contents and selecting the features.

7.5 Combinations in Usability Testing

Using multiple usability methods for one user is beneficial because it enables the researcher to better understand the user. In this research, we tested three combinations, each comprising different usability methods. At the beginning, we studied users' behaviour by conducting the diary study for one week. Then, the interview or co-inquiry method was used to investigate the reminder apps they use. This was followed by observation of users' responses to the reminder apps. The researcher had to describe the study requirements for the user before the study started, to know if the user was going to be busy or travelling, which would have impacted the study.

It should be noted that these combinations had some dysfunctional issues, as users did not have time for the observation after the interview and diary study. Moreover, users quit the study because the one-week diary study was too long for them.

Research studies on usability testing methods, such as those conducted by Kaikkonen et al. (2005), have indicated that the usability testing for a mobile application may be sufficient in a laboratory testing environment when navigation and user interface issues are studied. However, field testing may be effective when usability testing is combined with contextual tests or pilot tests in a natural context (Kaikkonen et al., 2005). In the current study, usability tests were conducted using various techniques such as the diary study, interview, observation and co-inquiry methods, which provided useful insights about the feedback of users regarding various types of reminder apps.

Research conducted by Page (2013) also studied the usability testing of six commonly used text input methods for smartphones, and tested smartphone users using the six methods in order to predict which is most effective for users. This current research study is similar to that of Page's because usability testing for the reminder app was

95

conducted using various types of apps and the results indicate which features are preferred by the users.

In terms of the context in which apps are tested, one study found that laboratory testing for usability apps is a tedious and time-consuming process that does not provide real use cases (Ma et al., 2013). Therefore, usability testing of mobile apps in a natural environment can yield useful results. This current study therefore conducts usability testing in a natural environment, in which users use their apps on their personal devices and have already used them. However, some aspects of this research may not have yielded natural results because users were assigned some specific tasks for the reminder apps. That is, the researcher asked the reminder app users to assign extra tasks when they finished.

One study regarding the understanding of usability methods for complex domains has reported that the researcher's technical skills in the area of domain testing is an important factor that affects the efficiency of usability testing techniques (Chilana, Wobbrock & Ko, 2010). In the current study, if the researcher had been more technically qualified, the usability testing could have been more exhaustive. Another research study has reported that one of the real challenges in mobile app development is the lack of focus in usability studies on the functionality and features of mobile apps that can help the developers with more insights from users (Joorabchi, Mesbah & Kruchten, 2013). This current study is therefore a positive step in this direction and the results of the study will assist developers of reminder apps in the future.

Norman and Nielson (2010) proposed the use of new interactive techniques in the usability testing of new applications, in order to allow new insights about user feedback about the usability of apps. This is in contrast to simply using traditional usability testing methods. The current study has achieved this to some extent by using a mixture of various usability testing techniques so as to collect user feedback for reminder apps. Further, a prior

study indicated the necessity of usability testing methods for research studies on mobile apps and noted the gap between the complexity of tasks and interaction with users (Coursaris & Kim, 2011). The current study has attempted to fill this gap; however, some usability testing methods, such as the diary study, were not considered convenient by users due to redundancy and amount of effort needed for record keeping. Further research in this direction may be useful.

7.6 Steps for Usability Testing Methods

This section provides the steps for each of the five methods used in this research.

7.6.1 Steps for Diary Study

1. Write down all information needed in small boxes.

2. Give the participant a start date and end date for the diary study.

3. Make the sure the data you need is written clearly (e.g., current time, current location, task location or task due date/time).

4. It is better to make the participant select the data instead of writing it (e.g., if you want ask about type of task, write some selected answer like personal, study, sport, business or other).

5. Describe all information that you want the participant to write in the diary form.

6. Show the participant an example of an answered diary form (e.g., write down an example of a diary form and show it to the participants).

7. Ask the participant if he/she has any questions about the diary form before giving it to him/her.

8. Tell the participant to write down the tasks they did throughout the period of study; inform them that they do not have to fill out all diary form boxes.

9. Tell the participant he/she is free to skip any task if it is too personal and they do not want to write it in the diary form.

10. Ask the participant to write in the diary form using a darkly coloured pen and no bright colours. Ask the user to make their handwriting clear.

11. Give the participant the choice to submit the diary form in person or by email.

12. Record all data in an Excel sheet or Word Document for analysis.

7.6.2 Steps for Screen Capture

1. Give the participant a start date and end date for the screen capture.

2. Ask the user to take screenshots (or screen captures) for each task they have added in the reminder app.

3. Show the user an example of the screenshots that you need.

4. Tell the participant he/she is free to skip any task if it is too personal and they do not want to take a screenshot of it.

5. Let the participants send the screenshots through IM apps, like WhatsApp or Telegram, which help the participant send the task instantaneously. This results in fewer complications.

6. Write down the current time or date that users send you the screenshots, for later analysis.

7. Download all screenshots to your computer. Record all data in an Excel sheet or Word Document for analysis.

7.6.3 Steps for Online Interview

1. Write down all questions and points you want to ask about reminder apps.

2. Tell the participant the estimated time that the interview will take (e.g., between 15 to 20 minutes).

3. Ask the participant what communication software he/she uses, so that you can download the same software.

4. Test the internet connection before conducting the interview.

5. Ask the participant to stay indoors for the interview (not a noisy place).

6. Ask the participant for a suitable time to conduct the interview.

7. If the user is overseas, know the exact time difference between your city and participant's city so that you do not miss the interview.

8. Tell the participant that he/she is free to not answer any question.

9. Keep asking the participant questions related to his/her answers.

10. Ask the participant if he/she want to add anything before jumping to the next question.

11. If the participant does not understand the question, give an example or ask the question in different way.

12. Record the interview.

13. Transcribe the interview into Word Documents for analysis.

7.6.4 Steps for Face-to-face Interview

1. Write down all questions and points you want to ask about reminder apps.

2. Tell the participant the estimated time that the interview will take (e.g., between 15 to 20 minutes).

3. Ask the participant to select an interview location they prefer, or suggest locations like a coffee shop or library. Try to avoid noisy places, so you can hear the participant clearly.

4. Ask the participant for a suitable time to conduct the interview.

5. Tell the participant that he/she is free to not answer any question.

6. Keep asking the participant questions related to his/her answers.

7. Ask the participant if he/she want to add anything before jumping to the next question.

8. If the participant does not understand the question, give an example or say the question in different way.

9. Record the interview.

10. Transcribe the interview into Word Documents for analysis.

7.6.5 Steps for Co-inquiry

1. Write down all questions and points you want to discuss with the participants.

2. Tell the participants the estimated time that the interview will take (e.g., between 15 to 20 minutes).

3. Tell the participant that he/she is free to not answer any question.

4. Ask the participants for a suitable time for them to do the co-inquiry. Usually co-inquiry includes two or more participants, so you need to find a time that suits everyone.

