A Real-time and Location-based Advertising Model

by

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Nowadays, advertising is seen as a vital part of business marketing. Sellers are engaging in various kinds of approaches to advertise their stores or products as more and more advertising models are available (e.g., Web advertising, Social Media advertising, In-app advertising). In the context of increasing competition, it is getting harder for shop owners to increase their markets and popularize their products. In many cases, shops do not get enough customer engagement even though they spend a lot of money and resources.

The main problems that many sellers currently face are as follows:

First, advertising is very expensive and there is a lot of potential for waste. Second, acquiring revenue usually takes a long time. Third, advertisements may not target the correct customers and the income will not be as expected. In light of the above problems, this dissertation describes an advertising model which aims to help small businesses

(such as small retail shops, small restaurants or coffee shops) to improve advertising effectiveness and save money.

This advertising model is applied in a real-time and location-based mobile application which enables sellers to publish advertisements (information) within a specific area and then this information is automatically displayed to active target users immediately. This dissertation investigates the differences between the model and current existing advertising methods and how the new advertising model may bring benefits to small businesses, based on the platform of mobile application. The research was conducted in the context of a project – Soosokan, which is a member of Trinity's innovation programme called LaunchBox. LaunchBox is a 3-month accelerator, open to teams of Trinity students with an early-stage business. It provides mentorship, connections, funding and the ideal collaborative environment to launch new startup ventures.

Data is collected from experiments, questionnaires and interviews to compare and evaluate the advertising model and show:

- The reasons why the advertising model applied in Soosokan application could benefit small businesses and the positive effects of this model.
- The feasibility of the advertising model and the applicability of this model to be employed in the Soosokan application.
- In general, the real-time and location-based application is widely accepted by the target customers, while these are still some functions of it need be improved.

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Chapter 1 Introduction

1.1. Background

“Advertising has played a major role in business to consumer marketing, and enabled sellers to meet communication and other marketing objectives”[1]. In the current world of commerce, advertising is a significant way that sellers could take to increase their market and popularize their products. With the development of the business, sellers’ demands for advertising is becoming more and more complex while the number of advertising models is also increasing.

Huge variety of advertising models bring multiple choices to sellers but also increase the competition. Many sellers, especially the owners of small businesses, feel hard to get benefit from those types of advertising. This means, it is hard for them to get prospective customer engagement even if they spend a great deal of time, resource and money on advertising.

Almost every person has own smart phone these days due to the rapid advance of the science and technology. In this case, now it is possible to offer advertisements everywhere and this will break the geographical limits. “The emergence of mobile

phones as the leading personal communications device portends their attractiveness as a potentially lucrative media platform for marketers."[2] At the same time, *location-based advertising (LBA)* [2, 3] is also helpful for sellers to target their customers. LBA is not a new concept but it can be applied in various advertising models with different methods. In this dissertation, the model of LBA also based real-time will utilize the LBS (location-based service) and deliver the targeted advertising initiatives from an identified seller "that is specific to the location of consumers" to consumers' mobile phones.

1.2. Motivation

A large amount of sellers include many small business owners acknowledge that they should advertise their shops and the products to attract more consumers. However, they may find current advertising models do not suit their shops after the trial. The reasons may cause the failure are as follow:

- Huge cost in advertising

Advertising usually accounts for a big portion of marketing fee and sometimes it may also bring some other kinds of expenses or even waste.

Some traditional advertisement tool such as flyer and poster will consume the resources of wood and may lead to some pollution. For example, some people may throw these paper away quickly without throwing them into the rubbish bin.

- Need long time to acquire advertising revenue

It is hard to see the profit which is brought by advertising quickly. Usually it will take a long time to see if the published advertisement can acquire revenue. This is because the release and the spread both need a period of time. To be precise, consumers need time to browse and accept the content of advertisement and then it may be possible for them to arise the purchase intention. At the same time, statistics and comparison of sales also require some time.

- Unexpected imbalance between cost and income of advertising

Lots of advertisements cannot reach the prospective objective which means that the advertisers may not gain enough money to defray the expense of advertising. Unexpected imbalance are usually caused by wrong strategy or analysis, it also may result from the incorrect and inappropriate advertising approaches and objectives.

In order to mitigate the above problems and to provide owners of small businesses with support on advertising, this project aims to implement and apply a real-time and location-based advertising model in a system called Soosokan. Soosokan is a real-time and location based information retrieving and publishing system. It consists of two separate Android applications. One of them is oriented to common users and it could be used to search available product that you want to buy immediately. This application also enables users browse nearby advertisements and save the advertisements if they want. Besides these, the system also supplies advertisements saving function. Another application is oriented to sellers (especially for the owners of small businesses). This application allows sellers to manage and update real-time product information and

publish their advertisements (or any other promotion information, coupon, etc.) based on location.

In summary, the motivation of the research is to help small businesses to improve their advertising effectiveness and save the money through a new real-time and location-based advertising model which will be applied in the Soosokan project (a commercial project based on mobile application). In short, main function of the proposed model in the Soosokan project is that sellers can use the Android application to release information within specific range, after which these information will be posted to the consumers' mobile application.

1.3. Research questions

The research questions that this dissertation aims to answer are as follows:

What are the benefits of using a real-time and location-based advertising model in the Soosokan application, compared to current advertising models?

Whether the real-time and location-based advertising model applied in the Soosokan application is suitable for helping small businesses to increase advertising effectiveness and save money?

1.4. Research objectives

According to the research question, objectives of the dissertation are:

1 Analyze existing advertising models and propose a set of features that address the needs of small business owners.

2 Implement the project which employs the real-time and location-based advertising model.

3 Evaluate if the real-time and location-based advertising model works well in Soosokan system.

4 Provide evidence that if the real-time and location-based advertising model could help to increase advertising effectiveness and save money.

The motivation of the dissertation is to contribute to the field of advertising especially for the owners of small businesses. Based on the motivation, this research need provide evidences to demonstrate if the real-time and location-based advertising model could bring benefits to small businesses.

1.5. Experiment approach

For achieving the objectives of the research, the following experiments are planned to conduct:

- Carry out experiments to test if the real-time and location-based model works well in Soosokan application. Two different experiments need be conducted to test the performance of the model, which mainly to test advertisement

information integrity, information correctness and the location information accuracy.

- Conduct a study with users and owners of small businesses through questionnaire to discover first-hand their concerns, attitudes and interests.
- Conduct a study through interview with consumers and managers of small business who tried to use the Soosokan application to find how users react to the model.
- Analyze collected data to draw the conclusion and evaluate possible future work.

1.6. Dissertation outline

This dissertation is organised as follows:

- Chapter 1 constitutes an introduction to the research and outlined the motivation, research question and objectives of it.
- Chapter 2 explores the state of the art in current existing advertising models.
- Chapter 3 introduces the development of the idea and as well as the design of the advertising model prototype.
- Chapter 4 discusses the technologies used to implement the model prototype and describes its key features.
- Chapter 5 details the evaluation process and results of these studies.
- Chapter 6 describes the main conclusions of this project and discusses the future work.

Chapter 2 State of Art

This chapter is to outline and review the current existing advertising models and make a comparison among these models in the last section of this chapter. Besides, the concept of location-based advertising is also explained in this chapter.

2.1. Concept and history of *advertising* [1, 4, 5]

People are “exposed to hundreds and maybe even thousands of commercial messages every day” [4], these messages usually occur in the form of newspapers, flyers, billboards, web sites, television or emails. In this condition, these communication tools may simply be seen as “*advertising*”. However, these tools are the medium pf marketing communications, and advertising is only one type of “marketing communication”[4].

From different aspects, *advertising* could be defined as different meanings. In this dissertation, from the functional perspective, *advertising*’s definition is “the structured and composed non-personal communication” about an organization, product, service or idea, which usually paid by “identified sponsors” through “a mass communication channel”[1]. It helps to inform and persuade consumers and then helps advertisers to achieve their marketing goals.

Table 1 Timetable of advertising history[4]

3000 BC–AD 499	AD 500–1599	1600–1799	1800–1899
3000 BC. Written advertisement offering "Whole gold coin" for runaway slave "Shem." **500 BC.** Political and trade graffiti on Pompeii walls. **AD 1.** First uppercase lettering appears on Greek buildings.	**1455.** First printed Bible. **1472.** First printed ad in English tacked on London church doors. **1544.** Claude Garamond, first "typefounder," perfects a roman typeface that bears his name and is still used today.	**1650.** First newspaper ad offers reward for stolen horses. **1662.** *London Gazette* offers first advertising supplement. **1704.** First ads in America published in the *Boston Newsletter.* **1729.** Ben Franklin is first to use "white space" and illustration in ads. **1785.** Widespread use of advertising and long print runs become possible.	**1841.** Volney B. Palmer becomes first "newspaper agent" (advertising agent) in America. **1844.** First magazine ad runs. **1869.** Francis W. Ayer founds ad agency bearing his father's name, N. W. Ayer & Sons, in Philadelphia. He initiates first "for commission" ad contract (1876), first market survey for an ad (1879), and first on-staff creative services (art in 1890, copywriting in 1892). **1888.** *Printers' Ink* is first U.S. publication for ad profession.
1900–1919	**1920–1939**	**1940–1959**	**1960–1969**
1900. Psychologists study the attention-getting and persuasive qualities of advertising. **1900.** Northwestern University is first to offer advertising as a discipline. **1903.** Scripps-McRae League of Newspapers appoints ad censor, rejects $500,000 in ads in first year. **1905.** First national ad plan is for the "Gillette Safety Razor." **1911.** First "truth in advertising" codes are established by what is now called the American Advertising Federation (AAF).	**1920s.** Albert Lasker, father of modern advertising, calls advertising "salesmanship in print." First ad testimonials by movie stars appear. Full-color printing is available in magazines. **1922.** First radio ad solves radio's need for financing. **1924.** N. W. Ayer produces first sponsored radio broadcast, the "Eveready Hour." **1930.** *Advertising Age* magazine is founded. **1938.** Wheeler-Lea amendments to FTC Act of 1938 grant FTC further power to curb false ad practices.	**1946.** America has 12 TV stations broadcasting to the public. **1947.** Lanham Trademark Act protects brand names and slogans. **1948.** 46 TV stations are operating and 300 others are awaiting FCC approval. **1950.** First political ads are used on TV by Gov. Dewey of New York. **1950s.** David Ogilvy's "Hathaway man" and "Commander Whitehead" become popular ad personae.	**1960s.** Doyle Dane Bernbach's "Think small" ad for American Volkswagen becomes one of the most famous ads of the decade, establishing a strong market position for the smallest European import. The agency's slogan for Avis, "We're only No. 2, so we try harder" is also very successful. New York's Madison Avenue becomes known worldwide as the center of the advertising world and features the best in advertising creativity.
1970–1979	**1980–1989**	**1990–1999**	**2000–2007**
1971. Armed services begin first advertising for the new "all-volunteer" military ("Be all that you can be in the Army"). **1972.** The *Ad Age* article "Positioning: The Battle for Your Mind" by Al Ries and Jack Trout details the strategy of positioning that dominates the 1970s. **1973.** Oil shortages begin period of "demarketing," ads aimed at slowing demand. **1970s (late).** Growth in self-indulgence, signified by popularity of self-fulfillment activities, spurs some agencies into making infomercials.	**1980s.** The "me" decade begins (baby boomers are indulgent but want social accountability). Ad agency megamergers take place worldwide. **1982.** First edition of *Contemporary Advertising* is published. **1984.** The Internet (government controlled since 1973) is turned over to the private sector. **1986.** *Marketing Warfare* by Al Ries and Jack Trout portrays marketing in terms of classic warfare manual written by General Clausewitz in 1831.	**1990s.** Early part of decade experiences recession. Marketers shift funds from advertising to sales promotion, leaving major agencies to fail or merge. **1994.** Media glut leads to market fragmentation; network TV is no longer sole medium for reaching total marketplace. Ad professions adopt integrated marketing communications (IMC) as the new strategy to build market relationships.	**2000.** The Internet is the fastest-growing new ad medium since TV, with 400 million users. Advertising is evolving into a two-way medium. **2005.** Online advertisers spend $8.32 billion to reach the 170 million wired U.S. residents. **2006.** YouTube has 100 million videos viewed daily. **2007.** Google earns over $3.5 billion in ad revenue for the first quarter alone. It consolidates online ad leadership by purchasing Double Click.

As Table 1 shows, along with the rapid development of economics and increased

competition, advertising also undergoes dramatic changes. A mass of advertising media and models became available for advertisers during the evolution of advertising. Meanwhile, advertising has been an important factor of improving the marketing effects and even the “living standard”. This is because advertisements “make people aware of the availability of products, imbues product with personality”, and also enables them to communicate information through the products they bought[4].

As different sellers may choose different types of advertising, depending on their particular marketing strategy, these different advertising models may bring different impacts on their businesses.

2.2. Traditional advertising

The traditional advertising is still a general model for advertising. Almost everyone could usually see various advertisements belong to this kind of advertising model in daily life. As [6] mentioned, traditional advertising is “messages or commercials communicated through historically established media such as television, radio, outdoor (billboards), print, and direct mail”. Standing from current advertising market’s point of view, traditional advertising usually represents advertising through television, radio, poster, flyer, magazine and some other media. The following paragraphs discuss and compare some different traditional advertising methods and the advantages or disadvantages of traditional advertising.

- Traditional print advertising

Print advertising mainly includes the advertising through billboards, newspapers, magazines or flyers. Billboard usually takes the largest forms and are very conspicuous. Most of the billboards are placed near the main roads and these advertisements must be short. Newspaper maybe one of the oldest advertising methods. In most cases, daily new edition “makes it also the most disposable type of advertising”[7]. Compared with newspapers, magazines are more long-term. Additionally, magazines are more “typically passed off to others”, so the chance of the advertisements on magazine will be seen is higher. Flyers, also called leaflets, is a form of paper advertisement. They are inexpensive to produce[8]. Author of [9] described that “leaflet distribution is estimated at producing over £12, 000, 0000 worth of business in the UK each week.” That amount was only estimated through surveying large corporations. So, if take all businesses (include the small and medium corporations) that “use leaflet delivery campaigns as part of their marketing” in to account, the actual figure is likely to be much higher. This is a very huge number, but the “response rates from leaflet drops can vary enormously” and there are no guarantees of the business revenue.

- Traditional broadcast advertising

Traditional broadcast advertising refers to “commercials that air to the public on the radio or television.”[10] It emerges with the growth of the availability of radios. Its goal is to leave an impression on people or “display and accentuate a lifestyle”. As television slowly “upstages radio”, advertising costs increase and the costs on the production of advertising also increase. In the meantime, the advertising messages are shaped in a much more robust, “image-heavy” form[10]. This means that upfront expenses may be

high because advertisers need to hire professionals to “perform, light, shoot and edit” these advertisements, “on top of the cost of running it”[11]. In terms of radio, it can reach a large area but the limit of it is that people may not hear the advertisement if they close the radio.

- Advantages and disadvantages of traditional advertising

The traditional advertising model contains various advertising methods. It remains some advantages today. “It can be relatively effective for reaching a target audience and it can be affordable to advertise frequently”[10]. People can touch, feel, hear and interact with this form of advertising. This kind of advertising also usually has a variety of styles, shapes, sizes, colours and so on.

But traditional advertising is more expensive than newer advertising models. It does not allow advertisers to make responses to the changes in the marketplace as quickly as the newer forms of advertising. Besides, it usually takes a long time to publish due to the long period of print or production.

2.3. Web advertising

Web advertising, sometimes also be thought of as the most common model of online advertising. Banner advertisements, AdWords advertisements, floating advertisements and some other website advertisements are all belong to this kind of advertising model. [12]

This advertising model appears after the boost of the use of Internet. “Web sales reached over 30 billion dollars in the year 2001”, the number is still increasing after a decade [13]. Web advertising, the model used by sorts of interesting web applications (such as a lot of websites), is also be considered as one of the big surprises to the 21st century. It is even more useful than the subscription.[14] The rest parts of this section aim to review and explain two typical advertising methods of web advertising and to summarize the merits and drawbacks of web advertising.

2.3.1. Banner advertisement

INVESTOPEDIA defines ‘banner advertising’ as “A rectangular graphic display that stretches across the top or bottom of a website or down the right or left sidebar.”[15]

Like picture-1, banner advertisements are usually image-based rather than text-based. These advertisements are also a very popular form of the website advertising.

