

A Design Framework for Mobile Social Commerce

By

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Thesis submitted to the

Faculty of Graduate and Postdoctoral Studies

in partial fulfilment of the degree requirements of

Master of Science in Systems Science



uOttawa

University of Ottawa

Ottawa, Ontario, Canada

April 2014

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Abstract

The use of mobile devices and social media has been increasing dramatically and becoming critical for B2C businesses. Such businesses need to consider implementing e-commerce services in the mobile environment with social integration to satisfy their customers' needs. Concepts like mobile commerce and social commerce are already being used extensively by many businesses. However, there are no clear guidelines in the literature on how to use mobile and social characteristics together for B2C e-commerce. Fusing these two concepts is what we call mobile social commerce (ms-commerce).

In this thesis, we performed a thorough literature review to identify the characteristics of ms-commerce. The findings enabled us to first devise a proper definition for ms-commerce as the concept of performing online commercial activities in a mobile environment with the help of contributions from customers. Second, elements of the building blocks of ms-commerce, namely business models, m-commerce and s-commerce were identified based on commonly accepted fundamentals of the related concepts. Each building block has a critical role in increasing the value and efficiency of the product/service being delivered online by B2C businesses.

We propose a mobile social commerce design framework along with a modular design model consisting of a generic class diagram that can be used for designing and developing ms-commerce applications that fit the specific needs of businesses. Businesses can choose the right elements to integrate in their ms-commerce application with the purpose of increasing the efficiency and integrating the social participation of customers. Three different scenarios were devised, and three mobile app prototypes were developed to support them, using the design model of our proposed framework.

Finally, in light of our experience in developing ms-commerce applications, we discussed and contrasted the three different mobile development strategies, namely native, hybrid and web-based.

Acknowledgements

It is a pleasure for me to thank all people who helped and encouraged me to write this thesis.

First of all, I would like to give my sincere gratitude to Dr. Morad Benyoucef for his wonderful and effective guidance and supervision throughout conducting this research. It was an outstanding experience and it wouldn't be possible without his support and experience.

I also would like to thank my friends and colleagues, Onur, Burcu, Zhengyang and Amir for their friendship, help and support. Special thanks to Justin, who was always there to support and understand me with patience, support and tolerance.

I am indebted to my parents, Ani Tais and Can; sisters, Miray and Selin; and Herman as I wouldn't be able to conduct my studies without their help for all these years. I thank them all for their full support and love.

This thesis is also a future reference to my beloved niece and nephew; Kayla and Ares for motivating them to be hard-working and self-disciplined individuals. I want them to know that they can accomplish anything they want as long as they never give up, and keep working hard for their dreams.

List of Acronyms

Acronym	Definition
API	Application Programming Interface
APNS	Apple Push Notification Service
B2B	Business-to-Business
B2C	Business-to-Customer
C2C	Customer-to-Customer
CSS	Cascading Style Sheet
CCP	Credit Card Provider
DSL	Digital Subscriber Line
DSRM	Design Science Research Methodology
GCM	Google Cloud Messaging
GPS	Global Positioning System
HTML	Hypertext Markup Language
IDE	Integrated Development Environment
IP	Internet Protocol
LBS	Location-based Services
OS	Operating System
QR	Quick Response
SDK	Software Development Kit
SMO	Social Media Optimization
SMP	Social Media Platform
SMS	Short Message Service
UI	User Interface
UML	Unified Modeling Language
URL	Uniform Resource Locator
UX	User Experience
WLAN	Wireless Local Area Network
WOM	Word-of-Mouth

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Chapter 1. Introduction

The usage of mobile devices, known as “*devices that can be carried and used anywhere at any time* (Constantinos Coursaris, 2002)”, has increased by 60.3% in developing countries in the last two years as their capabilities enable them to perform most daily activities of users (Bullas, 2013). For instance, today’s smartphones and tablets allow users to perform commercial transactions and engage in social interactions through mobile applications and web browsers. Users purchase products through personal accounts created on online platforms, and share ideas, ratings, reviews and personal experiences regarding the purchased product as well as the purchasing process. This way, users leverage each other’s feedback instead of relying solely on information provided by merchants.

As the use of mobile devices increases, the contribution of individual users to mobile content and services also increases due to the enabling Web 2.0 and mobile operating system (OS) capabilities. Especially, social networks and social media platforms are starting to integrate their services to those mobile devices in order to keep, and hopefully increase, user traffic. Considering the willingness of most users to join social media platforms for seeking information from varied and decentralized sources, and sharing their own information with their peers, social media platforms are becoming critical for organizations. Businesses are interested in analyzing user behavior and feedback about their products and services in order to build better strategies. Hence it is not surprising to find social media platforms (SMP) like Facebook, Google Plus, and Twitter as the main players of the web today (Bullas, 2013). The use of SMPs by individuals has been dramatically increasing as it enables users to follow each other and access information easily and very fast (Bullas, 2013; Richmond, 2011).

Considering the remarkable improvements in the technical and functional capabilities of mobile devices, the continuous increase in user generated content, and the widespread adoption of online commercial processes, we argue that a design framework for *Mobile Social Commerce (m-commerce)* is necessary from an academic as well as a practitioner’s perspective. It is predicted that businesses that already have an e-commerce strategy will need to start considering the factors of mobile device usage and the social contributions of their customers in order to satisfy

their customers' needs and increase their level of loyalty and trust, which are extremely important for online commercial activities (Büyüközkan, 2009; Li & Yeh, 2010; Lin & Wang, 2006; Siau & Shen, 2003). The same prediction applies to mobile commerce companies, as they will have to consider the effect of social media, especially in the decision making process of their mobile customers. The proposed ms-commerce design framework will enable those companies to follow common and reliable guidelines for implementing mobile and social features on top of their existing e-commerce services with the purpose of increasing consumer traffic and consumption of products and services.

Hence the objective of this thesis is to propose a design framework that aims to enhance existing e-commerce business models with characteristics of mobile commerce (m-commerce) and social commerce (s-commerce). To that end, a review of all related concepts and a formal definition of ms-commerce will be provided. A thorough literature review will be conducted to identify the e-commerce business models being used nowadays, and the characteristics of m-commerce and s-commerce susceptible to enhance these business models. Realistic scenarios of ms-commerce applications will be used to show the process flow between the mobile customer, the actual system and the social media platform(s). We will use an easy to understand (and to develop) UML notation for representing the resulting ms-commerce applications. Moreover, prototypes of the applications will be developed and tested.

1.1. Major Underlying Concepts

Mobile Social Commerce, or 'ms-commerce', is a brand new concept that has emerged as a result of the development of the Internet, Web 2.0 and mobile technologies over the years. It is an umbrella term which carries the characteristics of Mobile Commerce (m-commerce) and Social Commerce (s-commerce) at the same time and with the unique opportunities that can enable businesses to make more profit by providing new business value through the combination of these two concepts. The two concepts are derived from e-commerce, which refers to "*buying and selling of products and services over the Web* (Maamar, 2003; Tiwari, Buse, & Herstatt, 2006)".

Mobile commerce characteristics represent the concepts, elements and properties that are critical for the delivery of mobile services. Some of these characteristics, like *Mobility* and

Ubiquity, are formed by the mobile industry value chain players, while others like *Personalization*, *Localization* and *Interactivity* mostly depend on the service, developer or context.

Social commerce solutions consist of the toolsets and technologies that enable customers to participate to the content generation and distribution regarding the products and services that the company provides, in addition to the actual task of buying/selling products and services online (Dennison, Bourdage-Braun, & Chetuparambil, 2009; Marsden, 2010).

Business models represent “*the way of doing business* (Ballon, 2009)”. These models depend on the structure of the company, the industry within which the company’s business tasks are performed, the customers, and the characteristics of the service delivered to these customers. In this thesis, e-commerce business models will be our starting point and focus, since they provide us with robust background knowledge on how businesses perform their core activities throughout the online environment in order to deliver their product or service to customers.

Formally, a **framework** can be very “*helpful in organizing a complex subject, identifying the relationships between the parts, and revealing the areas in which further developments will be required* (Watson, Rainer, & Koh, 1991)”. Especially in academic and professional fields within the area of Information Systems, a well-developed design framework can guide practitioners to build the system and enable academics to identify the research areas that need to be pursued. This kind of framework can be used as a guideline to enable businesses and individuals to apply and integrate a concept with the help of the content-related tools and techniques defined for that particular concept in order to solve generic and well-known issues. According to Zhang and Benjamin (2007), a framework should be robust and hold for a long period of time to serve as a guide for practitioners and academics to understand the past and present by showing the potentially appropriate ways for future development of a specific system.

Mobile application development refers to the design and development of mobile services that aim to deliver the related content to customers. It can either be *native*, *hybrid* or *web-based* development depending on the choice of the developer and the business strategy (Christ, 2011).

Prototyping, which “*exhibits the essential features of a later type* (Naumann & Jenkins, 1982)”, is used in this thesis to demonstrate the validity of the proposed design framework by building proof-of-concept prototypes of ms-commerce applications.

1.2. Research Questions

Since the concept of Mobile Social Commerce is new, one important issue is the lack of a formal definition of this concept, even though there are various definitions in the literature for Mobile Commerce (Lin & Wang, 2006) and Social Commerce (Huang & Benyoucef, 2013) that can be combined towards an initial understanding of Mobile Social Commerce. Although terminologies like “Mobile Social Networking (Atzmueller, 2014)” and “Mobile Social Media (Kaplan, 2012)” partially cover the combined characteristics of m-commerce and s-commerce concepts, they do not give a direct and clear definition of the commercial part of the activities. While organizations are able to find the required tools and processes for designing and implementing mobile commerce (m-commerce) or social commerce (s-commerce) separately, there are no guidelines for designing and implementing both concepts at the same time. Hence the main goal of this thesis is centered on providing *a framework for designing and implementing Mobile Social Commerce*. A throughout justification for such framework will also be provided. Furthermore, and in light of our design and development process, we will review and discuss the various mobile development options (native, hybrid and web-based) available for developing ms-commerce applications. Also, the two major mobile operating systems, iOS and Android, will be discussed in the context of our proposed framework.

The objectives stated above can be achieved by finding answers to the following questions:

- What are the major components that constitute the Mobile Social Commerce Design Framework?
- Which development options/strategy (native, hybrid, web-based) is better suited for delivering the required ms-commerce services?

1.3. Research Motivation

Since the beginning of 2000's, the rate of online commercial transactions has been increasing thanks to e-commerce and Web 2.0 technologies. Between the years 2002 and 2008, retail e-commerce grew at more than 25% every year (Laudon & Traver, 2014). By the period of 2013 - 2014, retail e-commerce in the US and other areas like Europe and Asia continues to grow by over 15%. Considering the rates of growth during the last decade, it is estimated that by 2017, consumers will prefer to use online commercial mediums to buy and sell products and services and spend about \$637 billion, while businesses will invest \$6.6 trillion in online transactions.

Since e-commerce continues to enable businesses to deliver their products and services to existing and potential customers, online businesses have been reshaping their business models to optimally benefit from the capabilities of Web 2.0 tools and technologies. Small businesses are particularly proactive in entering the e-commerce era since enabling Web 2.0 tools and technologies are easily accessible these days. These businesses can easily use the infrastructure of key industry players like Apple, Amazon, Google, eBay and Facebook to deliver their products, content and services to customers.

Consumers can buy (and sell) products and services through personal accounts created on the online commercial platforms they use. In addition, they can share ideas, feedbacks, ratings, reviews and personal experiences about the purchased items and the purchasing process so that others within their social network can access this information to form an opinion before, during and after the commercial transaction (Goodwin, 2013). This way, consumers leverage each other's information instead of relying on product information provided by merchants.

The usage of mobile devices, which are generally defined as "devices that can be carried and used anywhere at any time by the user", such as PDAs, laptops, tablets and smartphones (Constantinos Coursaris, 2002), has increased as the capabilities of those devices raised to a level where their functionality enabled them to perform most daily activities of users. Mobile devices, more specifically smartphones became important devices for users, enabling them to perform business tasks, have social interactions on social media platforms and commercial transactions through mobile applications and web browsers. The number of smartphones in developing countries, for instance, increased by 60.3% to 818.4 million in the last two years (Bullas, 2013).

Today, there are more than 1.5 million mobile applications (apps) in Apple's and Google's app stores many of them for online commercial transactions as well as marketing and advertising. Since mobile device users are increasing over time, companies that provide social media platforms are starting to integrate their services to those mobile devices through interactive apps in order to keep and increase user traffic on their platforms. Considering that users are willing to join social media platforms in order to get the information they need from various and decentralized resources and share the information they have with others, those social media platforms become strategically important to organizations. Organizations are interested in analyzing user behaviour, feedback and ratings about their products and services in order to build better strategies and generate more profits. With the help of Web 2.0 technologies and innovative ideas, as well as users' engagement in online social interactions and transactions, major social media platforms such as Facebook, Google Plus and Twitter became major actors on the Web (Bullas, 2013).

Facebook's monthly active users have increased by 23% from 901 Million in March 2012 to 1.11 Billion in March 2013. With respect to that increase, the number of mobile users that are monthly active on Facebook has increased from 488 Million to 751 million by March 2013, which represents a 54% increase in the last year. As the second largest social network, Google Plus has 359 million monthly active users, and it grew by 33% from June 2012 to March 2013. Similarly, Twitter has 288 million monthly active users (Bullas, 2013), and 21% of Internet users logon to Twitter at least once a month. Just like Facebook, Twitter had a huge growth (44%) from June 2013 to March 2013. Finally, e-commerce sales via mobile devices are expected to increase to \$119 billion in 2015, up from \$1.2 million in 2009 (Richmond, 2011).

It is predicted that businesses that already have s-commerce strategies will need to start considering the factor of mobile device usage in order to satisfy their customer needs and keep the level of customer loyalty and trust high, which are extremely important factors for the success of online commercial activities (Büyükoçkan, 2009; Li & Yeh, 2010; Lin & Wang, 2006; Siau & Shen, 2003). The same applies to businesses that already have m-commerce solutions, as they will have to consider the effect of social media especially in the decision making process of mobile customers. The mobile social commerce design framework we seek to devise will allow those companies to follow common and reliable guidelines for implementing

the mobile and social concepts of e-commerce technologies and integrate them with to their business processes.

1.4. Research Objectives

The concept of Mobile Social Commerce originates from the meeting of two e-commerce concepts, namely m-commerce and s-commerce. The definition of those concepts will be reviewed and analyzed from the literature (academic and industrial). Both areas have been investigated individually; however, there is almost no academic work that covers both of them combined. From an organizational perspective, applying and implementing ms-commerce concepts will most certainly give companies the opportunity to increase the value of their products and services. In other words, ms-commerce will provide more valuable products and services to differentiate companies from their competition and increase the level of trust and loyalty of their potential and existing customers. Thus, the elements of ms-commerce will be investigated from the literature. These elements will be classified with existing e-commerce business models, mobile technologies and capabilities, and social contribution tools. With the help of this classification, a common design framework will be structured to enable businesses to build ms-commerce services for their customers. *The main objective of this research is therefore to propose a design framework for businesses to achieve the required standards and activities of ms-commerce services.*

The implementation of ms-commerce services based on our proposed design framework will enable us to identify the differences between popular mobile operating systems depending on different development strategies, namely native, hybrid and web-based. For the development of our ms-commerce prototypes, we opted for Apple iOS and Google Android platforms as they are the top two mobile operating systems with the majority of the market share: 79.3% (Android) and 13.2% (Apple) among 6 different systems (Llamas, Reith, & Shirer, 2013). *Hence, the second objective of this thesis is to provide a brief discussion of development and implementation differences between iOS and Android depending on the adopted development strategy (native, hybrid or web-based).*

1.5. Research Contribution

The expected outcome of this research depends on the results of the research objectives mentioned in the previous section.

Apart from the similar -but not same- definitions like “Mobile Social Networking (Atzmueller, 2014)” and “Mobile Social Media (Kaplan, 2012)”, our definition of the ms-commerce concept covers a variety of other areas from e-commerce business models to the recent technologies of mobile devices and operating systems as well as commonly used social toolsets which are based on the capabilities of Web 2.0 technologies.

The main contribution of this thesis is assumed to be a design framework for organizations to implement ms-commerce in increase the efficiency of their services by optimizing the use of mobile technology and social contribution during online commercial activities. The components of the framework will refer to recent technologies, toolsets, and features for implementing ms-commerce and for making non-technical decisions about implementing ms-commerce as a part of a long term multichannel strategy.

Another contribution will be a comparison of the three development strategies, namely *native development* and *hybrid development* which enable developers to design cross-platform applications, and *web-based development* for creating ms-commerce applications. Different development strategies provide different kinds of efficiency for developers and customers. For developers which are B2C businesses, the development process differs depending on the development environment used. Businesses may prefer to develop native mobile applications individually for every mobile operating system to get the best performance and quality. Hybrid development enables them to develop generic services that can be suitable for most commonly used operating systems. But the limitations are a concern since this strategy does not cover all native functionalities of mobile devices although this strategy is cheaper. Web-based development may be even cheaper, but the technical limitations of the services will be huge in addition to the issues of compatibility with the operating system. These three development strategies mostly affect end-users who will be interacting with the mobile apps. The sense and feeling of using a mobile app is highly critical for customers in terms of providing trust and loyalty (Marsden, 2010; Turban, King, Lee, Liang, & Turban, 2012). Even the selection of user

interface (UI) elements like buttons and text fields can affect customers' credibility towards the service. With the investigation of these development strategies, businesses will be able to identify which one is the most suitable strategy for their ms-commerce services.

1.6. Research Methodology

1.6.1. Definition of Design Science Research

The term *methodology* can be defined as “*a system of principles, practices, and procedures applied to a specific branch of knowledge* (Peppers et al. 2007)”. An appropriate methodology can enable researchers to conduct a successful research with respect to fulfilling the requirements of a particular group of tasks and activities.

Throughout this research, e-commerce business models, m-commerce characteristics and s-commerce solutions are investigated to derive the layers of the ms-commerce design framework. One of the methodologies that is appropriate for this research is called *Design Science Research Methodology*, or DSRM (Peppers et al. 2007; Hevner et al. 2004; March and Smith 1995), which is commonly used for performing research in the field of Information Systems.

March and Smith (1995) identify the characteristics of the *Design Science* concept by comparing it to *Natural Science*. It is stated that Natural Science tries to understand the reality whereas Design Science creates things that serve human purposes by providing technology oriented solutions. Peppers et al. (2007) claim that Design Science “creates and evaluates IT artifacts intended to solve identified organizational problems”. These artifacts include *constructs* (or concepts) that form a vocabulary of a domain, *models* that represent the set of propositions or statements expressing relationships among constructs, *methods* that are actually the set of steps used to perform a particular task, and *instantiations* that enable the realization of artifacts in their own environment to demonstrate the feasibility and effectiveness of the models and methods they contain (March and Smith 1995).

In order to assist researchers and readers, Hevner et al. (2004) prepared 7 guidelines to help in understanding the needs of a robust and efficient design-science research. The first guideline is called *Design as an Artifact* which is focused on creating a purposeful artifact depending on a particular problem domain. The second guideline is *Problem Relevance*. The third guideline,

called *Design Evaluation*, is focused on evaluating the artifact created in previous steps. The fourth guideline, called *Research Contributions*, is designed to state the novelty and innovativeness of the artifact with respect to the field’s needs. The fifth guideline, *Research Rigor*, makes sure that the definition, representation and consistency of the artifact is supported with proper arguments. The sixth guideline, defined as *Design as a Search Process*, is an iterative process which consists of creating the artifact and finding the required resources to utilize it. The last guideline, *Communication of Research* is aimed to provide the required communication between the researchers and the technical and managerial audience. The seven design-science research guidelines defined by Hevner et al. (2004) are summarized in Table 1.

Guideline	Description
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Table 1: Seven Design Science Research Guidelines (Hevner et al. 2004)

It is also mentioned that even though it does not have to be the exact same meaning of content, the research being conducted must satisfy the requirements of these seven guidelines in order to be categorized as a design-science research.

1.6.2. Design Science Research Methodology Process

In their research, Peffers et al. (2007) proposed a *Design Science Research Methodology (DSRM) Process Model* to enable researchers to conduct their research with respect to a commonly understood framework instead of an ad hoc basis. The model consists of 6 steps following each other as presented in Figure 1. The first step, *Identify Problem & Motivate* represents the definition of the problem domain and the potential effect of the referred solution

with respect to the state of art at that current moment. The second step, *Define Objectives of a Solution*, refers to identifying the potential results of applying the solution to the specific problem. The third step, *Design & Development* is about the actual design and development of the artifact, or in other words, the appropriate solution to the referred problem. The fourth step is identified as *Demonstration* to measure the effect/efficacy of using the developed artifact to solve the problem within one or more demonstrating examples. These examples may include a relative experimentation, computer simulation or case studies that enable readers to see how the artifact with its resulting effects is being used to solve the problem.

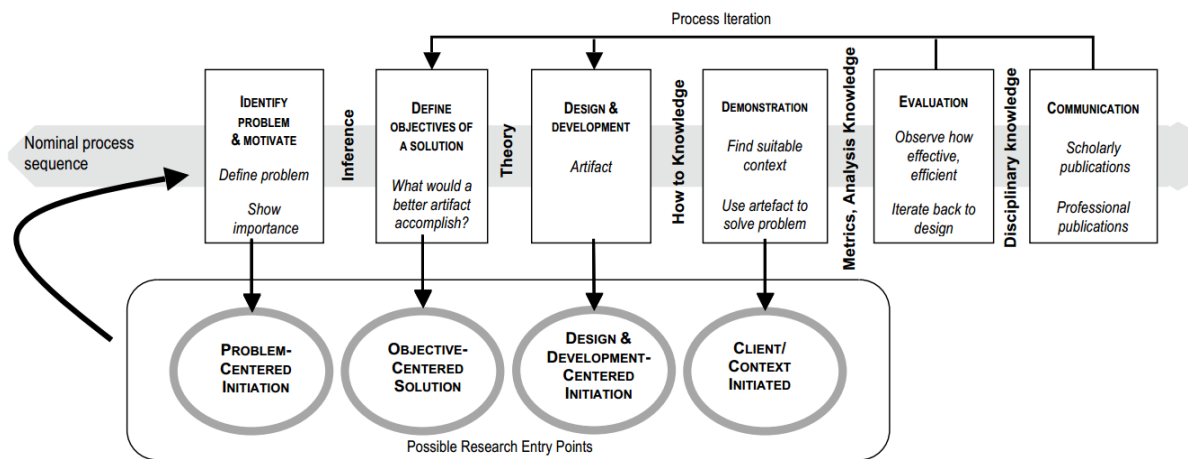


Figure 1: Design Science Research Methodology (DSRM) Process Model (Peffer et al. 2007)

Even though they are represented as sequential, it is mentioned that researchers can start from any step until the Demonstration step, depending on the purpose and content of their research. If the research is problem-centered like the one described in this thesis, the first step is the most appropriate one to start with when using the design-science research methodology. *Evaluation*, which is the fifth step, enables researchers to measure the efficiency of the result of using the artifact to solve the problem by comparing the desired results to the actual results. The last activity refers to the *Communication*, to enable researchers and other stakeholders to reach an understanding of the artifact, consequences of its use and the change in the environment after the application of the artifact to the specific problem.

Throughout this research we used the steps of the design-science research methodology process model as described below.

1. **Problem Identification and Motivation:** The main problem, which is the need of a design framework for mobile social commerce, is defined based on the literature review and observations of real world cases. Relevant research problems are specifically identified as well as the arguments for the motivation to find the appropriate answers. The lack of a definition for the term mobile social commerce (ms-commerce) is the source of the first research problem. The noticeable increase in mobile device usage and the contribution of users to content generation through online social toolsets constitutes the main motivation for identifying a proper definition for ms-commerce. The non-existence of specific guidelines for businesses to build appropriate ms-commerce services to meet their customers' expectations also motivated us to propose a design framework.
2. **Define objectives of a solution:** We provide an explanation of how the new artifacts, which are the components or *layers* of ms-commerce, within the framework are expected to provide a solution to the problem, along with the possible positive post-procedural effects of using the framework. The main objective of using these artifacts is to increase the value of B2C mobile services depending on the characteristics of the business as determined by its underlying e-commerce business model; the needs of customers and their contributions and feedback; and available features of mobile technologies such as mobile device features and mobile operating systems capabilities.
3. **Design and Development:** The framework is designed with respect to current literature, available development tools for mobile solutions and the integration of user participation to increase social interactivity. For every defined business model, mobile features and social toolsets are used to bring different solutions and contributions to businesses for satisfying customer needs and increasing the efficiency of existing services.
4. **Demonstration:** Prototyping activities are performed with the help of predefined scenarios, UML diagrams and using a hybrid application development strategy. These prototypes represent various characteristics and features of each (business models, mobile and social) layer in the framework that can be used in different scenarios.
5. **Evaluation:** The observation and investigation of how the created prototypes support the utility of the design framework is performed. In their research, Hevner et al. (2004) proposed five different methods of evaluation for design science research (see Table 2).

Method	Components	Description
Observational	Case Study	Study artifact in depth in business environment
	Field Study	Monitor use of artifact in multiple projects
Analytical	Static Analysis	Examine structure of artifact for static qualities (e.g., complexity)
	Architecture Analysis	Study fit of artifact into technical IS architecture
	Optimization	Demonstrate inherent optimal properties of artifact or provide optimality bounds on artifact behaviour
Experimental	Dynamic Analysis	Study artifact in use for dynamic qualities (e.g., performance)
	Controlled Experiment	Study artifact in controlled environment for qualities (e.g. usability)
Testing	Simulation	Execute artifact with artificial data
	Functional (Black Box) Testing	Execute the artifact interfaces to discover failures and identify defects
Descriptive	Structural (White Box) Testing	Perform coverage testing of some metric (e.g., execution paths) in the artifact implementation
	Informed Argument	Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artifacts utility
	Scenarios	Construct detailed scenarios around the artifact to demonstrate its utility

Table 2: Methods of Evaluation (Hevner et al. 2004)

The *Descriptive* method, represented as the last element in Table 2, is used in this thesis to evaluate the performance of our proposed design framework. Depending on the literature-based constructs (layers); e-commerce business needs, mobile characteristics and social toolsets, detailed scenarios are used to demonstrate how the framework helps businesses to achieve their specific ms-commerce business goals.