5. Try to avoid noisy places, so you can hear the participants clearly.

6. Keep asking the participants questions related to their answers and points of view.

7. Ask the participants if they want add anything before jumping to the next question or point.

8. If the participants do not understand a question or point, give an example or say the question in different way.

9. Record the co-inquiry.

10. Transcribe the co-inquiry into Word Documents for analysis.

7.6.6 Steps for Online Observation

1. Tell the participant the estimated time that the observation will take (e.g., between 15 to 20 minutes).

2. Ask the participant what communication software he/she uses, so that you can download the same software.

3. Test the internet connection before conducting the observation.

4. Ask the participant to stay indoors for the interview (not a noisy place).

5. Ask the participant for a suitable time to conduct the observation.

6. If the user is overseas, know the exact time difference between your city and participant's city.

7. Ask the participant to put his/her head up, so you can see their facial reactions when they are using the app.

8. Ask the participant to think aloud while using the app. If the participant does not understand what this means, give an example.

9. Ask the participant to add their own tasks in the reminder app.

10. If the participant does not have any task to do, ask him/her to add invented tasks (e.g., 'Can you add a new task named playing soccer, repeating every Friday at 5pm?').

11. Record the observation.

12. Record your observations into Word Documents for analysis (e.g., 'participant was frowning while adding the first task' or 'the first task took 2 minutes for the participant').

7.6.7 Steps for Face-to-face Observation

1. Tell the participant the estimated time that the observation will take (e.g., between 15 to 20 minutes).

2. Try to avoid noisy places, so you can hear the participant clearly.

3. Ask the participant for a suitable time to conduct the observation.

4. Ask the participant to put his/her head up, so you can see their facial reactions when they are using the app.

5. Ask the participant to think aloud while using the app. If the participant does not understand what this means, give an example.

6. Ask the participants to add their own tasks in the reminder app.

7. If the participant does not have any task to do, ask him/her to add invented tasks (e.g., 'Can you add a new task named playing soccer, repeating every Friday at 5pm?').

8. Record the observation.

9. Record your observations into Word Documents for analysis (e.g., 'participant was frowning while adding the first task' or 'the first task took 2 minutes for the participant').

Chapter 8: Conclusion

This research study has made some contributions to the understanding of the usability of various reminder apps. This study identifies the strengths and weaknesses of various reminder apps, and recommends design and features guidelines.

8.1 Critiques of Reminder Apps

Apple Store® and Google Play™ offer many reminder apps, which all focus on one thing: helping people to remember their future tasks. Developers of reminder apps aim to help users remember their tasks with added features. In Chapter 2 of this thesis, we critiqued five reminder apps to see how they work. Criteria and dimensions to select the five apps were: most downloaded, highest ratings and positive reviews from users. In addition, the apps critiqued had to be free and be general reminder apps rather than specialist apps. In this research, we found:

1. All five reminder apps ask users to write down a task title (or content) and select a due date/time.

2. Each reminder app uses its own features to help users remember their tasks. Some features are common in all five reminder apps, such as repeat, view completed tasks, edit tasks after adding, add notes to tasks and clear tasks after completion. Further, there are some unique features available in one or more reminder apps, such as time tracking of tasks, use of voice recognition to add tasks, add location, select priority and type, share tasks with friends and set ringtones for alerts.

3. All five reminder apps provide alerts and mobile notifications, but some apps also send reminders by email or location (or location-based services).

4. Reminder apps rely on using icons instead of words to showcase their features.

5. Reminder apps display tasks in different ways to their users in the list page. All five reminder apps display the task title. Moreover, each app displays the title name with different data, such as priority, type of task, due time/date and other details, depending on the reminder app.

8.2 Recommendations for Usability Studies of Reminder Apps

This research comprised five methods for knowing usability and user experience. Each method obtained different information from the users. Tthe methods were effective in the following ways:

1. The diary study helped to observe users' behaviour when using the apps.

2. The observation indicated what attracted users to apps and helped find errors by asking users to employ the think-aloud technique. Moreover, the observation showed the facial reactions of users, such as frowning or wrinkling of the brow, as well as their mood. There appeared to be no difference between conducting the observation face-to-face or online.

3. The interview technique focused on how users implemented the reminder apps, what features they used and what they liked and disliked about them. There appeared to be no difference between conducting the interview face-to-face or online.

4. Co-inquiry also focused on how users implemented the reminder apps, but it differed to the interview method as it allowed a group of users to discuss together and to indicate their experience and provide feedback about each aspect or question raised by the researcher.

5. The screen capture method focused on the features, functions and contents users used (or did not use) when operating their reminder apps.

8.3 Recommended Steps for Designers and Developers of Reminder Apps

This study has found that designers and developers of reminder apps can improve their design in the following main areas.

8.3.1 Interaction Design

1. Avoid using content with limited characters, as users prefer long sentences for the task title, task location and notes field.

2. Avoid adding clickable advertisements, as users click them by mistake, which closes the app and opens a browser.

3. Make the title task content and date/time picker the first boxes when users add new tasks, or when there are other functions or contents that need to be added by users.

4. Display the current date and time in the date/time picker, so users do not have to look at their watch for this information.

5. Other functions like sharing tasks with friends, repeating and reminders should be available in reminder apps.

6. Ensure that location and notes are available for use.

7. Save tasks after completion in a history page that allows users to use them again or delete them.

8. Allow users to choose whether they want email notifications to remember their tasks.

9. Allow users to set ringtones in the reminder app so they can distinguish reminders from call and text ringtones.

8.3.2 Visual Design

1. Avoid small clickable buttons on pages and ensure the buttons are displayed clearly.

2. Use common icons that users can easily identify. An information page can display and describe what each button or symbol does.

3. Use simple language to allow users to achieve their tasks.

4. Avoid adding many colours to the reminder app, and allow users to select the theme or colour scheme of the app.

5. Avoid complex or small fonts. A simple font type and size allows users to read clearly and complete their tasks quickly.

8.4 Contributions of this Study

To the researcher's knowledge, this is the first study to examine the usability of reminder apps. The study's findings will be of value to the usability community, including researchers, practitioners and users.

Previous studies on mobile apps, such as that of Norman and Nielson (2010), have stressed the importance of using innovative and interactive research methods for usability testing. The current research study has achieved this to some extent by using a mixture of different usability methods and techniques in order to provide useful insights about the usability of reminder apps.