Figure 1 Example of banner advertisement[1]

[1] Come from https://www.hollandandbarrett.ie/

Banner advertising is generally used to promote an advertiser's brand and/or to "get more visitors from the host website to go to the advertiser's website" or to the promotion page. This kind of advertising usually charge through three ways: cost per impression "(payment for every website visitor who sees the advertisement)", cost per click "(payment for every website visitor who clicks on the ad and visits the advertiser's website)", or cost per action ("payment for every website visitor who clicks on the advertisement, and then goes to the advertiser's website and completes a task" such as filling out a form or making a purchase directly) [15]. In fact, these three methods are the main ways to pricing the web advertising and they even are the usual methods for pricing most online advertising.

Basic, the static banner advertisements are simple to produce but amateur banner advertisements often work fine and need the help of professional advertisement designers due to "ads competing for viewer attention"[16]. As most forms of advertising, banner advertisements have considerable differences in quality because their creators' abilities and experiences are different. The applicable scope of banner advertising is even greater than that of most other forms, and the banner advertisements are simple and inexpensive in many cases.

2.3.2. AdWords advertisement

"AdWords" is another very typical web advertising method. *Google AdWords*[2] is

[2] https://www.google.com/adwords/

Google's advertising system in which advertisers "bid on certain keywords in order for their clickable advertisements to appear in Google's search results"[17].

In most cases, the research in [17] found Google *AdWords* is effective for various kinds of businesses on the condition that these advertisers do not waste their money on the inaccurate keywords or write "weak and low CTR (Click through rate) advertisements".

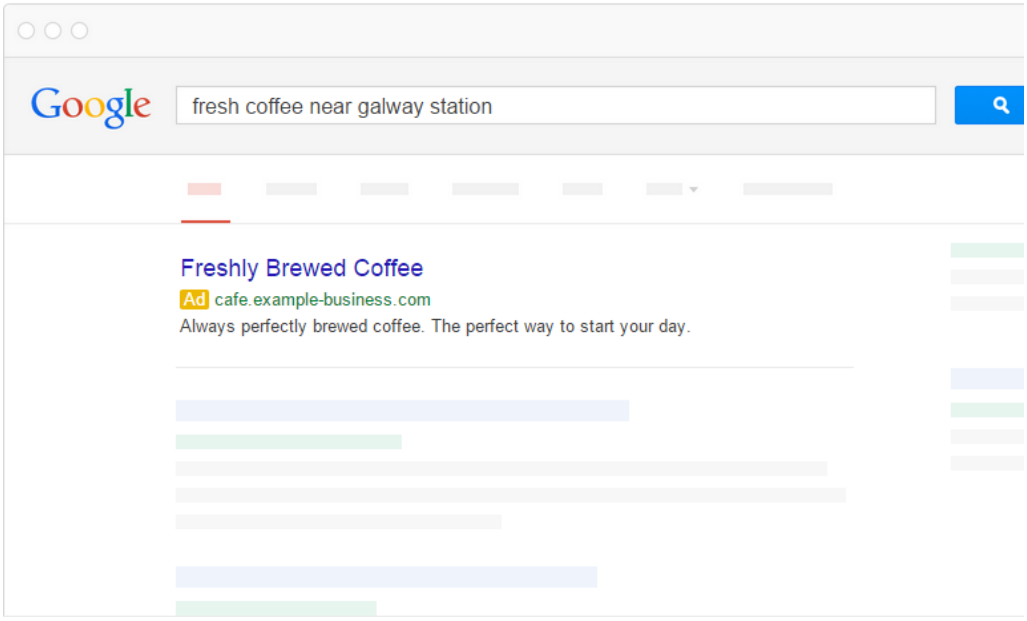

Figure 2 Example of AdWords advertisement on Google[3]

Advertisers that use the *AdWords* advertising need make payments based on CPC (cost per click), this means the payment an advertiser need to make depends on the amount of clicks that the company's advertisement receives. But if advertisers want their advertisement be placed in a good position on the search engine results page, they may

[3] https://www.google.com/adwords/

need to pay more money to make sure their quality scores and the CPC is enough high.

Sometimes, *AdWords* is a bit expensive, in this case, “most small businesses and startups are unable to compete with larger companies”. Some major companies such as *L’Oréal* and *Estee Lauder* already “locked down terms like moisturizer”, this means that small businesses or startups would “have to spend $5 or $7 per click for that term”. [18] Moreover, there is a limit for the word number of AdWords advertisement and there is also the limit of advertisement display in the result page.

2.3.3. Small summary of web advertising

Web advertising is almost a “necessity for modern businesses”, consumers increasingly rely on the Internet for more entertainment or information. [19] The merits of web advertising mainly are the huge impacts of the Internet which enables advertisers can reach more people than traditional advertising methods at “a fraction of the cost”. Web advertising can also be more “targeted” than some “traditional advertising”, it enables advertisement messages can be seen by the most relevant consumers. At the same time, web advertising is real-time and usually can get real reflect from consumers.

One obvious disadvantage of web advertising is that the “marketing materials are automatically available for others to copy, regardless of the legal ramifications”[20]. Another disadvantage is that people may choose some filter tools to filter the web advertisements because there are massive advertisements on the web based on the rapid development of the Internet technology.

In term of the expenses of web advertising, one company gives a sample pricing

standard for web advertising (shown in Table 2).

Table 2 Sample of web advertising pricing[4]

Pricing is for an advertisement on one page for six-months 10% discount given for a one-year contract	**Top/Bottom Banner Ad**	**Side Box Ad**
Dimensions in pixels	728w X 90h	300w X 250h
Percent of page visitors for which ad is displayed	40%*	100%
Time period included in price	six-months	six-months
Home Page	$4,350*	$6,000±
Any Single Directory Page	$2,000*	$1,900±
Any Single Niche Topic Page	$450**	$450±
City, state, Country Directory Result Page	$250 to $450*	$250 to $450±
All Other Single Pages	$1,000*	$1,000±

It also gives a sample for the specific position's web advertising fee (shown in Table 3).

Table 3 Example of specific position's advertising pricing

Premium Web Advertising Positions		
Run-of-Site Top Button	**1 Month**	**2 months**
195w X 90h 100% of all site views	$3,500	$6,500
Home Page Middle Banner	**1 Month**	**2 months**
728w X 90h 100% of page views	$2,000	$3,600

According to these two tables, it is not hard to find that web advertising is not very cheap and it may be harder for small businesses (such as small restaurants and small

[4] http://www.quirks.com/advertise/online/web_ads.aspx

retail shops) to publish a lot of advertisements through this way.

2.4. Advertising on social media

Unlike long time ago, people now prefer to use various newer communication tools to communicate with families and friends instead of traditional letter or even the telephone. Social media include “networks (e.g., Facebook, Twitter, and LinkedIn), wikis (e.g., Wikipedia), multimedia sharing sites (e.g., YouTube and Flickr), bookmarking sites (e.g., Del.icio.us and Digg), virtual worlds (e.g., Second Life), and rating sites (e.g. Yelp)” [21]. The emergence of social media help people to break the geographic limits and enable them to share real-time feelings and experience.

In the meantime, the wide use of social media brings new business opportunities to the advertisers. Social media advertising can be seen as a form of online advertising and it focuses on social networking service.[22][23] This kind of advertising allows people to interact with each other and to share the product’s or brand’s information. According to some research, advertisers “spent $5.1 billion on social media advertising in 2013 and this figure is expected to exceed $14 billion by 2018” [24].

Figure 3 Example of advertisement on Twitter[5]

Taking Facebook as an instance, there are numerous categories of advertisements can be released on social media. The categories include: [24] “Page Post Engagement (promote well-performing posts)”, Page likes (“get likes for the advertiser’s page and grow audience”), “clicks or links to website” (get people to visit advertiser’s website), “website conversions”, video views, “app installs(get consumers to install the mobile or desktop app)” and so on.

Based on the research of social media advertising model, strengths of it can be basically summarized are as follow: [25,26]

- This kind of advertising allows advertisers to “reach out to potential customers without spending exorbitant amounts of money” on advertising while keeping in touch with current customers.
- It allows advertisers to inform consumers or followers of “secret sales or special offers” quickly and simply. At the same time, consumers can contact the advertiser easily and this could enable sellers to respond quickly to any

[5] Come from https://twitter.com/Charmin

customers' feedback.

- Social media advertising makes it possible for advertisers to indirectly post their links to website content by "appearing in universal search results", this will contribute to improving the search traffic and online sales of them.
- Advertising on social media also provides an approach for advertisers to see the reflection of consumers and the reflection result could help them to improve the service in order to target more consumers.
- The budget and bid of advertisements are all depend on advertiser's choice, and usually the cost of social media advertising is cheaper than that of traditional advertising (print or television)

In terms of the weaknesses of social media advertising, it could be concluded as follow:

- Advertisers need to "commit resources to manage the social media presence", to make responses to feedback and to publish new content. In fact, updating social media advertisements takes time and effort and this will cause hidden costs.
- It is difficult for advertisers to qualify the "return on investment" or to measure the results of advertising. It is almost impossible to "evaluate the success and reach of brand interaction in terms of recommendations to others", or to determine how many consumers made a purchase or will be likely to do so in the future after they viewed the advertisements. [27]
- Some avid members of social network refuse the social media advertising because they feel that advertising on social media is "intrusive" to their privacy.

According to Web Pro News, “eight out of ten social media users feel ambivalent to uneasy about sharing personal information and place social networks low in security confidence.” [28]

- Most social networks are totally free for users to join and operate, while all advertisements could be viewed and transferred to any other people. Some “local businesses” may often “end up with followers who are not local”.

Figure 4 Facebook’s promoted post[6]

With regard to the expense and effectiveness of advertising on social media, [24] introduced some famous social media’s price for advertising and [29,30] mentioned the effectiveness of this kind of advertising model.

- Pricing

Some sources report that the average price for Facebook advertisement is around

[6] Come from http://mashable.com/2012/05/31/facebook-promoted-posts-tips/

“25 cents for every 1,000 impressions while others point to it being over six or seven dollars.” In fact, advertisers can choose pay by *CPC* or *CPM (explained in Appendix A)*, so in this case, seller need consider which model is more suitable for the shop.

The cost of advertising on Twitter is determined by the type of advertisement. Promoting Tweets and accounts may cost the advertiser from “50 cents to 10 dollars or more per engagement (video view, link click, follow, etc.)” based on how targeted the advertisement is[24].

As the payment method of Facebook, advertising on LinkedIn can also be paid on CPC (cost per click) or CPM (cost per thousand impressions), but LinkedIn sets a minimum budget of “$10/day for users of their ad platform”. There are also other pricing standards of LinkedIn such as “the minimum bids for CPC text ads ($2.00/click) and CPM text ads ($2.00/1,000 impressions)”.

- Effectiveness

Through social media advertising, most businesses could gain more business exposure within a short period. However, many audiences have become “de-sensitized, or purposefully determined to block out advertisements”. The advertisements’ content does not attract them anymore, or some of them feel “intrusive”. Many studies indicate that “click-through rates” on internet advertisements are just “0.01%”, and “4 out of 5 users (80%) have never even bought a product because of a Facebook advertisement”.

2.5. In mobile app advertising (in-app advertising)

Following rapid growth and diffusion of the Smartphone, "the mobile advertising market now offers mobile applications as a unique new advertising medium with great potential". [31] Most in-app advertisements are operated by similar arrangements as traditional web advertisements. Developers enable the advertisements join in the network and then "sell off" advertising spaces in apps to advertisers.

In-app advertisements may be published in different four sizes (shown in Figure 5) but all of them are smaller than traditional web advertisements due to the limited screen size.

Figure 5 Four sizes of mobile app advertisement[7]

There are three common advertising approaches [32] of in-app advertising:

- *Fat Finger* advertisements (also known as static ads), these advertisements are

[7] Come from http://appflood.com/blog/4-ad-creatives-to-inspire-mobile-developers

in-app banners advertisements that really depend on users “to inadvertently tap them” and themselves usually display as “static images or in video format”. Some of fat finger advertisements cannot be closed by users without download or even pay a little money. Figure 6 shows a sample of static advertisement.

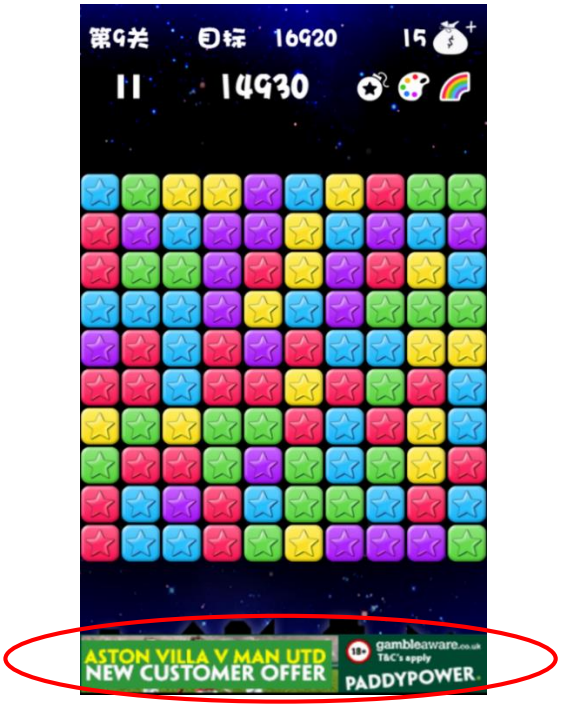

Figure 6 Sample of static advertisement in mobile app

- Card-based advertisements, this kind of advertisement has gone and “these advertisements natively blend into their app's interaction model”.
- Interstitial Advertisements, this kind of in-app advertising typically be used in mobile games. These advertisements usually command audiences’ full attention because they almost take up the entire screen in most cases. Figure 7 shows an example of interstitial advertisement. Interstitial advertisements allow advertisers to “add pre-roll video and full-screen interstitial banner advertisements” in mobile apps. Published advertisements often appear at

“natural break points” (for example, when the app is launched or “in a gaming scenario”).

Figure 7 Example of Interstitial Advertisement in mobile app

The most common way for mobile app advertising to cost advertisers’ money and “pay out to app developers” is CPC (cost per click),but there are also many other “commission structures available that pay for views, specific actions”, [33] or simply pay the monthly rental fee for specific type and period. The price for in-app advertising varies in different advertising companies and the cost of advertising hence depends on the “model, region, operating system and targeting cut if any”.

Main merit of in-app advertising is this kind of advertising is becoming a “reliable source of income at scale”. [34] Besides, in most cases, in-app advertising only appears when the mobile device connects to the network, and in most of the time, it can effectively capture consumers’ attention.

There are also many drawbacks of in-app advertising. Firstly, advertisers must have a very large and active user base if they want to receive a “meaningful income”. Secondly, “on mobile tiny canvas, cluttering with advertisements detracts from the user experience and may diminish usage”. Additionally, massive advertisements in application are ignored by consumers, and this will gradually leave developers with “no interaction” and therefore, “no ROI (return on investment)”. Lastly, it is difficult both for advertisers and developers to “present advertisements of relevance and value” to suitable consumers at right time. [32]

According to a report by *Juniper Research*, “spending on in-app advertising is expected to reach $17 billion by 2018”. This mount considerably rises from the “$3.5 billion spent in 2013”, and makes “in-app advertising the fastest growing sector of the mobile advertising market”. [35] In the field of mobile advertising, some experts think in-app advertising has great potential as an advertising model. *MediaBrix*, an App ad company, found that “in-app ads can yield 20 percent engagement and 2,000% higher click-through”.

2.6. Location based advertising

LBA (location based advertising) is not a complete advertising model, it is a strategy or it can also be considered as a new form of advertising as well as a part of LBS (location based service). LBA can integrate “mobile advertising” with “LBS”. [36] It can also be described as “a new form of marketing communication that uses location-tracking

technology in mobile networks to target consumers with location-specific advertising on their mobile phones"[2].