6. **Communication:** The results of the research are planned to be shared with peers through conference and journal publications.

In Figure 2, we represent our usage of the Design Science Research Methodology Process Model.

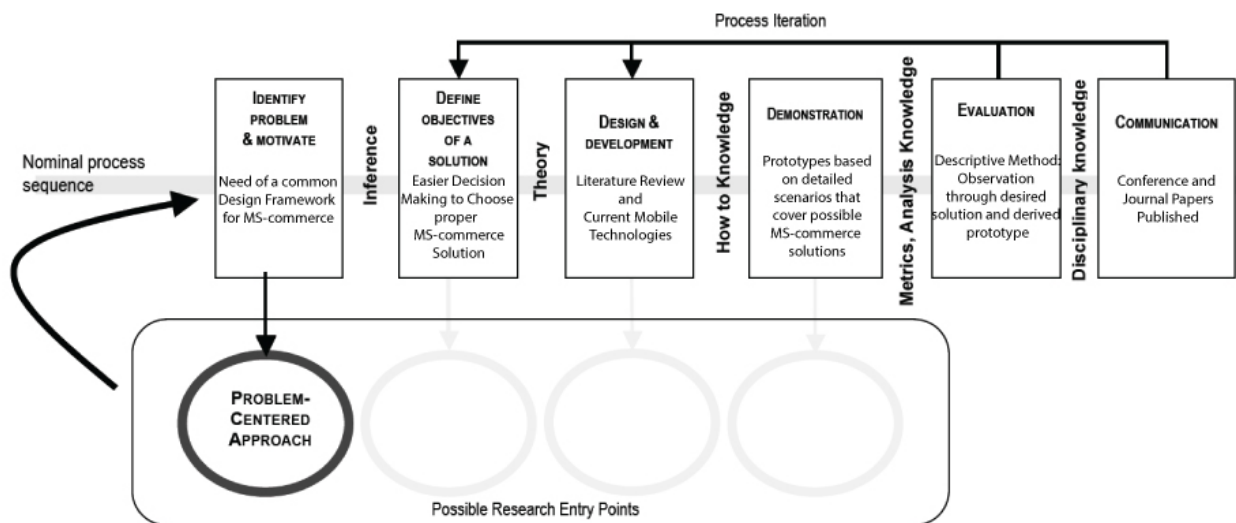


Figure 2: DSRM Process Model with Adopted Problem-Centered Approach (Peppers et al. 2007)

1.7. The Organization of Thesis

The organization of the thesis is as follows. The second chapter details the literature review of related concepts such as e-commerce, m-commerce, s-commerce and business models. The third chapter introduces the building blocks (layers) of ms-commerce. The fourth chapter introduces the design framework for ms-commerce. The fifth chapter presents three scenarios to validate the proposed design framework and describes prototypes of ms-commerce applications built based on those scenarios. A discussion of mobile development strategies is also included in this chapter. The last chapter provides a summary of this research including contributions and validation. Limitations and future work to enhance this research are also mentioned in this chapter.

Chapter 2. Literature Review

2.1. From E-commerce to Mobile Social Commerce

2.1.1. Electronic Commerce (e-commerce)

The term commerce is described as “*buying and selling of goods and services* (Frolick & Chen, 2004)”. Especially in the last ten years, commercial activities that are performed online have become highly efficient and effective for companies and customers. Following their definition of commerce, Frolick and Chen (2004) defined e-commerce as “*selling goods and services on the Internet*”. R. Tiwari, Buse, and Herstatt (2006) gave a similar definition for e-commerce as “*buying and selling of products and services over the Web*”, specifically mentioning ‘buying’ in addition to ‘selling’. Opong, Yen, and Merhout (2005) explain the concept of e-commerce in a more detailed way; as it “*includes activities such as electronic exchange, delivery, and/or transaction of information, goods, services, and payments over telecommunications networks, primarily the web*”. Moreover, the authors state that e-commerce activities also include establishing and maintaining online relationships between organizations and their suppliers, dealers/vendors, customers/users, strategic partners, regulators, and other agents related to or who support marketing, delivery, and distribution.

R. Tiwari, Buse, and Herstatt (2006) categorized e-commerce definitions within two major categories. The first one represents the definitions that are constrained with the monetary value of transactions. As an example, according to the definition of the German Federal Statistics Office, “*Transactions are regarded as e-commerce, when the offer as well as purchase or the actual availment of a product or service is carried out in electronic form, using a computer-mediated network against monetary payment*”. Kaynak, Tatoglu, and Kula (2005) also define e-commerce as “*any economic transaction where the buyer and seller come together through the electronic media of the Internet, form a contractual agreement concerning the pricing and delivery of particular goods and services, and complete the transaction through the delivery of payments and goods or services as contracted*”. However, these definitions are interpreted as too restrictive since they do not cover activities that may be performed before and after the commercial transaction that don’t have any monetary value for companies and/or customers. The second category of definitions does include non-monetary activities. For example, Mesenbourg (2001) defines e-commerce as “*any transaction completed over a computer-mediated network*”.

that involves the transfer of ownership or rights to use goods or services. Completed transactions may have a zero price (e.g., a free software download)". In other words, the e-commerce concept also covers transactions without monetary value as long as the service/product is being provided to customers. Furthermore, Varadarajan and Yadav (2002) define e-commerce as *"a networked information system that serves as an enabling infrastructure for buyers and sellers to exchange information, transact, and perform other activities related to the transaction before, during, and after the transaction"*. Finally, Maamar (2003) define e-commerce as *"a general term for any type of business, or commercial transaction that involves the transfer of information across the Internet"*, while (Zott, Amit, & Massa, 2011) state that it *"describes new gestalts and Internet-based ways of doing business"*.

Although some people see the *E-business* concept and the *E-commerce* concept as the same thing; we argue that these two concepts are different from each other. E-commerce, by its nature, includes digitally enabled commercial transactions between and among organizations as well as individuals. There is a tangible exchange of value -mostly monetary- across the involved parties in return for products or services. E-business, however, which is defined as *"business conducted over the Internet (Amit & Zott, 2001)"*, represents the business and operational transactions and processes that are performed through the digital medium. E-business helps organizations to optimize the flow of information between the departments as well as increase the accuracy, quality and efficiency of the internal business processes and the digital communication efficiency between companies. Even though the e-business components within an organization may constitute the required infrastructure for potential e-commerce activities, it aims to increase the efficiency and quality of the business rather than selling/buying products and services.

There are various types of e-commerce, the most common ones being B2B, B2C, and C2C. (Fang, 2002), states that *"e-commerce allows businesses to transact with each other more efficiently (B2B) and brings customers closer to businesses (B2C)"*. Oppong, Yen, and Merhout (2005) mention the customer-to-customer (C2C) type for online commercial transactions between individuals. However, Kaynak, Tatoglu, and Kula (2005) talk of three major e-commerce types. The first one is *"the linking of a firm to its forward and backward channel allies (e.g., retailers, distributors and suppliers), that is, [e-commerce] between firms (B2B)"*, whereas the second type is *"the commercial activities between firms and final customers (B2C)"*.

The third type of e-commerce represents “*the management within the enterprise, which focuses on supporting corporate activities and the integration of departmental activities*”. Finally, Laudon and Traver (2014) suggest six types of e-commerce including B2B, B2C, C2C, social e-commerce, mobile e-commerce and local e-commerce with respect to the recent technologies used by businesses and individuals.

The three major types of the e-commerce are briefly discussed below.

- *Business-to-Business (B2B) E-commerce*, considered as the largest form of e-commerce (Laudon & Traver, 2014), focuses on the online commercial activities between businesses without the involvement of individual buyers and sellers. Only in the United States, the growth of this type of e-commerce has reached \$5 trillion by the year 2014 and it is expected to increase to \$7 billion in 2017.
- *Business-to-Customer (B2C) E-commerce*, which is the most common and widely discussed type of e-commerce, represents the online commercial transactions between businesses and individual consumers. It includes purchases of goods, services and other kinds of content that can be provided online for consumers. Although the revenue of B2C (\$419 billion by the year 2014) is not even close to that of B2B, it is still the type of e-commerce that consumers are likely to encounter.
- *Customer-to-Customer (C2C) E-commerce* provides a medium for individual consumers to sell or purchase products from each other. The medium here is generally an online market maker/creator that provides a platform over the Internet with the help of Web 2.0 technologies, such as eBay¹ and Craigslist². It is assumed that the size of the C2C global market was over \$90 billion by the year 2013 (Laudon & Traver, 2014).

In our research, we focus on the B2C e-commerce type as we intend to let existing and potential customers be socially involved in content generation and distribution through online commercial services offered by businesses in a mobile environment. It should also be stated that, in our research, e-commerce transactions include the non-monetary dimension (Maamar, 2003; Mesenbourg, 2001; R. Tiwari et al., 2006; Varadarajan & Yadav, 2002; Zott et al., 2011).

¹ <http://www.ebay.com/>

² <http://www.craigslist.org/>

2.1.2. Mobile Commerce (m-commerce)

Benou, Vassilakis, and Vrechopoulos (2012) define Mobile Commerce or *m-commerce* as “any activity related to a commercial transaction and is conducted via wireless and mobile devices as user interface”, where the term ‘user interface’ is used to represent the functional layer between the user and the commercial transaction instead of a particular user interface of a mobile application. A simpler definition by Zhang, Yuan, and Archer (2002) states that m-commerce is “about content delivery (notification and reporting) and transactions (purchasing and data entry) on mobile devices”.

When trying to define m-commerce, Lin and Wang (2006) considered the relationship between e-commerce and m-commerce, and categorized m-commerce as a subset of e-commerce; “new types of e-commerce transactions, conducted through mobile devices (e.g., cellular phones, handheld or palm-sized computers, and even vehicle mounted interfaces), using wireless telecommunication networks and other wired e-commerce technologies, are termed mobile commerce (*m-commerce*)”. Within a similar perspective, Barnes (2007) and Ngai and Gunasekaran (2007) define m-commerce as “the ability to conduct financial transactions through wireless Internet-enabled devices”. In addition, Kim, Chan, and Gupta (2007) characterized m-commerce as “basically any e-commerce done in a wireless environment, especially via the Internet”. Zhang, Yuan, and Archer (2002) also supported this definition stating that “*m-commerce* is the continuation of e-commerce with the palm handheld, wireless laptops and a new generation of Web-enabled digital phones already on the market”.

Even though the boundaries of ‘commercial transactions’ are discussed in the literature in terms of whether or not to include non-financial transactions, (Frolick & Chen, 2004) uses the term m-commerce only for financial transactions that involve users and/or businesses. According to Frolick and Chen (2004), the difference between *m-commerce* and *mobile information* should be clear for organizations in order to identify the boundaries of their m-commerce services. The term *mobile information* is used for the information that is provided by an organization to its customers or employees through wireless data communication. The intent of such mobile information service between two sides does not have to include any commercial purpose.

R. G. Tiwari et al. (2011) also define m-commerce as “*any transaction with monetary value that is conducted over a wireless telecommunication network*”. Similarly, Clarke (2001) defines m-commerce as “*the ability to purchase goods anywhere through a wireless Internet-enabled device. Mobile commerce refers to any transaction with monetary value that is conducted via a mobile network. It will allow users to purchase products over the Internet without the use of a PC*”.

As m-commerce is considered a subset of e-commerce (Siau & Shen, 2003), some authors have stated the difference between the two concepts within their definition of m-commerce. (Coursaris & Hassanein, 2002) and Frolick and Chen (2004) define m-commerce as “*a natural extension of e-commerce as they share fundamental business principles, but m-commerce acts as another channel through which value can be added*”, whereas Kurkovsky, Zanev, and Kurkovsky (2005) claim that “*m-commerce is a special branch of e-commerce, in which mobile devices and their network connection medium are used to buy, sell and promote products, services and information*”. R. Tiwari, Buse, and Herstatt (2006) also claim that m-commerce “*opens new business opportunities by enabling innovative, location-based services (LBS) that the ‘immobile’ Internet cannot offer*”. Ayob, Hussin, and Dahlan (2009) interpret m-commerce as the “*next generation e-commerce*” as it enables users to access the Internet without needing to find a place to plug in. Maamar (2003) supports this view by stating that e-commerce is about “*being able to buy and sell goods/services over mobile devices*”. In addition to those definitions and interpretations, J. J. Zhang, Yuan, and Archer (2002) state that “*m-commerce is not simply a new distribution channel, a mobile Internet or a substitute for PC’s. Rather, it is a new aspect of consumerism and a much more powerful way to communicate with customers*”.

Delivering online content and services through m-commerce is more complex than it is through e-commerce, due to the characteristics of the mobile services infrastructure (Tsalgatidou & Pitoura, 2001). To understand the dynamics of m-commerce, the mobile services infrastructure must be analyzed with regards to the key players in the mobile industry value chain. These key players provide the hardware and software components for the whole mobile industry. For example, *device manufacturers* provide mobile devices like smartphones and tablets, while *equipment vendors (or suppliers)* provide useful and innovative physical mobile network infrastructure like base stations, routers, switches, and additional hardware that can increase the

efficiency of mobile devices Camponovo and Pigneur (2003) and J. J. Zhang, Yuan, and Archer (2002). Some device manufacturers, like Apple, are also *application providers* as they support their devices with the related mobile operating systems (OS) and mobile applications (apps) (Camponovo & Pigneur, 2003; J. J. Zhang et al., 2002). *Mobile network operators* or *network operators* enable mobile end-users and other actors in the industry value chain to access their networks and the Internet by constructing and maintaining the infrastructure (Camponovo & Pigneur, 2003; J. J. Zhang et al., 2002). Similarly, *Internet service providers (ISP)* provide access to the Internet with a purpose similar to mobile network operators and *WAP Gateway providers*. Furthermore according to Camponovo and Pigneur (2003), players like *regulation authorities* define the legal framework for all the players in the mobile industry to create the competitive environment with the purpose of satisfying the needs of every entity, while *consumer groups* represent the customers who use the final mobile service. *Payment agents* provide various methods of payment to end-users allowing them to have monetary transactions through their mobile devices. *Billing facilitators* which are defined as banks and credit card companies by J. J. Zhang, Yuan, and Archer (2002), take care of billing the end-users depending on the service they used. The mobile industry value chain players are at the center of the m-commerce concept since they provide the technical infrastructure in terms of the communications and required software platforms as well as the useful features of mobile devices that companies and users can use in order to satisfy the requirements of m-commerce.

2.1.3. Social Commerce

Social Commerce (*s-commerce* or *SC*) is a new research field that has emerged as commercial transactions on the Internet evolved into a more complex structure over time. The term was first introduced by the Internet company Yahoo! in 2005 to distinguish e-commerce from a new set of online activities that needed to be categorized as a new concept due to the characteristic changes in the decision making process of the customer/consumer/Internet-user to buy, sell or use the desired products/services (P. Marsden, 2010; Wang & Zhang, 2012). The earliest academic research which included the term 'social commerce' was published in 2007 (Curty & Zhang, 2011; Jascanu, Jascanu, & Nicolau, 2007).

Formal definitions of Social Commerce are different from the definitions of other online commercial concepts as the nature of commercial transactions depends on the type Web infrastructure and the participation of users during a specific social commerce activity. One such definition states that social commerce involves the usage of Web 2.0 and social media technologies to support online transactions and user contributions to assist in the acquisition of products and services (Liang & Turban, 2011). Social media technologies refer to the unique infrastructure that the social media service provider has, to let its users participate in the generation of information over time. Examples of such providers include Facebook, Twitter and Google Plus, as they give their users a domain to generate information about anything they are interested in with the help of the capabilities of Web 2.0 technologies (Anderson, Sims, Price, & Brusa, 2011; P. Marsden, 2010). Dennison, Bourdage-Braun, and Chetuparambil (2009) also stated that those examples of social media providers have gained in importance over the last few years thanks to social commerce, which they simply define as *“the concept of word-of-mouth, applied to e-commerce”*.

2.1.3.1. Social Media, Word-of-Mouth and Crowdsourcing

The development and evolution of Web 2.0 allowed Internet users to communicate through online communities in order to share, contribute and use the information that is derived not only from major authorities of the Internet, but also every single Internet user who has the desire to contribute to the online environment with any kind of information he/she has.

As communications with other people over the Internet became practical and easier, some websites started to provide unique Web features and services to their users to generate limitless amounts of information. These websites that enable users to create and distribute information are called social network sites, defined as *“web services for the Internet users to create a profile, articulate a list of other users known from social/professional environment and view and traverse other friends of friends with the same concept (Boyd and Ellison 2007)”*.

The term *Social Media* refers to *“the combination of specific solutions that are developed with the help of Web 2.0 tools and services to allow Internet users to participate in the generation of media content (Liang & Turban, 2011)”*. Over the years, the usage of social media on the Internet allowed people to access information in a way that none of the major online content provider companies could do. As users generate or participate in the content with reviews,

ratings, product photos and videos (Leitner & Grechenig, 2009), this leads to a limitless source of information that can be leveraged by users who want to engage in online commercial transactions as well as organizations that provide products and services online.

As researchers started to analyze the effect of social media on e-commerce transactions and marketing strategies over the Internet (Wilson, 2005), new concepts have started to emerge to identify the new bargaining power of social media users on commercial activities. *Word-of-mouth (WOM)*, or *viral marketing*, is one of those concepts as it explains “*the act of consumers providing information to other consumers* (Decker, 2007)”. As word-of-mouth marketing sees users as the central medium of the information distribution over social networks, the concept is highly effective for businesses in getting customer attention. Even though the terms ‘viral marketing’ and ‘word-of-mouth’ have the same logic, viral marketing is considered to have a bad impression on consumers considering that the word ‘viral’ sounds like it has psychologically a negative effect. Based on this psychological difference, Wilson (2005) defines viral marketing as “*any strategy that encourages individuals to pass on a marketing message to others, creating the potential for exponential growth in the message's exposure and influence*”. Different terms used for the same purpose as viral marketing and word-of-mouth are “creating a buzz”, “leveraging the media” and “network marketing”, since the marketing strategy is being applied to social media through online social networks (Ho & Dempsey, 2010).

Once linked users from all over the social network start to review the online content posted by an individual, and some of them start to share it within their own network, viral marketing becomes a real power to increase the awareness of the product or service. The effect of different kinds of viral marketing techniques over social networks and social media users has been analyzed by J. Y. C. Ho and Dempsey (2010). Kozinets et al. (2010) also give examples of the different usages of word-of-mouth and viral marketing terms such as “social media marketing”, “buzz” and “guerilla marketing”. The authors define word-of-mouth marketing (WOMM) as “*influencing customer-to-customer communications by professional marketing techniques*”.

Another related concept is *crowdsourcing*, which is derived from the combination of the words ‘crowd’ and ‘outsourcing’. The term was first used by Howe (2006) in his web article to mean “*taking advantage of the public in order to solve a specific problem*”. Another definition of the

concept is “*the act of taking a job traditionally performed by a designated agent, usually an employee, and outsourcing it to an undefined, generally large group of people in the form of an open call* (Chung, Chiu, Xiao, & Chi, 2009)”.

Apart from the “outsourcing” concept which refers to the “*acquisition of services from external service providers* (Grover, Cheon, & Teng, 1994)”, crowdsourcing uses the ‘crowd’ to find solutions to a problem. Marsden (2013) explains the logic of crowdsourcing from the perspective of companies, which are using the inexpensive technological network infrastructure, the Internet, and social content contributed online by individual users (i.e., amateurs) to find solutions to their problems and issues effectively. As the usage of information that is refined by Internet users increases, the gap between professionals and those amateurs is getting smaller every day.

Huberman, Romero, and Wu (2009) explain crowdsourcing from the users’ point of view. The idea behind crowdsourcing stands for the distribution and refinement process of the social media content, which may be any kind of data such as text or multimedia. Once a group of users starts to develop some kind of content and distributes it through the network without the control of a central authority, other users can participate in the further refinement of the same content and take advantage of it without any cost of usage. Furthermore, the usage of the content does not affect others who have the same intention, which is the concept of the ‘jointness of supply’ (Huberman et al., 2009). Once crowdsourcing is used as the right method to solve a specific problem, it becomes beneficial for both parties which are the organization itself and the users who participate in the solution with the help of their personal knowledge and experience (Chung et al., 2009).

2.1.3.2. Definition of Social Commerce (s-commerce)

According to Liang and Turban (2011), the term social commerce refers to “*the delivery of e-commerce activities and transactions via the social media environment, mostly in social networks and by using Web 2.0 software*”. It is also stated that social commerce is considered a subset of e-commerce with the additional participation of social media usage in order to assist in e-commerce transactions. With a more decisive perspective, Leitner and Grechenig (2009) define social commerce as “*the synonym for the next generation online commerce and is significantly affected by a fast preceding social networking*” since surveys show that potential online buyers

of a product/service give more importance to the feedback from other buyers than to classical and formal descriptions provided by the producer of the product/service. The authors argue that product-related information gathered from social media and crowdsourcing has a significant influence on the decision making process of the potential buyer. Furthermore, Wang and Zhang (2012) define social commerce as a new category of e-commerce, or the birth of a 'referral economy', stating that it is a "*form of commerce that is mediated by social media and is converging both online and offline environments*". Rad and Benyoucef (2011) define social commerce as a result of the evolution of e-commerce 1.0 which contains only one-to-one interactions between the seller and the buyer, into a more complex commercial process with the use of social media; while Curty and Zhang (2011) state that social commerce represents an emerging phenomenon stimulated by the Web 2.0 wave.

Huang and Benyoucef (2013) define social commerce as "*utilizing Web 2.0 in e-commerce, particularly core Web 2.0 features such as user-generated content and sharing of content*". Refinements in Web 2.0 are considered key in the effectiveness of social commerce since they influence business transactions and the reliability of the systems that businesses use. From the perspective of organizational development, the usage of Web 2.0 can create value by increasing the strength of business relationships with customers, finding new business opportunities to make more profit, and supporting product development with the help of reliable feedback from consumers, with the potential to help maximize marketing campaigns. Customers have also gained significant power with the usage of Web 2.0 technologies for e-commerce activities as they became aware that companies have to take their feedback into account to produce better products and services in order to keep the purchase rate and the customer loyalty high. As a result, the usage of Web 2.0 technologies led customers to take control of market power as their feedback for a specific product became more important than other criteria during the production process (Huang & Benyoucef, 2013).

Another term, *Social Shopping*, is used by Stephen and Toubia (2009) and Rad and Benyoucef (2011) in order to distinguish the significant contribution of social media during the decision making and buying process of an item online. However, the definition and the context of social shopping show the variety depending on the purpose of usage. According to Stephen and Toubia (2009), online commercial transactions through the use of social media should be defined

separately by considering the customer's and seller's perspective. For customers, the term social shopping refers to buying transactions through social media especially with the help of online word-of-mouth, whereas social commerce is more suitable for online sellers who use social media to communicate with their customers. Even though some researchers review and analyze buyers and sellers separately from each other, other researchers use the terms *social commerce* and *social shopping* interchangeably since *commerce* is broadly defined as “*the buying and selling of goods and services* (Frolick & Chen, 2004)”. Decker (2007) states that the two terms are slightly different, even though they share the same domain, social commerce having a more meaning for strategic decisions of an online vendor.

Some researchers see social commerce as a new channel that merges e-commerce and social media instead of seeing it as the next generation e-commerce. For instance, Anderson et al. (2011) distinguish social commerce from e-commerce as social commerce transactions are performed through social platforms rather than companies' websites. According to Marsden (2010), social commerce is “*the fusion of social media with e-commerce*” and “*the concept of word-of-mouth applied to e-commerce*”. The term social commerce is referred to as (1) ‘putting water-coolers next to cash tills’ and (2) ‘putting cash tills next to water-coolers’. The first explains social commerce activities in a way that e-commerce companies integrate social media to support online transactions to let users contribute to content generation. The second refers to social media providers that add e-commerce services to their websites to allow users to have online commercial transactions with the help of their ready-to-use social media profiles and attributes.

In our research, we opt for the first meaning of social commerce –i.e., ‘putting water-coolers next to cash tills’ (P. Marsden, 2010), as we integrate social media and other social toolsets within the online commercial content of the business. Table 3 summarizes e-commerce, m-commerce and s-commerce definitions by different authors.