Previous research has also noted the necessity of usability testing methods for mobile apps to keep in mind the gap between the complexity of usability testing apps and the interaction with users (Coursaris & Kim, 2011). In this aspect, the current research study has contributed by assigning simple tasks to users and also interacting with them through usability testing techniques, such as interview and co-inquiry methods.

Prior research has found that a key challenge in mobile app development is the lack of research conducted on usability testing for mobile apps, specifically research focusing on functionality and features, which can provide insights to developers based on user experience of these apps (Joorabchi, Mesbah & Kruchten, 2013). This current research addresses this gap because it provides input from users on various aspects of reminder apps, including features and functions, to aid app developers in addressing these issues in future development.

The literature also stressed the importance of using a natural environment in usability testing of apps, instead of traditional usability testing methods (Ma et al., 2013). According to Ma et al., laboratory testing for usability may not yield results as useful as those obtained from natural set-ups. Kaikkonen et al. (2005) suggested that a laboratory testing environment is not sufficient, especially when navigation and user interface issues are involved. This current study has addressed this issue to some extent by conducting usability testing that incorporates user interaction and users completing most of the tasks themselves in reminder apps.

The aforementioned researchers have also recommended field testing or pilot studies for usability testing. This current research functions as a pilot study of reminder apps usability testing, and therefore provides useful insights about the feedback of users regarding various types of reminder apps. This current research thus contributes towards future research studies on usability testing for mobile apps.

8.5 Limitations

This current study faced some limitations that affected the findings. First, the usability testing was conducted on a group of students aged between 20 to 35 years, and therefore cannot be generalised for other groups, such as professionals, the elderly and

doctors. Each group has different behaviours and criteria for using reminder apps. Nevertheless, it is hoped the usability guidelines for this study will help other groups. It should also be recognised that this study involved only seven participants, which is not a sufficient number to generalise the findings to the entire population. However, including a larger number of participants would have escalated the time taken and the costs incurred to conduct the present study.

Second, it was impossible for this study to cover all functions in the selected reminder apps. This is because there are many reminder apps that are available in the market, all with different interfaces, features, functions and content. Since participants were using selective reminder apps, they were potentially unaware of the features available in other reminder apps. Therefore, when users were questioned in the interview and co-inquiry methods, some participants did not understand the functions or features of other reminder apps they did not use.

Third, this study's use of only five reminder apps to find common features represented a limited sample. Further, only free reminder apps were selected in the current research study, while there are thousands of paid reminder apps available in the market.

Fourth, the criteria behind selecting the reminder apps were limited. They included download rates, user rating and reviews; however, users may have different criteria when selecting a reminder app, such as compatibility with their operating system or design of the app.

Fifth, the observation study in this research involved users focusing on their smartphone and tablet screens. It was thus hard to capture users' facial expressions and reactions if they were frowning or wrinkling while using the reminder apps. It was challenging to ask them to raise their heads from their screens in order to observe their faces.

Sixth, the usability guidelines proposed in this study are preliminary and need further research. This study is an initial step towards establishing strong guidelines for reminder apps.

Last, this research focused on analysing the content and functions of reminder apps, but did not focus on investigating the impact of certain design elements that may affect the perception of reminder app users.

8.6 Recommendations for Future Research

In light of these limitations, this section provides suggestions for future research studies on developing efficient and usable reminder apps. Future research can examine what content and functions need to feature on the 'Add Task' page. Studies could also involve different users testing each function and content and selecting which should be displayed, and which 'Task title' and date/time picker needs to be followed. Moreover, usability testing should be conducted on two types of 'Add Task' page, either displaying the extra contents/functions on the same page or by using different popups. Questionnaires or interviews should be sufficient to discover which type users prefer.

Usability testing on time/date pickers is needed as there are different styles available in reminder apps. Some reminder apps have the date detached from the time, other reminder apps have the date and time in the same picker. Some reminder apps have a fixed time and date that users can select (e.g., after one hour, after one day and so on), while other reminder apps have open date/time picker. All of these date/time pickers can be tested with users following a questionnaire method to see which is preferred.

Usability testing could also be conducted on the 'Remind me' (or 'Alert me') function, as multiple styles of this function are available in reminder apps. Some reminder apps provide custom selection that allows the user to select the time to remember the task

or the event. For example, users can select a reminder 14 or 20 minutes before the task. Other reminder apps provide limited or fixed times or days, and users can select between them. Observations can be made of users using different 'Remind me' styles, and this can be followed by interviews or questionnaires to see which style is preferred.

This thesis also recommends that an evaluation study be conducted on the 'Repeating' function, as multiple styles of this function are available in reminder apps. Reminder apps have different options to select when notifications are repeated, by selecting the exact time and day, selecting every day, every week and so on, or selecting how many times notifications are repeated (every 5 minutes, every 10 minutes and so on). Users can test these different styles and then be assessed for their feedback on their preferred style.

It is also recommended that visual studies on the 'Priority' function be undertaken. In this research, each reminder app had different style to select the priority of the task. Some reminder apps used words to indicate the priority between 'high—medium—low'. Other reminder apps used symbols or icons (e.g.,!,!!,!!!!). Moreover, some reminder apps used colours for selecting priority, like red for urgent, yellow for medium, blue for low and so on. These variations can be presented to users to determine which is easier to understand.

Developing or implementing sharing functions in reminder apps can also be examined. This function is not available in most of the reminder apps in the market. This current study found that users who want to share some of their tasks with their friends have to use email or have friends use the same reminder app to share tasks with them.

Evaluation studies could be conducted for adding URLs or links to the tasks in the reminder apps. In this research, most users had not used or heard about this content— perhaps because most users were students. Research can be conducted to see whether this

content can be part of the 'Add Task' page or whether users can use the notes field to add such information.

Developing the voice recognition on reminder app can also be explored. This technology is quite new and users face problems with using this technology to add their tasks in the reminder apps. Problems include environment issues like noise or pronunciation issues. Observations can be made of different groups to determine the issues of using voice recognition. This can be followed by developing guidelines to improve voice recognition.

Evaluation studies can also be made on location-based services (LBS) of reminder apps, to test the services with different users and compare them with time-based services to see which is easier.

There can also be evaluation studies of task details in reminder apps' list pages. Each reminder app displays task details in the list page (or homepage) differently. Researchers can test multiple styles with different users and then conduct interviews or questionnaires to develop guidelines for a task's details in the list page.

Usability guidelines for the list page (or homepage) of reminder apps can be developed. Each reminder app in the market has different homepage (or list page) style. Some reminder apps display the tasks in one list, some display tasks in folders or by days (e.g., today tasks, tomorrow tasks, after one week tasks, after one month tasks and so on). Other reminder apps display tasks in a calendar or timetable style. Users can test different styles and then be assessed to discover what style they prefer and find easy to use. Depending on the feedback collected from users, the design and layout of the reminder apps can be modified.