The opportunity for advertisers to utilize LBA increases tremendously in recent years. It plays a vital role in many sellers' marketing campaigns and there are plenty of ways to use this method. Through a lot of successful examples of the practice of LBA, it has be proven to be an effective and successful strategy. [37]

There are two approaches of LBA: the "push" approach and the "pull" approach"[3]. These two concepts are familiar in the context of "traditional marketing communications", but they are defined differently with regard to "location based advertising". Within the "push" method, advertisers may take some actions to push their advertisements to the user side and then consumers could choose to see it or quit. For example, the push approach may be used when users walk near a restaurant at lunch time and receive text messages from the restaurant which letting them know the menu of the lunch for this restaurant or a special meal today. But within the "pull" method, users are seeking the information they need rather than "the information seeking them". For instance, a tourist wants to know where the nearest restaurant with cheap price is, so he is eager to find some related information in order to choose one restaurant from the seeking result. In other words, the pull approach means that "the user chooses the time and place to access the information" [2].

The examples of the following two companies present the real practice of LBA and show the effectiveness of it.

- O2's Placecast

  O2, a famous phone operator, made "an interesting move and developed a service which is drawing invisible geo-tagged lines and borders" in certain areas. Then these will trigger "an SMS message to be sent to anyone" who are using the service when they "enter a new border" [37]. Many big companies (such as Starbucks and L'Oréal) are on the board now because this service can help them to attract more customers, and of course, they certainly need the help from the service provider like O2. But, it is hard to implement for some small shops because the price for this kind of service is usually high.

- "Best Western mobile ad campaign generates 0.95 CTR" [38]

  "Best Western" is relying on location-based advertising, which aims to target potential customers near airports or competitors' locations. This company encourages customers to use their mobile devices to view the nearby hotels or directly book a room through the Internet. Through "leveraging location-based mobile advertising, hoteliers can capture these bookings by engaging travelers in proximity to their locations". The highest daily CLR of the Best Western's location-based mobile advertisement is "2.3 percent, which is significantly higher than the average network click-through rate of 0.8 percent", according to data collected from PayPal Media Network.

2.7. Summary

The last section of this chapter aims to make a comparison among current advertising models described in the previous sections. The detailed information is shown in Table4.

Table 4 Summary of current existing advertising models

	Traditional Advertising	Web Advertising	Advertising on Social Media	In Mobile App Advertising
Expenses	Usually expensive (Example[8]: Half page ads on an Irish newspaper - €500 for one day in a week)	It depends, usually charge by CPC/CPM/CPA. (E.g.728w*90h homepage middle banner ads on a website- €1,800/month)	Depends. (E.g. Facebook-25cents/1000 impressions; LinkedIn - $10/day, $2/click/1000 impressions)	Depends as web ads. In worldwide market, in-app advertising spent $3.5billion(2013), and expect to reach 17billion(2018)
Publishing time	Need long time to design and produce	Need time to design but releasing is quick	Easy and quick to publish	Need developer's help so will take some time
Effectiveness	Wide audience and relatively effective	Has good effects in most cases except sometimes be ignored	Gain more business exposure. 80% cannot lead to purchase	"Yield 20% engagement and 2,000% higher click through"
Information Integrity & Correctness	Limited information space and hard to edit again	No details. Should be correct and easy to edit	No details. Easy to edit.	No details. Limited ads space, hard to change
Advertiser Revenue	No Details.	No information	No information	No information

[8] Data come from a seller during the evaluation period of this dissertation.

Chapter 3 Design and development of the idea

3.1. The background of the Soosokan project

The real-time and location-based advertising model, the topic of this dissertation, is employed in a project which called Soosokan. The idea of “Soosokan” originated from a business innovation programme of the MSc in Computer Science (Networks and Distributed Systems) of Trinity College Dublin, finally delivering to a presentation to investors and celebrities in IT industry at the Citi’s UpStart Competition (Dragon’s Den).

The original idea of this project comes from a problem that we really meet in daily life. All members of the Soosokan development team are from China, thus we usually feel hard to buy a product immediately when we need it. For example, we may be eager to buy one kind of Chinese ingredient, but we are not familiar with the surroundings and we do not know which shop sells it. In this condition, we have to spend a lot of time to search online, and in some cases, we may finally fail to locate the product. This problem is not merely ours. Through talk with local classmates and friends, we found that a lot of local people also find difficult to locate a specific product or one specific place (such as the nearest petrol station and available parking place). Besides these, we also found that many shop owners were facing up some other troubles. Those small businesses

may hold cheap but valuable products, however, as a result of inconspicuous location, inappropriate marketing strategy or ineffective advertising, it is very hard for those small businesses to get customer engagement. In this context, we decide to develop a real time and location-based system which mainly consists of two separate Android applications in order to help people locate nearby product and also help sellers to target more users based on location.

In order to extend the concept and "refine the value proposition", the preliminary market research was conducted during the academic year. Eventually, the concept of Soosokan was presented at the Citi Upstart competition in May. We are glad that the concept was well accepted and praised with very valuable reviews in the event. Positive responses from industry personalities bring inspirations to us because it demonstrates our idea has the potential and we can make the further development.

Main value propositions presented in Citi Upstart competition were the initial hypotheses for Soosokan project which contains the following points:

- Information retrieving platform: This concept obviously denotes that Soosokan is a platform which provides the searching function. Consumers could use Soosokan to locate the product they want to buy immediately. This could save their time and energy. At the same time, sellers could use the platform to publish information about their products and manage these information. This function gives them the opportunity to present more information about their shops to the target customers.
- Real-time and location-based: The whole Soosokan system is based on real-

time and geographic location, the advertising model in the application is the same. Through the research, we found that people usually choose the nearby shop to buy the stuff they need or they would like to go shopping in these shops, especially when they are urgent to buy one product. Location and the real-time information are necessary and important for them because no one will choose a famous but far shopping center which may not sell the product they want rather than a nearby retail which has the available product. So, this is the reason why they need such an application to help them to collect these information. Compared to the flexible and diverse online shopping, some people will still prefer to go shopping in physical stores without waiting for delivery. Consumers usually shop in the physical shops with ease because they can see and touch physical products, and this may also mitigate the risk of goods return.

- Advertising publishing platform: Soosokan is not only an information retrieving platform for consumers, it is also an information publishing platform for sellers. The real-time and location-based advertising model is different from the existing advertising models. Sellers could select a range to publish their advertisements. The default three choices of the range are 1km, 2km and 3km. The reason why we made this setting is that long distance advertising is not very effective for sellers. The consumers with high possibilities to visit the shop are people who usually appear in around area of the shop. For example, the potential and targeted users of a restaurant near a college are the college students and staffs. After sellers publish the advertisements, these information

will be posted to active consumers who are now within their selected regions.

3.2. LaunchBox[9]： Student Start-up Accelerator of Trinity College

Only providing the solution to a problem based on the basic analysis of the market is not sufficient. This is because the proposed solution may be too general and in most cases it cannot cover the needs of target users. Therefore, it was necessary to conduct detailed investigations based on the prototype in order to confirm or refute the stated parts of the prototype and, if necessary, update or add new functions.

In this condition, in order to discover the real market situation through identifying the customers to which the system would be targeted and test if the advertising model is suitable for target sellers, the research which focus on reality beyond the theoretical formulation need be conducted.

For this purpose, we needed not only conduct the deeper market research, but also interact with some professionals and get the newest state of the industry. In addition, this research would share the information of the market studies and then to analyse the feasibility of a start-up prototype and if Soosokan principles and the advertising model is reasonable to proceed as the initial design.

[9] http://www.launchbox.ie/

In the light of the above reasons, we joined *LaunchBox* programme. *LaunchBox* is a three month accelerator open to teams of Trinity Students with an early-stage business. It provides mentorship, connections, funding and collaborative environment for us to launch the new startup ventures. Furthermore, LaunchBox arranged a calendar of workshops and visits from investors, entrepreneurs and experts in various fields of business. These events help teams to critically evaluate their proposals and rectify the objectives to the right direction.

During the period of the LaunchBox programme, we learned two important and useful points which are very favourable for the implementation of the study: the best methods for performing research and evaluation for this particular project proposal and receiving advice and validation from members, which are really helpful feedback for our project.

3.2.1. Research methods in the study

Most visitors of LaunchBox have business background, and many of them are experts on the fields of start-up business or technology. We also go out for visiting some well-developed workshops which are really experienced (such as the MasterCard workshop). Most of them showed agreement with the guidelines of Soosokan's viability research, and they also gave some feedback and guides on the improvement of the project.

As a start-up programme, Soosokan is based on the *lean start-up* methodology[39]

This methodology features a model that covers the entire process of establishing and developing a start-up. Regarding the research study during the period of LaunchBox programme, the approaches of lean start-up methodology mainly translate into two

points:

- Address the product market and audiences: the Lean Canvas[40]
- Build–Measure–Learn

3.2.1.1. The Lean Canvas

On the basis of the preliminary market research which had been carried out in the academic semester, the first round of data has been gathered. In the start-up environment, these data should be analysed and to conclude some business points from it. There is a tool that helps to visually documenting and developing the business hypotheses and the business model, and this tool is the one-page business model diagram (i.e. Lean Canvas).

Compared to traditional business model canvas, lean canvas is more suitable for start-ups that are not familiar with customer segments and even do not know how to accurately test and sell the products. Writing and updating the lean canvas helps us to find a suitable position of our product and the specific customer segments for Soosokan. While updated the lean canvas following some experts' suggestions, we changed the original target customers from "common users" and "sellers" to "the people who find hard to locate available product (especially for impulse buyers)" and "small businesses". Narrowing down the range of the target audience is because previous proposed market is too big and abstract for a new start-up, and the original model also made it hard for us to address the need of various audiences. In addition, we also updated the prototype of Soosokan as well as the advertising model based on the change of business model.

This is also the actual inception of the research topic in which the motivation and purpose are both oriented to small businesses.

The lean canvas only visualizes and documents the process of business hypothesis's development, but the validations of the prototype and plan need to be conducted as the as the validated learning loop or Build-Measure-Learn loop in lean start-up model. Details of the validated learning loop will be explained in the next section.

3.2.1.2. Build-Measure-Learn

The Build-Measure-Learn feedback loop is a part of validated study of a startup product. As Figure 8 demonstrates, "The fundamental activity of a startup is to turn ideas into products, measure how customers respond, and then learn whether to pivot or persevere" [39]. All these steps consist of a typical loop. Before the final product publishes, measuring the product following the loop many times in the manufacturing period is necessary.

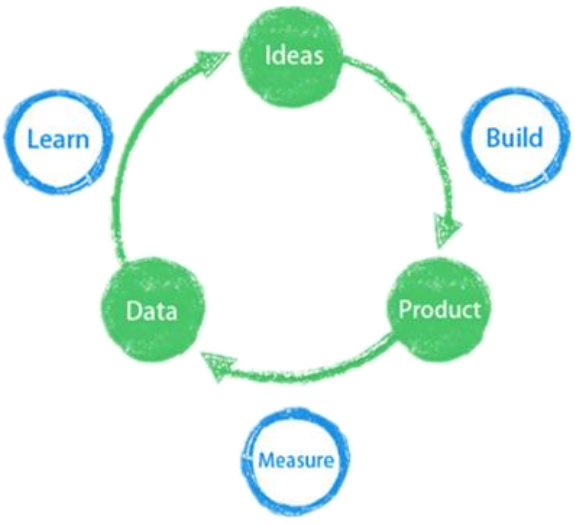

Figure 8 Build-Measure-Learn Loop

With regard to the Soosokan project, the build-measure-learn loop was used to drive the research into implementing a real-time and location-based information retrieving and publishing system. In term of the advertising model, test of it was also conducted during the loop. Experiments were conducted to test the prototype of the model and then the evaluation included questionnaires, users' trials and interviews was performed with target users to validate the applicability of the proposed model in Soosokan.

At the end of LaunchBox programme, we completed the loop of the validated learning and published the official version of Soosokan application for users. However, due to the limited time and some remaining problems, Soosokan application for small businesses is only the test version and the collected data from the feedback loop still need to be analysed, after which a new loop for the newer version application can be conducted.

3.3. Prototype of the real-time and location-based advertising model

The prototype of the real-time and location-based advertising model is designed as Figure 9.

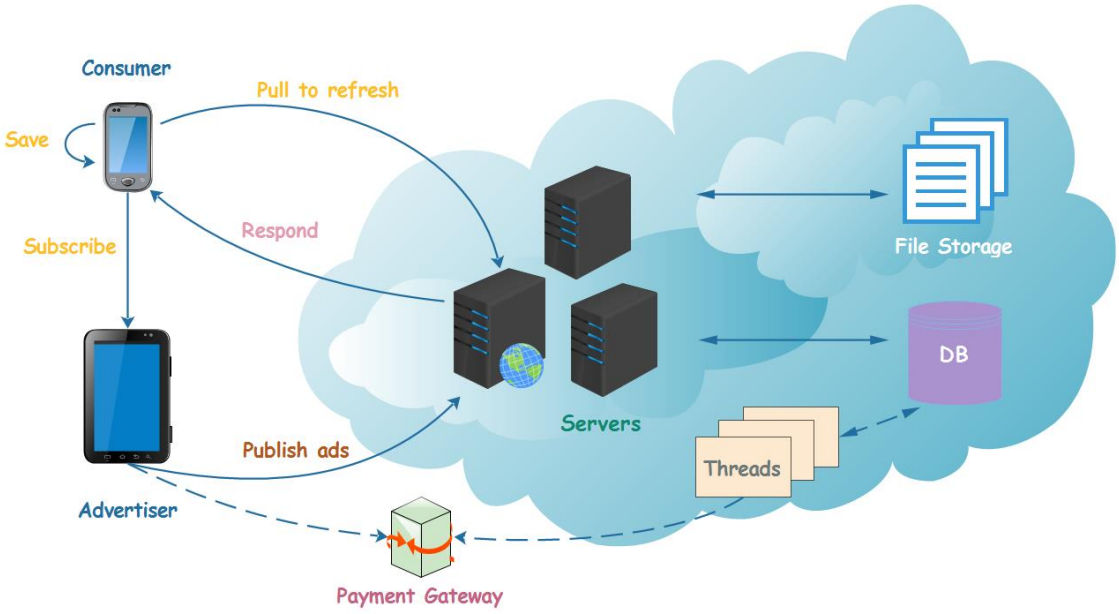

Figure 9 Prototype of the real-time and location-based advertising model

Consumers and advertisers both use Android devices because the whole Soosokan business system is based on Android platform. As Figure 9 shows, original data of advertisement is edited by advertiser through their devices and all the published data are based on real-time and the geographic location of the advertiser.

- Targeted advertising within specific location ranges. One characteristic of this advertising model is the targeted advertising within selected range. There are three kinds of range can be selected by the advertiser during the editing process: 1km, 2km, and 3km. According to the market research and state of arts studies in the previous chapter, we found that location-based advertising is an effective strategy for advertisers to publish advertisements. This is because that potential user base of a physical store is usually the people who often appear in the nearby area of the store. To some extent, targeted advertising within a restricted range actually implements an accurate customer orientation. Unlike advertising on social media

which may attract the consumers who live far from the shop, this targeted advertising model is more reasonable and effective. For example, the advertisement from a shop which is located within 1km range will be more appealing than that of another shop which is located at 30km far away. In conclusion, targeted advertising within fixed range could help advertiser to target more consumers and then gain the customer engagement.

- NoSQL database and deployment of server over the cloud. Taking the whole Soosokan system and its future development into consideration, cloud database and the server deployed on cloud are better choices for the project. Cloud service improves the system scalability and reduces the response time of the system. This setting is also suitable to tackle the huge amount of data in the future when there is a large number of people are using the Soosokan application which employs the advertising model.
- Pull-to-Refresh. Consumers can pull to refresh the home page and then get the newest advertisements list from server, sorting by the published time. The pull method avoids the problem that consumers may encounter in the in-app advertising model. This means, the advertisements in this model will not be annoying because it only appears in the form of list on the home page. At the same time, consumers have the capability to choose a time to update the list if they want to see updated nearby advertisements.

Besides, the cache mechanism which can save the latest viewed advertisements list effectively reduces the response time. When consumer request to update the advertisements list, server only need return updated data.