Chapter 2. Literature Review

Author(s)	Definition
Electronic Commerce (e-commerce)	
Mesenbourg (2001)	“Any transaction completed over a computer-mediated network that involves the transfer of ownership or rights to use goods or services. Completed transactions may have a zero price (e.g., a free software download)”
Fang (2002)	“Allows businesses to transact with each other more efficiently (B2B) and brings customers closer to businesses (B2C)”
Varadarajan and Yadav (2002)	“A networked information system that serves as an enabling infrastructure for buyers and sellers to exchange information, transact, and perform other activities related to the transaction before, during, and after the transaction”
Maamar (2003)	“A general term for any type of business, or commercial transaction, that involves the transfer of information across the Internet”
Frolick and Chen (2004)	“Selling goods and services on the Internet”
Kaynak, Tatoglu, and Kula (2005)	“Any economic transaction where the buyer and seller come together through the electronic media of the Internet, form a contractual agreement concerning the pricing and delivery of particular goods and services, and complete the transaction through the delivery of payments and goods or services as contracted”
Opping, Yen, and Merhout (2005)	“Includes activities such as electronic exchange, delivery, and/or transaction of information, goods, services, and payments over telecommunications networks, primarily the web”
Tiwari, Buse, and Herstatt (2006)	“The buying and selling of products and services over the Web” “At least partially electronic form of a transaction; and the transfer of ownership or rights to use a good or service, whether against monetary payment or otherwise”
Zott, Amit, and Massa (2011)	“new gestalts and Internet-based ways of “doing business”
Mobile Commerce (m-commerce)	
Clarke (2001)	“The ability to purchase goods anywhere through a wireless Internet-enabled device. Mobile commerce refers to any transaction with monetary value that is conducted via a mobile network. It will allow users to purchase products over the Internet without the use of a PC”
Zhang, Yuan, and Archer (2002)	“About content delivery (notification and reporting) and transactions (purchasing and data entry) on mobile devices” “The continuation of e-commerce with the palm handheld, wireless laptops and a new generation of Web-enabled digital phones already on the market”
Maamar (2003)	“Being able to buy and sell goods/services over mobile devices”
Coursaris (2002)	“A natural extension of e-commerce as they share fundamental business principles, but m-commerce acts as another channel through which value can be added to e-business process”
Frolick and Chen (2004)	“M-commerce is a special branch of e-commerce, in which mobile devices and their network connection medium are used to buy, sell and promote products, services and information.”
Kurkovsky, et al. (2005)	“New types of e-commerce transactions, conducted through mobile devices (e.g., cellular phones, handheld or palm-sized computers, and even vehicle mounted interfaces), using wireless telecommunication networks and other wired e-commerce technologies, are termed mobile commerce (m-commerce)”
Lin and Wang (2006)	“Mobile e-commerce”
R. Tiwari, Buse, and Herstatt (2006)	“Opens new business opportunities by enabling innovative, location-based services (LBS) that the “immobile” Internet cannot offer.” “The ability to conduct financial transactions through wireless Internet-enabled devices”
Barnes (2007)	“Basically any e-commerce done in a wireless environment, especially via the Internet”
Ngai and Gunasekaran (2007)	“Enables users to access the Internet without needing to find a place to plug in”
Kim, Chan, and Gupta (2007)	“Next generation e-commerce”
Ayob, Hussin, and Dahlan (2009)	“Any transactions with monetary value that is conducted over a wireless telecommunication network”
Tiwari et al. (2011)	“Any activity related to a commercial transaction and is conducted via wireless and mobile devices as user interface”
Benou, Vassilakis, and Vrechopoulos (2012)	
Social Commerce (s-commerce)	
Stephen and Toubia (2009)	“Buying transaction through social media especially with the help of word-of-mouth on the Internet”
Leitner and Grechenig (2009)	“The synonym for the next generation online commerce and is significantly affected by a fast preceding social networking”
Marsden (2010)	“The fusion of social media with e-commerce” “Basically the concept of word-of-mouth applied to e-commerce”
Curty and Zhang (2011)	“An emerging phenomenon stimulated by the Web 2.0 wave”
Rad and Benyoucef (2011)	“Result of the evolution of e-commerce 1.0 which contains only one-to-one interactions between the seller and the buyer, into a more complex form of commercial process with the use of social media” “Network of sellers”
Liang and Turban (2011)	“the delivery of e-commerce activities and transactions via the social media environment, mostly in social networks and by using Web 2.0 software” “Subset of e-commerce”
Wang and Zhang (2012)	“Form of commerce that is mediated by social media and is converging both online and offline environments” “A new category of e-commerce”
Huang and Benyoucef (2013)	“Utilizing Web 2.0 in e-commerce, particularly core Web 2.0 features such as user-generated content and sharing of content”

Table 3: Definitions of E-commerce, M-commerce and S-commerce

2.2. Business Models

The proper definition of business model has changed over time as the business structure and technological development in related industries evolved into new forms of models to find the optimal products and services for the customers (Ballon 2009; Camponovo and Pigneur 2003; Magretta 2002; Osterwalder, Pigneur, and Tucci 2005).

One generic definition of a business model is “*the way of doing business* (Ballon 2009)”. Another definition given by Magretta (2002) is “*the stories that explain how enterprises work*”. Osterwalder, Pigneur, and Tucci (2005) defined a business model as “*the architecture of a business*”. Other terms like ‘Business Idea (Normann 2001)’ and ‘Business Design (Slywotzky 1996)’ are also used to identify the similar dynamics of businesses. The term Business Design is defined as “*the totality of how a company selects its customers, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profit*” whereas the term Business Idea represent “*the internal business structure and the relationship with the company’s environment*”.

Even though these definitions of business model are quite straightforward, the complexity of those models has increased with respect to the increased quality of products and services. As competition between companies increases, and they try to differentiate their products and services to survive, the simplistic meaning of business model became insufficient to explain the whole logic behind ‘doing business’. Many scholars and business people preferred to categorize and analyze the components of the business model concept as the complexity became a real barrier in terms of investigating the internal logic of business models. As Hedman and Kalling (2003) state, a business model is “*used to describe the key components of a business*”. According to Johnson, Christensen, and Kagermann (2008), the concept of business model can be investigated through its four major elements that create and deliver a particular value once taken into consideration together. Those elements, which are called ‘*Customer Value Proposition*’, ‘*Profit Formula*’, ‘*Key Resources*’ and ‘*Key Processes*’, interrelate to each other to enable the constant growth of product and service sales in the long term. The actual reason that those supporting elements interact with each other to use the existing resources within the set of

systematic processes is *to create the actual value* out of the service for the customers of the company and the profit that will be driven from that value over time.

Thus, *customer value proposition* is the most important element in Johnson, Christensen, and Kagermann's (2008)'s business model concept. It is defined as “*a way to help customers get an important job done*”, and the term *job* means a “*specific problem of customers that needs an effective solution*”. The value of the solution which is provided by the company lies behind the level of effectiveness of existing alternative solutions to the same problem. As a specific company's solution is relatively more satisfactory than others and customer expectations are met in a better way, the value of that solution becomes more important for the customers and also for the company since it will give the company an opportunity to differentiate itself and make more profit in the long term.

Even though the internal processes and structure of companies are important to decide whether a specific business model is compatible or not, Ballon (2009) writes that the business model “*explains how the company makes money by specifying where it is positioned in the value chain*” and basically states that the business model can identify the ways of making profit depending on its position in the industry and relationship with its environment. Shynajain (2011) defines the business model concept as “*a set of planned activities designed to result in a profit in a marketplace*”. From the perspective of the technological development and use within the business processes of a particular company, R. G. Tiwari et al. (2011) define the business model as “*a mediating construct between a technology and the economic value*”.

As the definitions and logic of business model elements continued to evolve over time, the importance and position of value proposition throughout the services and products that companies provide to their customers has affected the definition of business models. In other words, the definition of the concept has started to be more value-focused. As one of the value-focused definitions, Linder (2000) defined a business model as “*the core logic of an organization for creating value*”. It is mentioned that people don't have enough conceptual knowledge to distinguish the actual business model and its components (revenue model, the commerce process mode, the organizational form and the value proposition) when they are talking in a specific context. As those components work together for the same purpose to create the value for the customer and the company, the value itself is defined as the major intention for other

components as with the given definition. Camponovo and Pigneur (2003) similarly define business models as they “*describe the logic of a ‘business system’ for creating value that lies behind the actual processes*”, while Zott and Amit (2010) preferred to define it as “*the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities* with also mentioning that a *business model is geared toward total value creation for all parties involved*”. Kshetri (2007) also define business models as the “*description of a company’s intention to create and capture value by linking new technological environments to business strategies*” which basically refers value as an essential component of a business model.

Table 4 shows the definition of the term business model by various researchers throughout the last decade.

Author(s)	Definition
Business Model	
Linder (2000)	“The core logic of an organization for creating value”
Magretta (2002)	“The stories that explain how enterprises work”
Hedman & Kalling (2003)	“The internal business structure and the relationship with the company’s environment”
Camponovo & Pigneur (2003)	“The logic of a business system for creating value that lies behind the actual processes”
Osterwalder et al. (2005)	“The architecture of a business”
Kshetri (2007)	“The description of a company’s intention to create and capture value by linking new technological environments to business strategies”
Johnson et al. (2008)	“A way to help customers get an important job done as the term job is used for a specific problem of customers that needs an effective solution”
Ballon (2009)	“The way of doing business”
Zott & Amit (2010)	“How the company makes money by specifying where it is positioned in the value chain” “The content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” “Is geared toward total value creation for all parties involved”
Tiwari et al. (2011)	“A mediating construct between a technology and the economic value”
Shynajain (2011)	“A set of planned activities designed to result in a profit in a marketplace”
Business Idea	
Normann (2001)	“The internal business structure and the relationship with the company’s environment”
Business Design	
Slywotzky (1996)	“The totality of how a company selects its customers, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profit”

Table 4: Definitions of Business Model

Finally, according to Zott, Amit, and Massa (2011), the biggest percentage of business models is related to ‘*e-business and the use of information technology in organizations*’. Since the term *e-business* refers to “*doing the business electronically*” (Hedman and Kalling 2003; Osterwalder and Pigneur 2002; Zott, Amit, and Massa 2011), it is assumed that the e-commerce sub-field is part of this category of business models.

2.2.1. E-commerce Business Models

Since the concept of e-commerce is considered as the next step of traditional commerce, many business models used for e-commerce are derived from traditional commerce. An e-commerce business model describes “ *new methods and ways of doing business through the Internet with the effective use of information and communication technologies (ICT), and offering new taxonomies or frameworks to categorize those models rationally with respect to the interrelationship of its components* (Zott, Amit, and Massa 2011)”. Those components, like marketing, pricing strategy, network structure, revenue model and value proposition, are not in isolation even though they have different objectives (Zott, Amit, and Massa 2011). The development of the Internet allowed companies with traditional commerce activities to migrate online to adopt new strategies and create competitive advantage.

As the Internet enabled traditional organizations to increase their profit by providing goods and services to more customers, new business models compatible with the technological innovations have emerged. Bambury (1998) proposes the following classification for e-commerce business models.

1. *Transplanted real-world Business Models* represent the traditional business activities which have been used in the real-world, transplanted onto the Internet. Amazon³ is a good example for this category as it sells goods and services through its website and replicates the behavior of real world businesses (Bambury 1998).
2. *Native Internet Business Models* emerged with the Internet. As a common instance for these business models, there is the ‘digital products and the digital delivery model’. For example, Shutterstock⁴, founded in 2003, connects customers with high quality images, illustrations, vectors and videos through its website.

Note that unlike real world business activities which are based on the scarcity of the product and service, native Internet business activities are based on the abundance of information since anybody can access and trade it for a specific purpose (Bambury 1998).

³ <http://www.amazon.com/>

⁴ <http://www.shutterstock.com/>

Tsalgatidou and Pitoura (2001) analyzed e-commerce business models them according to their 'degree of innovation' which asks whether "*the particular business model is new or already exists in traditional commerce*". As an example the '*e-shop*' business model does not have any innovation in terms of the business activities since is an electronic version of traditional ways of selling. However, the '*value chain integration*' business model enhances the communication and collaboration between the parties located in the same supply chain and don't exist in the traditional commerce as it is dependent on the technological environment. Thus, the degree of innovation is considered as high in this business model.

A typology to classify e-business models in two dimensions, namely '*relational objectives*' and '*value-based objectives*', is proposed by Lam and Harrison-Walker (2003). Relational objectives represent the type of communication between the firm and other parties. Three types are mentioned: (1) '*Direct Access*' represents the models that enable bypassing wholesalers and retailers (direct model); (2) '*Network Development*' is about the models that refine the connectivity among the firm and external parties; and '*Corporate Communication*' for the models that provide communication tools to connect the firm with customers. Value-based objectives address values that the business models can add to the firm. Two values are mentioned: (1) '*Financial Improvement*' includes the models that add monetary benefits through methods like advertising and user fees; and (2) '*Product and Channel Enrichment*' includes the models that focus on non-monetary benefits such as customer loyalty, brand awareness, etc. Finally, Lam and Harrison-Walker (2003) classify e-commerce business models within 6 cells (see Figure 3).

		II. VALUE-BASED OBJECTIVES	
		Financial improvement	Product/channel enrichment
I. RELATIONAL OBJECTIVES	Direct access	CELL 1 Internet merchants and portals <i>User-paid</i> <ul style="list-style-type: none"> • Manufacturer • Subscription • Pay-per-use • Product line extension • Voluntary contributor • Public support 	CELL 2 Virtual product differentiation <ul style="list-style-type: none"> • Online product enhancement • Bundling • Post-purchase support
	Network development	CELL 3 Brokerage networks <i>User-paid</i> <ul style="list-style-type: none"> • Online auction • Dutch auction • Reverse auction • Bounty broker • Online exchange Purchase assistance networks <i>User-paid</i> <ul style="list-style-type: none"> • Buyer cooperative • Manufacturers' agent Retail networks <i>User-paid</i> <ul style="list-style-type: none"> • E-tailer 	CELL 4 Interactive networks <ul style="list-style-type: none"> • Dealer support • Collaborative design • Community-building
	Corporate communications	CELL 5 Internet promoters <i>User-paid</i> (Not available)	CELL 6 Image building <ul style="list-style-type: none"> • Category-building • Brand-building • Free trial

Figure 3: Six Cells of E-commerce Business Models (Lam and Harrison-Walker 2003)

For example, the Cell 1, which combines Direct Access and Financial Improvement, contains business models like ‘*Manufacturer*’ that enables companies to reach their customers directly to sell goods and services, and ‘*Subscription*’ that provides content to their subscribers in exchange for fees. More than 30 other e-business models are reviewed by Lam and Harrison-Walker (2003).

As the technological capabilities of the Internet and Web 2.0 evolved over the years, e-commerce business models continued to evolve in order to satisfy the needs and wants of customers and businesses. Some of these models are still simple as they didn’t integrate their structure to the technological innovations (Rappa 2010). Through the ‘*Manufacturer*’ business model (Lam and Harrison-Walker 2003; Rappa 2010), most companies produce goods and services and sell them to customers on the Internet. As simple as it sounds, this is highly effective since the company keeps making profit through the earned revenue as long as it is more than the cost of operation. The effectiveness of the model still satisfies the company; hence the model keeps its simplicity even though the techniques and methods in terms of technological innovations used may change as a part of the internal business process.

Rappa (2010) defined 41 e-commerce (referred to as *Internet Commerce*) business models and divided them into 9 categories. Some business models have evolved into a more complex structure to survive. A good example to this situation is the *Broadcasting* model as mentioned by Rappa (2010): “*Radio and later television programming has been broadcasted over the airways free to anyone with a receiver for much of the past century. The broadcaster is part of a complex network of distributors, content creators, advertisers, and listeners or viewers. Who makes money and how much is not always clear at the outset. The bottom line depends on many competing factors* (Rappa 2010)”.

Other business models, such as the ones mentioned by Dial (2012), are used but are not proven yet. For example, *Facebook*'s business model is included in the list as ‘still unproven and uncharted’. Pietka (2012) classifies business models with regards to the new features they bring. Business models like *Social Bookmarking*, which enables users to “*search for specific content gathered from different resources and highly integrated with social networks*”, and *Next Generation Marketplace* which “*uses efficient personalization methods to match the customers and the products depending on their interests* (Pietka 2012)” are considered future generation business models.

Laudon and Traver (2014) and Shynajain (2011), propose the following 7 generic B2C e-commerce business models: *Portal*, *E-tailer*, *Content Provider*, *Transaction Broker*, *Market Creator*, *Service Provider* and *Community Provider*. The *Portal* business model, which offers customers an integrated package of content and services on one single platform, has three variations, namely *Horizontal/General* for portals containing non-specific content, *Vertical/Specialized* for specialized content, and *Search*, only mentioned by Laudon and Traver (2014), for Web searching. The *E-tailer* business model has 4 variations: *Virtual Merchants* representing the digital version of retail stores, *Bricks-and-Clicks* for those who have physical and online stores, *Catalog Merchant* which is the online version of direct mail catalogs, and *Manufacturer-Direct* for manufacturers who use the online channel to sell directly to the customer. The *Content Provider* business model offers online information and entertainment to customers like newspapers and sports sites. *Transaction Broker* enables customers to have faster, easier and cheaper transactions over the Internet such as booking holiday packages or selling/buying stocks online. *Market Creator* represents companies that gather buyers and sellers

together online to enable them to have commercial transactions. *Community Provider* enables users to meet online to share ideas, interests and hobbies with each other. Finally, *Service Provider* represents companies that make profit by selling services instead of products (e.g., financial services).

Table 5 summarizes the mentioned business models above.

Author(s)	Referred As	E-commerce Business Models
Bambury (1998)	Internet Commerce, E-commerce	Transplanted: Mail-order, Advertising-based, Subscription, Free Trial, Direct Marketing, Real Estate, Incentive Scheme, B2B Native: Library, Freeware, Information Barter, Digital Products and Digital Delivery, Access Provision, Website Hosting and Internet Services
Tsalgatidou & Pitoura (2001)	Internet E-commerce	e-Shop, e-Auctions, e-Procurement, Trust Services, Value Chain Integration, Third Party Marketplace, the Hub or the Portal, Virtual Organization, Application Service Provider (ASP), Value Chain Service Providers, Process Outsourcing
Lam & Harrison-Walker (2003)	E-business	Internet Merchants and Portals, Virtual Product Differentiation, Brokerage Networks, Retail Networks, Purchase Assistance Networks, Interactive Networks, Internet Promoters, Image Building
Rappa, (2010)	Internet Commerce	Brokerage, Advertising, Infomediary, Merchant, Manufacturer (Direct), Affiliate, Community, Subscription, Utility
Shynajain (2011)	B2C E-commerce	Portal, E-tailer/Storefront, Content Provider, Transaction Broker, Service Provider, Market Creator, Community Provider
Laudon & Traver (2011)	B2C E-commerce	Portal, E-tailer, Content Provider, Transaction Broker, Market Creator, Service Provider, Community Provider
Pietka (2012)	E-commerce	Flash Sales, Subscriptions, Social bookmarking Websites, Collaborative Commerce, Next Generation Marketplaces
Dial (2012)	E-commerce	The Single Brand, Marketplace, Vertical Marketplace, Community Marketplace, Flash Sell, Crossover, Personalization, Immaterial going Physical, Facebook/Social Commerce

Table 5: E-commerce Business Models

E-commerce business models can achieve significant improvements in the organizational structure, products and services, and the business environment (Zott, Amit, and Massa 2011). As technology continuously refines, one significant effect of e-commerce business models is the potential change in the rules of competition. The emergence of commercial transactions on mobile devices can be given as an example of the change in the rules of competition since new technological developments force companies to find new ways to maintain their competitiveness. Thus, capturing a new type of value is another characteristic of e-commerce business models as organizations always search for more and more innovative solutions to survive in their particular industry.

2.3. Mobile Social Commerce

Since m-commerce and s-commerce share the same origin through e-commerce (Ayob, Hussin, and Dahlan 2009; Kurkovsky, Zanev, and Kurkovsky 2005; Leitner and Grechenig 2009; Wang and Zhang 2012; J. J. Zhang, Yuan, and Archer 2002), combining the features of these two concepts in order to provide a value added service to end-customers is highly desirable in the mobile service industry.

For mobile commerce, we opt for the definition by (Benou, Vassilakis, and Vrechopoulos 2012): “*any activity related to a commercial transaction and is conducted via wireless and mobile devices as user interface*”. This definition points to what m-commerce provides as an advantage over e-commerce to businesses and customers. M-commerce brings unique characteristics such as *mobility*, *ubiquity* and *context-sensitivity* (Pousttchi, Weizmann, and Turowski 2003). Since customers have personal mobile devices like smartphones and tablets, mobility is standard for them as they can reach mobile services throughout the day. As they are assumingly connected to the Internet all the time, they can be reached regardless of the time and place, hence ubiquity is also assured. Context-sensitivity is quite important for businesses which aim to differentiate their services from others. Such businesses can utilize context-sensitivity features like *localization*, *personalization* and *interactivity*. Localization refers to the set of location-based services that are used to get the geographic location of the customers and provide relevant services and content. Personalization can increase the efficiency of mobile services as these services can access personal information deployed on the users’ mobile devices; such as contacts, SMS and other personal profiles to provide personalized content. Interactivity is another feature of context-sensitivity as the screen sizes of mobile devices are small and need to be utilized efficiently. Smaller screen sizes on mobile devices force businesses to build interactive services with the help of the touch screen technology and various input features like voice recognition and built-in cameras. These characteristics, which are mobility, ubiquity and context-sensitivity, enable companies to deliver m-commerce services to their customers.

We define social commerce (s-commerce) as “*utilizing Web 2.0 in e-commerce, particularly core Web 2.0 features such as user-generated content and sharing of content* (Huang and Benyoucef 2013)”. S-commerce has its own characteristic features that can add value to the mobile services

designed and built through mobility, ubiquity and context-sensitivity. The features of s-commerce can be summarized in three concepts: Social Media, Word-of-Mouth and Crowdsourcing (as discussed before).

The combined usage of m-commerce and s-commerce brings the discussion to another level where these concepts are utilized to serve the same purpose of delivering services to end-users. Some terms like ‘*Mobile Social Networking*’ (Atzmueller 2014; Counts and Fisher 2008) and ‘*Mobile Social Media*’ are already used in the literature to refer to mobile services and social features used together. Mobile Social Networking is defined as “*social networking where individuals with similar interests converse and connect with one another through their mobile phone and/or tablet* (D. Zhang et al. 2014)”. A popular example is Foursquare⁵ which enables users to check-in at different geographical locations and share personal opinions with others as well as get information about a particular place. As stated by Atzmueller (2014), mobile social networks have emerged to address the need of mobile and ubiquitous applications to provide social networking and social media functionalities in diverse contexts.

Even though terminologies like mobile social network and mobile social media cover the characteristics of the m-commerce and s-commerce concepts, they do not address directly and clearly the commercial part of the activities. Thus, we define Mobile Social Commerce (ms-commerce) as *the set of e-commerce activities performed in a mobile environment with the participation of users in content generation and sharing*. User-generated content can either originate on social media platforms (e.g., Facebook, Twitter and Google Plus) or companies’ own toolsets (e.g., forums, reviews and ratings), enabling customers to provide information and feedback about products and services and to share that content with others who have the same interests. These social activities take place in a mobile environment where mobile or web applications are used by customers to perform online commercial transactions.

⁵ <https://foursquare.com/>

Chapter 3. Building Blocks of Mobile Social Commerce

3.1. E-commerce Business Models

With respect to the information provided in the previous section, we consider the 7 generic e-commerce business models identified by Laudon and Traver (2014) and Shynajain (2011) as the first building block of ms-commerce. The reason is that they are the most comprehensive ones and they cover most of the B2C business models and their variations mentioned by other researchers (Bambury, 1998; Dial, 2012; Lam & Harrison-Walker, 2003; Pietka, 2012; Rappa, 2010; Tsalgatidou & Pitoura, 2001).

These 7 e-commerce business models are briefly explained below.

3.1.1. E-tailer Business Model

As one of the most widely used e-commerce business models, *E-tailer* is an “*online retailer store where users can access, check the updated inventory and place an order for a desired product*(Laudon & Traver, 2014; Stewart & Zhao, 2000)”. For customers, the value behind the E-tailer business model consists of saving time and minimizing the effort to buy an item. Customers can easily review the information about the desired product, compare it to similar products and order it without the need to go to the physical store. For companies this business model enables them to minimize the cost of distribution and retailing of their products. Predicting the needs of future inventory becomes easier over time. Without the burden of mass production, manufacturers can produce customized products and send them directly to customers.

This business model can be analyzed through 4 variations. For example, *Virtual Merchant*, also called ‘*pure player*’ (Rasheed & Geiger, 2004), is a retailer that only has an online presence, such as Amazon. Another variation, *Bricks-and-Clicks* represents companies that sell online as well as in physical stores. Companies like Walmart⁶, Sears⁷ and IKEA⁸ fit in this category.

⁶ <http://www.walmart.ca/>

⁷ <http://www.sears.ca/>

Catalog Merchant provides online catalogs for users to review the products and select items to buy. As an example, ShopRite⁹ provides different types of flyers to offer discounts for grocery and pharmaceutical items. *Manufacturer-direct* enables “*manufacturers to reach buyers directly and thereby compress the distribution channel* (Laudon & Traver, 2014; Rappa, 2010)”. This business model enables manufacturers to avoid the intermediary players that handle the distribution of their products as they can reach their customers directly online. This way, manufacturers can offer customized products to their customers. As an example, Dell¹⁰ doesn't have any distributors or retailers (exceptionally, in the US, Dell products are now being carried by Walmart stores) to sell their products to customers.

3.1.2. Portal Business Model

‘*Portals*’ provide an online environment for customers to access various services like Web search tools, news, email, weather reports, calendars, instant messaging, shopping, music downloads, video streaming and more (Laudon & Traver, 2014). For customers, the value of the Portal business model can be seen as the time saved by gathering all the information needed for daily activities on a single platform and expanding a specific content by searching over the Web. Businesses can collect referral fees from other companies for directing the visitors to their own websites. Advertising is another powerful source of monetary value for portals as millions of users access them every day.

There are three variations of Portals defined by Laudon and Traver (2014). *Horizontal/General Portal* offers general content about different topics. The content may include news about local sports, entertainment and finance, and weather report of the city and other trending topics by other users. Companies like Yahoo¹¹, AOL¹² and MSN¹³ are examples of this type of portal. *Vertical/Specialized Portal*, also known as ‘vortal’, has similar characteristics with Horizontal Portals but the content is focused on a specialized topic, industry, community or interest. Even

⁸ <http://www.ikea.com/>

⁹ <http://www.shoprte.com/>

¹⁰ <http://www.dell.com/>

¹¹ <http://www.yahoo.com/>

¹² <http://www.aol.com/>

¹³ <http://www.msn.com/>

though the users who use specialized portals are relatively fewer than those who use Horizontal Portals, the specialized content creates a stronger community, incites users to pay more for premium content and attracts other companies to advertise on portals about their products/services related to the content (Laudon & Traver, 2014). CIO Insight¹⁴ is a portal where news, books and research articles about the IT industry are provided through the website. *Search Portal* provides search engine features as the primary service in addition to other services mentioned above. Google is the most popular example of search portals.