Visual studies on icons and symbols in reminder apps can also be conducted, as each reminder app in the market has its own icons and symbols. This current study found

that users preferred using common icons to add their tasks. Users also found some icons difficult to understand, and they had to click on some icons to know what the icons did. Comparing user responses to different icons and symbols to determine common icons or symbols can be done in future studies. As reminder apps are global products, participants can be drawn from different religions, nationalities, ethnicities and genders to produce a representative result.

Visual studies can also be made on different colours and text in reminder apps. In the current research, users had problems with the colours of the reminder apps and sometimes selected a reminder app because of the colour. Therefore, colour plays an important role when using and selecting a reminder app. Further, users sometimes struggled to understand the meaning of text in the reminder apps, so an evaluation study could be conducted to address this.

Fonts could also be evaluated, as the reminder apps used different fonts for their interfaces. Assessment studies could be conducted in order to find what fonts are comfortable for users. Also, users can be presented with the same reminder app using small and large fonts for a limited time in order to understand their reaction to font changes in the reminder apps.

Search functionality is an important aspect of reminder apps. Future research can study the impact of search functionality on the usability of the reminder apps. Searching the reminder apps for assigned tasks can be of immense benefit to users, as they do not have to browse through the entire reminder app in order to locate tasks assigned earlier.

Enhancing the spell check feature and suggesting words to users in reminder apps can be of immense benefit to users. Future research studies can investigate the impact of spell check features on the user preference of the reminder apps, and also gather feedback

from users on whether they are interested in incorporating the spell check and suggest text feature in reminder apps.

Further research studies can investigate the comparative use of reminder apps among different groups of people. For example, a study can compare the use of reminder apps by groups of professionals, such as doctors, lawyers or businessmen, and compare how they use the same app for different types of tasks. It is expected that each type of user will have a different requirement for the reminder app and thus would need specific features from the same reminder app. Also, further research could study the use of reminder apps by the elderly, including those aged above 60 years. It would be interesting to understand how their requirements differ to the rest of the population.

The current research was conducted on a small group of students using selective reminder apps. Later research studies with higher budgets and longer time frames can select a larger group of people and use various reminder apps available in the market. In this way, future research can provide a wider analysis of usability methods for reminder apps. The results from such studies will help app developers in enhancing the usability of upcoming reminder apps and also suggest new features for reminder apps.

Future studies can also incorporate reminder app developers as study participants, in order to better assist users of the reminder apps and better understand the problems faced by reminder app users. Future research studies can also focus on the impact of cultural factors such as religion, nationality, ethnicity and language on the use and perception of reminder apps. People of different cultural backgrounds may interpret reminder app text and images in a specific manner, which may affect their preference of use of reminder apps.

8.7 Conclusion

Digital devices such as smartphones and tablets have become constant companions and are often used by people to operate reminder apps to remember their future tasks, and also manage their busy time schedule effectively. Thousands of reminder apps are available in the market through vendors such as Apple Store® and Google Play™. Many daily tasks need to be tracked, and many important events such as birthdays, appointments, assignment deadlines and anniversaries cannot be missed. This study has focused on reminder apps users, including six males and one female, all students aged between 20 years to 35 years. The main objective of this study was to examine the usability of the selected reminder apps.

Five usability methods were implemented in this research, including a diary study, interview, co-inquiry, observation and screen captures, in order to assess user experience and behaviour while using the reminder apps. This research study has demonstrated that reminder apps are highly valued and popular products with smartphone and tablet users. A strong level of motivation existed to use the reminder apps, as they provide features that help users to effectively manage their tasks and also remember their future tasks. Additionally, the research study found that users use reminder apps for remembering different types of tasks, such as times to wake up, remembering an assignment deadline, meeting friends or important business meetings. Users also set different types of priorities, such as low, medium or high, depending on the importance of tasks. Some users only use reminder apps for high-priority tasks and use their natural memory to remember low and medium priority tasks.

The observations from this study reveal that reminder apps have certain design and visual deficiencies in relation to usability. For example, small buttons located adjacent to each other on the reminder apps are often clicked by users by mistake. Also, the use of

difficult or misleading language makes users confused about what they select. Content with limited characters may limit the writing of tasks by users.

Results from this study indicate that the majority of the research participants use reminder apps with no loyalty, and thus use multiple reminder apps at the same time or frequently switch from one reminder app to the other after a short time. This study is the first usability study conducted in the context of reminder apps. It is based on existing understandings of user needs when using reminder apps and is likely to benefit reminder app developers, designers and users in the long run.

Through this study, I have attempted to enhance my understanding of users' needs in relation to reminder apps for smartphones and tablets. In addition, I have gained knowledge of ways to run usability tests for tablets and smartphones reminder apps and improved my interpersonal skills in the process.

References

Borriello, G. & Holmquist, L. E. (2002). *UbiComp 2002: Ubiquitous Computing: 4th International Conference, Göteborg, Sweden, September 29–October 1, 2002. Proceedings*. New York, NY: Springer Science & Business Media.

Buur, J. & Bagger, K. (1999). Replacing usability testing with user dialogue: How a Danish manufacturing company enhanced its product design process by supporting user participation. *Communications of the ACM, 42*(5), 63–66.

Carter, P. (2007). Experiential group learning for developing competencies in usability practice. *Information Systems and Technology Education: From the University to the Workplace*, 242.

Carter, P. (2007). Liberating usability testing. *interactions*, *14*(2), 18–22.

Chilana, P. K., Wobbrock, J. O. & Ko, A. J. (2010, April). Understanding usability practices in complex domains. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2337–2346). ACM.

Collins, D. (2014). *Cognitive interviewing practice*. London: SAGE.

Cooper, A., Reimann, R. & Cronin, D. (2007). *About face 3: The essentials of interaction design*. John Wiley & Sons.

Coursaris, K. & Kim, D. J. (2011). A meta-analytical review of empirical mobile usability studies. *User Experience Professionals Association, 6*(3), 117–171.

Cuello, J. & Vittone, J. (2013). *Designing mobile apps*. José Vittone.

Deng, L. & Huang, X. (2004). Challenges in adopting speech recognition. *Communications of the ACM*, *47*(1), 69–75

Filippi, S. & Barattin, D. (2011). *IMProVe 2011: International Conference on Innovative Methods in Product Design. Proceedings: Full Papers Volume.* IMProVe 2011.

116

Fling, B. (2009). Mobile design and development: Practical concepts and techniques for creating mobile sites and web apps.

Goodman, E., Kuniavsky, M. & Moed, A. (2012). *Observing the user experience: A practitioner's guide to user research.* Cambridge, MA: Elsevier.