- Saving function. This is also a characteristic of the advertising model, and it enables consumers to save advertisements to local database in order to view it again quickly and conveniently whenever they want.
- Shop subscription. Consumers could choose to subscribe a shop, after which they could view the shop and browse all information of products sold in this shop. Small business can gain more chances to show their products based on this function.
- Online Payment. In the real-time and location-based advertising model, advertising pricing is planned to be based on CPC (cost per click). The price which an advertiser needs to pay depends on the click amount of each advertisement. This method enables advertisers to know how much people really view the advertisements and to a degree, collected data from the click log could help advertisers to analyze customers' interests. Third-party payment gateway is proposed to be utilized in the model. Payment gateway is "a service from a provider of e-commerce services that authorizes credit card payments for online business". In this model, payment gateway takes charge of credit card transactions (advertisers use it to pay the advertising fee) to ensure that sensitive information (private information of advertisers) is passed securely between customer and the vendor.

3.3.1. Use case scenario

According to the description of the advertising prototype and characteristics in the previous section, there are two kinds of users in the system. In this section, the use case diagram (Figure 10) will demonstrate the functional requirements from different user's perspective.

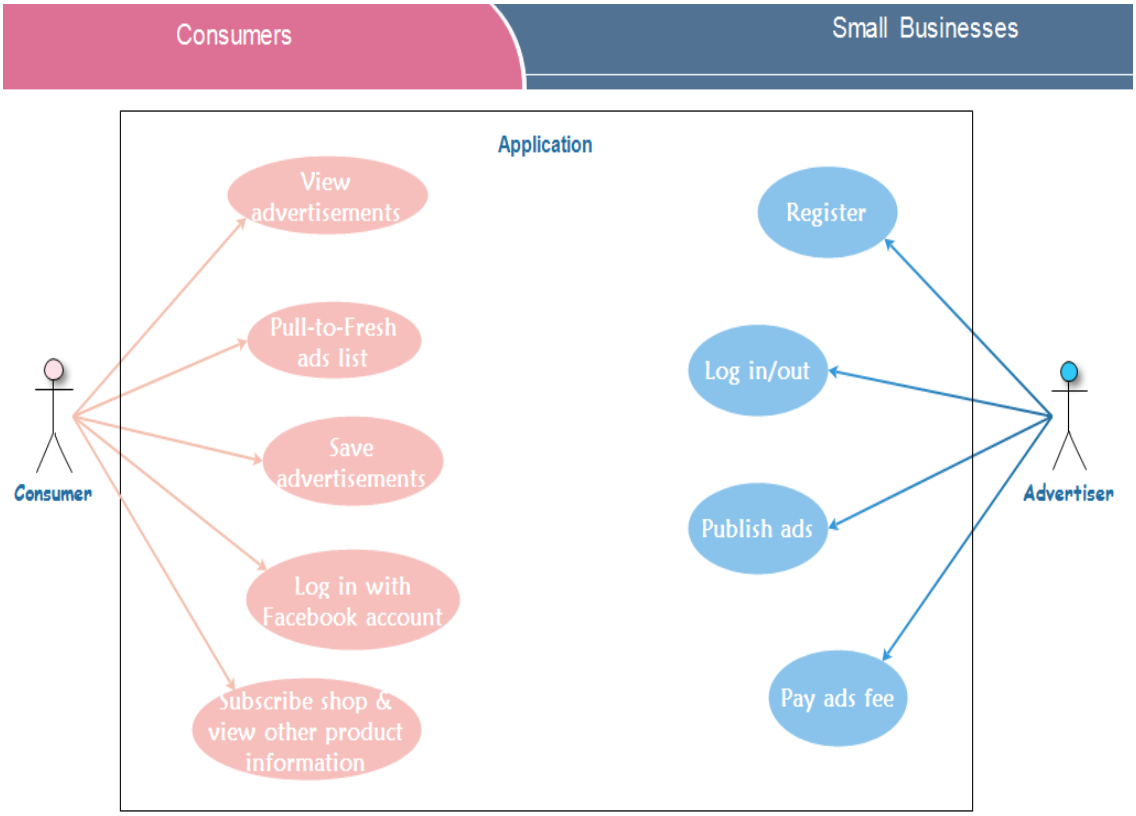

Figure 10 Use cases diagram

3.3.2. Technical architecture

The main technical architecture (focus on the components of the advertising model) of the project which employs the real-time and location-based advertising model is shown as Figure 11.

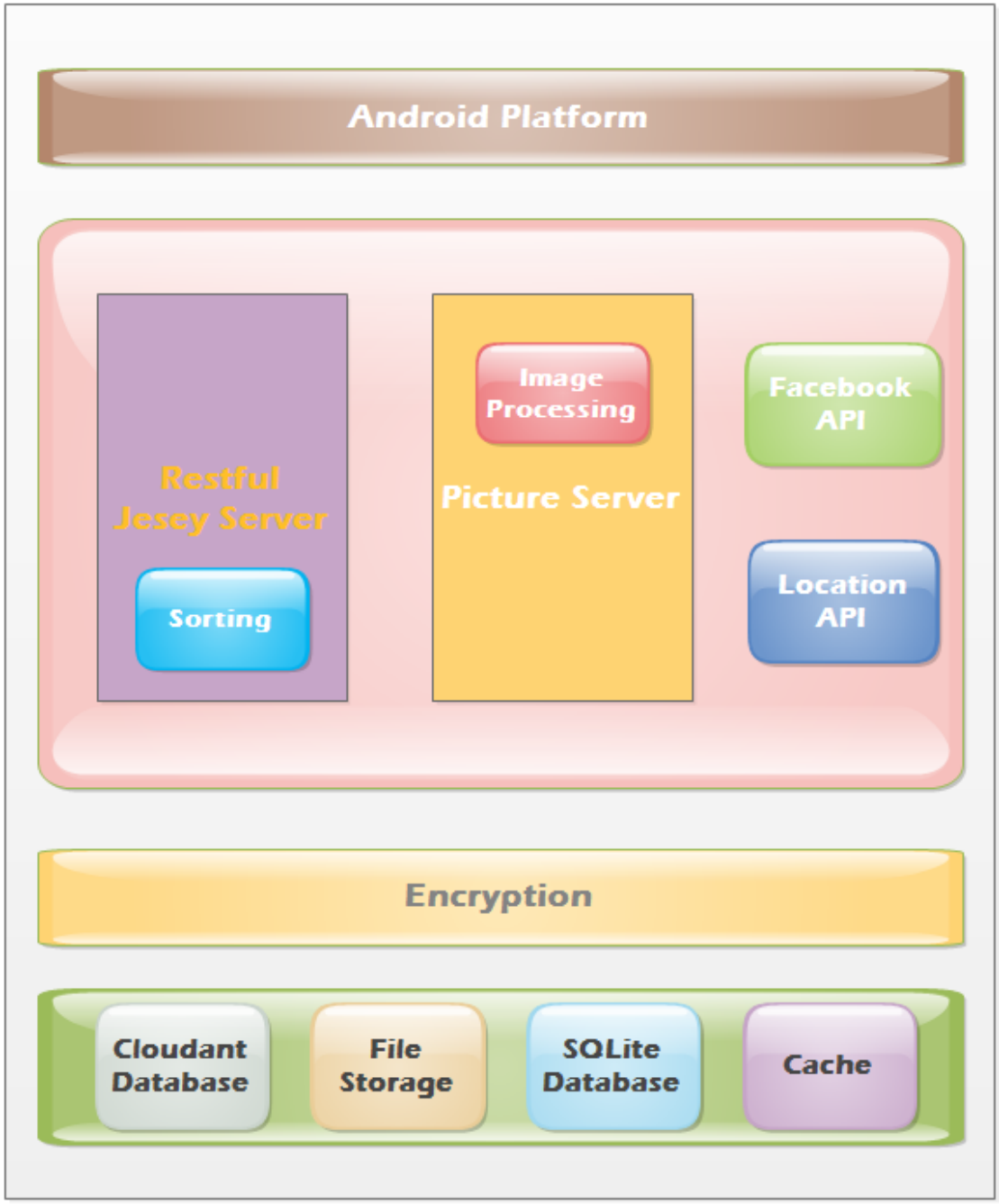

Figure 11 Technical Architecture

Chapter 4 Implementation

This chapter is to explore the technologies related to the implementation of the advertising model in Soosokan project and to review its main features. Implementation technologies are explained in the first section and the resulting system in which the real-time and location-based model applied is presented in the other section of the chapter.

4.1. Chosen technologies

4.1.1. Client

In order to implement the real-time and location-based model in an Android mobile application, using the Android Software Development Kit is necessary. In this project, developing language is Java and the Eclipse[10] is used as an IDE (Integrated Development Environment). Besides, the plug-in Android Developer Tools (ADT) for creating Android project in Eclipse need to be installed. With regard to Android Software Development Kit (SDK), it is established for particular software packages (such as software framework, hardware platform, and operating system) by software engineers. The SDK in Android

[10] https://eclipse.org/

development provides a set of libraries and other essential tools for the developers.

In addition to the basic technologies used in the Android application developments, this android project also made heavy use of the MVC (Model-View-Controller) pattern. According to [41], MVC pattern is explained as:

- Model: What to display
- View: How it is displayed
- Controller: Formatting the models from display and handling events like user input

The MVC architecture enables data to be presented in different ways throughout the system. In this project, the MVC pattern was implemented by using JSONObjects to represent the models used in the application. These models were used by controllers when displaying information back to the user. Activities were used as controllers to retrieve user input, handle all events, request web services, process data and call XML format views to show in front of application users.

4.1.2. Servers

4.1.2.1. Main server

The main server of the project is based on the REST architecture and the Jersey frame. “REST is an architecture style for designing networked applications”[42]. It is a lightweight development style, it can reduce development complexity and also improve the system scalability. Rather than “using complex mechanisms such as CORBA, RPC or SOAP to connect between machines”, REST uses simple HTTP to make calls. Rest is an

alternative to mechanisms “like RPC (Remote Procedure Calls) and Web Services (SOAP, WSDL, et al.)” because REST web service pattern is simple than SOAP and XML-RPC. RESTful applications “use HTTP requests to post data (create and/or update), read data (e.g., make queries), and delete data” [43]. In another word, REST uses “HTTP” to conduct all four “CRUD (Create/Read/Update/Delete)” operations.

Jersey is a RESTful Java Framework to request web service and it is mainly used to handle the business logic layer. In Jersey MVC model, Jersey frame abstracts all functions as resources which could be invoked remotely by clients. In addition, the encapsulated HTTP requests will be handled to call the responding functions in these resources.

4.1.2.2. Picture Server and picture store

All the processing of pictures in the project is in the charge of a separate picture server which utilizes the Java Servlet technology. Java Servlet technology “provides Web developers with a simple, consistent mechanism for extending the functionality of a Web server and for accessing existing business systems”[44]. It can be viewed as a small applet which runs on the server. Servlets support almost all web servers, from Apache to Zeus” [45]. With regard to the picture storage, Microsoft Azure Storage[11] was adopted in the project. Azure Storage “provides the flexibility to store and retrieve large amounts of unstructured data”, and it can keep up with the growing data needs which means it has high scalability and per account holds “up to 500 TB of total storage”. Based on the convenience and scalability of this storage. The Azure BLOB storage was used to

[11] http://azure.microsoft.com/en-us/documentation/services/storage/

work as file system in the project in order to store all pictures of advertisements.

All mentioned servers of the project are deployed on Microsoft Azure, the cloud for modern business, as the following figure.

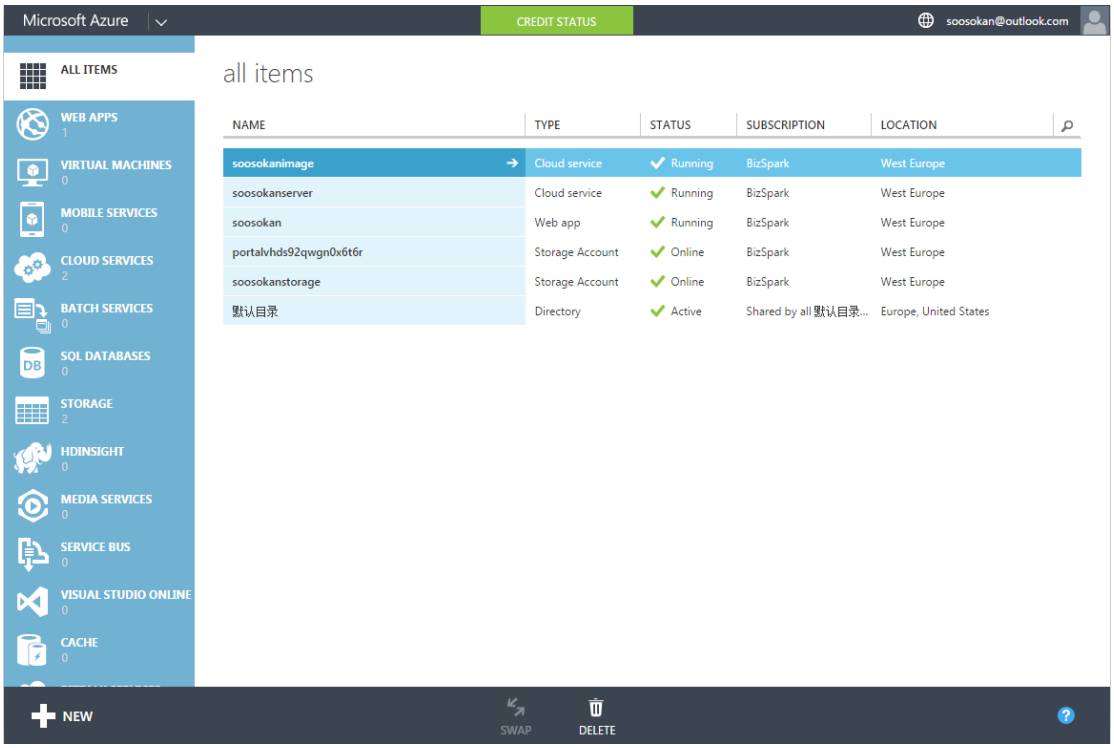

Figure 12 Deployed servers on Microsoft Azure

4.1.3. Data store

4.1.3.1. Cloudant

Taking the scalability and the volume of data storage into considerations, Cloud database was employed in the project. This was also an advice from Citi's mentor as he mentioned Citi also uses this kind of database.

IBM Cloudant[12] is a NoSQL database platform built for the cloud. It has a RESTful API, and this API “makes it easy to access from any language or platform-as-a-service (PaaS)” [46]. In Cloudant database, self-describing JSON "documents" are automatically “stored, indexed, and distributed across an elastic database cluster that can span multiple racks, data centers, or cloud providers to provide superior scalability and availability”. Each entry is described as a document in the database. Besides, Cloudant contains the RESTful API which enables “Get, Put, Index and Query JSON documents” directly from the browsers and devices through the API “over secure HTTP/S”.

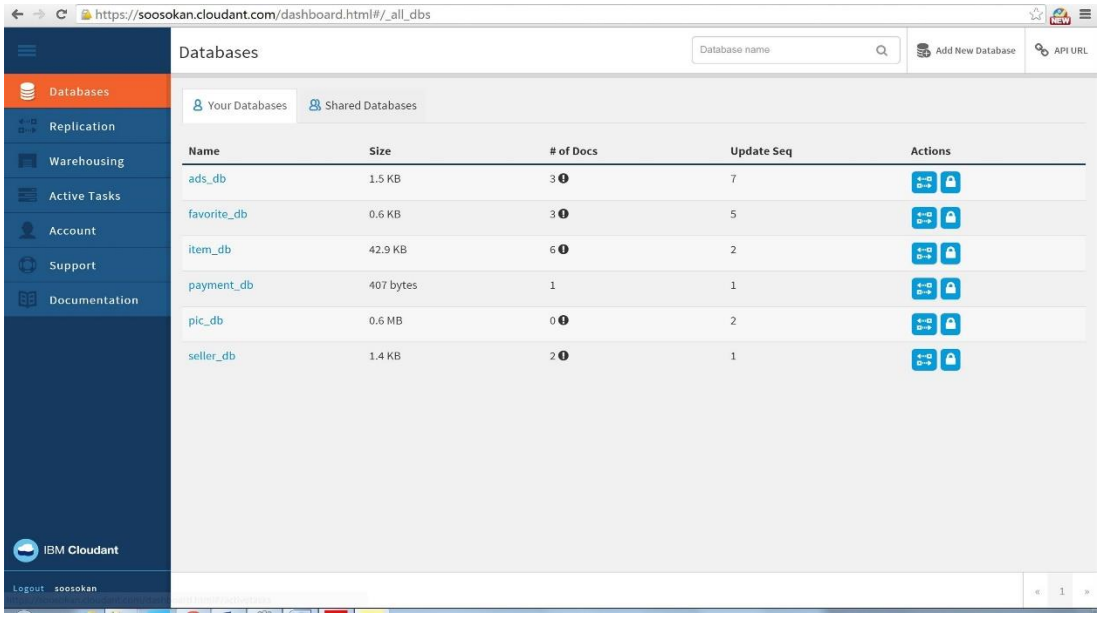

Figure 13 Cloudant GUI

There are many other NoSQL database capabilities of Cloudant and this database provides graphical user interface for developers to manage it. The interface is represented as Figure 13. Most data of the projects are stored in Cloudant database

[12] https://cloudant.com/

except the pictures which was stated before. However, there are still other two kinds of data store methods are used in this project in order to implement some functions.