3.1.3. Content Provider Business Model

‘*Content Providers*’ provide digital content to users over the Web. The content might be video, music, photos, text and any kind of digital product (Laudon & Traver, 2014). For customers, accessing attractive content with a fixed charge or no charge at all is the actual reason behind using the service. This will reduce the time they spend on searching and finding the desired content. Since the content is deployed online, the customers are able to access it anytime they want. For companies, the actual value is to make profit through advertising and subscription by providing unique content. Owning the content adds significant value and leverage to the company over its competitors. The stable inflow of cash is highly important since the company can estimate future demand for its services and identify new ways to strengthen these services. As a popular example, Netflix¹⁵ enables users to watch video content in exchange for a subscription fee paid monthly.

3.1.4. Transaction Broker Business Model

‘*Transaction Brokers*’ are companies that process transactions for their customers over the Internet (Laudon & Traver, 2014). They gather customers who demand a certain kind of service and other businesses and/or individuals that can provide that service. For customers, the value of using these services is to save time and money by finding the right service. In contrast to traditional alternatives, using online services is faster and practical for customers to review and

¹⁴ <http://www.cioinsight.com/>

¹⁵ <http://netflix.com/>

compare alternative solutions. For transaction brokers, providing such service for employers and potential employees enables them to generate profit through subscription and listing fees, commissions from every transaction and advertising (Shynajain, 2011). Monster¹⁶ is a good example as it is an online environment where people can apply for jobs provided by various employers.

3.1.5. Market Creator Business Model

Market creators provide an online environment for buyers and sellers to meet and have peer-to-peer transactions (Laudon & Traver, 2014; Shynajain, 2011). Even though this business model and *transaction broker* look alike at a glance, market creators don't carry out the transaction process between the buyers and sellers. Instead, they create the market to enable buyers and sellers to meet and carry their own transactions. Sellers can rapidly sell their products in mass quantities. Market creators do not carry inventory or incur production costs as they are only enablers. They get a percentage on every transaction and can charge listing fees just like transaction brokers. Kijiji¹⁷, Canada's most popular classifieds site, gathers buyers and sellers from the same regions enabling them to buy/sell cars, furniture, electronics and many other items.

3.1.6. Service Provider Business Model

'*Service providers*' provide various services to their customers online (Laudon & Traver, 2014; Shynajain, 2011). These services, such as insurance services, financial planning or document editing, are more convenient, time-saving and lower-cost solutions than traditional alternatives (Laudon & Traver, 2014). For customers, using such an online service is desirable since it provides online content and instant information that can be accessed from any medium, including mobile devices. Businesses can generate profit by subscription fee or payment by transaction. As they provide the service online, they save time and serve more customers. For example,

¹⁶ <http://www.monster.com/>

¹⁷ <http://www.kijiji.ca/>

ThinkFree¹⁸ provides Hancom Office Suite online, which is an online document editing and creating service for customers.

3.1.7. Community Provider Business Model

‘*Community Providers*’ provide an online environment where users can get together to share their personal opinions, pictures, videos and even have commercial transactions like buying and selling items (Laudon & Traver, 2014). Examples like Facebook, Twitter and Google Plus have been dominating the Web with the help of content generated by users. Users can easily access, share their personal experience, get ideas from others on their network and learn more about their own environment. For community providers, using the content generated by users is the actual value as it can be used for profit generating purposes such as selling the information to third-party companies as well as generating profit through advertising. As an example, BlackPlanet¹⁹ is a website where black people and their friends can get together for friendship, dating and networking online. As the system brings people with similar desires and interests together, the website is a good example for this business model.

These 7 commonly used e-commerce business models and their variations can be considered as one of the building blocks of ms-commerce and we believe that they can be enhanced by mobile and social features.

3.2. Unique Characteristics of Mobile Commerce

Characteristics of m-commerce allow businesses to provide efficient mobile services. With the help of enabling infrastructure, different features can be used to build the required functionality. Some of these characteristics represent the actual difference between m-commerce and e-commerce. For example, *Mobility* is at the core of value creation in m-commerce since it refers to “*the independence of the user who uses particular mobile services anytime and anywhere* (Ankar & D’Incau, 2002; Clarke, 2001; Zhang, Yuan, & Archer, 2002; Nah, Siau, & Sheng,

¹⁸ <http://www.thinkfree.com/>

¹⁹ <http://www.blackplanet.com/>

2005)”. Also, *Ubiquity* represents “*the availability of mobile devices to receive service from anywhere on a real-time basis* (Anckar & D’Incau, 2002; Clarke, 2001; Pousttchi, Weizmann, & Turowski, 2003)”. With the help of the mobile network infrastructure, customers with mobile devices are available all the time to get m-commerce services.

Other characteristics and features are not necessary to build the service, yet a combination of them helps businesses to develop their services efficiently. For instance, *personalization*, defined as “*the ability to customize each individual user’s experience* (Wu, Im, Tremaine, Instone, & Turoff, 2003)”, can allow companies to improve value by providing personalized products and services to customers (Clarke, 2001; Tsalgatidou & Pitoura, 2001; Tiwari, Husain, Srivastava, & Singh, 2011). Another major feature of m-commerce is *location-based services (LBS)*, defined as “*services that have the content related to the location of an individual* (Rao & Minakakis, 2003)”. This feature is also widely referred to as ‘*localization*’ (Clarke, 2001; Tiwari et al., 2011), ‘*location-sensitivity*’ (Zhang et al., 2002) and ‘*location-awareness*’ (Tsalgatidou & Pitoura, 2001). Different kinds of location-based services can be provided to the mobile consumer (Rao & Minakakis, 2003) as shown in Table 6. *Interactivity*, which means “*the extent to which users can participate in modifying the form and content of a mediated environment in real time*”, is another feature that can help businesses to develop efficient mobile services through direct and real time information exchange. According to Pousttchi et al. (2003), mobile features like personalization, localization and interactivity can be grouped under the term *Context-Sensitivity*.

Author(s)	Referred As	Elements
Clarke (2001)	Value Proposition Attributes	Mobility, Localization, Personalization, Convenience
Tsalgatidou & Pitoura (2001)	Usability Implications	Location awareness, Conditions of usage, Adaptivity, Ubiquity, Personalization, Broadcasting
Anckar & D’Incau (2002)	Value adding Features	Flexibility, Convenience, Ubiquity
J. J. Zhang et al. (2002)	Key Design Factors	Mobility, Location-sensitivity, Time-critical, Personal Identity, Special Market niche-targeted
Rao & Minakakis (2003)	Consumer Demand (in terms of LBS)	Where am I queries, Point of Need Information Delivery, Niche Consumer Applications, Industrial and Corporate Applications
Pousttchi et al. (2003)	Mobile Added Values	Ubiquity ; Efficiency, Flexibility, Context-Sensitivity ; Personalization, Interactivity, Location-determination, Identifying Functions , Command and Control Functions
Nah et al. (2005)	Advantages	Mobility, Flexibility, Dissemination
R. G. Tiwari et al. (2011)	Value Factors	Mobility, Localization, Personalization, Convenience

Table 6: Characteristics and Features of M-commerce

Other reviewed m-commerce characteristics are shown in Table 6. These are also referred to as ‘*advantages*’ (Nah et al., 2005), ‘*implications*’ (Tsalgatidou & Pitoura, 2001), ‘*design factors*’ (Zhang et al., 2002), ‘*demand of the consumer*’ (Rao & Minakakis, 2003) and - most commonly - ‘*value*’ (Anckar & D’Incau, 2002; Clarke, 2001; Pousttchi et al., 2003; Tiwari et al., 2011).

In this research, we retain *Mobility*, *Ubiquity* and *Context-sensitivity* (including Personalization, Localization and Interactivity) as the three major characteristics of the m-commerce block. Mobility is mentioned as the most critical characteristic by majority of authors (Clarke, 2001; Nah et al., 2005; Tiwari et al., 2011; Zhang et al., 2002). The other two characteristics are based on the categorization of Pousttchi et al. (2003). Ubiquity, which is important to construct the wireless network infrastructure for mobile services (Anckar & D’Incau, 2002; Pousttchi et al., 2003; Tsalgatidou & Pitoura, 2001) is considered as an umbrella concept that covers other features like efficiency and flexibility. With a similar perspective, context-sensitivity characteristic also covers features like personalization (Clarke, 2001; Pousttchi et al., 2003; Tiwari et al., 2011; Tsalgatidou & Pitoura, 2001; Zhang et al., 2002), interactivity and location-determination (Clarke, 2001; Rao & Minakakis, 2003; Tiwari et al., 2011; Tsalgatidou & Pitoura, 2001; Zhang et al., 2002). These characteristics constitute the mobile infrastructure and cover commonly used functionalities for m-commerce. Others like *convenience*, *dissemination*, *broadcasting*, and many more may still have critical functionalities depending on the mobile service provider, the content and the mobile user; but they are not discussed further as we believe they will not have the potential to dramatically enhance the value of ms-commerce in the context of this research.

3.2.1. Mobility

The mobility characteristic provides the required software and hardware infrastructure for the mobile environment. Businesses that aim to deliver their products and services have the opportunity to develop native, hybrid and web-based mobile applications for various mobile operating systems. These mobile operating systems are ranked by (Joseph & Kurian K, 2013)

based on their usage rate. For instance, Android²⁰ is the most popular with 37.19% market share. Since it is an open source operating system (Oliver, 2009; Joseph & Kurian K, 2013; Kamboj & Gupta, 2012), Android is preferred by many mobile device manufacturers like Samsung²¹, HTC²² and Nexus²³. In contrast, Apple’s iOS²⁴ is only used for the mobile devices manufactured by Apple. The market share for iOS is 27.12%. Other significant mobile operating systems that have the potential to provide efficient mobile services are BlackBerry OS²⁵ with a market share of 3.27%, and Windows Phone²⁶ with a 1.18% market share (see Figure 4).

Operating System	Percent
Android	37.19
iOS	27.18
Series 40	12.56
SymbianOS	7.98
Samsung	4.7
Unknown	4.28
BlackBerry OS	3.27
Windows Phone	1.18
Sony Ericsson	0.63
bada	0.41
Nintendo 3DS	0.16
Playstation	0.1
Linux	0.08
Brew	0.07
Nintendo	0.04
Motorola	0.03
LG	0.03
MeeGo	0.03
Windows	0.02
WAP	0.01

Figure 4: Market Share of Mobile Operating Systems (Joseph & Kurian K, 2013)

Even though Android and iOS provide built-in browser applications for end-users to access traditional e-commerce websites (Jain, 2013; Oliver, 2009; Sheikh, Ganai, Malik, & Dar, 2013), developing mobile applications for commercial purposes will give businesses the option of using the features that are unique to these mobile operating systems. These features can be core services like multitasking, maps, location identification and push notification (Apple, n.d.; Brahler, 2010; Kanoi & Jdiet, 2013; Li, Wang, Jackie, Jiang, & Liu, 2012; Zhong, 2013). Most

²⁰ <http://www.android.com/>

²¹ <http://www.samsung.com/>

²² <http://www.htc.com/www/>

²³ <http://www.google.ca/nexus/>

²⁴ <http://www.apple.com/ios/>

²⁵ <http://ca.blackberry.com/software/smartphones/blackberry-10-os.html>

²⁶ <http://www.windowsphone.com/en-us/features>

mobile platforms like iOS and Android offer Software Development Kits (SDK) with Application Programming Interfaces (APIs).

Three mobile development strategies, namely native, hybrid and Web-based, are being used to develop mobile applications (Christ 2011). As can be seen in Figure 5, *native applications* require a development phase for every single mobile operating system; thus it takes time and requires a lot of effort to utilize the service. Even though this option is costly, it gives full flexibility to the developers to use the features provided by mobile operating systems, which can radically increase the efficiency and value of the mobile service. Wasserman (2010) states that native applications are the easiest to test in terms of analyzing the performance and efficiency of the service provided. Since native applications are developed with the same SDK that is also used for other native applications, it will share the common look-and-feel with the other applications; thus it will help mobile end-users feel comfortable.

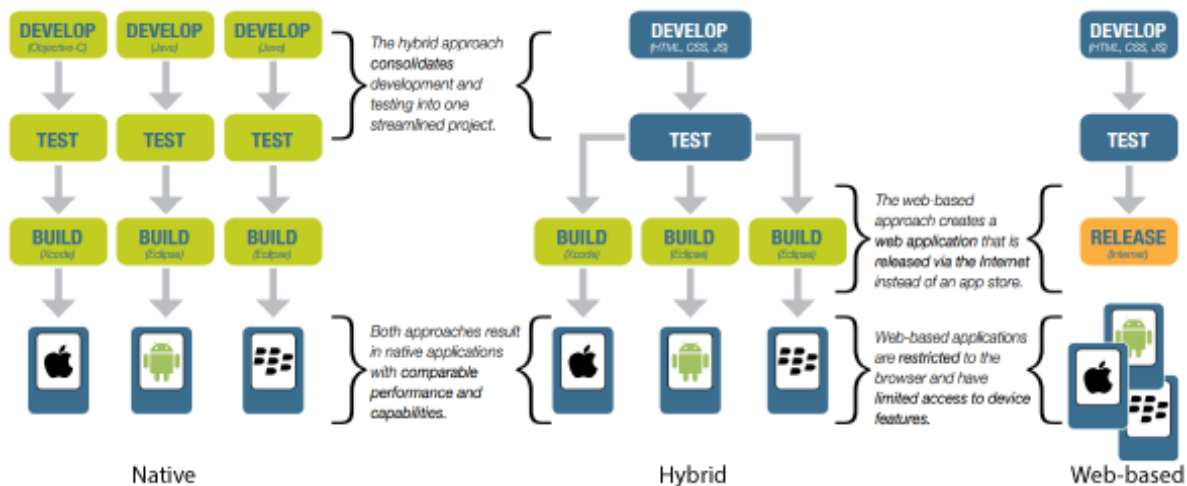


Figure 5: The Three mobile App Development Strategies, from Christ (2011)

Another alternative is to develop *Web-based applications* to avoid the cost and time of delivering the service. The main logic of this alternative is to develop one web-based application with the help of technologies like Hypertext Markup Language (HTML) 5, Cascading Style Sheet (CSS) and JavaScript, and enable mobile users to access the service through mobile browsers like Safari and Chrome (Gardner, 2011).

The difference between mobile websites and web apps is not quite clear. However, some experts agree on certain parameters and concepts that can distinguish a mobile website and web

application. Hazael-Massieux (2010) states that web services can be considered as mobile web apps if they provide some of the standards like rich and interactive user interface, using device capabilities, enabling offline access and letting users perform certain tasks for specific goals instead of accessing static information.

While they are cost effective, Web-based mobile applications don't give full capability to developers to use the features of the mobile devices, even though there are frameworks, like jQT²⁷ and Sencha²⁸ that can be used to replicate the native mobile user interface. Moreover, there are concerns about the possible revenue production since they are not released through the native app stores (Christ, 2011). It is also hard to test Web-based mobile applications on a specific mobile platform as it doesn't carry the characteristics of native development frameworks (Wasserman, 2010).

The third solution, which is considered the most efficient (Christ, 2011) for developers, is *hybrid mobile applications* which basically represent native applications that use Web technologies like HTML, CSS and JavaScript to develop the required service instead of the native programming languages like Objective-C and Java. With this approach, developers can use platforms like PhoneGap²⁹, Appcelerator Titanium³⁰ or RhoMobile³¹, to generate the required code for mobile operating systems. Hybrid mobile applications can easily be developed through Web technologies in addition to having the ability to use mobile phone features natively.

Currently, companies are using any or a combination of these three alternatives to deliver their mobile services. Most companies, like eBay, IKEA, Groupon³² and Orbitz³³ that aim to invest on m-commerce prefer to develop native apps for every operating system to optimize the value of their services, while others like T-mobile, RayBan and IGN prefer to use the hybrid development strategy. Other companies, like Dell, Lenovo³⁴, Facebook and Alma&CO³⁵ use a mobile version

²⁷ <http://jqts.com/>

²⁸ <http://www.sencha.com/>

²⁹ <http://phonegap.com/>

³⁰ <http://www.appcelerator.com/titanium/>

³¹ <http://www.motorolasolutions.com/US-EN/Business+Product+and+Services/Software+and+Applications/RhoMobile+Suite>

³² <http://www.groupon.com/>

³³ <http://www.orbitz.com/>

³⁴ <http://www.lenovo.com/>

³⁵ <http://myalmaco.com/>

of their traditional Web services. It is critical for them to redesign the Web interface to highlight commonly used functions as the mobile device screens are limited and it is important for users to perform fast and practical activities (Wasserman, 2010).

3.2.2. Ubiquity

Since mobile devices are easy to carry and are mostly used for personal purposes, mobile users can get the service they need whenever possible. Network communication standards like WiFi, 3G and 4G provided by mobile network providers are widely used. 3G, which was introduced in 2001, “enables users to connect to the Internet through their mobile devices as it provides up to 14 Mbps data speed (Kamboj & Gupta, 2012)”. As the next generation of 3G, 4G provides even faster data speed which is assumed to be up to 100 Mbps (Khan, Qadeer, Ansari, & Waheed, 2009). WiFi (or wireless Ethernet 802.11b standard of WLAN -Wireless Local Area Network - technology) is also widely used by mobile users to connect to the Internet (Lehr & McKnight, 2003). In contrast to 3G and 4G which provide end-to-end service that enables users to travel long distances and still stay connected, with WiFi technology the end-user is located at most a hundred meters away from the DSL or cable modem (Lehr & McKnight, 2003).

Unlike traditional Internet usage, mobile users have been using online services through fixed data plans in exchange of a monthly fee paid to mobile service providers. The high quality content expected from m-commerce applications may exceed the data limit specified in the contracts and the users may have to pay larger bills. But often companies offer various quality options, such as low resolution versions of high definition videos, for the content to optimize the data usage and content display in order to avoid high costs of mobile communication.

With the help of mobile communications standards, customers can always be reached regardless of their location and time through their mobile devices. Since these standards are already in use and considered a fundamental part of the basic infrastructure of m-commerce, *ubiquity* can be assured for ms-commerce services as well.

3.2.3. Context-Sensitivity

The context-sensitivity characteristic of m-commerce has three basic features: *personalization*, *localization* and *interactivity* (Pousttchi et al., 2003). These features are discussed below in terms of compatibility and potential value contribution to e-commerce business models.

3.2.3.1. Personalization

In contrast to laptops and PCs, mobile devices are used as highly personal items. Personalization is about “*providing the content which is related to the needs and wants of the end-user without asking anything* (Koukia, Rigou, & Sirmakessis, 2006)”. Since every device is carried by its owner, personalization can add significant value to mobile services in terms of providing content that is specifically generated for the mobile user. According to Ho & Kwok (2002) and Koukia et al. (2006), mobile users prefer to interact with personalized content rather than general content considering the screen size of mobile devices.

From a business point of view, personalization can increase sales and maintain customer loyalty (Fan & Poole, 2006). Personalization can be performed by leveraging the user’s previous transactions, personal information - such as profile of the user- and providing future content with respect to those transactions (Koukia et al., 2006), and information gathered through other mobile users who had similar activities (Fan & Poole, 2006). For example, Twitter asks users if they want to follow other users whose phone numbers are recorded in the user’s phonebook to connect with relatives and increase the flow of information on the platform. As another example, accessing the information about what kind of items and information are being ‘liked’ by the user on Facebook can enable third party developers to provide more personalized offers and information which can be filtered with respect to the user’s location.

3.2.3.2. Localization

With the help of mobile operating systems and mobile communications infrastructure, identifying the location of the user became an essential part of mobile services (Mahatanankoon, Wen, & Lim, 2005). Companies can use the location parameter to deliver location-based content to their customers. The content may be the geographical specification of the customer on the map, news about a specific city, region or country, weather information and many other services that serve the needs of customers. *Location-based Services (LBS)* are defined as “*services that*

depend on and are enhanced by the positional information of mobile device (Dhar & Varshney, 2011; Rao & Minakakis, 2003)”. Different types of LBS can be used (Cupper, Treu, & Linnhoff-Popien, 2006).

- (1) *Reactive and proactive LBS* are services that are either requested by the user on demand (*reactive*), such as requesting the shortest route when driving, or automatically occurring as a result of being located in a specific location (*proactive*).
- (2) *Self-referencing and cross-referencing LBS* are services that are either requested by the users to get information about their own geographical location (*self-referencing*) or another person or place (*cross-referencing*) (Rao & Minakakis, 2003). The aim of these two requests should include the content derived from the location parameters such as the shortest routes between two annotations.
- (3) *Single-target and multi-target LBS* are services that are either requested to get a single point of location (*single-target*) such as the location of a friend’s home, or multiple locations at the same time (*multi-target*) such as all Starbucks stores in a specific area.
- (4) *Central and peer-to-peer LBS* are services that are either provided by a central server (*central*) or exchanged by two individuals without the functionality of intermediary actors (*peer-to-peer*).
- (5) *Outdoor and indoor LBS* are services that are either delivered in wide geographical areas with the help of satellite and cellular positioning technologies (*outdoor*) or inside buildings through local positioning technologies (*indoor*). Going to a restaurant and accessing the related content about the menus and promotions is an example of indoor LBS.

All the major mobile operating systems like iOS and Android have the capacity to handle location-based services to enhance the quality and efficiency of the mobile services (Oliver, 2009). Thus, location-based services have a great potential to increase the value of the service for customers by delivering the desired content depending on their current location.

3.2.3.3. Interactivity

Most mobile devices have touch screen technology that enables users to interact with the interface of the mobile application displaying the content. Since mobile devices are personal and their screen size is limited, interactivity is more important for m-commerce than it is for e-

commerce. Interactivity refers to “*the extent to which users can participate in modifying the form and content of a mediated environment in real time* (Steuer, 1992)”. The following six constructs of interactivity for mobile devices are defined in (Gao, Rau, & Salvendy, 2010).

- (1) *User Control* refers to “*the capability of changing the viewing experience by choosing the desired content, timing and sequence of a communication*”. This is highly important for m-commerce since users feel frustrated if the content does not refer to what they need or want.
- (2) *Two-way Communication* “*enables users to send feedback based on received content*”. Since users are more likely to give feedback with their mobile devices than their PCs, it is essentially important for m-commerce to give the user a chance to have control over the content.
- (3) *Synchronicity* refers to “*the speed of the messages that are being sent / received mutually*”. Synchronicity is getting faster hence increasing user satisfaction towards interactivity.
- (4) *Connectedness* refers to “*the feeling of being connected to various resources of information and content depending on the users’ interests*”. Companies can use features of mobile platforms to link their content to the customer within various communication mediums like notifications, alerts and links to more related topics. As the connectedness increases, the interactivity of the user becomes more frequent.
- (5) *Playfulness* refers to “*interacting with the content without the participation of another individual*”. Since people use their mobile devices almost all the time, especially when they are waiting for a bus or spending free time, they seek playfulness when they are interacting with mobile content.
- (6) *Interpersonal Communication* refers to “*the degree of communication between two individuals who have mobile devices*”. As these two individuals communicate more efficiently, the interactivity level gets higher.

Today’s mobile services can provide the required degree of any or a combination of these six constructs thanks to mobile operating systems and the development of communication and hardware infrastructure.

Table 7 summarizes the concepts and technologies for m-commerce characteristics discussed above.

Characteristics	Features	Satisfying Concepts and Technologies
Mobility		<i>Mobile Operating Systems</i> : Android, iOS, BlackBerry OS, Windows Phone
Ubiquity		<i>Mobile communication technologies</i> : WiFi, 3G, 4G
Context-Sensitivity	<i>Personalization</i>	Previous Transactions, Other Users' Similar Activities, GPS, Contacts, Emails, Social Media Platforms
	<i>Localization</i>	<i>Location-based Services (LBS)</i> : Reactive and Proactive LBS, Self-referencing and cross-referencing LBS, Single-target and multi-target LBS, Central and peer-to-peer LBS, Outdoor and indoor LBS
	<i>Interactivity</i>	<i>Six constructs of interactivity</i> : User control, Two-way communication, Synchronicity, Connectedness, Playfulness, Interpersonal communication

Table 7: Concepts and Technologies Satisfying the Need of M-commerce Characteristics

As mentioned in the previous chapter, the first two characteristics of m-commerce, *mobility* and *ubiquity*, are provided by the mobile industry value chain players. *Device manufacturers* provide the mobile devices for customers and some of these manufacturers also develop the required mobile operating system for their mobile device. These key players offer the required concepts and features that can potentially be used to answer the needs for *mobility*. Other players like *mobile network operators* and *Internet service providers* construct the mobile communication systems for mobile devices. Hence, requirements of *ubiquity* are satisfied by these players. The other major characteristic, *context-sensitivity* is adjusted more likely depending on the nature of the service and its functional requirements. Thus, even though the enabling technologies of *personalization*, *localization* and *interactivity* are provided within the mobile operating systems, the implementation of these features depends on the businesses that deliver the m-commerce services to customers.

3.3. Contribution of Social Commerce Solutions

Businesses can use s-commerce solutions to reach their customers efficiently and benefit from direct communication and feedback. Integrating social features into the provision of services brings new customers (Dennison, Bourdage-Braun, & Chetuparambil, 2009), and the involvement of social networks and media enables information about products and services to be distributed over customers' social networks. Users usually trust their friends and relatives more than any other authority (P. Marsden, 2010); social networks let prospective customers observe the shopping experience of their peers and be encouraged to participate in the same experience.