Goodwin, K. (2011). *Designing for the digital age: How to create human-centered Products and Services.* IN: John Wiley & Sons.

Hodges, S., Williams, L., Berry, E., Izadi, S., Srinivasan, J., Butler, A.,... Wood, K. (2006). SenseCam: A retrospective memory aid. In *UbiComp 2006: Ubiquitous Computing* (pp. 177–193). Springer Berlin Heidelberg.

Jacko, J. A. & Stephanidis, C. (Eds.). (2003). *Human–computer interaction: Theory and practice* (Vol. 1). CRC Press.

Joorabchi, M. E., Mesbah, A. & Kruchten, P. (2013, October). Real challenges in mobile app development. In *Empirical Software Engineering and Measurement, 2013 ACM/IEEE International Symposium on* (pp. 15–24). IEEE.

Kaikkonen, A., Kekäläinen, A., Cankar, M., Kallio, T. & Kankainen, A. (2005). Usability testing of mobile applications: A comparison between laboratory and field testing. *Journal of Usability Studies, 1*(1), 4–16.

Kim, J., Park, Y., Kim, C. & Lee, H. (2014). Mobile application service networks: Apple's app store. *Service Business*, *8*(1), 1–27.

Krumm, J. C. & Hughes, R. L. (2006). *U.S. Patent Application 11/462,885*.

Laurel, B. (2003). *Design research: Methods and merspectives.* LA: MIT Press.

Leung, N., Nkhoma, M. & John, B. (2013). *Proceedings of the 4th International Conference on IS Management and Evaluation: ICIME 2013.* UK: Academic Conferences Limited.

Ma, X., Yan, B., Chen, G., Zhang, C., Huang, K., Drury, J. & Wang, L. (2013). Design and

    implementation of a toolkit for usability testing of mobile apps. *Mobile Networks*

    and Applications, *18*(1), 81–97.

Marcus, A. (2011). *Design, user experience, and usability. Theory, Methods, Tools and*

    Practice: First International Conference, DUXU 2011, Held as Part of HCI

    International 2011, Orlando, FL, USA, July 9–14, 2011, Proceedings. CA: Springer

    Science & Business Media.

Miller, T. & Monaghan, C (2013). Apple's app store marks historic 50 billionth download.

    Retrieved from http://www.apple.com/pr/library/2013/05/16Apples-App-Store-

    Marks-Historic-50-Billionth-Download.html.

Nguyen, N. T., Kowalczyk, R. & Chen, S.-M. (2009). *Computational collective*

    intelligence. Semantic Web, Social Networks and Multiagent Systems: First

    International Conference, ICCCI 2009, Wroclaw, Poland, October 5–7, 2009,

    Proceedings. Poland: Springer Science & Business Media.

Nielsen, J., Clemmensen, T. & Yssing, C. (2002, October). Getting access to what goes on

    in people's heads? Reflections on the think-aloud technique. In *Proceedings of the*

    second Nordic conference on Human–computer interaction (pp. 101–110). ACM.

Norlin, E. (2002). *Usability testing for library websites: A hands-on guide*. American

    Library Association.

Norman, D. A. & Nielsen, J. (2010). Gestural interfaces: A step backward in usability.

    Design and Usability, 46–49.

Page, T. (2013). Usability of text input interfaces in smartphones. *Journal of Design*

    Research, *11*(1), 39–56.

Serenko, A. (2008). A model of user adoption of interface agents for email notification.

    Interacting with Computers, *20*(4), 461–472.

Uden, L., Oshee, D. F., Ting, I.-H. & Liberona, D. (2014). *Knowledge management in organizations: 9th International Conference, KMO 2014, Santiago, Chile, September 2–5, 2014, Proceedings.* NY: Springer.

van Teijlingen, E. & Hundley, V. (2001). The importance of pilot studies. *Social research update*, (35), 1–4.

Welinske, J. (2014). *Developing user assistance for mobile apps: 2nd Edition.* Lulu.com.

Xu, Z. & Zhu, S. (2012, August). Abusing notification services on smartphones for phishing and spamming. In *WOOT* (pp. 1–11).

Yoo, S.-D. (2008). *EKC2008 Proceedings of the EU–Korea Conference on Science and Technology.* Germany: Springer Science & Business Media.

Zhang, D. & Adipat, B. (2003). Challenges, methodologies, and issues in the usability testing of mobile applications. *International Journal of Human–Computer Interaction, 18*(3), 293–308.

Appendices

Appendix A

AUT UNIVERSITY
TE WĀNANGA ARONUI O TĀMAKI MAKAU RAU

**AUTEC
SECRETARIAT**

11 November 2014

Phil Carter
Faculty of Design and Creative Technologies

Dear Phil

Re Ethics Application:　　　**14/352 Remembering future tasks: A usability study of reminder applications.**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 11 November 2017.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through http://www.aut.ac.nz/researchethics. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 11 November 2017;
- A brief report on the status of the project using form EA3, which is available online through http://www.aut.ac.nz/researchethics. This report is to be submitted either when the approval expires on 11 November 2017 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc:　　　Wesam Abusaber m_wessam@hotmail.com

Participant Information Sheet

Date Information Sheet Produced:
Project Title
    Remembering future tasks: A usability study of reminders applications.

An Invitation
    This Wesam Abusaber, I am doing master of computer and information sciences at Auckland University of Technology. This is an invitation to join a research project to come up with improvements or guidelines for a new reminder application. The findings will be disseminated among all participants. The wider community will have access to my master thesis published online. This study will take about 10 to 30 minutes. All the reminder applications will be used in this research are free and easily removable from the devices.

What is the purpose of this research?
    The central purpose of this research is to come up with improvements or guidelines for a new reminder application. this research will allow me get my master's degree in Computer and Information Sciences from Auckland University of Technology.

How was I identified and why am I being invited to participate in this research?
    You have been identified as a potential participant owning a smartphone application or tablet. Anyone is familiar with using smartphones or tablets are welcome to join this research.

What will happen in this research?
*   A diary study following with an interview: is the first method in our study; participants will be asked to download any reminder application and use it for one week. Through this week, participants will write down in diary study form provided by the researcher. The diary study form will include (application name, device operating system, time and location for adding a task, task name and time, type of task and priority of the task). After one week, the researcher will interview each participant.
*   A diary study and workshop: Per-workshop, participant will be asked to use a reminder application for one week. Through this week, participants will write down every task they want to remember in diary study form provided by researcher. The diary study form will include (application name, device operating system, time and location for adding a task, task name and time, type of task and priority of the task). After one week, all the participants will sit together and discuss the application. The researcher will manage the discussion.
*   Observation (or usability testing): participant will be asked to follow their tasks by using reminder application. This will be video recorded.