4.1.3.2. SQLite Database

The first one is the SQLite database. It was used to implement the function of saving advertisements in the phone. All the saved advertisements' data were stored in this database. This advertising model enables consumers to save advertisements for fear that they may want to browse the advertisement again but fail to find it. When consumers press the button on the page of detailed advertisement, this advertisement will be stored in the SQLite database. System will create a unique ID for each saved advertisement and then consumers could view these advertisements on the interface of saved advertisements' list. The unique id is the keyword to find the detailed information of the advertisement in the database and then these data can be invoked to display to the consumer.

4.1.3.3. Cache

Another one data store approach used in the project was ASimpleCache. It is a lightweight open source caching framework developed for Android. It may only have one java file (streamline from more than a dozen classes). ASimpleCache can be used to cache various Android objects include ordinary string, JSON objects, serialized java objects, byte array and so on. In Android development, ASimpleCache could be used to replace SharedPreferences profile, especially when the application needs to read data from the Internet. This is because ASimpleCache could cache the requested data, and then the application can re-read data while the cache data is out of date. This

contributes to the reduction of client traffic and server concurrency. In this project, ASimpleCache was used to cache advertisements requested from the Server in order to diminish response time and data traffic for consumers.

4.1.4. Location service and subscription

Since the advertising model is based on geographic location and the project contains the subscription function, location services and Facebook APIs are employed in the implementation processes.

4.1.4.1. Location Services

Android framework location APIs is in the package “android.location”. Android platform allows the mobile application access to the location services which supported by the device “through classes in android.location package”. LocationManager system service is the fundamental component of Android location framework and it provides APIs to determine the geographic location. In “location-aware” Android application, developers can “utilize GPS and Android’s Network Location Provider to acquire the user location”.[47] In the real-time and location-based model, advertiser’s GPS information will be stored with the advertisements in the database. When a consumer chooses to refresh the advertisements list, the location information of the consumer will be collected and transferred with the request. Then, the server will process the request and make a judgement about what advertisements should be displayed to the user. Algorithm in the server side will access the data stored in database and calculate the distance between the advertiser and the consumer based on their GPS information. If

the calculated result is within the area which was chosen by advertiser while publishing the advertisement, all advertisements that meet the requirement will be sorted by another sorting algorithm on the server side and then transferred back to a list to the consumer.

4.1.4.2. Facebook APIs

Because the advertising model contains the function of shop subscription, Facebook APIs and SDK were used to help consumers log in the system with their Facebook accounts, and then to complete the subscription.

Facebook SDK for Android is a very easy method to integrate the Android application with Facebook. According to the introduction on Facebook developer page, Facebook SDK enables “Facebook login, share and send dialogs, app events log and read/write graph API”.

In this project, what the system need to do is to read the data (basic data of consumer such as name, gender and the most important is the account ID) from the interface and then link the account ID with the seller ID when the consumer choose to subscribe a shop. Only in this case, when consumer logs in the system through the Facebook Account, the system can help them to find the corresponding information of subscription through the ID and the linked seller ID.

4.1.5. Payment Gateway

In this project, the implemented application for advertisers (sellers) is only the test

version which was designed to be used totally free and then to get feedback from advertisers. The policy (i.e. providing a three-month free trial of the product) is one part of the marketing plan. In this case, third party online payment gateway is not completed in this dissertation, but after the first round trial and feedback collection, this function is still need to be implemented. Then, official version of the application can be released on Google play from which sellers can download the application and continue using it after the free trial.

For future development, Payment Gateway that enables *preapproved payments* (charge nothing until the transaction is processed as anticipation) is suitable for the advertising model in Soosokan system. PayPal[13]and Amazon Payments[14] are both very popular and both provide the payment gateway which implements the “preapproved payments” feature.

4.2. Model Features Overview

Although Soosokan project implemented a series of functions such as specific item search for consumers and the item management for sellers (i.e. advertiser in the advertising model), this chapter only focuses on the features involved in the real-time

[13] https://www.paypal.com

[14] https://payments.amazon.com/home

and location-based advertising model.

4.2.1. Targeted advertisement publish within specific range

This feature was implemented in the Android application developed for small businesses. All advertisements are published by the owners of small businesses, here known as advertisers.

4.2.1.1. Advertiser registration and log in

The first step for an advertiser to release the advertisement is to register an account and then use it to log in to the application developed for small businesses. The email address must be unique and it is the name for log in as well as the key to identify the user. Figure 14 shows the interface of advertiser registration and log in.

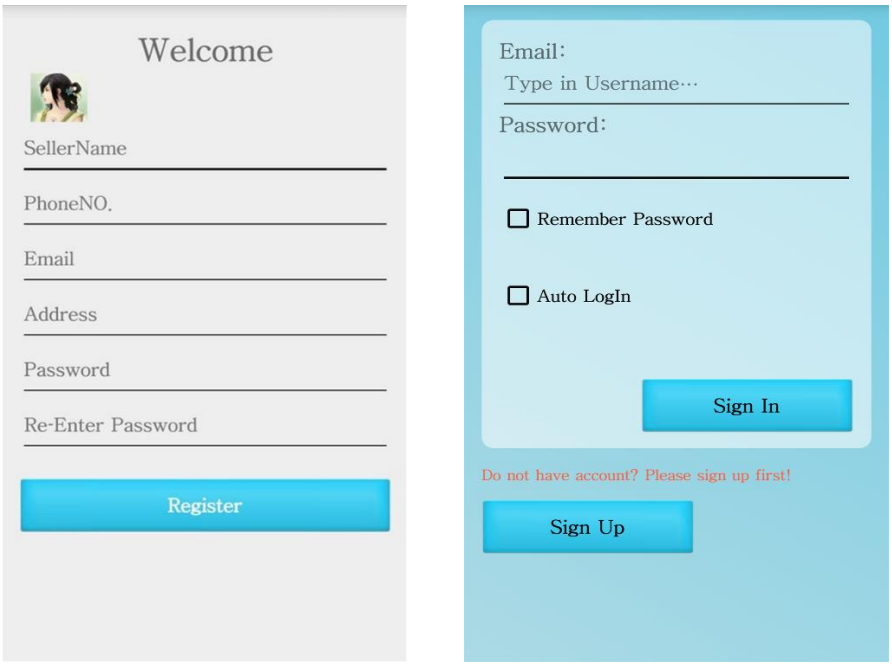

Figure 14 Interfaces of advertiser's registration and log in

4.2.1.2. Advertisement view

In the home page of the application for advertisers (shown as the first picture of Figure 15), advertiser could choose to view their published advertisements and manage the items' information.

All published advertisements of the advertiser are classified by types. The view page is shown as the second picture of Figure 15.

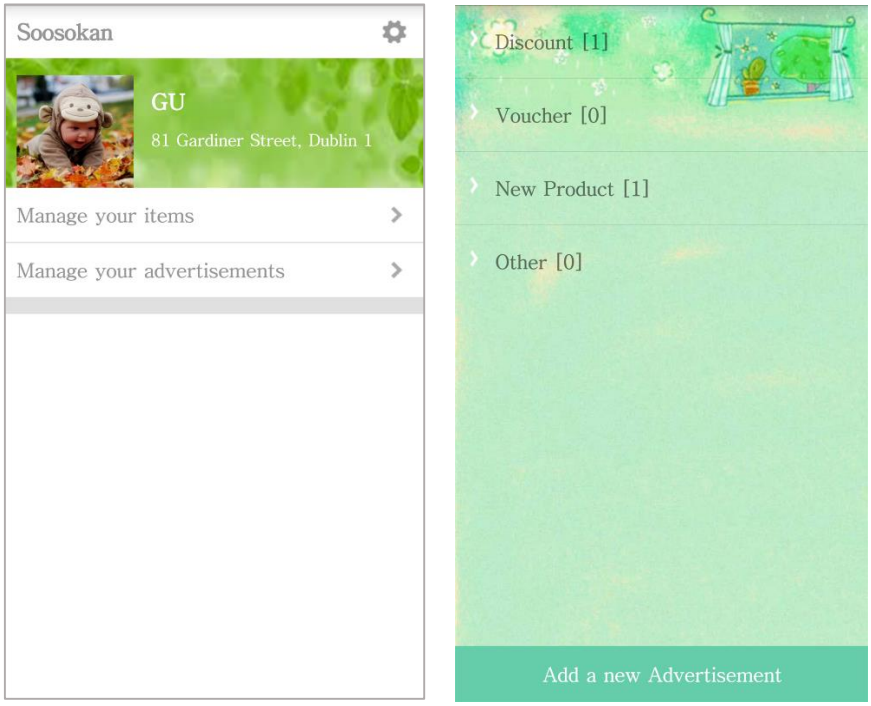

Figure 15 Home page of the application for advertisers and page of advertisements view

4.2.1.3. Publish advertisement within specific range

When the advertiser edits an advertisement, he or she can choose the advertisement's type and the specific range of the advertisement. The process of the advertisement editing is displayed in the below figure. Upon the advertiser completes the edit and

presses the add button, this advertisement will be upload to the server and then can be posted to consumers.

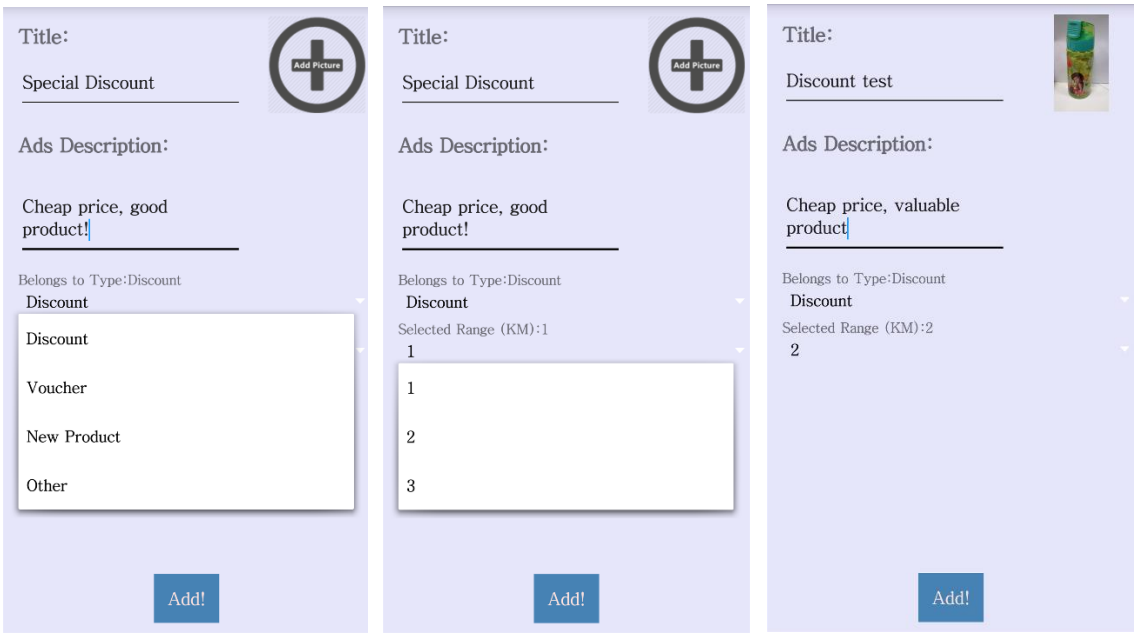

Figure 16 Advertisement edit for publish

4.2.2. Pull to refresh

Figure 17 shows the home page of the Android application developed for consumers. When a consumer opens the application, the list of full advertisements on the home page will show the latest viewed advertisements which were saved in the cache at last time. If this is the first time for a consumer to open the application or if cache is empty, the application will automatically request the newest nearby advertisements from the server. Consumers can also pull the list to obtain newer advertisements, the second picture of Figure 17 shows refreshed list of advertisements and new advertisement is added to the list now.

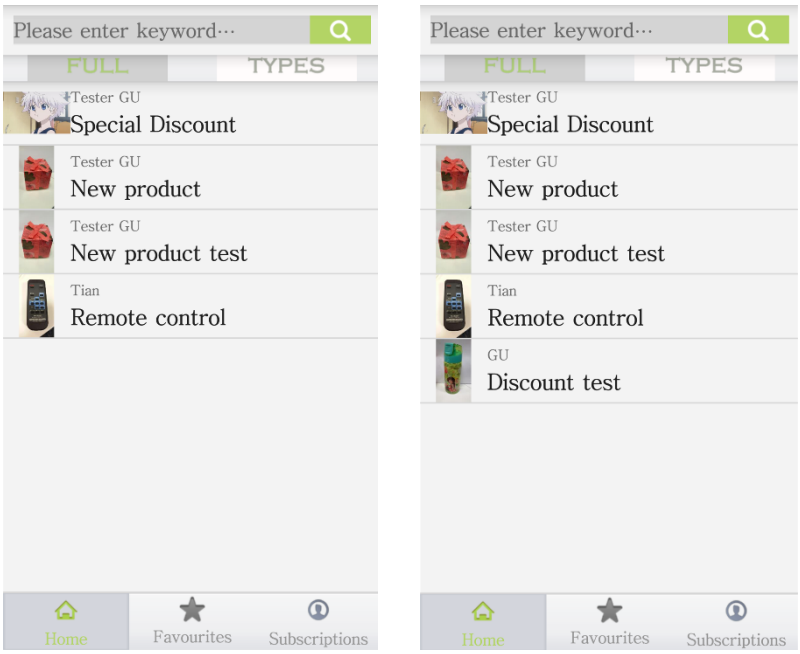

Figure 17 Home page of the application for consumer

There is one tab host below the search box. Default setting for the advertisements display is to show all last viewed nearby advertisements, however, consumers can press another tab to display the advertisements classified by types.

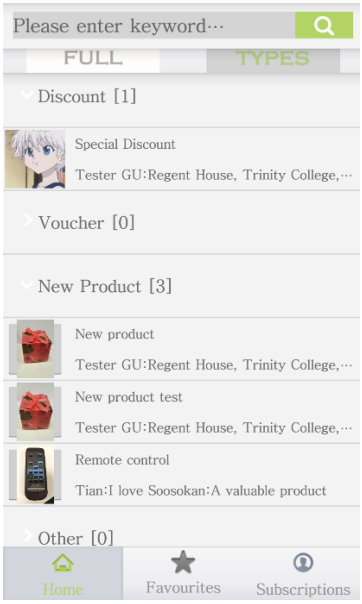

Figure 18 View advertisements classified by types

Advertisements are divided into four principal types: Discount, Voucher, New product and other. The classified advertisements are displayed as Figure 18.

4.2.3. Save advertisements

This model also enables consumers to save the advertisements, for fear that it may be difficult for them to find the advertisement when they want to view it again. Consumers could press the ☆ button on the detailed advertisement view page (shown as the first picture in Figure 19) to save an advertisement to local database. Then consumers to switch the bottom tab to “Favourites” page to view all stored advertisements. The page which displays all saved advertisements is shown as the second picture in Figure 19.