S-commerce solutions include Web 2.0 elements and toolsets like blogs, forums, photos, videos, comments, ratings, user profiles, reviews and recommendations (Dennison et al., 2009). With respect to these elements, commonly used solutions are categorized by various researchers (Dennison et al., 2009; J. Marsden, 2013; Richardson, n.d.). These solutions generically include concepts like forums, reviews and blogs where users can get together to communicate, and social media components to enable users to share content through social networks. The 6 dimensions of s-commerce proposed by P. Marsden (2010) cover these concepts. These are discussed below.

3.3.1. Social Shopping

Social Shopping allows people to shop together through online stores that are built on social media platforms. With the help of services like ‘Facebook Connect’ by Facebook and ‘Friend Connect’ by Google, companies can integrate their websites to these platforms in order to sell their products.

Group Buying is another concept as it allows people to have the buying power to get better deals from companies. With a similar perspective, *Co-browsing* lets people shop together by providing synchronized page views and chat facilities. This way, vendors sell their products in bulk to groups of users. Groupon is one example of group buying, where customers can download the mobile app and get discount rates on various products and services. This way, users buy cheaper products while companies sell more items faster and increase the rate of new customers (Steele, 2011).

Group Gifting is another concept that enables people to buy gifts collectively through social networks. As the customer logs in and creates a personalized list of items, other people can be invited to participate. As these people also login, they can buy the items for the customer as a gift. Ebay Group Gifts³⁶ is a good example of group gifting. *Social Shopping Portals* also invite users to shop multiple stores together by providing one or a combination of the concepts mentioned above. Kaboodle³⁷, which is one of the leading social shopping portals with 12

³⁶ <http://groupgifts.ebay.com/>

³⁷ <http://www.kaboodle.com/>

million products and over 5 million monthly visitors, enables its customers to search for different parameters to find desired products and get them with the cheapest price possible.

3.3.2. Ratings and Reviews

Ratings and Reviews allow users to share feedback on products and related information with others. This enables users to get independent opinions before, during and after buying desired products (Dennison et al., 2009). *Customer Ratings and Reviews* and *Customer Testimonials* originate from independent users who have the experience about the product while *Expert Ratings & Reviews* are provided by individuals (or companies) that have intellectual competence over the products and are highly trusted by users. *Sponsored Reviews* are provided by individuals who are getting paid for analyzing and reviewing certain products. Amazon is an excellent example of integrating customer ratings and reviews on their website and mobile app. As customers provide more and more feedback about specific products, their credibility gets higher. This basically encourages customers to contribute more and be an example for others who aim to have the same goal (Ozakca and Lim 2006).

The difference between expert and sponsored reviews is about the agreement between the company that provides the product and the reviewer. Since companies know that websites like Cnet³⁸, Gizmodo³⁹ and Engadget⁴⁰ are highly credible, some of these companies actually request reviews of their products in exchange of financial support. Through readers, reviews are supposed to increase awareness and go viral on social networks.

3.3.3. Recommendations and Referrals

Recommendations and Referrals enable customers to share ideas and information about a specific product within their social networks. The actual difference between recommendations and referrals, and ratings and reviews is about the visibility of the user contribution (P. Marsden, 2010). Ratings and reviews are visible for all users on the website or mobile app while

³⁸ <http://www.cnet.com/>

³⁹ <http://gizmodo.com/>

⁴⁰ <http://www.engadget.com/>

recommendations and referrals are only done between individuals. Recommendations and referrals may be from an individual to another, or to a group of individuals with the same interest.

Social Bookmarking is one type of recommendation where customers create lists of products on providers' websites and share them on their social network. 'Wish lists' or 'gift lists' are some commonly used examples for social bookmarking. Key players like Amazon, Ebay and BestBuy⁴¹ offer personalized wish lists for their customers to share with others through their social media profiles and networks. Some websites like WishPot⁴², EverNote⁴³ and WishListr⁴⁴ also offer independent wish list creating tools. Some of these tools, like Amazon Universal Wish List, can be integrated to online shopping websites to directly find the listed items to buy (Fitzpatrick, 2009).

Referral Programs reward customers with discounts as they bring more customers to the company with social bookmarking. As the existing customer creates a list of items, which is not necessarily 'wish/gift lists', s/he *refers* this list to another person through email, social media profile or even SMS, if the customer is using a mobile device. As customers start to attract others with these lists of items, they start to get rewarding discounts. *Social Recommendations* provide reviews and recommendations about products depending on the feedback of customers' friends in their social network. Netflix's 'My List' feature has the characteristics of social bookmarking and social recommendations concepts.

3.3.4. Forums and Communities

Companies that integrate forums to their websites can benefit from user involvement and content generation. With the participation of more users, companies can understand the needs and wants for certain products. *Questions and Answers (Q&A) Forum* enable customers to search for specific answers to related problems and issues (P. Marsden, 2010). If there is no result, the

⁴¹ <http://bestbuy.com/>

⁴² <http://www.wishpot.com/>

⁴³ <https://evernote.com/>

⁴⁴ <http://www.wishlistr.com/>

customer can create a new question and wait for other customers or experts to provide the answer. Q&A forums can be especially used for technical topics that require a certain level of knowledge and experience. As an example, Appcelerator⁴⁵ successfully uses its Q&A forum to enable customers to solve their coding and platform usability issues by searching existing topics or creating new ones. With a similar perspective to Q&A Forums, *Discussion Forums* also enable users to create new topics and discuss any issues related to the products or services of the company. Shopify⁴⁶ offers a discussion forum to solve the issues of their customers when they are implementing the service. *Customer Communities* are very similar to Discussion Forums but the purpose of these forums or boards is to support a particular community of a company, product or a service. For example iFans⁴⁷ provides a forum for the fans of Apple products.

Retail Blogs like MyStarbucks Idea⁴⁸ and Official Google Blog⁴⁹ enable businesses to share information with their customers. Since the provider of the content is the company itself, customers get the latest and most accurate news. When the company needs to make an announcement about any kind of issue, they put the content as individual posts to these blogs and let their customers share and distribute the information through social networks and social media platforms.

3.3.5. Social Media Optimization

Social Media Optimization (SMO) refers to the set of tools that aim to attract users by publicizing and distributing the content provided by companies. Social media platforms like Facebook, Twitter and Google Plus are mostly selected as the primary distribution channel, yet forums, discussion boards and other websites such as Youtube⁵⁰ and SlideShare⁵¹ that have a high rate of user contribution are also being used for SMO in some cases. Since businesses can easily create their pages and profiles on social media platforms, they can start to share syndicated news about

⁴⁵ <http://www.appcelerator.com/>

⁴⁶ <https://ecommerce.shopify.com/c/ecommerce-discussion/>

⁴⁷ <http://www.ifans.com/forums/>

⁴⁸ <http://mystarbucksidea.force.com/apex/ideaHome>

⁴⁹ <http://googleblog.blogspot.ca/>

⁵⁰ <https://www.youtube.com/>

⁵¹ <http://www.slideshare.net/>

the products, services and events within individual posts. This is referred to as the *News Feeds* feature by P. Marsden (2010). For example, Adidas⁵² has three different pages and profiles on Facebook, Twitter and Google Plus. The *Deal Feeds* feature is almost the same as news feeds but is focused on the deals that the company/brand offers to its customers. It is considered the most important reason for people on social media platforms to follow companies and learn about the offered deals (Advertime, 2009).

In addition to news feeds and deal feeds, some companies prefer to use the *Media Sharing* feature where interactive media content like pictures, banners and videos is added. BlendTec⁵³ has been using this feature on social media to provide entertainment videos for their followers by encouraging them to share the information, and possibly buy the product.

Through news feeds, deal feeds and media sharing features, companies can also perform the *Link Building* feature to provide a way for their followers to access their own website with adding the URL address to shared information. Also, *Social Media Events* gather users together through events organized by companies. As an example, Amazon organized a photo contest called “2 Million Kindle Fans” on Facebook. The photo which got the most likes and shares on Facebook was promised to be uploaded as the cover photo of Amazon Kindle official Facebook page.

3.3.6. Social Ads and Apps

Some businesses use *Social Ads and Apps* to reach their potential customers and increase brand awareness. If the focal consumer group for the content does not belong to a specific field of interest, then social media platforms are better mediums to spread the word and increase awareness. Forums are preferred for *Social Ads* if the company serves a particular customer group, like gaming. For example, PCGamer⁵⁴ provides interactive banner ads for different games and promotions that have the potential to be highly attractive to users.

Social Apps and *Social Widgets* offer online applications, mostly built on social media platforms to support social interaction and distribution of content about a product, service or brand. They

⁵² <http://www.adidas.com/>

⁵³ <http://www.blendtec.com/>

⁵⁴ <http://www.pcgamer.com/>

provide attractive content to let users get and redeem codes and extra content. The major difference between social apps and social widgets is the fact that social widgets are atomic applications that can be integrated into various websites like blogs, forums and personal websites, whereas social apps are more complex, structured applications that are being used on social media platforms. They can't be easily integrated to other websites since their characteristic features depend on the primary social media platform (Radfar, 2009).

The s-commerce solutions discussed above are summarized in Table 8.

Author(s)	S-commerce Solutions	Web 2.0 Elements and Toolsets Used
Dennison et al. (2009)	Shopper Show-and-Tell	Blogs, Photos, Comments
	Product Page Discussion	Ratings, Reviews, Recommendations, Comments
	Product Journals	Photos, User Profiles, Blogs
	How-to Guides	Articles(by users, employees and experts), Videos
Marsden (2010)	Custom Solutions	Combination of any of the Web 2.0 elements mentioned.
	Social Shopping	Social Media Stores, Portable Social Graphs, Group Buying, Co-Browsing, Group Gifting, Social Shopping Portals
	Ratings & Reviews	Customer Ratings & Reviews, Expert Ratings & Reviews, Sponsored Reviews, Customer Testimonials
	Recommendations & Referrals	Social Bookmarking, Referral Programs, Social Recommendations
	Forums & Communities	Discussion Forums, Q&A Forums, Retail Blogs, Customer Communities
(Richardson, n.d.)	Social Media Optimization (SMO)	News Feeds, Deal Feeds, Media Sharing, Social Media Events, Link Building
	Social Ads & Apps	Social Adds, Social Apps, Shop Widgets
	Bloggng	Online Content Management Systems like Drupal, WordPress, Blogger
	Social Networking	Facebook, Twitter, LinkedIn, MySpace, Bebo, FastPitch, I-Meet
	Multimedia Tools	Flickr, TweetPhoto, Youtube, LiveCast, Vimeo
	Online Reviews and Opinions	Ratings, Reviews, Forums and other bulletin board concepts

Table 8: S-commerce Solutions with Web 2.0 Elements and Toolsets Used

In our design framework for ms-commerce, we adopt the s-commerce solutions classified in (P. Marsden, 2010) since we believe that they are representative of the concept and they include innovative solutions like Social Media Optimization and Social Ads. However, we do not include *Social Shopping* in our framework since other characteristics can be combined to deliver a similar functionality. For example, the concept of *Social Shopping Portal* is about providing the cheapest price for a specific item to customers with the help of social networks. A business that uses the *market creator* e-commerce business model can easily integrate this functionality to its website by gathering information form their customers and their social networks. *Group Gifting* is another element of Social Shopping that can be imitated with the use of

Chapter 3. Building Blocks of Mobile Social Commerce

Recommendations and Referrals solution in *content provider* or *e-tailer* business models to let customers create lists and share it with others to get benefit.

Chapter 4. Mobile Social Commerce Design Framework

Based on the discussion in the previous chapters, we devised a design framework for ms-commerce. The framework covers two perspectives. The *conceptual perspective* enables businesses to categorize themselves based on their existing (or sought after) e-commerce business model, and then investigate the possible mobile and social elements that can be useful in delivering ms-commerce services to their customers. The *design perspective* on the other hand provides guidelines for design and development of these ms-commerce services.

4.1. Conceptual Perspective

The building blocks of ms-commerce, which are e-commerce business models, m-commerce characteristics and s-commerce solutions, are represented as layers in Figure 6. The *business models* layer is where the main characteristics of B2C e-commerce businesses are identified and classified. The *mobile* layer is where the characteristics and features of m-commerce are located. These two layers represent the *m-commerce* concept. Once the *social* layer is added to the other two layers, s-commerce solutions are built onto m-commerce; and ms-commerce is conceptually constituted.

Characteristics in the mobile layer like *mobility* and *ubiquity* will enable businesses (who implement e-commerce business models) to reach customers regardless of location and time. The features of *context-sensitivity*, namely *personalization*, *localization* and *interactivity* will play a critical role in differentiating mobile services from those of the competition. Furthermore, to enable active participation of customers in content generation and distribution, businesses can integrate one or a combination of solutions from the social layer like social media optimization, and toolsets like forums, blogs, reviews, ratings and recommendations to their mobile services.

Mobile Social Commerce (ms-commerce)

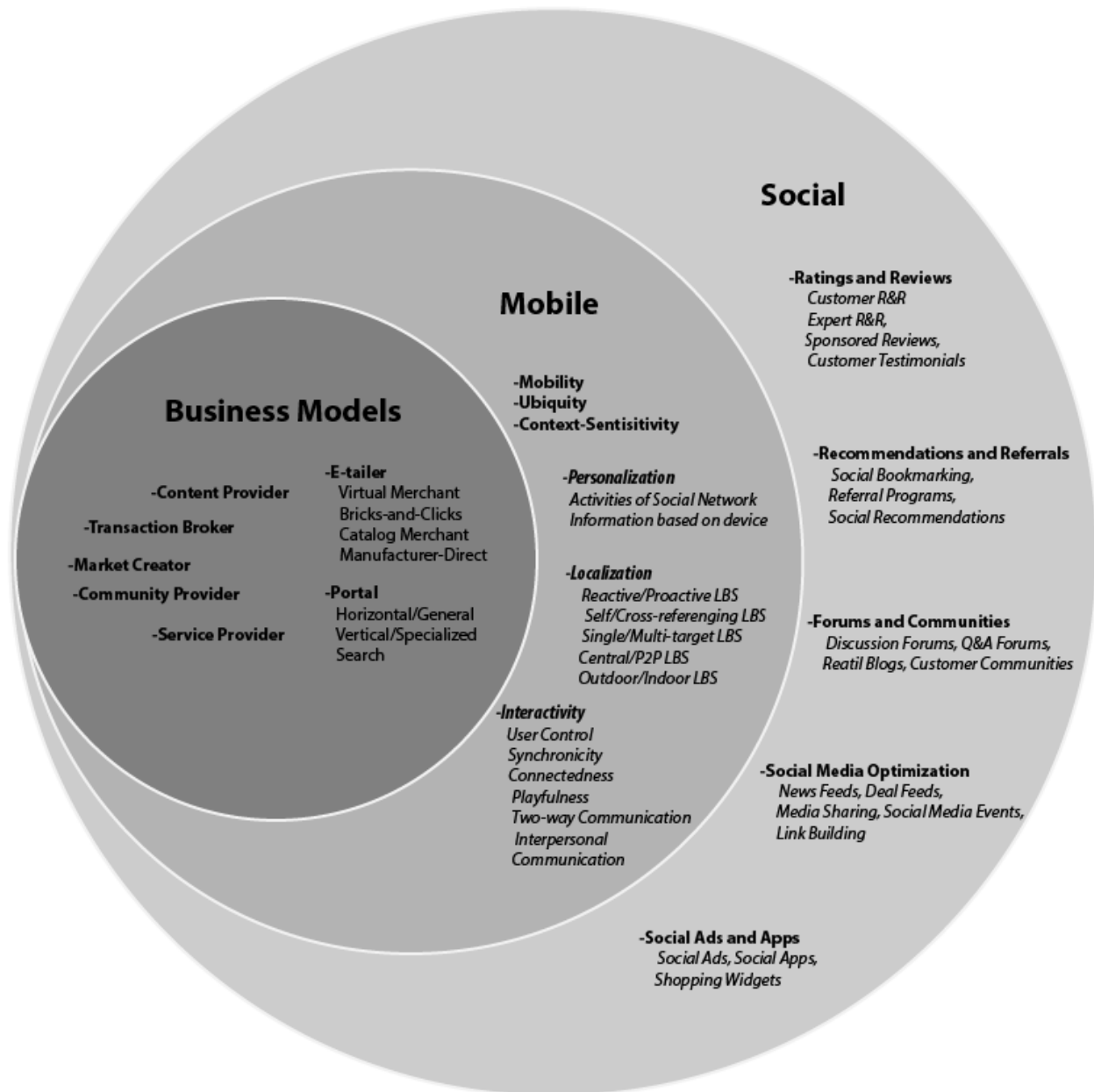


Figure 6: Layers of Mobile Social Commerce

The layers of ms-commerce proposed above are based on our observations of real-world e-commerce companies and their mobile and social needs as well as on the literature review. We know that several successful e-commerce companies are already using a combination of the various elements found in the outer two layers of ms-commerce (see outer two layers in Figure 6). Below, we analyze the mobile apps of some of those e-commerce companies classified based

on their business models (see inner layer in Figure 6). In this analysis we aim to provide evidence that ms-commerce can actually increase the value of the offered service even though it might have been developed in an ad-hoc manner.

4.1.1. E-tailer Business Model

Amazon is the most popular example of the *Virtual Merchant* variation. In terms of *mobility* and *ubiquity*, Amazon has integrated its services to the mobile environment through native applications on iOS and Android in addition to optimizing its traditional website for mobile browsers. In terms of *context-sensitivity*, the native application offers *personalization* and *interactivity* through individual user accounts. In terms of interactivity, three major activities can be performed to search and organize the desired items by customers. Thus, *user control* is high as customers can interact with the content. They can create ‘Wish Lists’ to collect all the items they consider purchasing and share them with others, hence *interpersonal communication* is performed. Another interactivity feature, called ‘Add to Cart’, enables customers to collect and purchase items at the same time. As an example of *synchronicity*, customers can directly click the ‘Buy Now with 1-Click’ button at the description page and buy an item without any intermediate steps. Other *personalized* features such as recommended items depending on the customer’s previous transactions can be displayed along with gift cards to be sent to others. The mobile app of Amazon also uses solutions from the social layer. On the product description screen, the user can directly share the item information with others through social media platforms such as Facebook and Twitter. As the user shares the content with others, s/he can add a personal message to provide opinions and thoughts about the product. Thus, the *social media optimization (SMO)* solution from the social layer is used throughout the user experience. Also through the Wish List feature, other people can access the shared wish list and order those items as a gift to the owner of the list. This reflects the *social bookmarking* property of *recommendations and referrals* from the social layer. Customers can rate products during the post-purchasing phase by providing feedback, which represents an implementation of *ratings and reviews* from the social layer.

IKEA, a *Bricks-and-Clicks* variation, has developed native apps for iOS and Android as well as a mobile website to satisfy *mobility* and *ubiquity*. With the *localization* feature of *context-*

sensitivity, the company provides online offers and events that are only available in the nearest store. It is a type of *reactive, outdoor, central, cross-referencing* and *multi-target* service (Copper, Treu, and Linnhoff-Popien 2006) as the customer requests the information about the closest IKEA store to find out the address and driving instructions from the customer's location. The native application asks the user to switch to the default map application, such as Apple Maps or Google Maps, to provide the related service. With the help of a 'Shopping List' component, users can create unique lists of products as the *user control* feature of *interactivity* with the estimated price information and the availability status of each item. In terms of social integration, the company enables users to share items with others through Facebook and Twitter for *social media optimization*. The *ratings and reviews* solution is also implemented on product pages as well as *Q&A forums* of *forums and communities* solution (see social layer in Figure 6).

ShopRite, an example of the *Catalog Merchant* variation, has, in addition to its website, a native mobile app. In terms of *localization*, the app enables customers in the US to *reactively locate* themselves to find the nearest store and related discounts available in that particular store. This localization feature is also *single-target, outdoor* and *cross-referencing* since customers query only the nearest store from a *central* database. Furthermore, the company enables customers to create personal lists of offers to be used in the nearest stores as a sign of *user control* through direct *interactivity*. Since club members must provide their location information and their desired categories of grocery items, the app provides *personalized* recommendations for each customer. In terms of social integration, the company has a banner area where they share *social ads* for their own content. This content includes information to attract customers about new products that are available in local stores.

Dell is a good example of the *Manufacturer-direct* variation as the company has a mobile website to reach customers with a compatible interface design. In terms of *context-sensitivity*, Dell uses *interactivity* successfully through *playfulness* as the users can compare the products and customize them. Also, *interpersonal communication* is assured as customers can communicate with the representatives of the company to learn more about the products. The mobile website also provides *ratings and reviews* as one the main social solutions. In addition to providing personal opinions about a product, customers can rate it considering three parameters; features, performance and value.

4.1.2. Portal Business Model

As one of the portal variations, Yahoo is a good example of *horizontal/general portals*. The company provides a mobile website for users. The *localization* feature is *proactively* used in order to provide relevant content. The content includes news about local sports, entertainment and finance, a weather report of the city, and other trending topics by other users. With respect to the content the user was previously interested in, the mobile website provides more *personalized* content at the bottom of the screen. Users can share the news with others through social media by providing their personal opinion with a link directing the readers back to the mobile website. Thus, the *social media optimization* solution is used.

As an example of *vertical/specialized portals*, CIO Insight has a mobile website that provides the same content as the regular website where users can review books, articles, and hints and recommendations about IT. The *connectedness* element of *interactivity* is used since users can review the content offline by downloading it to the mobile device for future review. They also have official social media pages and profiles on SMPs like LinkedIn, Twitter and Facebook as they have been sharing the articles with these SMP users with a link to the regular or mobile website.

Google is a perfect example of the last variation of the portal business model, the *search portal*. Google's mobile app⁵⁵ can be used on iOS and Android through native apps. It uses the *localization* feature *proactively* to provide relevant content like local weather, traffic and nearby restaurants. The *connectedness* feature of *interactivity* is also supported since the application sends push notifications to inform users. *User control* is provided as users can choose what to display on the screen. *Two-way communication* is supported through voice recognition and image upload for searching specific topics. *Personalization* is supported by recording the search history and recommending related topics. Even though there is no social integration for this example, the mobile characteristics and features are highly utilized to let customers have the smoothest experience throughout the use of the mobile app.

⁵⁵ <http://www.google.ca/mobile/>

4.1.3. Content Provider Business Model

Netflix is one of the most popular content providers as the company enables its users to watch movies, TV shows and documentaries through any browser that supports Silverlight⁵⁶. Netflix also have native applications for iOS, Android and Windows Phone.

In terms of *context-sensitivity*, Netflix uses the three features to provide an efficient service to mobile customers. With the help of *localization*, the company identifies the country of the subscriber proactively and displays available content. Additionally, the company displays potentially desired *personalized* recommendations to the user depending on previous activities and what others liked on Facebook. In the related section, Netflix asks the user to get the permission to access the user's Facebook profile to learn what kind of movies the user liked on her/his network. With the help of the touchscreen features, users can control the desired videos through *two-way communication interactivity*. In terms of *user control*, they can create lists of movies and watch them later through 'my list' feature. Customers can rate the watched movies and share their opinions with others. With the social solution of *customer ratings and reviews*, users can make the decision to watch that particular movie or not depending on the comments and ratings. These ratings are also used by the app to provide lists of movies in "top rated" and "top discussed" categories.

4.1.4. Transaction Broker Business Model

As a transaction broker, Monster has a native mobile app, called Monster Jobs, to provide the service of job searching to their mobile customers. The app uses *reactive localization* to enable customers to search for jobs offered by organizations near them. In terms of *interactivity, user control* is high since users can search for particular jobs. *Connectedness* is also supported since users can set email job alerts. As users login and set the industry related to their profession during their initial registration, *personalized* job offers are displayed for them. In terms of sharing and distributing content, the mobile app enables users to share the desired jobs with others on Facebook and Twitter. Through the *link building* method, users can share personal

⁵⁶ <http://www.microsoft.com/silverlight/>

messages and links to the job posts on Monster's website through *social media optimization*. Users can share content through email and messaging as well.

4.1.5. Market Creator Business Model

Kijiji is a market creator. The company brings buyers and sellers together through its mobile website and native app. The mobile app uses *reactive localization* to enable users to have buying and/or selling activities locally. In terms of *interactivity*, *user control* is provided through the search options to display the desired content. *Inter-personal communication* is provided to enable buyers and sellers to communicate with each other before, during and after the deal. As for *synchronicity*, the native app enables users to post an item by taking photos with their mobile device and uploading the information about the item. The *connectedness* property is used by sending push notifications and alerts to inform mobile users about a specific item or offer. In terms of social integration, the *social media optimization* solution is used. The mobile app enables users to share posted items with others on Facebook and Twitter by providing a link directed to the post; pictures, description of the item and an optional message from the user.

4.1.6. Service Provider Business Model

Dropbox is one of the most popular examples of the service provider business model as it provides free space for users to upload their files and access these files from any Internet-enabled device including smartphones, tablets and laptops. In terms of *interactivity*, the *user control* property is used since the users can modify the content anytime. The *playfulness* is also high in terms of displaying the content in different size options, enabling users to zoom in/out, search for specific keywords and copy highlighted areas if necessary. Dropbox uses *referral programs* of the *recommendations and referrals* solution in the social layer to gain more customers by enabling existing ones to refer the service through email and messages. The existing customer can select a specific document and send it through the preferred communication channel to other users. As the new user accesses the system to display the file and registers as a new customer, the primary customer is rewarded with more space.

4.1.7. Community Provider Business Model

GROWLr⁵⁷, a community provider for LGBT people, provides native mobile apps on iOS and Android. Since it brings people with similar orientations and identities together, it is considered a community provider. In terms of *context-sensitivity*, *localization* is used as a key element throughout the mobile app. With the permission of user, the mobile app *reactively* provides the list of other nearby people, which also refers to *cross-referencing*, *peer-to-peer*, *outdoor* and *multi-target* LBS. As another filtering parameter, the app uses the personal information provided by the user when the profile is created to display other profiles with similar interests, hobbies and activities; hence the *personalization* feature is used. Once two users find each other and one of them sends a message to the other, the *interactivity* feature is used. In terms of social integration, the users can use a common area to share posts about daily activities and opinions. Other users can leave comments and expand the topic for others as well. This can be seen as the *customer communities* in terms of the *forums and communities* solution in the social layer. In addition to this, one specific post of a user who shared her/his opinions through a personal profile can be shared by others on several social media platforms such as Twitter and Facebook with a generated URL address back to the application, hence *social media optimization* is applied.