What are the discomforts and risks?
    Care will be taken to ensure that discomforts and risks are minimum. Participants will share their experiences and views of using reminder applications.

How will these discomforts and risks be alleviated?

Anonymity of the participants will be maintained

What are the benefits?
The results of the study will come up with improvements and guidelines for future reminder application and might prompt towards the needs of more research in this area.

How will my privacy be protected?
Anonymity and confidentiality will be maintained for both questionnaires and interviews. Data collected will be kept secure by the researcher.

What are the costs of participating in this research?
There are no costs involved in participating this research

What opportunity do I have to consider this invitation?
The details of the research will be emailed or given face to face to the participants for the three methods. All the dates will be set as per the convenience of the participants. Participation is voluntary.

How do I agree to participate in this research?
Please reply to my email if you are interested in participating in this research.

Will I receive feedback on the results of this research?
Feedback will be ongoing throughout the project and is an essential component of the collaborative approach.

What do I do if I have concerns about this research?
Any concerns regarding the nature of the this project should be notified in the first instance to the project supervisor, Phil Carter, Senior Lecturer, School of Computer and Mathematical Sciences
Email address: pcarter@aut.ac.nz
Ph: 09 921 9999 xtn 5300
Whom do I contact for further information about this research?
Researcher Contact Details:
Wesam Abusaber
Email Address: m_wessam@hotmail.com
Tel No: +64 2102 787822
Supervisor Contact Details:
Phil Carter
Email Address: pcarter@aut.ac.nz
Ph. 09 921 9999 xtn 5300

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, **AUTEC Reference number** *type the reference number*.

Appendix C

Consent Form

For use when interviews are involved.

Project title: **Remembering future tasks: A usability study of reminders applications**

Project Supervisor: **Phil Carter**

Researcher: **Wesam Abusaber**

○ I have read and understood the information provided about this research project in the Information Sheet dated dd mmmm yyyy.

○ I have had the opportunity to ask questions and to have them answered.

○ I understand that notes will be taken during the interviews and that they will also be video and audio recorded and transcribed.

○ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.

○ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.

○ I agree to take part in this research.

○ I wish to receive a copy of the report from the research (please tick one):
YesO   NoO

Participant's signature:
....

Participant's name:
....

Participant's Contact Details (if appropriate):
....
....
....
....

Date:

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEC Reference number type the AUTEC reference number

Note: The Participant should retain a copy of this form.

Appendix D

	Add notes to your task.	Why?
P1	Yes	I use it when I want add extra information about the task.
P2	No	I just write the title.
P3	No	I just add everything to the task title.
P4	No	Because I used good keywords to remind myself for example party in faculty and I do not need to add extra staff like party is about that I just need three to two words.
P5	No	Task title is enough.
P6	Yes	Add some extra information about the tasks
P7	No	I do not add notes to the task.

	Add URL or links to your task.	Why?
P1	Yes	I use it once when I was going to sport club and I did not know the location so I added their URL in the task to find the location latter.
P2	No	I did not add any URL or links to my task.
P3	No	I did not do that before.
P4	No	I did not do that before.
P5	No	It did not come to my mind to be honest.
P6	No	I did not thought about it but I might use it.
P7	No	Sometime I added email address in the notes content.

	Add location for the tasks.	Why?
P1	Yes	I will add the location to my tasks if I need it.
P2	Yes	I usually add the place for the tasks like library or coffee shop's name.
P3	Yes	It depends on the tasks. If the tasks in new places that I have not visit before I add the address to remember.
P4	Yes	I just add the location as note or text in the title.
P5	No	I do not think I need to add the location in my tasks.
P6	Yes	Yes I do list the location if its specific address, for example if I have to pick up something from Trademe (website) I would like to add the address.
P7	No	I do not have this feature in my app but if the app has this

feature I will use it because sometimes is useful to add the location. For example if I want to do the WOF for my car I would like to add the garage location that I will do the WOF on it.

	List your tasks under folder?	Why?
P1	Yes	In Evernote app I can create my own folders and add the tasks in them.
P2	No	I do not add the tasks under folders; I just want to remember the tasks. I have four folders (study, friends, sport and personal).
P3	Yes	I like using folders because if I did not put the tasks in folder I will be confused.
P4	No	Because I used good keywords to remind myself for example party in faculty and I do not need to add extra staff like party is about that I just need three to two words.
P5	No	It is available in Calendar application but I do not use it, I am not good for organizing folders
P6	No	This reminder app does not let me do that but if it did I will create folders into folder. For example I will create study folder and into this folder I will create three folders for my papers and I will do the same with sport.
P7	No	I do not have this feature in my reminder app but my reminder app has heading color on the top of each task. The color deepened on the time for example if the task today it will appear with dark color and if it tomorrow will be little bright and so on. The feature does recognize me the date of the tasks but it does annoying me. I think folders are a good idea to have in reminder app for example adding red folder for important tasks.

	Share tasks in reminder app.	Why?
P1	Yes	I share the tasks with my friends in my cycle inner.
P2	No	But I would have this feature in the reminder apps I used.
P3	No	I would like this feature to be added in the reminder app.
P4	Yes	But require me to have the email of the friends and I cannot add them by their contacts phone.
P5	No	I think this is a personal thing I do not want to share them with other people.
P6	No	The reminder app I used does not let me share tasks with

friends but if the application has this feature I will probably share some events with friends like meeting or shopping with my mum or sister.

P7	No	But I think I will share if the reminder app I used has this features.

	Add tasks by voice recognition.	Why?
P1	Yes	Normally I do not use voice recognition. I used voice recorder just if I want to add records to the tasks like a phone number or location. I might use voice recognition if I'm busy or in a hurry.
P2	Yes	S Planner has voice recognition I just tested it once, to know how to use it but I did not use it at all because I prefer writing the tasks.
P3	No	I like typing tasks.
P4	No	I do not think I need this feature; it might help the people who driving.
P5	No	I like typing my task, and this reminder app does not have this feature.
P6	NO	The app doesn't have this feature but if has it I will use it if it works probably.
P7	Yes	For me I tried but did not work with me, I think my pronunciation is not good enough. I tried twice and didn't work. The application has this feature but didn't work probably.