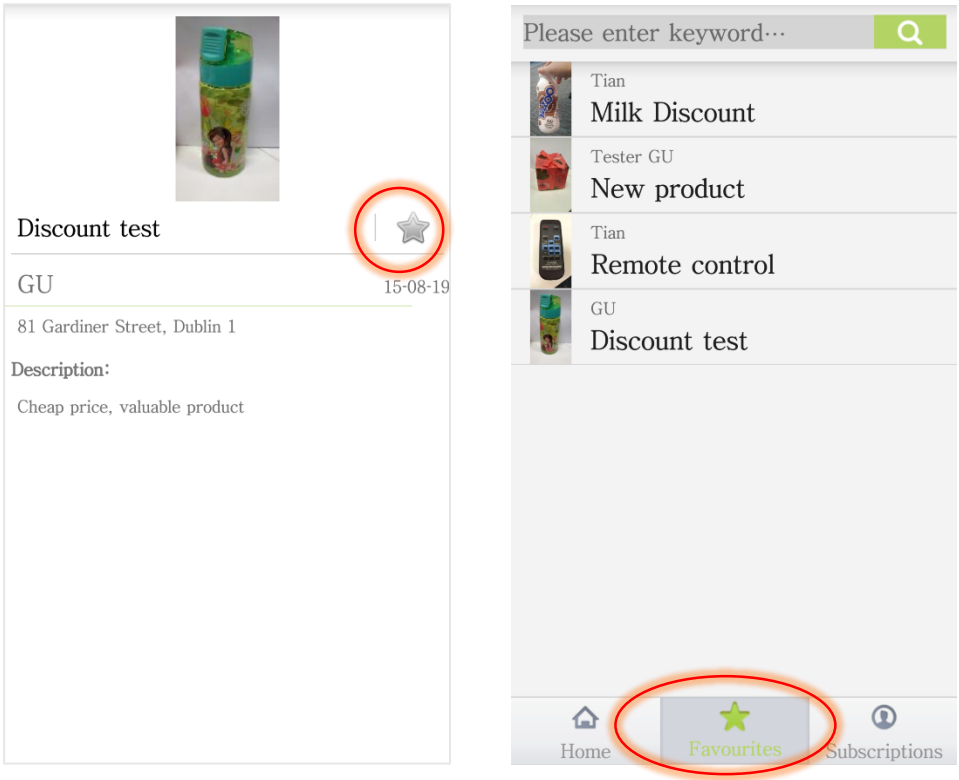

Figure 19 Saving advertisements

4.2.4. Shop subscription

Consumers have the capability to subscribe a shop and then they can visit the shop on "Subscriptions" page and view more details of other products sold in this shop. To complete the subscription, consumers need to log in with their Facebook account. This function's process is displayed as Figure 20.

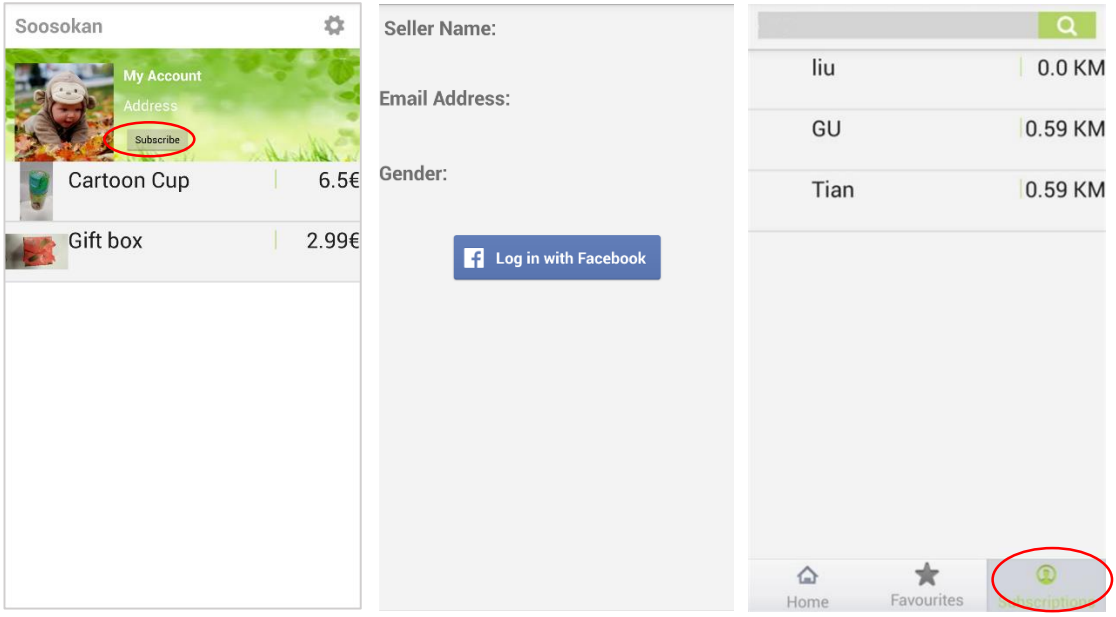

Figure 20 Shop subscription function

Chapter 5 Evaluation

5.1. Evaluation process

The complete evaluation process of the project consists of three parts: Internal performance test, questionnaires, and interviews.

The internal performance test focuses on the performance of the advertising model implemented in the android application. Two experiments were conducted to test the advertising function in the application.

Questionnaire surveys were conducted after the internal test. Two separate questionnaires (can be seen in Appendix B and C) were targeted to consumers and managers of small businesses. The purpose of the questionnaire surveys is to discover customers' concerns, interests and their attitudes to this model.

With regard to the interviews, all interviews took place after that the participants tried the application and be willing to attend the survey.

Details of these three stages of evaluation as well as the evaluation results are described in the following sections.

5.2. Internal performance test

System test usually includes the functionality test and performance test. In order to evaluate if the real-time and location-based model work well in the Soosokan application, performance test of the targeted advertising function was firstly conducted. Besides, in this project, interviews (explained in section 5.4) were organized after participants tried to use the application, which not only tested the functionality of the prototype but also gained valuable feedback.

5.2.1. Experiment approach

Equipment used in two experiments are:

Two Android phones (Android 4.0.2 and Android 4.2.2) and One laptop with Eclipse.

Experiment place for the two tests is: Regent House, Trinity College Dublin.

5.2.1.1. Experiment 1

First experiment is performed to test the integrity and correctness of advertisement's content. If the advertisement received by consumers is same as that of advertiser published, the integrity and correctness will both be 100%. In other words, this test is to make sure if the project enables all pieces of information in the advertisement are transferred completely and correctly from advertisers to consumers.

Processes:

1. Installing the two applications for consumers and advertisers on two Android phones separately. At first time, setting the location of the advertiser is 0.2km far from the regent house through coding in the application (In normal application, advertiser's position is located automatically when he/she registers, after which the location information will be stored in the database. Then, when the advertiser publishes an advertisement, this GPS information will be added to the advertisement. When a consumer requests advertisements through pull to refresh, the location information of this consumer will be transferred with the request to server. Algorithm in server side will calculate the distance between the consumer and the advertisement and finally server will return the advertisements meet the requirement to consumers. In order to conveniently conduct the experiment, I changed some codes in the activity of registration to set fixed location information for the advertiser instead of automatic localization).
2. Trying to publish different advertisements based on this distance (select 1km as advertising range) in different time periods of a day (08:00-10:00, 10:00-12:00, 12:00-14:00, 14:00-16:00, 16:00-18:00, and 18:00-20:00) and publish 3 different advertisements at each period.
3. Changing the fixed distance to 0.4km, 0.6km, 0.8km (changing distance needs re-install the application for small businesses) separately and repeat the previous step to publish different advertisements in different time periods.
4. Using another phone which installed the application for consumers to refresh the advertisements list and compare received advertisement with the published one by advertiser. If the results (advertisement's title, description, picture and publisher

name) are similar as the results shown in Figure 21, their integrity and correctness can be seen as 100%.

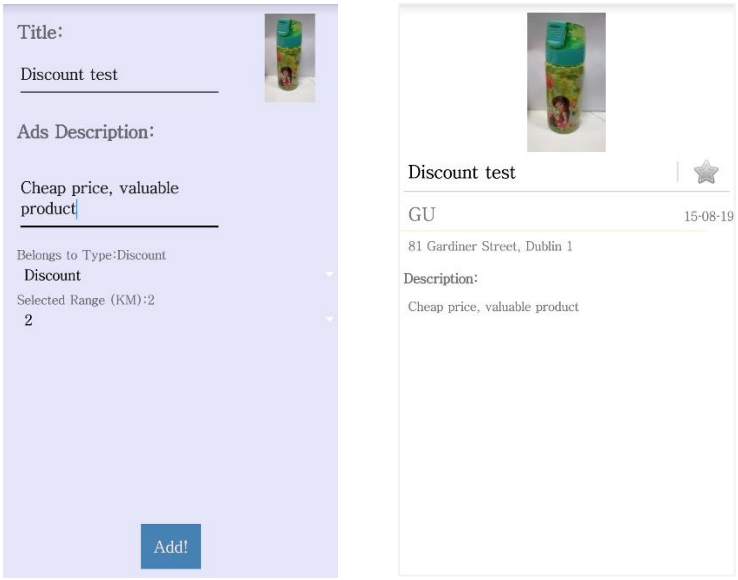

Figure 21 Published advertisement vs. received advertisement

5. Then trying to change the fixed distance to other distances within other two kinds of ranges (1.2km, 1.4km, 1.6km, 1.8km, 2.2km, 2.4km, 2.6km, and 2.8km) and publish three advertisements at different time period as previous.
6. Writing down the data of each tests (the integrity and correctness rate) and then analyze them to make a summary.

5.2.1.2. Experiment 2

This experiment aims to test the accuracy of the targeted advertising function. In this experiment, consumer's receiving rate of advertisements needs to be collected to test if the advertisement which published by advertisers can be posted to proper advertisers who are in the specific range that selected by advertisers. It is also a performance test of locating function in the project, because errors all result from the imprecise

localization for consumers.

Processes:

1. Like experiment 1, the location of advertiser still need to be set fixed through coding. And two applications need be installed again on different Android phones.
2. Trying to publish five different advertisement (as experiment 1) at different distances (0.1km, 0.3km, 0.5km, 0.7km, 0.9km, 0.95km and 1.05km) in different time period of a day (08:00-10:00, 10:00-12:00, 12:00-14:00, 14:00-16:00, 16:00-18:00, and 18:00-20:00) while selected range is 1km. Then, using the phone to pull to refresh the list and check how many advertisements can be received. Setting 1.05km as a variable is to test if the consumer who is more than 1km away from the advertiser could still receive the advertisement and then to explore the receiving rate in extra range. If five advertisements can be all seen by consumer, the receiving rate is 100%. However, if only three of the advertisements can be refreshed to consumers, the receiving rate will be 60%. Based on the receiving rate, the accuracy of the localization function can be analyzed.
3. Following previous step, publishing 5 different advertisements at more different distances(0.1km, 0.3km, 0.5km, 0.7km, 0.9km, 1.1km, 1.3km, 1.5km, 1.7km, 1.9km, and 1.95km) at different periods of a day(same segment) while the selected range is 2km. And then check and write down the receiving rate.
4. Continuing publish 5 different advertisements at different distances (0.1km, 0.3km, 0.5km, 0.7km, 0.9km, 1.1km, 1.3km, 1.5km, 1.7km, 1.9km, 2.1km, 2.3km, 2.5km, 2.7km, 2.9km, and 2.95km) at each period (same period segment as before) while

selected advertising range is 3km. Then, write down the corresponding data of receiving rate.

5. Aggregating all collected data and analyze the accuracy of the targeted advertising function.

5.2.2. Experiment Results

From the repeated tests, collected data from experiment 1 shows that the integrity and correctness of the received advertisements content are both approximately 100%. This indicates the advertising model could completely and correctly transfer data from advertisers to consumers. Unlike using some traditional advertising methods, the data published on the papers still need be processed by publisher and the production process may cause some errors, advertising using this model is more convenient and it also makes sure that the data consumers received is same as the data published by advertiser.

The result of experiment 2 is shown in Figure 22. It is obvious that the receiving rate within the selected range is higher and almost are close to 100%, but near the boundary of the selected range, receiving rate reduces a little compared to the middle parts. This may because the localization is still not very precise and it may cause some errors in the locating process. In this condition, locating function of the model should be improved in the next round development.

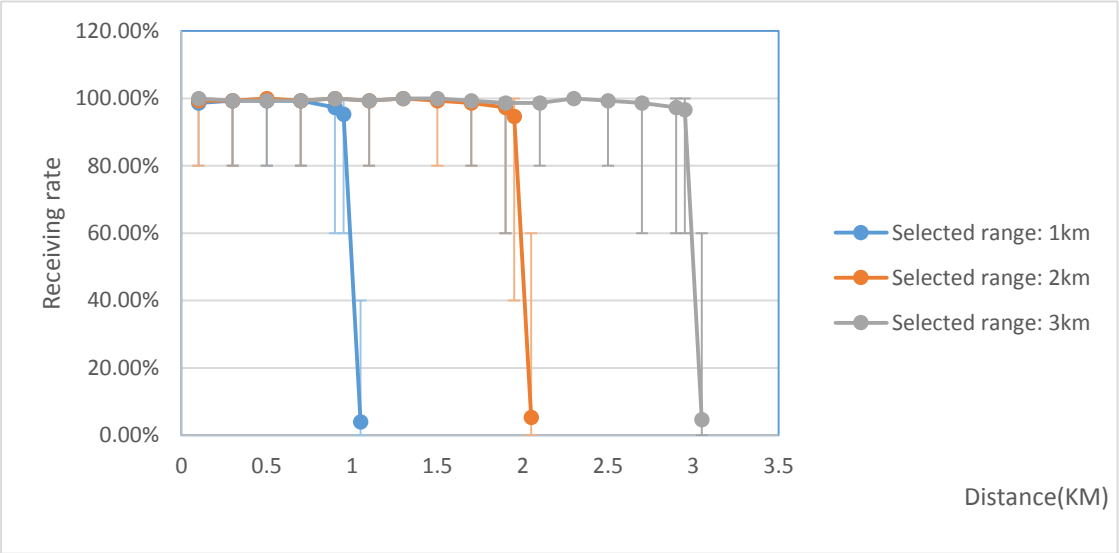

Figure 22 Receiving rate of advertisements

Aside from some small localization errors, in most cases, the locating function of the model works well in the project. This function enables consumers within suitable range to get all available advertisements and sometimes may get more advertisements, which to a degree also ensures the acceptability of the advertisers' advertisements.

5.3. Questionnaire survey

In order to explore customer's real concerns, interests and their attitudes towards the real-time and location-based advertising model which is employed in the mobile application, two questionnaires were designed separately for common users, also known as consumers, and managers of small businesses. This survey also follows the *lean startup* methodology.

Participants of the survey:

- 20 adults who may come from different countries and work/study in different areas. They were randomly selected by standing in Trinity campus and asking passers-by. All of them were voluntary to take part in the survey.
- Selected different small businesses and then talk to the managers of these shops to invite them to take part in the survey. Finally, ten managers were voluntary to fill in the questionnaire.

5.3.1. Results from the questionnaires

This section describes the main results of the questionnaire surveys from three different aspects. In order to focus on the survey objective in this dissertation, some questions on the questionnaires were omitted. I select and aggregate some questions to make a summary from different perspectives.

5.3.1.1. Customers' concerns and interests

In the previous chapter- state of art, current advertising models were explained and compared. In order to get more first-hand information about the market situation, some related questions were included in the questionnaires. Firstly, two questions on the questionnaire for consumers were used to test which kinds of advertisements consumers usually browse in daily life and which kind of these advertisements they like the most. The results are shown in Figure 23 and 24.

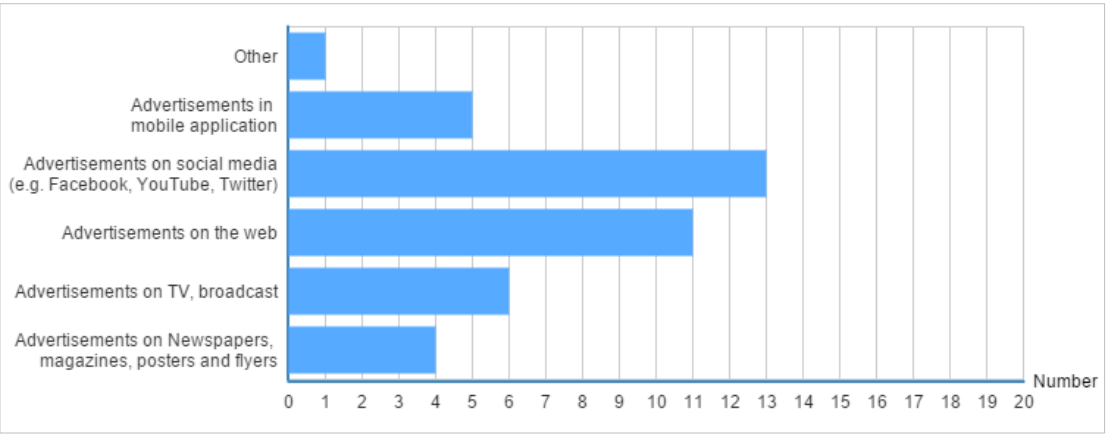

Figure 23 Advertisements that consumers usually view (Q6 in Appendix B)

As Figure 23 shows, the most popular kind of advertisements that consumers usually view is the advertisements on social media. At the same time, web advertisement is also a hot type of advertisements.