4.2. Design Perspective

In this section we leverage the various elements in the layers of ms-commerce (see Figure 6) to devise a design model for ms-commerce. The components of this design model enable us to see how the functionality of each ms-commerce element can be implemented in a modular way within mobile applications that businesses aim to build.

Technology is rapidly changing. Thus, implementing ms-commerce on a technical level is challenging especially since the requirements are quite numerous. For instance, let us consider the integration of the *social media optimization* solution from the social layer of ms-commerce. This involves major social media platforms to enable customers to distribute content on behalf of businesses. The integration of these SMPs is straightforward as these platforms provide SDKs

⁵⁷ <http://www.growlrapp.com/>

for each major development platform and environment. Yet, today's social media platform pioneers can easily be replaced by new and more innovative ones. Take MySpace⁵⁸ for instance. They had over 100 million users in 2006, but they were overtaken by Facebook in 2009. A business that plans to integrate this kind of functionality needs to consider whether the service will last or will disappear in favor of a new one. Programming languages that are being used to develop mobile apps are rapidly evolving as well. As the technological capabilities evolve; faster, more efficient and practical programming languages and methodologies are also being introduced.

Due to the fact that technologies and development tools evolve rapidly, and most importantly the fact that business requirements change regularly, we need a flexible and high level (i.e., independent from the technology and the programming languages) design model for developing and deploying ms-commerce apps.

Figure 7 shows the generic ms-commerce design model covering the layers of the conceptual perspective, with abstract and concrete classes and their relationships. The components of each layer are briefly summarized below as each component having its unique identifier: *B** for e-commerce business models; *M** for mobile characteristics and features; and *S** for social solutions.

The bottom level of the class diagram in Figure 7, namely *business models*, includes 7 components, each one representing an e-commerce business model (see Table 9).

⁵⁸ <https://myspace.com/>

Bottom level: Business Models	
Identifier	Component
B1	E-tailer is an online retailer where users can access, check the updated inventory and place an order for a desired product, with four variations; (B1.1) Virtual Merchant, (B1.2) Bricks-and-Clicks, (B1.3) Catalog Merchant and (B1.4) Manufacturer-direct business models.
B2	Portal provides an online environment for customers to access services like Web search tools, news, email, calendars, instant messaging, shopping, music downloads, video streaming, etc. The model has three variations; (B2.1) Horizontal/General, (B3.2) Vertical/Specialized and (B3.3) Search Portals.
B3	Content Provider provides digital content to users over the Web. The content might be video, music, photos, text and any digital product that can be distributed over the Internet.
B4	Transaction Broker models transactions for customers over the Internet. These businesses are mostly focused on (but not limited to) financial, travel and job placement services.
B5	Market Creator provides an online environment for buyers and sellers to have peer-to-peer transactions. Buyers search for and buy products by paying the price that the seller defined.
B6	Service Provider provides various services to customers online. These services can be consultancy about a particular topic, knowledge trade and expertise, financial planning, bill management, cloud software applications like online document editing, email management, etc.
B7	Community Provider provides an online environment where users can get together with others with similar interests to share personal opinions, pictures, and videos, and have commercial transactions like buying and selling items.

Table 9: The bottom level of the Class Diagram: Business Models

The mobile layer in the conceptual perspective has three characteristics: *mobility*, *ubiquity* and *context-sensitivity*. Context sensitivity has three features: *personalization*, *localization* and *interactivity*. In the design model, the three characteristics are separated. The second level, called *mobile infrastructure*, includes *mobility* and *ubiquity* (see Table 10).

Middle level: Mobile Infrastructure	
Identifier	Component
M1	Mobility provides the required software infrastructure like OSs and core mobile services like multitasking, maps, notification and location identification.
M2	Ubiquity provides instant communication between the businesses and customers independently from time and location.

Table 10: The middle level of the Class Diagram: Mobile Infrastructure

Context-sensitivity (see Table 11) is in the top level of the design model (i.e., *design and development*), along with *social solutions*. *Context-Sensitivity* enables companies to differentiate their services by increasing the *personalization* of the delivered content, making the content or services more *interactive* and/or enhancing existing services with *localization* by obtaining the user's location and delivering the service based on that location. Unlike *mobility* and *ubiquity*, it is not necessary to use all the context sensitivity features at the same time to deliver a service, yet context-sensitivity clearly shapes the nature of the mobile service. Also in the top level of the class diagram are the social solutions from the social layer of the conceptual perspective (see Table 11). The top level of the design model constitutes the required functionalities of the mobile app that businesses aim to design, develop and release for their customers.

Top level: Design and Development	
Identifier	Class
M3	Context-Sensitivity provides various features to characterize the mobile app depending on business needs. These features are (M3.1) personalization, which provides content related to the needs and wants of the end-user without asking anything, (M3.2) interactivity, as the extent to which users can participate in modifying the form and content of a mediated environment in real time, and (M3.3) localization services are shaped by the location information.
S1	Ratings and Reviews allows users to share feedback on products and related information with other users.
S2	Recommendations and Referrals let customers share negative or positive opinions and information about a specific product within their social networks.
S3	Forums and Communities enable users and businesses to communicate with forums, discussion boards and community tools.
S4	Social Media Optimization (SMO) refers to the set of tools that aim to attract existing and prospective customers by publicizing and distributing the content on social media platforms as the primary distribution channel.
S5	Social Ads and Apps are advertising material and promotional applications built to attract users with content and playfulness. Social Ads can be placed on blogs, forums and social media platforms to offer promotions and discount coupons to users.

Table 11: The Top Level of the Class Diagram: Design and Development

In Table 12 we provide a summary of our investigation of whether or not some of the most successful web companies implement the elements of the top level (i.e., *design and development*) of the ms-commerce design model.

Business Models	Design and Development					Company			
	M3.1	M3.2	M3.3	S1	S2		S3	S4	S5
B1.1	•	•		•	•		•		Amazon
B1.2		•	•	•		•	•		IKEA
B1.3	•	•	•					•	ShopRite
B1.4		•		•					Dell
B2.1	•		•				•		Yahoo
B2.2		•					•		CIO Insight
B2.3	•	•	•						Google
B3	•	•	•	•					Netflix
B4	•	•	•				•		Monster
B5		•	•				•		Kijiji
B6		•			•				Dropbox
B7	•	•	•			•	•		GROWLr

Table 12: Companies Implementing Elements of the Top Level of the Class Diagram

As can be seen in Table 12, the *design and development* level is the ‘programming part’ of the mobile app as it enables developers from any (native, hybrid or web) background to identify and integrate the desired functionalities for the required ms-commerce app.

Every *abstract class* in the class diagram represents an individual component from the mobile and social layers of ms-commerce. Classes categorized as *concrete* represent classes or files that

contain actual programming code, depending on the type of mobile development platform, to perform the required functionalities of the mobile service. The features of context-sensitivity (M3.1, M3.2, and M3.3) and social solutions (S1, S2, S3, S4, and S5) are represented as abstract classes since their functionality varies for every single scenario depending on the needs of the related business model. The additional abstract class *Add-on(s)* represents miscellaneous tasks that are not included within the three layers of ms-commerce.

The concrete *Application* class contains the required code for User Interface (UI) elements such as buttons, text fields, view objects, windows and tabs. This is especially important for the *Customer* (see top of Figure 7) who interacts with the mobile app.

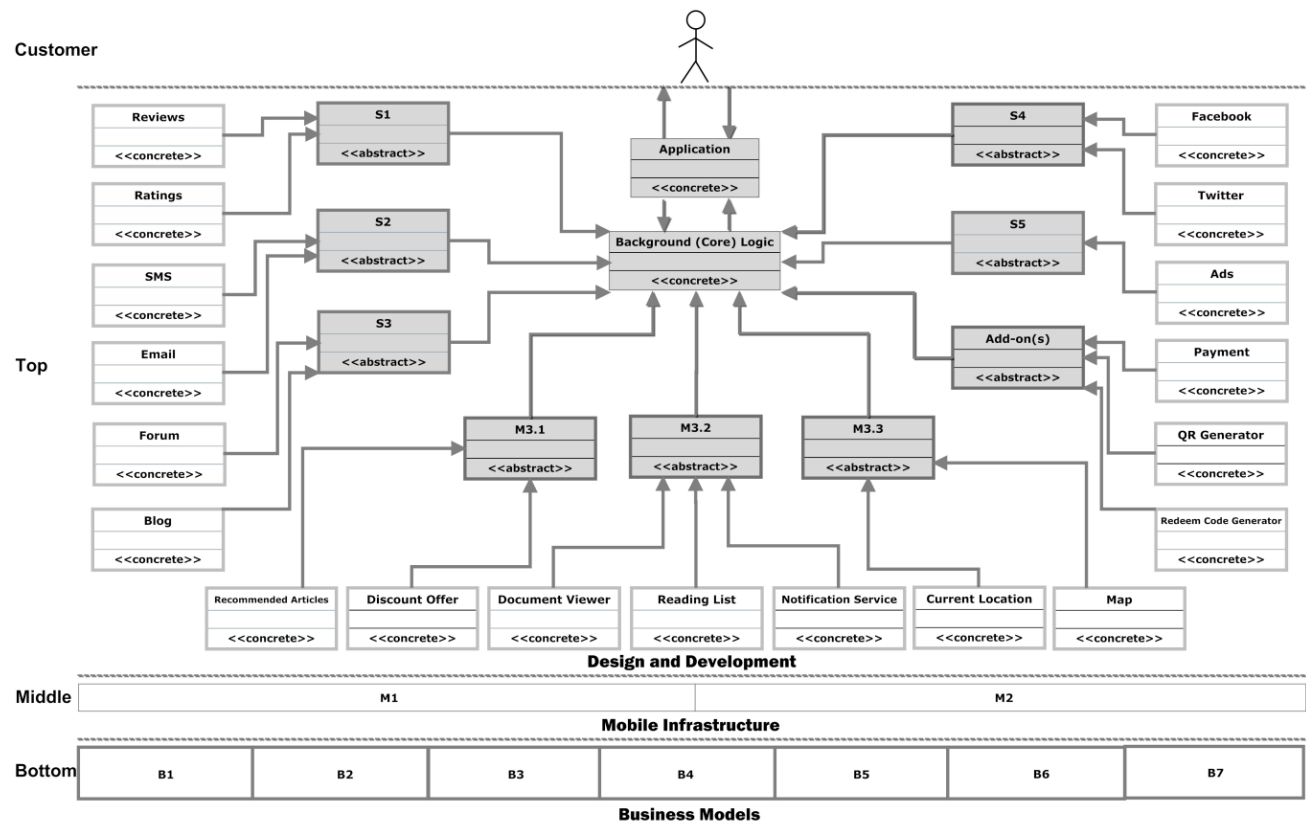


Figure 7: Class Diagram for MS-commerce

The core logic of the mobile service is placed within another concrete class, *Background (Core) Logic*, to separate the UI elements from the internal functional model that forms the actual functionality by utilizing the code from other classes. The UI elements in the *Application* class are called and modeled through the *Core* class to use the customer's inputs, as well as sending

outputs to the customer. Also, the methods in other concrete classes are called and used through the same *Core* class which collects all the activities performed in the background.

The concrete classes which are attached to M* and S* classes contain the actual code to perform the related -mobile and/or social- functionality throughout the mobile service. For example, the abstract M3.3 class, which is the *localization* feature of *context-sensitivity*, has two concrete classes called ‘Current Location’ and ‘Map’. The first class contains the required piece of code that identifies the location of the user who is using the mobile app with different accuracy options and sends the necessary parameters to the Core class. With the same approach, the Map class has the required code for displaying maps depending on the preferences of developers and OS capabilities. Creating visual annotations for specific points and providing routes between two annotations are some other functional capabilities of this class. As the core class gets these inputs, related methods are activated to perform a specific duty by using parameters from different concrete classes at the same time, like assigning the location parameter to the map annotation to display the user’s recent location dynamically.

The M3.1 (*personalization*) abstract class has two concrete classes attached. The ‘Recommended Article’ concrete class includes the required code for creating personalized lists of items with respect to the personal information provided by the mobile app user through UI input elements. Similarly, depending on the users’ profile information and previous activities, the concrete ‘Discount Offer’ class provides personalized information in form of discount messages. Whenever it is triggered, the Core class accepts this discount message and notifies the user through various display mediums like ‘Notification Service’, a concrete class of M3.2 (*interactivity*) to increase the connectedness. Another example of M3.2 is the ‘Reading List’ class where the required code for creating lists of items and enabling users to have full control over it. The code is called into the Core class by a function and used when necessary. This function in the Core class also enables the user to create her/his own list and share it with other users through SMS or Email instances that can be called from concrete classes attached to S2 (recommendations and referrals).

The same working logic is applied to all other abstract classes and their concrete classes. The actual reason for separating the development code into concrete classes is based on the rapid change of mobile and social technologies. For example S4, which represents the *social media*

optimization solution, has two concrete classes attached; Facebook and Twitter. For every SMP, the related class provides the implementation code to integrate the mobile app to social networks through users' personal profile.

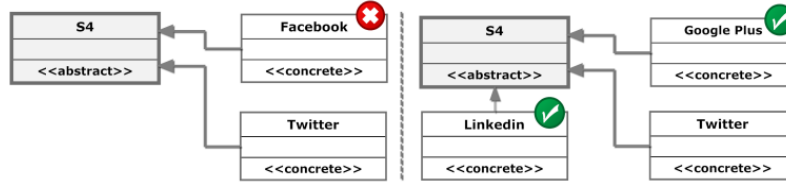


Figure 8: Modularity of Concrete Classes in Design Model

The concrete classes can be currently used to integrate Facebook and Twitter, yet these platforms may change in the future depending on the increasing popularity and technological capabilities of the new platforms. With this modular approach, new concrete class components (see Figure 8) can be attached to the mobile app without manipulating or harming the consistency of the rest of the code.

Chapter 5. Scenarios and Prototypes

In this chapter we present three scenarios of ms-commerce initiatives, and then describe the prototypes of ms-commerce apps that support those initiatives. The prototypes were built by following our proposed design framework. For the design of Activity Diagrams, we've preferred to use SmartDraw⁵⁹, which is a commonly used software solution for UML diagrams. The related prototypes for each scenario are designed and developed by using Appcelerator Titanium, which is a cross-platform mobile development environment. As the primary programming language, we've used JavaScript to construct the required components (see Appendix A).

5.1. Scenario 1: CapitalBurger

CapitalBurger has 3 restaurants that offer burgers, drinks and related items. Compared to its competitors, CapitalBurger is struggling with the number of incoming customers especially during lunch time. In order to increase its service between 12.00 and 3.00 PM, CapitalBurger has decided to develop a mobile app for their customers. This app is planned to provide discounts for items on the menu depending on the users' location. Users can identify their favorite menu items to get discounts when they are located within 2 kilometers of one of the 3 restaurants.

The app uses different components of ms-commerce with regard to the three conceptual layers. Within the *business model* layer, CapitalBurger is considered a *service provider*. In most cases, service providers deliver the service completely online. What makes them pure service providers is that the whole transaction starts (the “before”), continues (the “during”) and ends (the “after”) completely online. There are some services, however, that cannot be delivered purely online, like dentistry, hospital services and food services. Even though the main transaction is performed offline, such businesses can use their online presence to increase the quality of their services. Hence CapitalBurger is considered a service provider since it uses the Internet to provide discount offers (focused on the “before”, not the “during” or “after”) with the aim of increasing consumption in its branches.

⁵⁹ <http://www.smartdraw.com/>

In terms of the *mobile* layer, characteristics like mobility, ubiquity and context-sensitivity are actively used throughout the scenario. For the *mobility* characteristic, the mobile app is developed for a cross-platform mobile environment. Since the mobile service can select the location and time to provide the service to customers, as it is provided between 12.00 – 3.00 PM around 2 kilometers of distance to the geographical location of the restaurants, the *ubiquity* characteristic is also there. In terms of *context-sensitivity*; the *localization* feature is used to proactively identify the location of the customers and enable the system to make a decision about sending the discount offer. The location awareness creates the core value of the service. In addition to the *proactive* property, the localization is also *cross-referencing* and *multi-target*; since the user is able to see the location information of all restaurants as well as her/his own position, *central* and *outdoor*; where the location information of all restaurants in the city is provided from a central database and the users are identified within a radius of 2 kilometers.

Another feature, *personalization* is integrated by providing the discount offer depending on the customer's preferences of desired items within the menu, and previously accepted offers. Delivering the discount offer to the device through *notification services* is a sign of the *interactivity* feature as it provides *two-way communication* between the customer and the mobile app.

The scenario uses *social media optimization (SMO)* as the main medium to integrate sociability to increase the awareness of others. With the help of the published and shared content through the existing customers' social media profile(s), the *link building* and *media sharing* properties of SMO are adopted as the primary functionality of the social layer.

Throughout the scenario, four main actors are identified to perform specific activities. These are explained below;

- **Customer:** The mobile user who decides to download the native app to her/his mobile device that runs iOS or Android, to benefit from using the related service.
- **Mobile Application (app):** The system behind the designed mobile application. This actor will proactively initialize and deliver the required service such as identifying the user location, building the bridge between internal content, social media platforms and

networks, activating specific methods and using the database to inform local systems deployed in each restaurant.

- **Social Media Platform (SMP):** One/combination of the platforms where the Customer has profiles. Preferred platforms are Facebook and Twitter for this scenario.
- **Restaurant:** The local system that is individually deployed in each restaurant with permission to access the centralized database that is also used by the mobile app.

The activity diagram in Figure 9 shows the activities of these actors and their interactions.

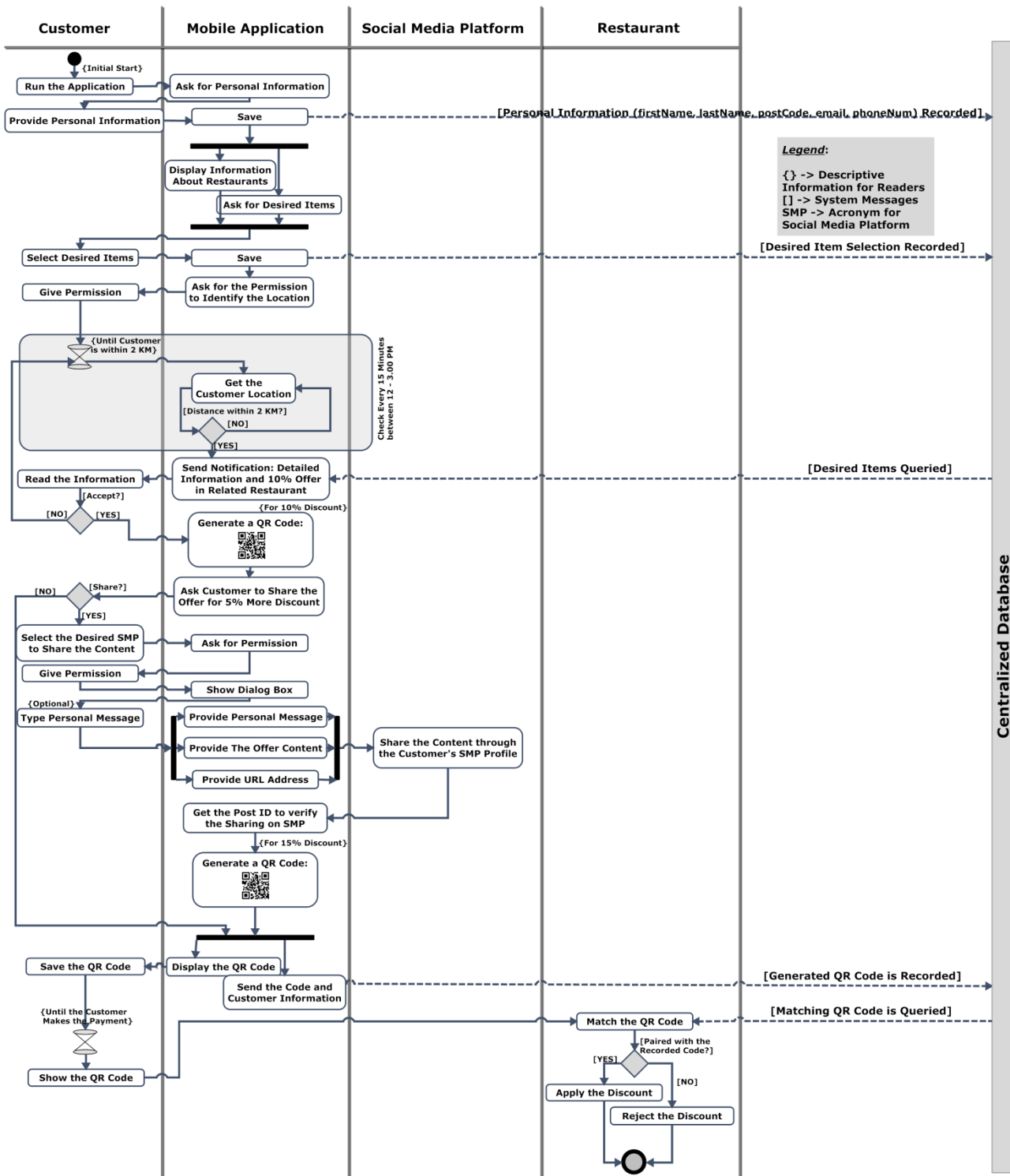


Figure 9: Activity Diagram of the CapitalBurger Scenario

Figure 10 highlights the abstract and concrete classes on the class diagram of the ms-commerce design model for this scenario.

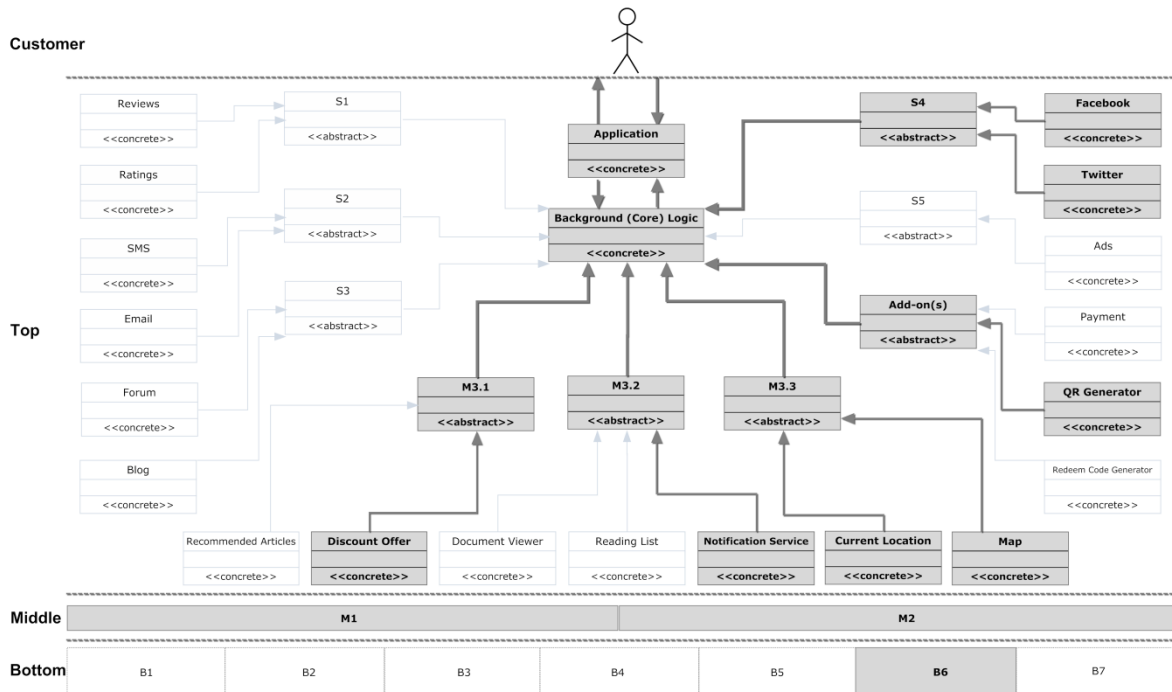


Figure 10: Design Model for the CapitalBurger app

Since CapitalBurger is categorized as a *service provider*, the *B6* component is selected from the bottom level.

Since the mobile app supports the mobility and ubiquity characteristics to deliver the service efficiently, these are selected in middle level.

In top level, all mobile components are used to deliver the required functionality throughout the user experience. As *M3.3* abstract class represents localization activities; the ‘Map’ and ‘Location’ concrete classes perform specific duties like identifying the location of the customers and using natively-supported map modules to display the position of customers and restaurants as annotations. The other component is *M3.2*, where the ‘Notification Service’ concrete class is used to deliver the discount information to the customer with high level of *connectedness* in terms of *interactivity*. Some of these offers are generated for customers specifically depending on their personal inputs about the desired items and elements from the menu. Thus, the *M3.1* abstract class is also attached to the Core class as it has the concrete ‘Discount Offer’ class,

where the required code for generating the discount offer depending on customer information is contained.

In terms of social integration, the abstract *S4* class (*SMO*) is used to provide the required code for social media platform integration within the mobile app. Concrete classes like ‘Facebook’ and ‘Twitter’ are connected to the core logic through *S4* since they contain the functionality for enabling users to share the content through their social media profiles. Both concrete classes contain the application-specific keys as well; i.e., the API code for the peered applications built on Facebook and Twitter.

The concrete class ‘QR Generator’ is also attached with the relevant code to the abstract *Add-on(s)* class to generate the QR code whenever it is required.