	Use time tracking for tasks	Why?
P1	No	I have not seen this feature before.
P2	Yes	Because in one day I have multiple tasks, so I would like to see estimated time for each task.
P3	Yes	It is useful to see the estimated time because some important tasks need to be checked every time like submitting an assignment or meeting.
P4	No	Does not matter to me.
P5	No	I just need to remember the tasks.
P6	No	It is not available in my reminder app. I do not think it is good idea to display the estimated time. I just want the reminder app remind me the tasks.
P7	Yes	Yes I do use it to make sure that I don't have task overlapping

		incase that I'm busy

	Set the ringtones for the reminder app	**Why?**
P1	Yes	Yes, because I like the ringtones to be different from call or text ringtones to notice that the ringtone is for a reminder task.
P2	Yes	I like to put songs as a ringtone to remember my tasks.
P3	Yes	Usually I leave the ringtones the same. I don't change them.
P4	No	I just add tasks and I do not care about the ringtones.
P5	No	I haven't used it in this app, I think it will be useful but I didn't think about it.
P6	No	I will use it if I could.
P7	Yes	I usually set the ringtone even this app has this feature to set the ringtone in each task and I liked. I have special ringtone for university tasks.

	Delete tasks after completion	**Why?**
P1	No	I keep them for a while if I do not use them again I will remove it.
P2	Yes	It is gone automatically, it is not important to me to see the past tasks. The important to me is the future tasks.
P3	Yes	Because I like to add a new tasks and that helps me to remember.
P4	No	I keep them in the history and do not remove any tasks.
P5	No	Keep them and use them again.
P6	No	If I want to use it again I will reset the date and time but if I do not use it again I will delete it.
P7	Yes	This app delete all the tasks that has been completed, after I swapped the notify reminder the tasks will be deleted automatically but I would like to have history lists for old tasks.

	Missing in reminder apps participants used
P1	1. Select the font because this reminder app has unclear font. 2. Add more data like location, and phone number to the task. 3. Add images to the task by taking photo or bring them from the phone's studio or gallery.

4. Add notes to the task.

P2   1. Notification should indicate what is this task in the phone's screen when the task time due.
     2. Select the ringtones for the task.

P3   1. Select color themes and font.
     2. Sharing tasks with friends.

P4   1. Sharing tasks with friends by their phone contact not email.

P5   1. Remind me about a coming event in New Zealand for example.
     2. Bring the event from social media websites like Facebook to see my friends' birthdays.

P6   1. Calendar interface shows all the days.
     2. Select the repeating when I add the task, not after adding the task.

P7   1. Add tasks for more than two days, this reminder app allows me just to add tasks for tomorrow.

	Color	Layout	Icons
P1	I like app with colorful interface.	I like the app with good design and easy to use.	Some icon is clear, for example a Plus sign mean add new task.
P2	Color helpful to show priority of the tasks.	The app I used have a small buttons; sometimes I clicked in wrong button by mistake.	I like using icons and abbreviations in the applications, it helps me to save time. For example, for birthday's you can put a cake and the plus sign for add new task.
P3	I like apps with nice color and beautiful themes; I do not give attention to apps with poor color.	I like S Planner because it has big buttons, so I can add the task quickly and I do not have to enter a lot of data just task name and select the time and date.	Some icons are clear such as + for adding and recycle bin or deleting or clearing. That's will be good to use it in reminder app.
P4	I like sample color and not complex color. Two colors are enough for me.	I feel confidence using the Calendar app because it shows you the calendar style and your tasks for every day.	Sometimes icons not enough but in Calendar application I did not find any problem with symbols and icons. They use very common icons like plus to add a new task, and they don not use a new icons.
P5	I do not like apps with a lot of colors.	This app is easy to select the day and time.	I like icons that make the app looks better.
P6	I would like some colors not a lot because	I like the simplicity of using To Do Reminder app	I like using icons as long as commonly used but not

	if the app has many colors I will get confused.	and fast to add task.	something that I do not know what is for. Adding help screen shows what is each icon means.
P7	White and black enough, with some colors shows the different between the tasks.	I like the main page displaying all the tasks for current day or current months. But I have a problem with advertising. I always clicked on the advertising box by mistake which is took me to the browser.	I think it will make the application prettier than words for example in this app I did not know what plus sign mean until I press it. I like it sample plus to add a new task.

Appendix E

	No of tasks	Time	Steps for adding task. (Think aloud)	Observations
P2	1	01:43.40	1. Meet friends. 2. Next Wednesday. 23rd of December. 3. Location, hillcrest. 4. Remind me 15 minutes before the task. 5. Work placements.	P2 added the same task but in different reminder apps that he used. He took more time in the first app because the app required more details like location, description. P2 in the first reminder app was wrinkles and frowning lots while clicking on the buttons and entering requires details.
	2	00:49.20	1. Meet friends. 2. 23rd of December. 3. Remind me 25 minutes before the task.	P2 clicked in wrong button by mistake in the first app. Compering with the second reminder app, participant was more confidence with using the second app.
P3	1	01:23.18	1. Group meeting. 2. Tomorrow. 3. 6pm 4. Hamilton Lake. 5. Dinner 6. Selecting ringtones.	P3 added three tasks in his reminder app, in first task he spent a lot of time because he had to add the location, notes and selected the ringtones. In second task he just added the task name, time, date and location. Third task was short because he just added the task name, time and select the repeating everyday. P3 was confidence while using the reminder app but when he set the time in the first task, he was looking at his own watch. P3 did not frowning and wrinkles a lot when was doing the tasks.
	2	01:03.11	1. Soccer at Uni. 2. 7.45pm. 3. Friday. 4. Uni sport center.	
	3	00:40.10	1. Wake up. 2. 8.45am 3. Repeat every day.	
P4	1	02:42.00	1. Ahmad's birthday. 2. 13th of December. 3. All day. 4. Remind me 2 days before the tasks. 5. Send task to Mohanad email and me email as well.	P4 added one task in his reminder app. In this task he ask the reminder app to share task with his friend selecting his friend form the list. The participant was confidence while using the reminder app and did not frowning and wrinkles a lot when he was doing the task.
P5	1		1. Wake up. 2. Tomorrow, 7am. 3. Repeat every day	P5 added three tasks in his reminder app. He did all the tasks fast as he was confidence. P5 did not frowning and

		once.	wrinkles a lot while he adding the tasks in the reminder app.
	2	1. First class. 2. Tomorrow, 10am. 3. Remind me half an hour before the task. 4. Mechanical engineering.	
	3	1. Gym. 2. Tomorrow, 5pm. 3. Remind me 15 minutes before the task.	
P6	1	1. Philology trip. 2. 21st of March. 3. 22nd of March. 4. Remind me 2 days before the task time. 5. University of Waikato. 6. Meeting at gate 9 in the university. 1. Kayaking training. 2. Wednesday. 3. 5.30pm. 4. 7pm. 5. Repeating weekly.	P6 did two tasks; first task took more time than the second task because P6 had to write notes, asks the reminder app to remind her 2 days before the task, add task's location and notes. For second task she set the repetition to repeat the task every week. P6 was confidence while adding the tasks and did not frowning and wrinkles a lot while adding the tasks in the reminder app.
P7	1	1. Immigration. 2. Thursday, 9am 3. Repeat once. 4. Applying for visa. 1. Physiotherapy.	P7 did two tasks; first task did not take time, as the P7 was wrinkles his brow while selecting the time. In second task he was a little bit confused with selecting the repetitions. He said I'm
	2	2. Friday, 12 pm. 3. Repeat weekly.	not sure what does repeat weekly, every 2 weeks or every 3 weeks means. Then he select weekly. P7 clicked on wrong button by mistake during the observation.