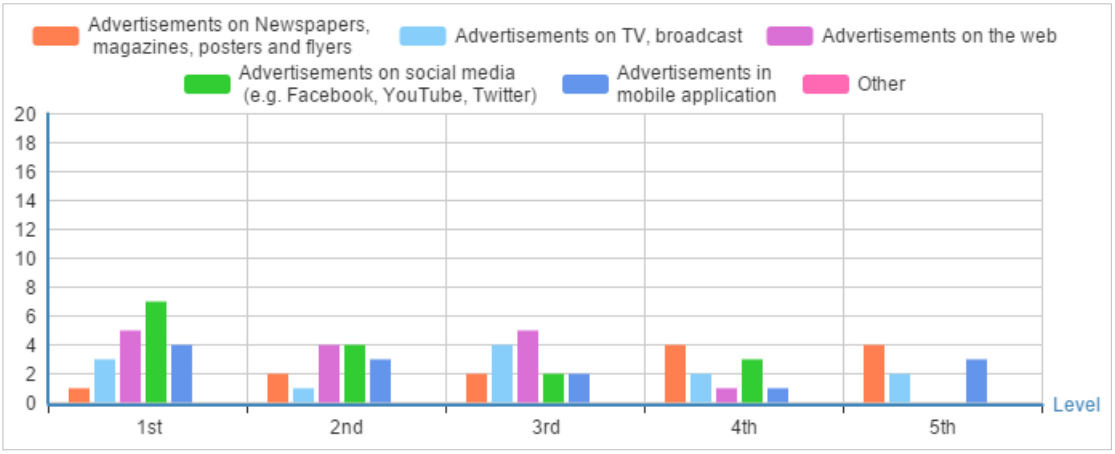

Figure 24 Consumers' preferences of different advertisements (Q7 in Appendix B)

Result of the question that intended to test which kind of advertisement the customer would like to view is shown as Figure 4. It demonstrates that Social media advertisements, web advertisements and in-app advertisements are more attractive for consumers.

With regard to small businesses, the questionnaire for small businesses also includes one question to test which kind of advertising models the advertisers usually use. Figure 25 demonstrates the result and we could know from it that advertising on social media was mostly used in these small businesses, followed by traditional advertising and web advertising.

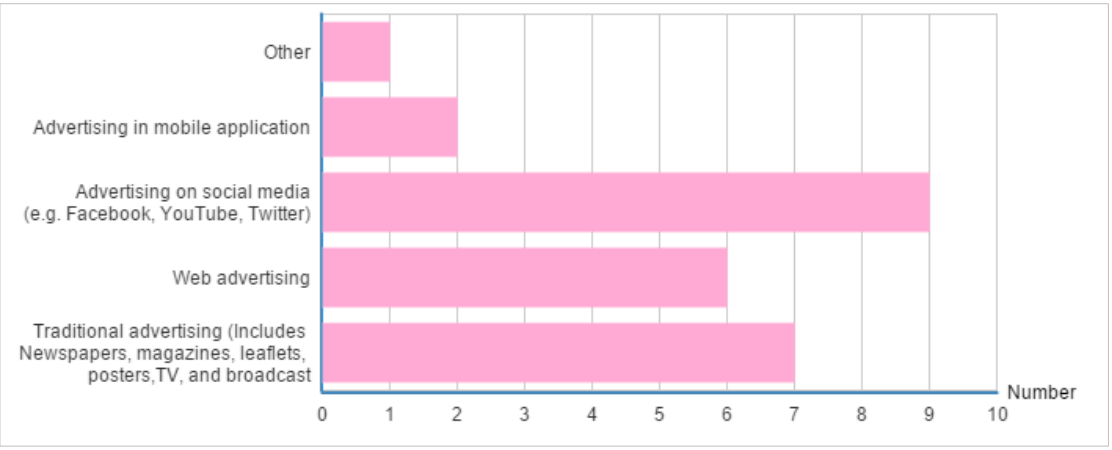

Figure 25 Advertising models that advertisers usually use

5.3.1.2. Current advertising methods' situations in small businesses

Last section mentioned the most popular advertising methods which small businesses usually choose. Based on the questionnaire for small businesses, information (includes expenses, preferences, and effectiveness) of the real usage of different advertising methods in small businesses was collected and summarized in Table 5.

This survey investigated ten small businesses. According to Table 5, the general expenses on advertising for those ten shops in a typical month can be seen is between €0 and €30. The proposed charging standard for the Soosokan application is based on CPC and per click will cost €0.01.

Table 5 Details of advertising situation of small businesses (Appendix C- Q2, Q5, Q6, Q7)

	Expenses on ads in a typical month - Q2	Preferences of ads usage in the shop (according to costs) – Q5	Effectiveness (1-10,#1 being very ineffective and 10 being very effective) – Q6	Price of advertising (1-10, #1 being very cheap and 10 being very expensive) – Q7
Shop 1	€66+	Traditional advertising; Web advertising; Social-media advertising	9	7
Shop 2	Not Given	Advertising on social media	8	7
Shop 3	€16 to €30	Advertising on social media	7	5
Shop 4	€0 to €15	In-app advertising; Advertising on social media	7	2
Shop 5	€0 to €15	Traditional advertising	6	4
Shop 6	€16 to €30	Web advertising; Advertising on social media; Traditional advertising	5	8
Shop 7	€16 to €30	Advertising on social media; Web advertising; Traditional advertising	5	10
Shop 8	€0 to €15	Other	3	5
Shop 9	€0 to €15	Web advertising; Advertising on social media	3	4
Shop 10	€16 to €30	Traditional advertising; Web advertising	2	8

Compared to the current price, this price for advertising through the model applied in Soosokan is reasonable because the advertiser only need to pay for the advertisements which were viewed by their targeted customers. To some extent, the proposed advertising model could ensure the ROI with high possibilities than other advertising models because it only charges advertisers after nearby consumers viewed the advertisement.

As Table 5 indicates, more than half managers of small businesses in this survey feel the advertising fee is a little expensive and the effectiveness usually increases along with the more kinds of advertising and higher investments. Social media advertising, web advertising and traditional advertising were used popularly and in most cases these advertising models could be effective. However, in some other cases, these methods may be ineffective. The performance of these advertising model is not very stable and it may vary in different environments. What we could learn from the studies is that we need deeper analyze the market situation and flexibly improve the proposed advertising model to enable it not only caters to the needs of the customers but also caters to the market's trend.

5.3.1.3. Customers' attitudes towards the proposed advertising prototype

There are many questions on the questionnaire are to test the customers' attitudes towards the proposed prototype. The evaluation process mainly concentrates on some questions of functionality test and the willingness investigation.

Figure 26 presents the information about the consumers' attitudes towards the homepage's real-time advertisements based on pull-to-refresh method. More than 80% people do not reject the model when 30% of them definitely like the way to view advertisements.

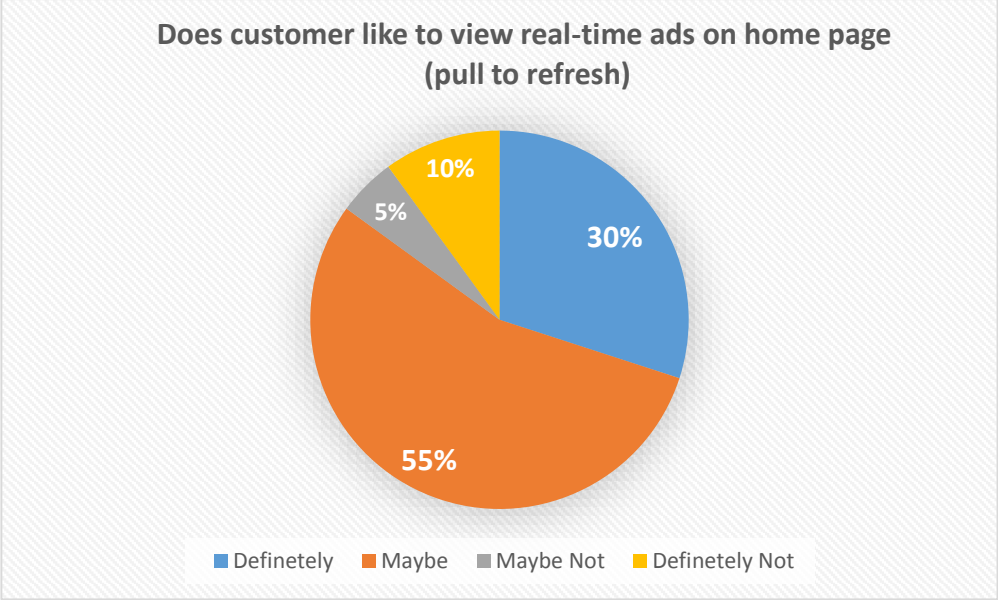

Figure 26 Consumers' attitudes towards the homepage's advertisements (Q8)

In terms of the function of saving advertisements on client side, consumers' attitudes are shown in Figure 27.

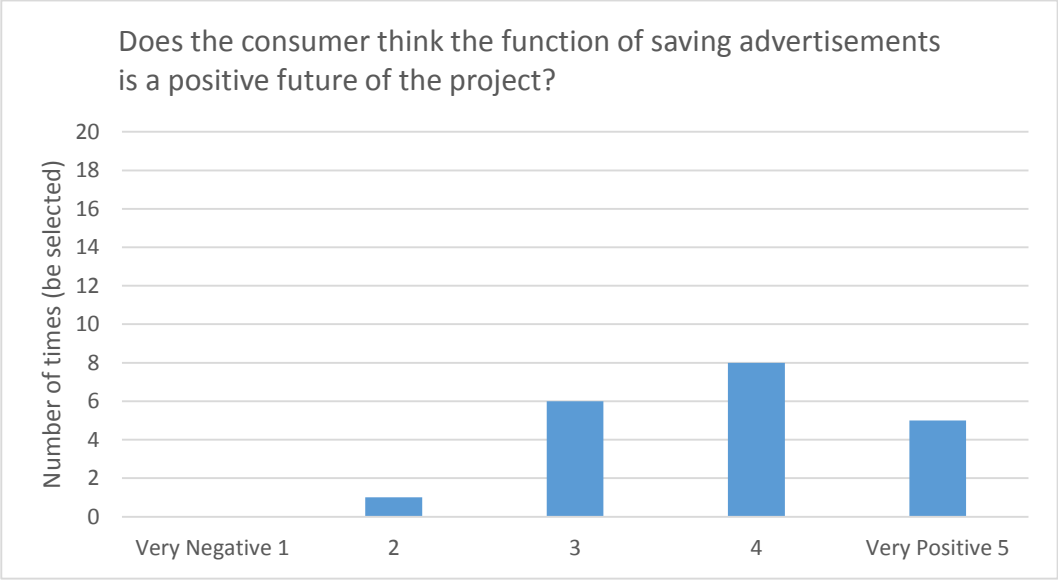

Figure 27 Consumers' attitudes towards ads saving function (Q10 in Appendix B)

Majority of consumers in the survey agree that the advertisements saving function is a positive feature of the prototype.

At the same time, Figure 28 (Q11 in Appendix B&C) demonstrates the information about customers' (consumers and owners of small businesses) opinions on the function of shop subscription.

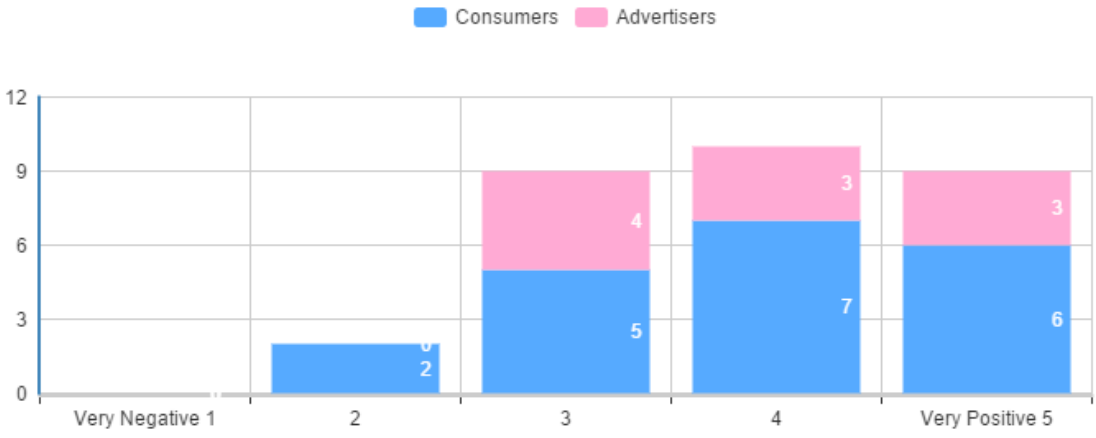

Figure 28 Customers' attitudes towards shop subscription function

Most participants in the questionnaire surveys support the shop subscription function of advertising prototype.

Furthermore, the questionnaire contains one question to test if the advertiser considers location-based and targeted advertising is a good feature of the prototype. The result (Q10 in Appendix C) shown in Figure 29 indicates that most advertisers of small businesses agree that location-based advertising function is a positive feature which also can be seen as an effective feature of the advertising prototype.

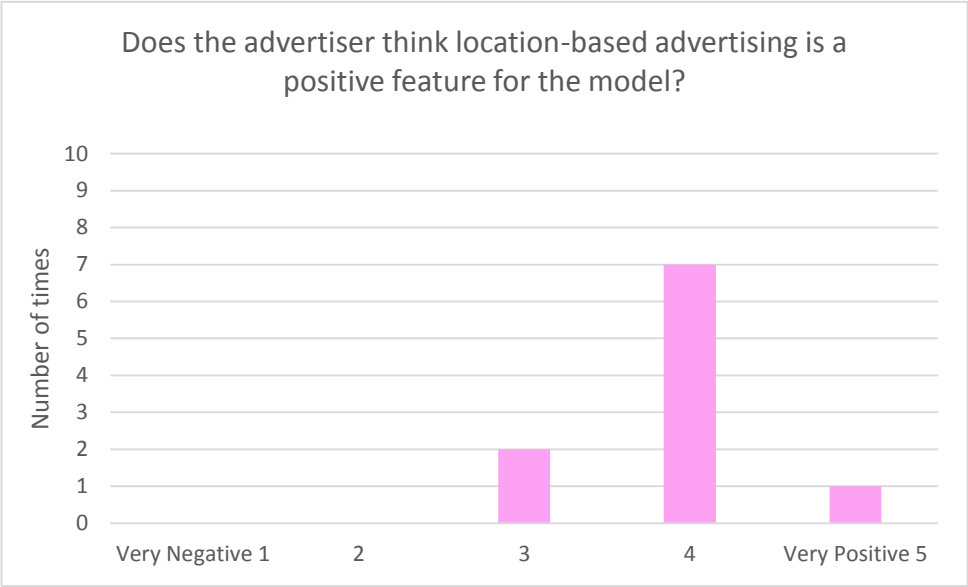

Figure 29 Advertisers' attitudes towards location-based & targeted advertising

At last, Figure 30 illustrates the customers' willingness for using the application. These two charts also validate that this advertising prototype is acceptable for the customers (both for consumers and small businesses).