A brief description of user activities is given below with related mobile app screenshots.

As the user downloads the mobile application on her/his iOS or Android device, the mobile application asks for personal information such as name, postcode, and email. After this information is recorded to the centralized database, the mobile application displays detailed information about the restaurants as well as the items in the menu (i.e., burgers, desserts, soups, combos and drinks). The customer will be asked to select some of these items to enable the mobile app to recognize the desired items for future offers and discounts (see Figure 11a).

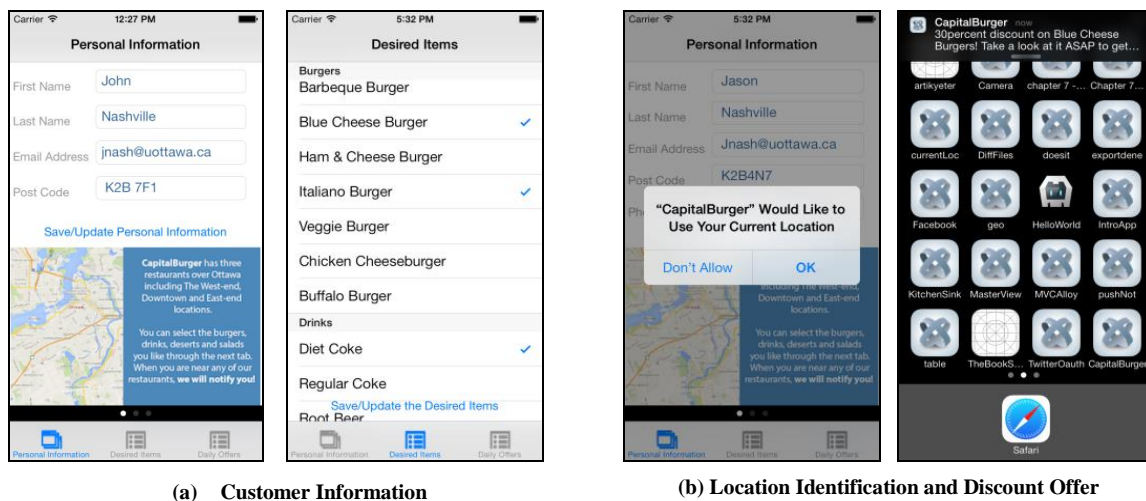


Figure 11: Screenshots from Running the CapitalBurger app

After the desired items list is recorded to the centralized database, the app asks for permission to identify the customer’s location; then the customer grants it. Right after the application

recognizes that the local time is 12.00 PM, it starts to scan the area (e.g., every 15 minutes) with a radius of 2 kilometers around the three restaurants. As the customers are detected within this range, a daily discount offer about the desired product is sent to the devices through notification services (see Figure 11b).

If the potential customer is interested in accepting the offer, s/he will press the notification on the screen and be directed to the application while a unique QR code is generated for the discount (i.e., 10%). The application will also display the detailed information about the discount offer such as the rate of the discount and included items. The generated QR code will not be displayed at this phase since the customer still has the potential to increase the discount rate by sharing the offer with her/his social network through Twitter or Facebook. In the next step, the app asks the customer if s/he wants to share the offer. If the decision is no, the customer will be able to touch a button to display the generated QR code. The customer then proceeds to use this code during the payment after eating the meal in the restaurant. If the decision of sharing the offer is yes, then the customer will be asked to select the desired SMP to share the content. Right after selecting it (i.e., Twitter), the app will ask for permission to post the related offer on behalf of the customer's personal account with a login screen (see Figure 12a).

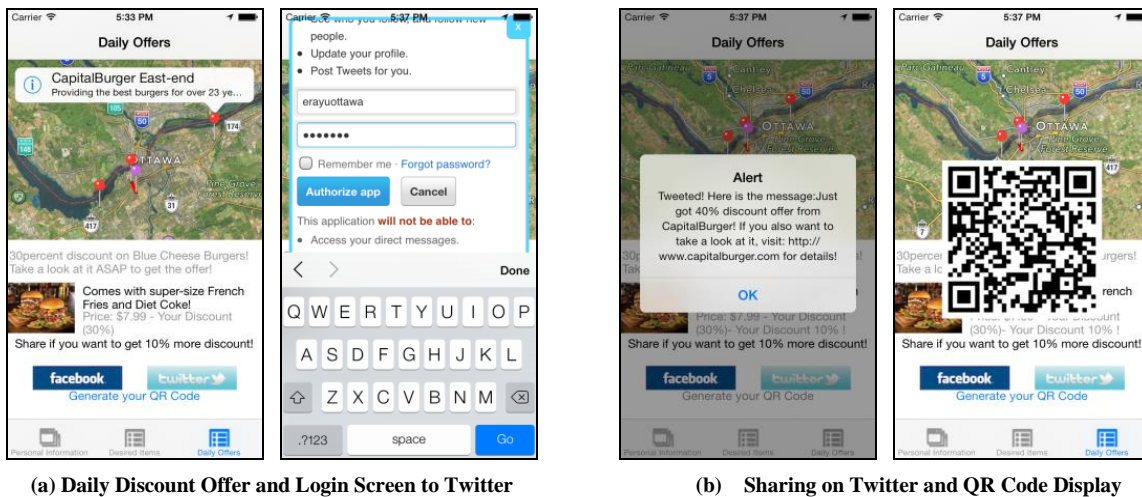


Figure 12: Screenshots from Running the CapitalBurger app

The app will then share the information of the specific offer with an included URL address that will enable others to access the app. As the customer shares the content with her/his social network, the app will get the unique identification number of the shared post to verify that the customer has indeed shared it. Then a new QR code will be generated to offer an increased (i.e.,

+5%) discount and will be displayed on the mobile device screen to keep it as-is until s/he proceeds to the payment phase. At the same time, the QR code will also be recorded to the centralized database to be compared later during payment (see Figure 12b).

The related JavaScript code used for this mobile app prototype can be reviewed through Appendix B.

5.2. Scenario 2: PowerNHL

PowerNHL provides detailed reports about the professional ice hockey clubs in National Hockey League (NHL) throughout its official website. These reports cover content like league rankings, playoffs, comparison of teams' performance, and future forecasts about the likelihood of game results. Considering the wide use of mobile devices, the company decides to implement a new strategy to increase the amount of subscribers by developing a mobile application. Especially, tablet devices like iPad and Galaxy Tab Pro are highly compatible for reviewing these reports since they have larger screens; so text, figures and tables would be displayed easily. The app enables people to buy periodic subscriptions using online payment. Fans can also use redeem codes to extend the amount of days they have.

This scenario uses elements from all three conceptual layers of ms-commerce. In terms of *business models*, the company is a *content provider* as it delivers online content to users. The *context-sensitivity* characteristic from the *mobile* layer is also used; in terms of *personalization*, the user provides her/his favorite NHL club and division at the beginning and the mobile app provides specific recommendations with respect to this information. For *interactivity*, the *playfulness* of the content is high since the native OS features enable users to zoom in, highlight a specific section, and modify the size and font type of the text. *User control* is also present through reading lists which are created and modified by the mobile users. The subscriber can add new articles to this list to review it at another time. Additionally, the *interpersonal communication* property is leveraged as users can communicate with each other by rating the content and providing feedback for others.

The scenario uses three elements of the *social* layer. Since subscribers can rate the content and provide feedback, *customer ratings and reviews* is used as a part of the *ratings and reviews*

solution. The *recommendations and referrals* solution is used by sharing personalized reading lists with others who may or may not be subscribers by sending an email with information about selected reports. This is referred to as *social bookmarking* because the primary user is giving another user the opportunity to access the content, while s/he gets an extension of his/her subscription and PowerNHL gains a new customer. The redeem code can also be gathered through advertising on social media. As mentioned earlier, most websites like Facebook, Twitter and Google offer advertising opportunities for companies to publish banners and multimedia content. So PowerNHL can place ads on Facebook to distribute redeem codes to users to access the content for a number of days. The company can also use the *social ads* solution by enabling other companies to place ads within the mobile app to increase revenue.

The actors of the scenario are mentioned below;

- **Subscriber:** The mobile user who uses the mobile app to access, review and rate reports, and to provide feedback.
- **Mobile Application (app):** The system behind the released mobile application. It will perform the required activities like getting the user information, providing the relevant reports, displaying the content, displaying the feedback for each report with ratings and reviews, etc.
- **Credit Card Provider:** The system that is integrated into the app to get the payment information from the subscriber and check the validity. Depending on the verification/rejection of the validity, it enables the app to proceed to further activities.

The activity diagram in Figure 13 shows the activities of the three actors and the interaction between them for the PowerNHL scenario.

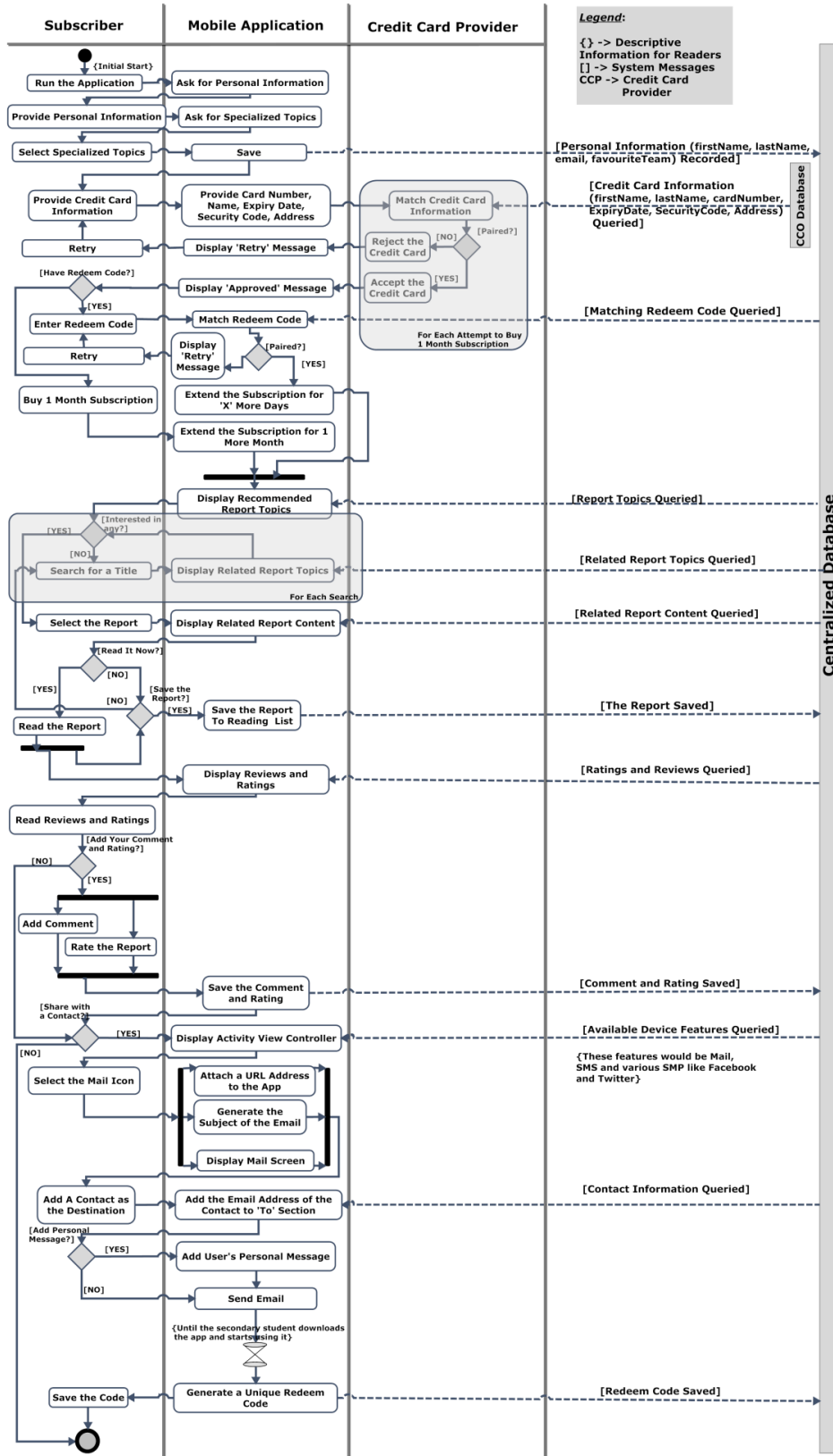


Figure 13: Activity Diagram of PowerNHL Scenario

The class diagram for this scenario is represented in Figure 14. As PowerNHL is a content provider, the *B3* component is selected in bottom layer. The *M1* and *M2* components are also selected from the middle layer to constitute the mobile infrastructure for online commercial activities.

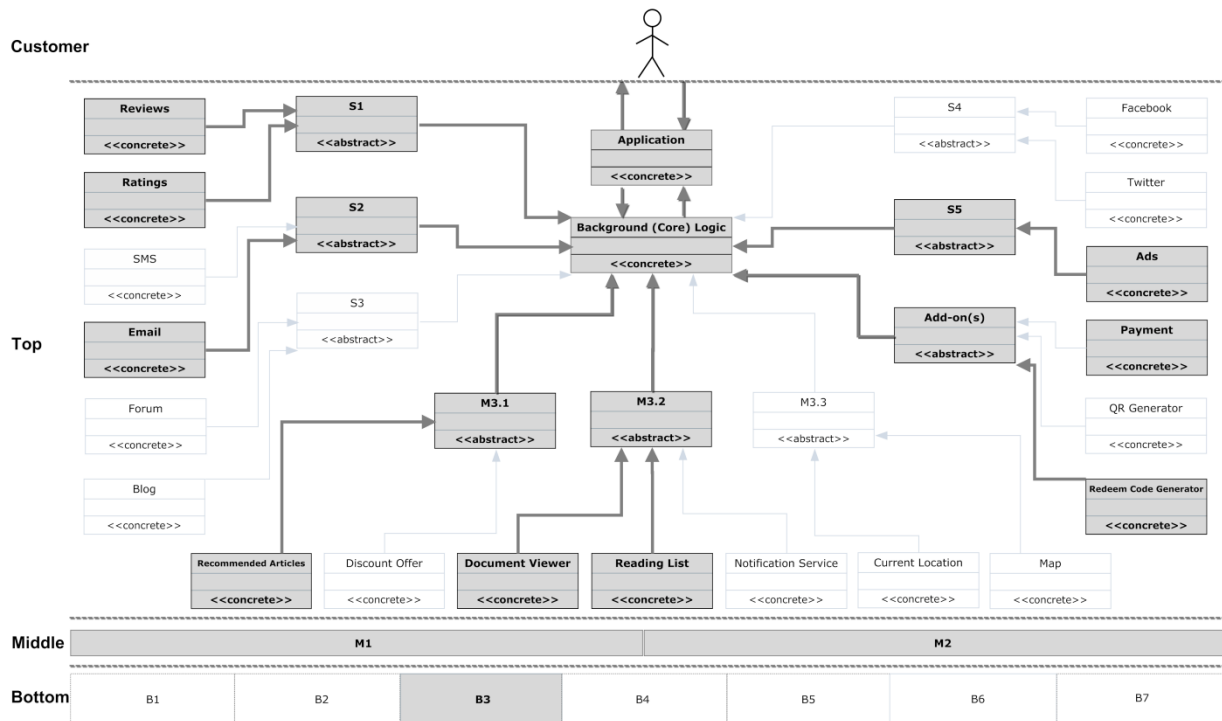


Figure 14: Design Model for the PowerNHL app

The developed mobile app for this scenario uses two components from the mobile layer, *M3.1* and *M3.2*. *M3.1* includes ‘Recommended Articles’ to provide the functional code for personal recommendations. As the *Core* class gets the input from the subscriber through UI elements in *Application*, it matches the user’s parameters to trigger the methods in *M3.1* that generate the list of personalized articles. *M3.2* uses two main concrete classes; the ‘Document Viewer’ class contains the native document viewer module for the mobile OS. Whenever the subscriber wants to read the content, the *Core* class calls the required code for display with built-in capabilities like zooming in/out, highlighting and playing with the size and font. ‘Reading List’ contains the required code for creating reading lists. These lists provide functionalities like adding and deleting the items, displaying details of each item before actually opening it and sharing the list with others through email.

In terms of social integration, the *S1* component includes two concrete classes, ‘Ratings’ and ‘Reviews’, that contain the functional code for querying ratings and reviews sent by others for each report the subscriber reviews. The *S2* component is also used since it enables the subscriber to share her/his reading list with others by email; where the ‘Email’ class includes the required code. The email automatically includes information about the shared list in addition to the subscriber’s personal message. Subscribers can choose the receiver’s email through device contacts. The mobile app also uses *S5* to instantiate the concrete ‘Ads’ class and place social ads of other companies and individuals through the content to generate more profit. As miscellaneous functionalities, the concrete ‘Payment’ class includes the required code to validate or reject the payment details by communicating with the providers. Also, the ‘Redeem Code Generator’ is used to create unique codes and deliver it to subscribers whenever it’s necessary. Both of these concrete classes are represented as attached to abstract *Add-on(s)* class.

The logic of the subscriber’s activities through the usage of the mobile application is explained below with screenshots.

The subscriber downloads the app on her/his mobile device (i.e., iPad). After s/he downloads it, the app asks the user to fill personal information such as the name, email address, the name of the favorite NHL club and division. This information will be used to provide personalized content throughout the user experience (see Figure 15). The user will also provide her/his credit card information to buy the subscription. Even though s/he may have a redeem code to access the content, a valid credit card will be required. The credit card information includes credit card number, security code, expiry date, address and the name of the subscriber.

Once the subscriber gives all the required information to the app, the system will transfer it to the integrated system of the credit card provider (CCP). The CCP will compare information from the user to the paired one in its own database. If the information doesn’t match, the mobile app will inform the user to try again. If it is paired, it will verify the validity and the user will be informed that the payment can be performed (see Figure 15).

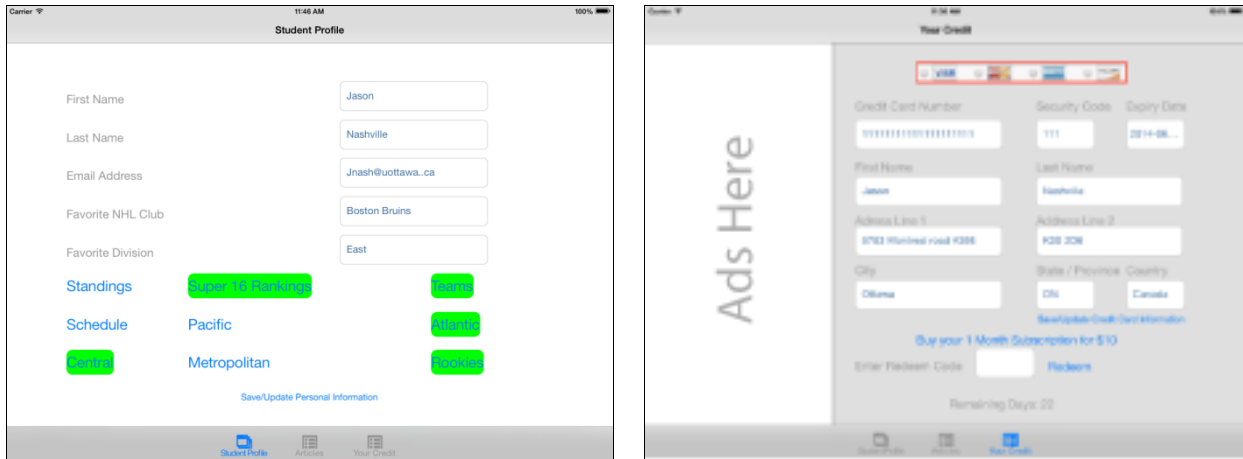


Figure 15: User Information

At this phase, the subscriber buys the subscription by clicking the related button. S/he can use the same button to renew her/his subscription for the next month as long as the credit card information is still valid. If not, s/he can change the information and get it verified through the credit card provider any time needed. As the user gets her/his subscription membership, the application displays recommended reports depending on personal information. S/he also has the option to search for other reports. As the subscriber searches for a specific keyword, related titles will be displayed on the screen if there are any. Otherwise, a message will be displayed to the subscriber to search for another keyword (see Figure 16).

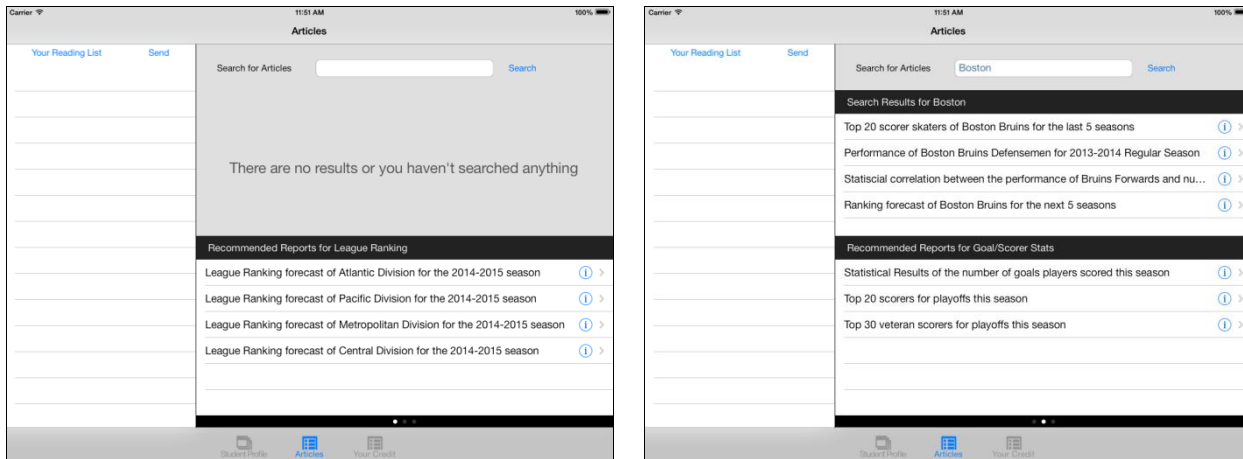


Figure 16: Initially Recommended and Searched Reports

After a specific report is selected, a popover window will appear to display summarized information about the content. The option of opening or saving the report into a reading list is also displayed here. If the subscriber opens it, the application will activate the native document reader of the related mobile OS. The content is highly customizable since the native OS features

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give users the chance to zoom in, highlight a specific sentence or paragraph, and modify the size and font type of the text (see Figure 17).

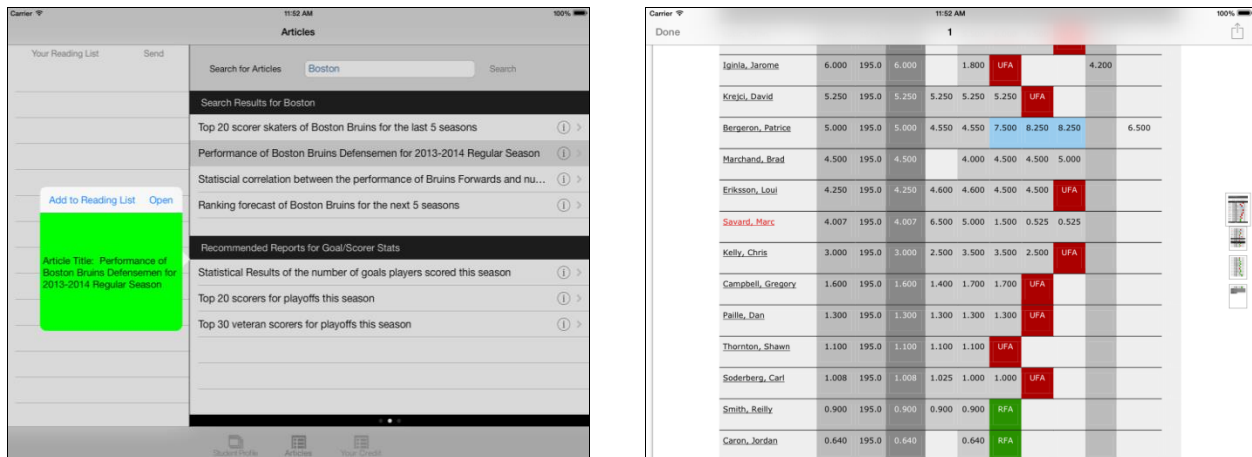


Figure 17: Selecting and Displaying Reports

If the subscriber adds the report to her/his reading list, s/he will be able to read the comments and reviews by other subscribers about the content. This information will also be displayed through a popover window which can be deactivated as the user touches another part of the screen. S/he will also have the option to provide her/his own feedback. The overall rating of the report will also be displayed at the top of these comments and the subscriber will be able to rate the report from 1 (the lowest) to 5 (the best) (see Figure 18).