Appendix F

App Name	OS	Time	Location	Task Name	Task time and date	Type	Priority
Participant 1							
GoKeep	Android	10:30pm	Home	Call friend	Empty	Personal	Medium
GoKeep	Android	04:15pm	Coffee	Grocery	Empty	Personal	High
Google Calendar	Android	07:35pm	Home	Birthday gift	Empty	Birthday	Medium
GoKeep	Android	03:00pm	Coffee	Pay insurance	Empty	Personal	High
GoKeep	Android	11:50am	Home	Immigration visa	Empty	Personal	High
GoKeep	Android	05:15pm	Coffee	Homework	Empty	Personal	High
GoKeep	Android	12:50pm	BNZ Bank	Class	16/11/14	Business	High
Google Calendar	Android	07:15pm	Home	Birthday	21/11/14	Social	Medium
GoKeep	Android	04:00pm	Home	Visa collection	Empty	Personal	High
Google Calendar	Android	05:00pm	Home	Ticket	Empty	Travel	High
GoKeep	Android	12:20pm	University	Math help	10/11/14	Study	High
GoKeep	Android	Empty	University	Study preparation	Empty	Study	High
GoKeep	Android	09:00am	Home	Empty	19/11/14	Sport	Medium
GoKeep	Android	06:30pm	Devon St	Arm aikido	11/11/14	Sport	Medium
GoKeep	Android	11:00am	Home	Account info	27/11/14	Business	High
GoKeep	Android	12:30pm	Home	Pass	Empty	Study	High
GoKeep	Android	11:50pm	Home	Payment	02/11/14	Business	High
GoKeep	Android	Empty	Home	Cleaning	04/11/14	Info	Medium
GoKeep	Android	Empty	AUT	AUT info	12/10/14	Study	High
Evernote	Android	Empty	Home	Pick passport	17/11/14	Personal	High
Participant 3							
Empty	Android	10:00am	Home	Class at gym	01:05pm 02/12/14	Sport	High
Empty	Android	02:00pm	Coffee	Important meeting	08:00pm 02/12/14	Personal	Medium
Empty	Android	12:00am	Home	More staff	10:00am 03/12/14	Personal	Medium
Empty	Android	05:00pm	Friend's house	Interview	07:00pm 03/12/14	Business	High
Empty	Android	02:45pm	Coffee	Class at gym	04:30pm 04/12/14	Sport	High
Empty	Android	04:00pm	Home	Class at gym	09:15am 05/12/14	Sport	Medium
Empty	Android	09:00pm	Home	Meet officer	10:00am 08/12/14	Personal	High
Empty	Android	11:00pm	Home	Close contract	04:00pm 0812/14	Business	High
Participant 5							
Remind Me	Android	10:49pm	On bed	Take my supplement	07:44am 04/03/15	Sport	High
Remind Me	Android	10:50pm	On bed	Class time	10:00am 04/03/15	Study	High

Remind Me	Android	10:50pm	On bed	Gym time	12:00pm 04/03/15	Sport	High
Remind Me	Android	10:50pm	On bed	Study time	05:30am 04/03/15	Study	High
Remind Me	Android	11:30am	On bed	Home rent	09:00am 07/03/15	Personal	High
Remind Me	Android	09:00am	On bed	Do my visa	09:00am 09/03/15	Personal	High
Participant 6							
Planner Plus	IOS	05:30pm	Home	Dragon boating	05:30pm 02/03/15	Sport	High
Planner Plus	IOS	09:30am	Coffee	D boat	09am – 12pm 8th of March	Sport	Medium
Planner Plus	IOS	Empty	Empty	Writing project	03:00pm 4th of March	Study	Medium
Planner Plus	IOS	Empty	Empty	Mama birthday	6th of March	Personal	High
Planner Plus	IOS	Empty	Empty	Bread	05:00pm 3rd of March	Personal	High
Planner Plus	IOS	Empty	Empty	Print paper outline	05:00pm 6th of March	Study	Medium
Planner Plus	IOS	Empty	Empty	Visiting granddad	09am – 12pm 4th of March	Personal	High
Planner Plus	IOS	Empty	Empty	DB Regionals	09am – 05pm 21st of March	Sport	High
Planner Plus	IOS	Empty	Empty	BIOL314 field trip	21st – 22nd March	Study	High
Planner Plus	IOS	Empty	Empty	Netball Game	07pm – 10pm 10th of March	Sport	Medium
Planner Plus	IOS	Empty	Empty	BIOL314 Data Assignment	04:00pm 26th of March	Study	High
Planner Plus	IOS	Empty	Empty	Dragon Boat Nationals	28th – 29th March	Sport	High
Participant 7							
To Do Reminder	Android	06:00pm	Home	Student advisor	01:30pm 03/03/15	Study	Medium
To Do Reminder	Android	03:00pm	Home	Car WOF	10:00am 06/03/15	Personal	High
To Do Reminder	Android	09:00am	University	Sign enrollment	01:15pm 09/03/15	Study	High
To Do Reminder	Android	09:00pm	Coffee	Apply visa	11:00am 10/03/15	Personal	High

Appendix G

Application Name:
Operating System Android – IOS – Blackberry – Windows Other:
Time:
Location:
Task Name:
Task Time/Date:
Type of Task Personal – Sport – Study – Business Other:
Priority High   –   Medium   -   Low

Application Name:
Operating System Android – IOS – Blackberry – Windows Other:
Time:
Location:
Task Name:
Task Time/Date:
Type of Task Personal – Sport – Study – Business Other:
Priority High   –   Medium   -   Low

Application Name:
Operating System Android – IOS – Blackberry – Windows Other:
Time:
Location:
Task Name:
Task Time/Date:
Type of Task Personal – Sport – Study – Business Other:
Priority High   –   Medium   -   Low

Application Name:
Operating System Android – IOS – Blackberry – Windows Other:
Time:
Location:
Task Name:
Task Time/Date:
Type of Task Personal – Sport – Study – Business Other:
Priority High   –   Medium   -   Low