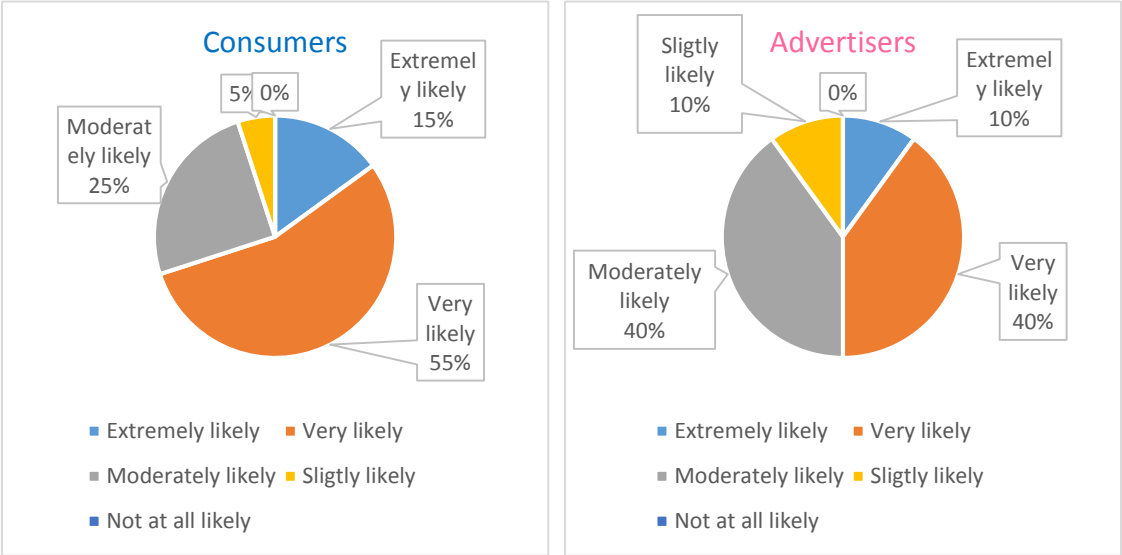

Figure 30 Customers' willingness to use the application

5.4. Interviews

In order to validate the applicability of the prototype and find how users react to the model, some participants were invited to take part in the trial of the test version of the application through a test link. The link is sent by email and they could randomly choose to try or not. Interviews were conducted after the 3-days trail and all participants in the survey were voluntary.

Participants of the interviews:

- 8 colleagues of LaunchBox program that come from different majors are invited to attend the interview and to provide some feedback.
- Only 3 shop owners download the test version of application and tried to use. After the trial, the interviews were conducted in their shops and all their information was protected confidentially.

Preparatory work：

Before the participants' trials, the alpha test application was published on the Google play, and then the test link was sent to these participants who expressed that they would like to attend the test.

When they received the link, they could register as a tester and then download the application for use. In case that they are not familiar with the application and there is no instruction in the app, I explained main features of the application to them.

5.4.1. Feedback

Interviews were conducted after the users' trials and each interview usually costs no more than 5 minutes.

Main questions I asked in the interview are listed in the document (Appendix D).

The main conclusions for the information that collected from the interviews are:

In interviews for testers that tried to use the application for consumers:

- Most testers of the application for consumers expressed that they like the application and they found the response time of the application is short. Besides, it enables them to find required information quickly.
- The favourite functions in the advertising model are saving advertisements. This function could help them to conveniently view the advertisement again at any time.

- Testers also expressed that the user interface is friendly. It is easy for them to use because almost all functions could be invoked on the home page.
- These participants also said that the application is useful for them, but one problem is that too less available shops are engaged in the application. This causes advertisements and information are both limited. Another drawback of the project is about shop subscription function. They found that it is hard to use this function because a lot of people do not know how to subscribe a shop without instructions

In the interviews of managers that tried to use the application for small businesses:

- Managers of the three shops expressed that the application is easy to operate and all advertising functions are convenient to use.
- They also appreciated that the advertisement information is totally controlled by themselves and these data can be updated at any time. Besides, updated advertisements can be requested by consumers immediately without time latency.
- These testers said that the most important rule for them to use one kind of advertising is the stable and huge use base, the problem of the application is that it has not gathered enough users. So in this case, the effect of the location-based advertising function is also not obvious.
- In terms of the pricing standard, these managers expressed that charging by the CPC in the advertising model is acceptable. To some degree, it could save money for advertisers.

- One problem of the advertising method is that the advertisement's form is too simple and fixed. They want more flexible advertisement's form and better user interface.

In addition to the above conclusions, participants also supplied some valuable suggestions, these advice will be discussed in the future work.

5.5. Summary of evaluation

Through the series of evaluation processes, most objectives of the evaluation were implemented. Besides the acknowledgement of customer's needs and interests, the system performance and functionality were also validated. The attitudes of customers towards the prototype was also be identified as acceptable. In addition, some potential advantages of the advertising model were also found during the evaluation process.

The results of internal experiments indicated the integrity and correctness of the advertisement's content is high but the localization function is still need be improved.

Through the questionnaires and the interviews, we found that the real-time and location-based advertising model works well in the Soosokan project. It is easy to operate for users and the response time is also short. According to the feedback from customers, most of them like the functions of the prototype and would like to use this application. Managers of small businesses also helped us to verify that the charging standard is reasonable.

In conclusion, the evaluation successfully measured the prototype and validated the applicability of the advertising model. Last but also important, valuable feedback and suggestions were collected from the participants of the evaluation tests.

Chapter 6 Conclusion and future work

This chapter describes the main conclusions of this project and outlines further ideas that can be accomplished as future work.

6.1. Conclusions

This dissertation proposed a real-time and location-based advertising model which aims to help small businesses mitigate the problems they currently face with. Due to the uncertain market environment, the studies of the original business idea followed the lean start-up methodology.

A preliminary research on the current existing advertising models was carried out firstly in the state of art. During this period, the basic concept of location-based advertising was also introduced. The analysis and summary of the current advertising models helped to identify the problems and then put up a solution as a model. The introduction of the advertising prototype was described after the explanation of the development process of the idea. This dissertation also demonstrated the implementation of the model in the Soosokan application. In order to validate the feasibility of the model applied in Soosokan and explore how the users would react to this model, the three-

step evaluation was conducted.

Through these studies and the collected feedback from customers, the main benefit of the real-time and location-based advertising model in Soosokan application can be concluded as: For small businesses, the significant customers of Soosokan application, this model enables targeted advertising within a specific range. This function could help to improve the hit rate of consumers because it focus on specific areas. Besides, this advertising model is full of timeliness which could allow consumers to request the advertisements upon the advertisers published it, without latency. Moreover, this model is also easy to operate and the advertising function has a strong controllability. Compared to the current advertising models which may need to take a long time to modify or update a new advertisement even with the help of producers and developers, this application enables every advertiser to edit and publish the advertisement conveniently and quickly. It may also reduce the expenses for the design and production of the advertisement.

In addition, the system tests also validate the integrity and accuracy of the advertisements' information. Customers' attitudes proved the applicability of this real-time and location-based model to the Soosokan application. In fact, it integrates with other components of Soosokan application very well and then work together to improve the overall capability of Soosokan application.

However, there are still some problems need to be improved in the future development, such as improving the accuracy of localization, enhancing the shop subscription function or optimizing the application's user interfaces.

6.2. Future work

According to the evaluation results of this project as well as the feedback collected in from the questionnaires and interviews. There are four main tasks could (some of them need) to be implemented in the future.

6.2.1. Route guide and online payment

Firstly, the implementation of online payment should be made a priority as advertisers need to pay for advertisements by CPC after 3-month free trial. The policy of a three-month free trial is one part of the Soosokan marketing plan, which aims to attract more shop owners to try this product and be engaged in this system.

In terms of route guide, this idea comes from the suggestions supplied by participants during the interview. Some participants expressed that they could easily view the information about the advertisement which includes the address of the shop, but they feel difficult to locate the shop through the address. They may need to use some other tools such as Google map to find the place, and this costs them more time. So if the application contains the route guide function, it will be more convenient and attractive. In this case, adding the route guide function to the application is necessary for the future development.

6.2.2. Improving shop subscription function

The shop subscription function has been implemented in the application which employs the real-time and location-based advertising model. It enables consumers to subscribe

a shop and then view the details of product information in this shop through “subscriptions” page. However, some participants in the interviews (oriented to consumers) put up a new idea which is to add the subscribe button on the view page of advertisement. They think subscribing a shop through an advertisement is also a good choice for them. Based on this idea, we also plan to add some new contents in the subscription function, such as notifications of updates advertisements from subscribed shops.

6.2.3. Enlarge publish range for some businesses

During the interviews with small businesses, one retail shop’s manager offered comments on the feature of publishing advertisements within a specific range. He expressed that this advertising method is acceptable to him and his shop, but he wants to publish the advertisements in a wider range. Although his shop is not very big, he still wants to enlarge the market to let more people know his shop. In this condition, we plan to improve this advertising function by enlarging publish range for some small businesses which aim to expand their markets.

6.2.4. Enable DIY advertisement style

The last plan for the future development is to enable advertisers to design their own special advertisements. The form of advertisement is fixed in the current advertising model because this form makes it easy for advertisers to operate and edit advertisement, and to some extent, simple form also shortens the publishing time. However, competition in the advertising market is intensifying. Diverse and special

advertisements are becoming more important media for businesses to attract more consumers. Therefore, we should guarantee the needs of advertisers to enable them DIY their own advertisement. This means the application need support advertisers to design and publish their particular advertisements produced by themselves. At the same time, we need also remain the simple form for some advertisers who may not like to spend a lot of time designing and editing their advertisements.

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Appendix A-Abbreviations

Short Term	Expanded Term
CPM	Cost Per Thousand impressions; advertiser pays when a user sees an advertisement
CPC	Cost Per Click; advertiser pays when a user clicks on the advertisement
CPA	Cost Per Action; advertiser pays when a user completes a specific action
CTR	Click-through Rate; number of clicks on the ad divided by the number of delivered impressions of that ad
ROI	Return on investment
LBA	Location Based Advertising
LBS	Location Based Service
IDE	Integrated Development Environment
SDK	Software Development Kit
ADT	Android Development Tools
MVC	Model-View-Controller
REST	Representational State Transfer
HTTP	Hypertext Transfer Protocol
DIY	Do It Yourself

Appendix B: Questionnaire for Consumers

Would you like Soosokan?

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

1. Do you live in Dublin?

- ○ Yes
- ○ No

2. What is your gender?

- ○ Female
- ○ Male

3. Which category below includes your age?

- ○ 18-25
- ○ 26-35
- ○ 36-40
- ○ 51-65
- ○ 66 or older

4. What kinds of nearby shops are you interested in mostly? (Can choose more than one option)

- ☐ Shopping Center
- ☐ Pub or Bar
- ☐ Supermarket
- ☐ Restaurant
- ☐ Hotel
- ☐ Cinema
- ☐ Other (please specify)

5. What kinds of below information from a shop are you interested in? (multiple choice)

- ☐ Discount and promotion information
- ☐ Product's detailed information (includes price)
- ☐ Coupon
- ☐ New Product Introduction
- ☐ Other (please specify)

6. Which of the following advertisements do you usually browse in daily life? (Select all that apply)

- [ ] Advertisements on newspapers, magazines, posters and flyers
- [ ] Advertisements on TV, broadcast
- [ ] Advertisements on the web
- [ ] Advertisements on Social Media (e.g. Facebook, YouTube, Twitter)
- [ ] Advertisements in mobile application
- [ ] Other (please specify)

7. Please rank the following advertisements which you would like to browse in order of interest, #1 being the favourite. (You can only select the options that apply)

⠿ ▲▼	Advertisements on newspapers, magazines, posters and flyers
⠿ ▲▼	Advertisements on TV or broadcast
⠿ ▲▼	Advertisements on the web
⠿ ▲▼	Advertisements on social media (e.g. Facebook, YouTube, Twitter)
⠿ ▲▼	Advertisements in mobile application
⠿ ▲▼	Other

8. Would you like to receive information from nearby shops on your mobile application's home page? (Only update when you want to refresh and will not affect other functions of application)

- ○ Definitely
- ○ Maybe
- ○ Maybe not
- ○ Definitely not

9. The Soosokan application helps you to locate the available product which is close to you with supporting of detailed product information and shop subscription (All functions are optional).How likely are you be to download and use this application?

- ○ Extremely likely
- ○ Very likely
- ○ Moderately likely
- ○ Slightly likely
- ○ Not at all likely

10. Do you think the function to save advertisement (Users can save advertisements in order to browse it again) is a positive feature of Soosokan application?

Very negative				Very positive
○	○	○	○	○

11. Do you think the subscription function of Soosokan application (Users can subscribe the shops they like and then they are able to view the details of products sold in these shops) is a positive feature?

Very negative				Very positive
○	○	○	○	○

12. Do you have any other comments, questions, or suggestions?

 # Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised.

Appendix C: Questionnaire for small businesses

Investigation of small businesses

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

1. Please choose your shop's category:

- ◯ Shopping center
- ◯ Supermarket
- ◯ Restaurant
- ◯ Pub/Bar
- ◯ Retail
- ◯ Other (please specify)

2. In a typical month, how much do you usually spend on advertising?

- ◯ €0 to €15
- ◯ €16 to €30
- ◯ €31 to €40
- ◯ €41 to €55
- ◯ €56 to €65
- ◯ €66+

3. Roughly how many full-time employees currently work for your shop?

- ◯ 1-10
- ◯ 11-20
- ◯ 21-35
- ◯ 36-50
- ◯ 51-65
- ◯ 66-80
- ◯ 81-100
- ◯ 100+

4. Which of the following advertising methods do you usually use? (Please select all that apply.)

- [ ] Newspapers, magazines, flyers and posters
- [ ] TV, broadcast
- [ ] Web advertising
- [ ] Advertising on social media (e.g. Facebook, YouTube, Twitter)
- [ ] Advertisement in mobile application
- [ ] Other (please specify)

5. Please rank the following advertising methods on which you spend money in order of amount, #1 being the most. (You can only select the objects that apply)

⠿ ▲▼	Newspapers, magazines, flyers and posters
⠿ ▲▼	TV, broadcast
⠿ ▲▼	Web advertising
⠿ ▲▼	Advertising on social media (e.g. Facebook, YouTube, Twitter)
⠿ ▲▼	Advertising in mobile application
⠿ ▲▼	Other

6. How effective do you think your original advertising is? (Can it help you target more customers)

Very ineffective									Very effective
○	○	○	○	○	○	○	○	○	○

7. Is your original advertising expensive?

Very cheap									Very expensive
○	○	○	○	○	○	○	○	○	○

8. Which kind of following information do you want to advertise? (Select all that apply.)

- [ ] Discount or promotion
- [ ] Coupon
- [ ] Valuable product
- [ ] New product
- [ ] Other (please specify)

9. Soosokan helps sellers to popularize their shops and target more consumers with the support of location-based advertising, product management and information pushing service. How likely are you to use this application?

- ○ Extremely likely
- ○ Very likely
- ○ Moderately likely
- ○ Slightly likely
- ○ Not at all likely

10. Do you think location-based advertising (sellers choose the specific range to publish advertisements and then these information will be browsed by active users within the specific area) is a positive feature to target users?

Very negative				Very Positive
○	○	○	○	○

11. Do you think the shop subscription function (users can subscribe seller's shop and then they can browse all available advertisements of the shop on the subscription page) of Soosokan application is a positive feature?

Very negative				Very positive
○	○	○	○	○

12. Do you have any other comments, questions, or suggestions?

#Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised.

Appendix D: Interview proposals

Main questions were asked in the interview:

For Consumers:

1. How useful do you feel Soosokan's service is? Could it help you to find what you want to buy quickly and conveniently?
2. Which function of the Soosokan application do you like best? Why?
3. Which function of Soosokan do you think should be improved? Why?
4. Do you like the function of browsing the information from nearby shops? Which kind of information do you like best? Which kind of information you do not want to see? Why?
5. How likely are you to recommend Soosokan to others?
6. Do you have any other comments, suggestions for the Soosokan application?

For Managers of small businesses:

1. How likely are you to continue using this application after your 3-month free trial ends?
2. Which function of the Soosokan application do you like best? Why?
3. Which function of Soosokan do you think should be improved? Why?
4. How useful do you feel the Soosokan application is? Could it reach the requirement for your advertising plan?
5. How useful do you feel the function that advertising in specific geographic range is? Could it help you to improve advertising effectiveness? Could it help you to save advertising costs and increase revenue?
6. Do you have any other comments, suggestions or requests for the Soosokan application?