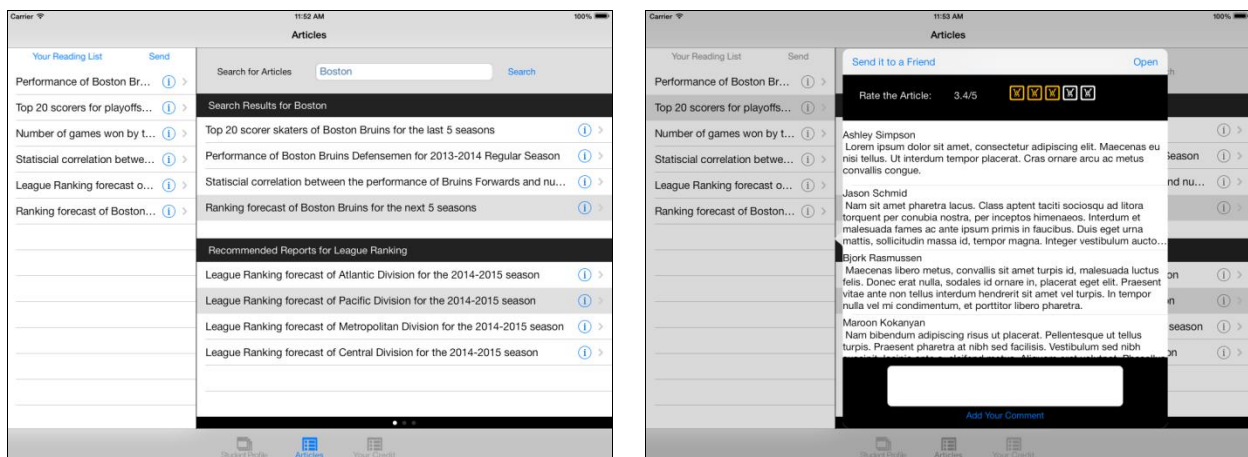


Figure 18: Creating Reading List and Using Ratings and Reviews for Each Report

As the reading list is created and populated, the subscriber has the option to share this list with others. S/he can share the list through either email or instant messaging options. Since iPad simulator is used as the primary mobile device in this scenario, the email option is chosen as a sharing medium. Once the subscriber clicks the share button, an email screen will automatically

be triggered and displayed. The ‘Subject’ of the email will be assigned automatically depending on the title of the report with a summarized sample of the content. By clicking the button on the right hand side of the ‘To’ section, the list of contacts can be displayed through a small view controller. The subscriber can search for a particular person by scrolling down and up the list. Once a contact is selected, the email address will be automatically added to the receiving address section. Multiple contacts can be added if needed. Optionally, the subscriber can add a personal message to the body of the email. If s/he has a predefined signature, it will be also added at the end of body section. As the final step, the subscriber clicks the ‘Send’ button to send the email to another person, who is potentially another NHL fan (see Figure 19).

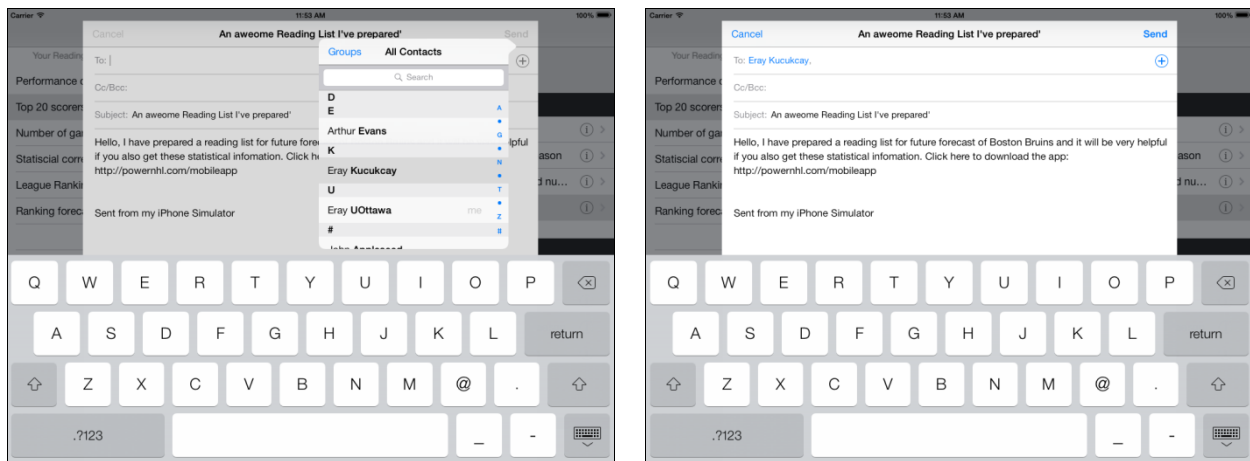


Figure 19: Sending the Reading List by Email and Selecting the Contact

When the fan displays the incoming email, the link will direct her/him to download the application and s/he will be able to provide the personal information just like the primary subscriber did. If s/he provides the same email address as the one in which s/he received the reading list, the system will generate a unique redeem code. This redeem code will be sent to the primary subscriber to extend the subscription by certain amount of days.

As the primary subscriber gets the code, s/he can use it right away by typing it to the particular text field in the app and clicking the ‘Redeem’ button (see Figure 15). The system will pair this code to the one stored in the database and if it is verified, the remaining time of the current membership will be extended.

5.3. Scenario 3: DreamBike

DreamBike manufactures bicycle parts such as wheels, pedals, brakes, saddles, handlebars and frames in different sizes, colors and standards, as well as assembled bicycles to target professional and occasional bikers around the city. Their most recent sales and distribution strategy involves intermediary players such as third-party bike stores that get commissions per sale. Until now, they've supplied mass quantities of items to satisfy the demand from these stores. The assembled bikes are classified and distributed as in fixed series without any option of customization.

The company wants to use a multi-channel strategy to sell their products with an online system that includes a website and a mobile app. By reducing the amount of supply for bike stores and selling their products online without extra cost caused by third-party commissions, the company aims to reduce the inventory costs and offer more customized products. Due to their existing agreement with local bike stores, DreamBike also plans to recommend to customers to buy the desired items from the closest store without waiting for the delivery.

This scenario and related mobile app use different elements in the conceptual levels of m-commerce. DreamBike is considered as a *Manufacturer-direct* variation of *E-tailer* in terms of e-commerce *business models*.

In addition to *mobility* and *ubiquity* (*mobile layer*), the scenario contains two features of *context-sensitivity*. Through *interactivity*, the mobile app offers high level of *playfulness* in terms of enabling the customer to customize the color and size of desired products before purchasing. Also, as the customer provides personal and payment information at the time they start using the app, items can be ordered by clicking a single button without any extra steps. This is a great example for the *synchronicity* feature as it provides a seamless shopping experience. Another property, *interpersonal communication* is used as users –including bike experts– can communicate to help each other by sharing their personal experience to solve issues. The users are informed about new comments instantly, which can be considered as a sign of *connectedness*.

As another feature of *context-sensitivity*, *localization* is also used. As the customer prefers to purchase the desired item from a local store instead of waiting for the delivery, the mobile app

uses this localization feature *reactively* to identify the location of the user, find the closest local bike store and check the availability of that particular item in the inventory. Thus, it is also *cross-referencing* and *multi-target* as more than one local stores are displayed in the map; *central* and *outdoor* as the location information of these local stores is retrieved from a central database.

Some of the customers are more likely to be committed cyclists who aim to improve their biking performance. They are eager to ask questions about the parts in terms of compatibility with other components and bikes that belong to different brands. Thus, the scenario uses the *questions & answers forum* feature of *forums & communities* in the *social* layer.

The actors of this scenario are mentioned below;

1. **Customer:** The user who will get information and purchase an item with the option of customizing –if applicable- it, and ask questions about the item if necessary.
2. **Mobile Application (app):** The system logic behind the released mobile application. It performs the required tasks such as displaying the searched items available in the inventory, providing tools and buttons to customize it if applicable, enabling customers to ask questions and read others' comments.
3. **Expert:** An expert who has the primary purpose of answering unanswered questions in the Q&A forum.
4. **Credit Card Provider (CCP):** The system that is integrated into the app to get the payment information from the customer and check the validity. Depending on the verification/rejection of the validity, it enables the app to proceed with further activities.

The activity diagram in Figure 20 represents the activities of the actors and interactions between them throughout the scenario.

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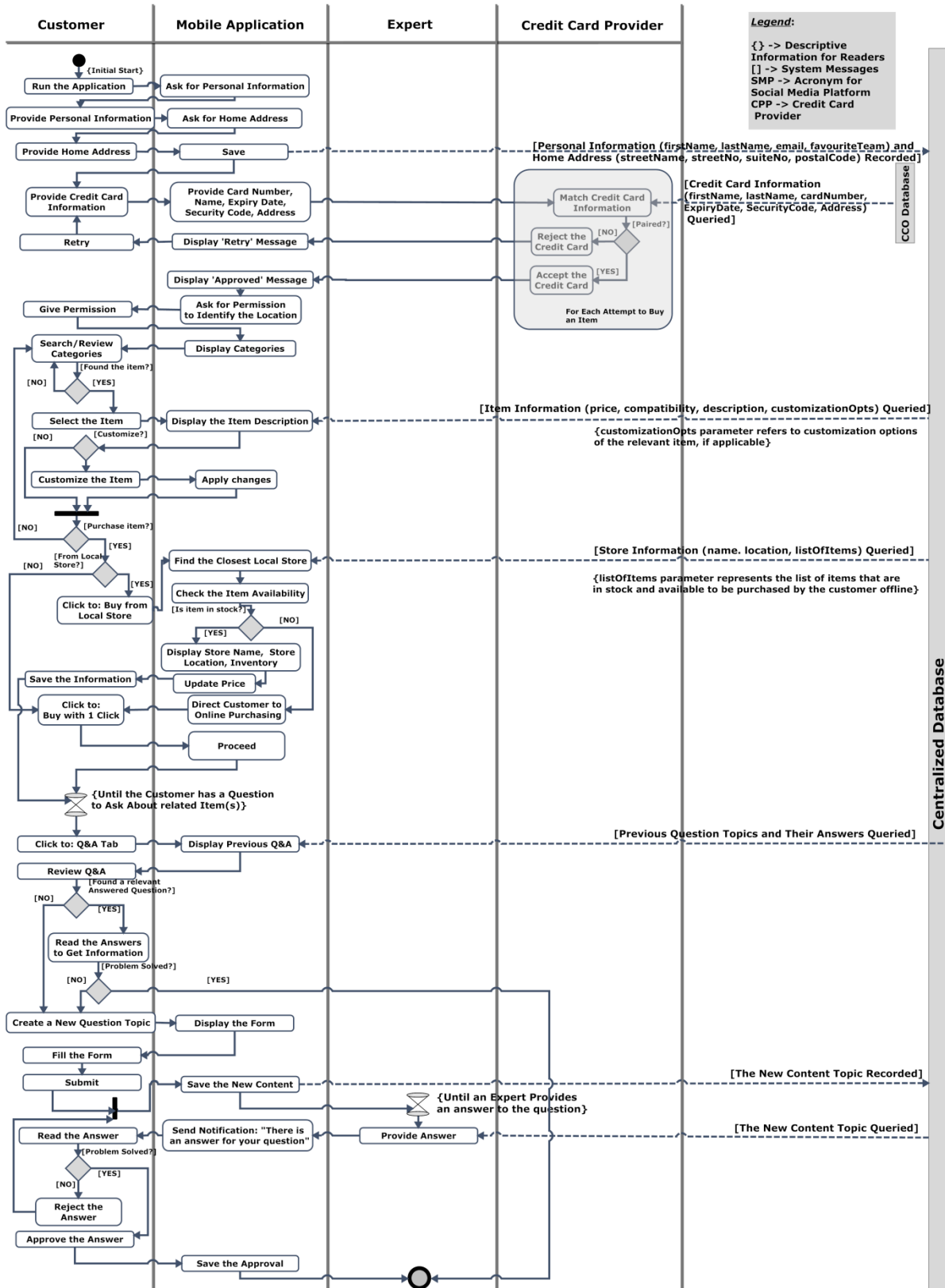


Figure 20: Activity Diagram of DreamBike Scenario

The class diagram for this scenario is represented in Figure 21. As DreamBike is considered as an E-tailer, the *BI* component is selected from the first level. The second level is also important as *MI* provides the required hardware and software infrastructure for mobile devices where *M2* enables these devices to be connected all the time.

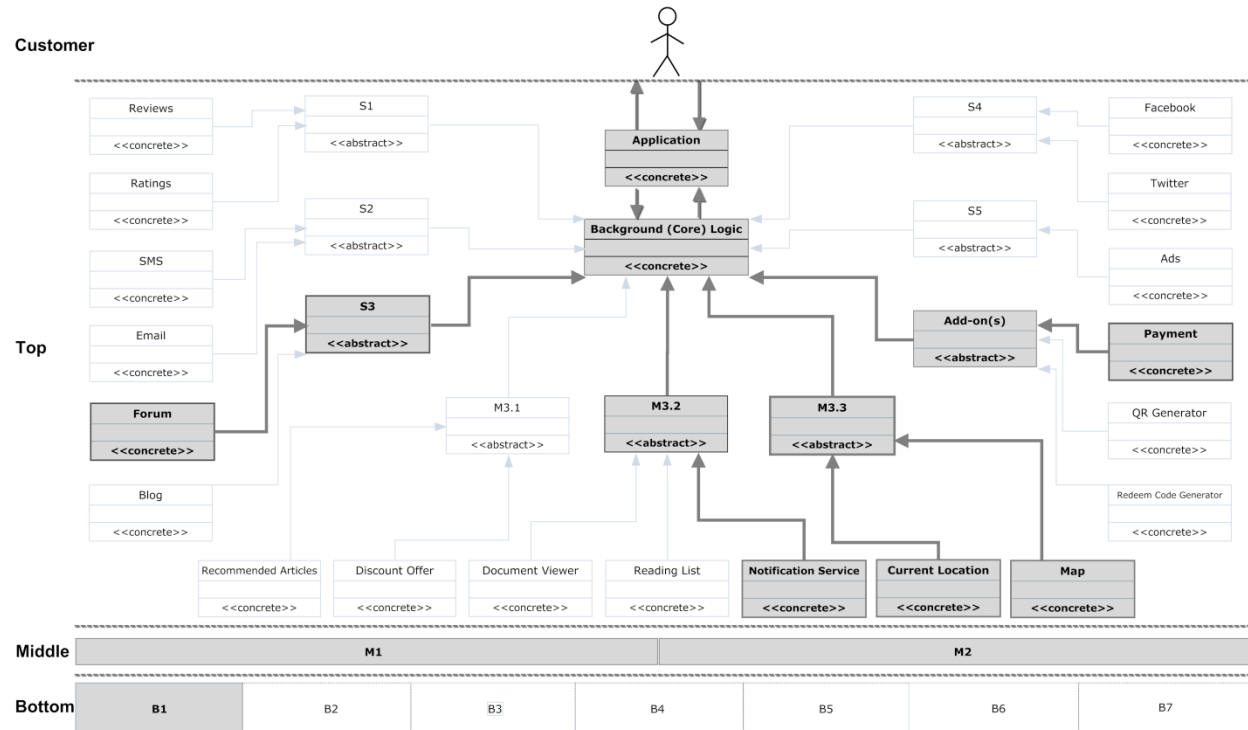


Figure 21: Design Model for the DreamBike app

The mobile app uses the *M3.2* and *M3.3* components. Concrete classes like ‘Map’ and ‘Current Location’ start to provide the required code to the *Core* class through *M3.3* to identify the customer’s location, find the closest physical local store and then display the related map. The *M3.2* component triggers the notifications for delivering the required information to customers when they are not using the mobile app actively.

For social integration, *S3* is used to provide the existing questions and related answers to customers whenever necessary. Plus, this component enables the customer to create new answers or leave comments on the existing answers. The *S3* component includes two concrete classes called ‘Forum’ and ‘Blog’, where the first one is being used throughout this scenario.

The concrete ‘Payment’ class is used through the *Add-on(s)* class as the customers provide their credit card information and it needs to be validated for further purchasing activities.

The logic of the mobile application is described as below.

The customer downloads the mobile app to her/his smart phone and the system initially requires the name, email address, home address and credit card information. As soon as CPP checks the validity of the credit card and approves it, all the information is saved to the system (see Figure 22).

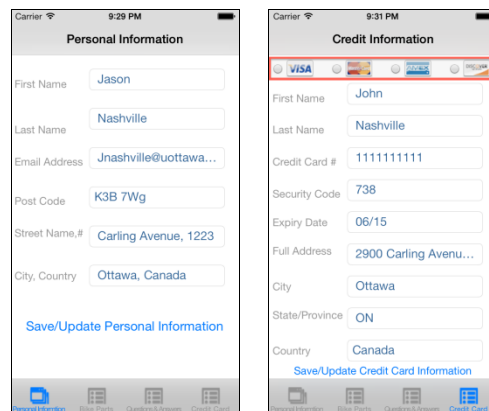
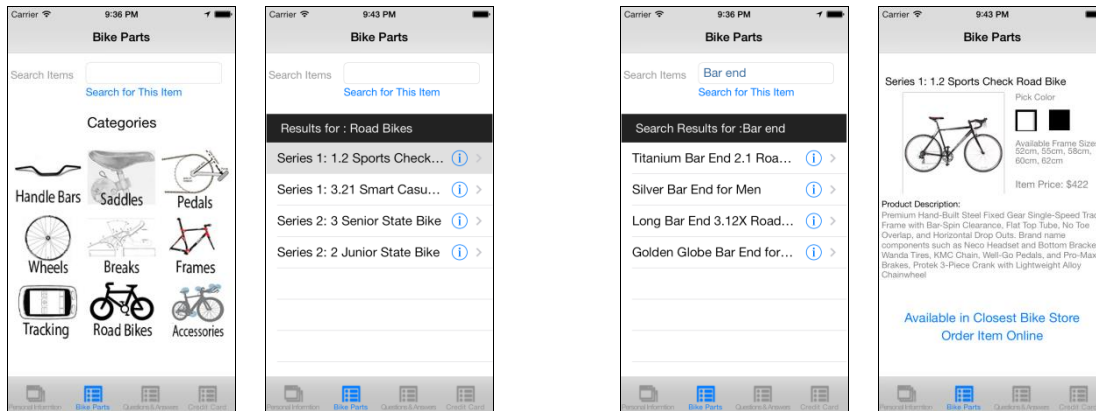


Figure 22: Entering Personal and Payment Information

The customer can review the categories of bike parts such as wheels, frames, saddles and handle bars. Each category contains items of various series in different sizes and needs. One particular category is called ‘Road Bikes’, which contains assembled bikes that are ready to be purchased and used right away. The items in this category give customers the option to customize before purchasing as they can arrange a desired color for the frame, wheels and handlebar, and change the size of the frame and wheels.

They can also review items by displaying categories or a search bar located at the top of the screen. As they find an item, they can get detailed information about it by clicking the related title (see Figure 23a). The app then directs the customer to another page where the item description, price and customization options are displayed. Customers can use the customization buttons such as different color and size options for the desired bike. The price of the item is also displayed on this screen in addition to the description (see Figure 23b).



(a) Searching for Items

(b) Displaying/Customizing Items

Figure 23: Screenshots from Running the DreamBike App

The company also offers the option to buy an item from a local bike store if they don't want to wait for delivery, and accept to pay the extra commission to the store. For this feature, the app will require the permission of locating the customer. With 'Buy from Local Store' button, customers can get the location of the closest local store where the item is in inventory. As the customer clicks this button, the closest bike store will be shown with annotations in map view. The price of the item will also be updated (i.e., 15% increased) with commission fee. If the customer accepts this price, s/he can save the location information including the address of the closest physical store and availability of the item, and then purchase it offline (see Figure 24).

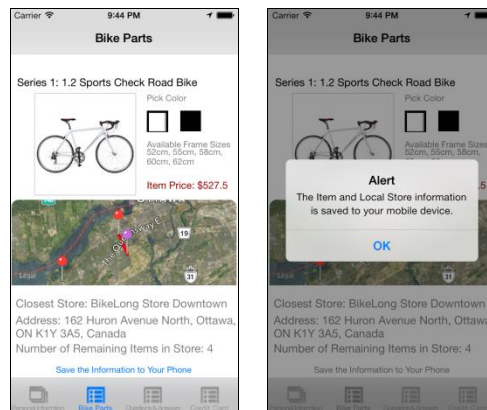


Figure 24: Displaying Closest Bike Store and Saving the Location Information

As the customer decides to buy the item online, s/he clicks the 'Buy with 1 Click' button displayed on the item description page.

Before, during and after the purchasing phase, customers are able to ask questions about the items and other related issues. Some items are compatible with only certain bike series; whereas

some of them can be used generically on any bike. Topics like different sizes of wheels, handle bars, saddles, pedals and information about how to assemble these on different types of bikes are potential issues that can be discussed through the Q&A forums.

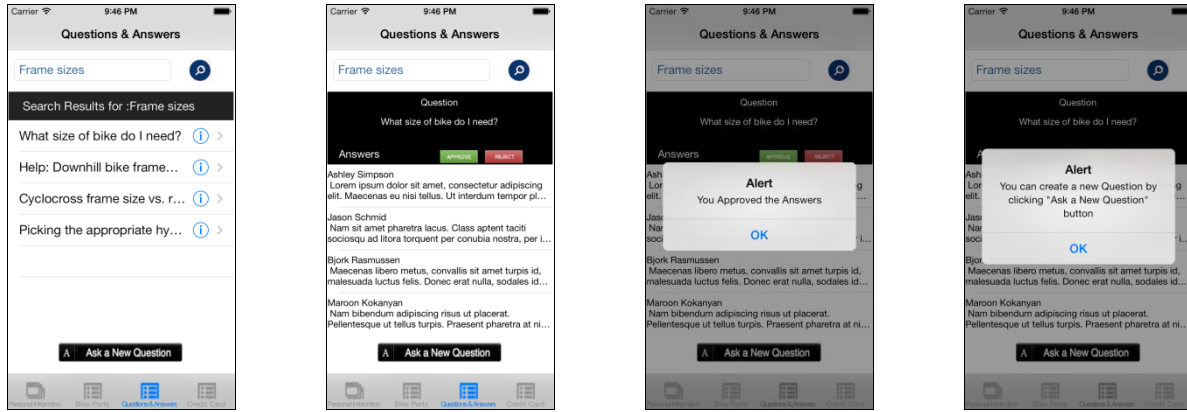


Figure 25: Steps of Reviewing Asked Questions through Q&A Forums

Customers can search for topics to find answers to their questions. They can directly use the search bar located at the top of the ‘Questions & Answers’ tab to find previously asked questions that ask for a solution to a similar issue. As the customer opens an asked question, the mobile app displays the detailed content (if any) of the question and given answers. These answers are either given by expert users who are hired to answer these questions on behalf of the company. As the customer finds one answer that solves the problem, then s/he can approve the content by clicking the ‘Approve’ button and the mobile app displays an alert to inform the customer that the answers are approved (see Figure 25).

If the customer can’t find any answer to the problem throughout the provided information, s/he clicks the ‘Reject’ button. Again, the mobile app displays an alert to inform the customer that s/he can ask a new question through the ‘Ask a New Question’ button located at the bottom of the screen.



Figure 26: Asking a new Question and Getting Notifications to Review it

As the customer chooses to ask a new question, a new screen is displayed to enable the user to define the topic of the question as well as detailed information about it (see Figure 26). At this phase, the customer explains her/his issue to get help. As one of the hired experts provides an answer, the app triggers a notification to inform the customer that there is a new answer for the question asked previously. The customer clicks the notification, the app starts to run again and directly displays the provided answer. If the answer is useful, the customer clicks the ‘Approve’ button. Otherwise, the customer can click to the ‘Reject’ button to wait for another answer.

5.4. Comparison

Here we compare the three strategies based on how they handle key requirements of our design and development process and our proposed design model. This comparison will be performed on the following elements: programming languages; UI/UX design; location services; map services, and notification services.

5.4.1. Programming Languages

Regardless of the development strategy, every development environment has a primary programming language for enabling mobile developers to build the app. For a native development strategy, Apple encourages mobile developers to use Objective-C for iOS, whereas Google developers use Java for Android devices with the ability of implementing portions of C and C++.

Hybrid developers can use various programming languages depending on the platform or framework they use. For example, Appcelerator Titanium which falls into the second category of hybrid development uses JavaScript to develop the mobile apps. RhoMobile, which is an open-source framework, uses Ruby and HTML together for development. On the other hand, PhoneGap developers use a combination of HTML, CSS and JavaScript with a perspective that is closer to a Web-based development strategy.

For Web-based development, mobile web apps mostly use HTML5, CSS and JavaScript to develop the required services through mobile browsers like Safari and Chrome. Web-developers should also consider platform-specific constraints depending on these mobile browsers. For instance, the content that is delivered in Flash won't be visible to iOS users since Apple doesn't support the technology due to its high battery consumption.

Hybrid developers are able to use languages like JavaScript to build generic apps that run on most mobile OSs like iOS and Android. Thus, in terms of saving time and development cost, businesses can use cross-platform development environments like Appcelerator Titanium or frameworks like PhoneGap and RhoMobile to build generic apps. Native development, on the other hand, requires various programming skills. A business that prefers to use a native development strategy may need to hire several developers to deliver the same specific mobile app on different platforms.

5.4.2. User Interface (UI) / User Experience (UX) Design

The user interface of a mobile app is considered as important as the back-end functionality since it is the actual medium where the user and mobile service meet. The appearance of the user interface is the first and most critical criterion for the user in terms of making the decision of liking or disliking the mobile app. Users like to see UI elements like buttons, text fields, icons and windows that are similar to the ones in other mobile apps. Psychologically, they feel more comfortable with the familiarity of the appearance depending on the mobile platform.

Apple provides UIKit for mobile developers who prefer a native development strategy for building iOS apps. The UIKit includes Views that refer to building blocks, or in other words, layers to design the user interface within a hierarchical structure. Google also provides building

blocks to design the user interface for Android mobile apps with ready-to-use elements like buttons, tabs, pickers, text field areas and many more. Unless developers and designers prefer to use custom elements, all the apps developed through native integrated development environments (IDEs) will share the common UI elements to provide a familiar user experience to customers.

For hybrid development, developers can use the native UI elements to make sure that customers won't have any negative feelings about the design. Development tools that fall into the second category of the Hybrid strategy can use native UI elements to deliver a familiar user experience for the mobile app end-users.

Other alternatives like Web-based development and the first category of the hybrid strategy can't use the native UI elements since they can't access natively supported libraries. Instead, they can imitate these UI elements with custom-built libraries of buttons, text-field areas, pickers and other needed components. Even though the logic of using custom UI elements is not the same as native development, users psychologically feel more comfortable by interacting with familiar elements throughout the experience. Another option is to provide a completely different, yet innovative user experience. The appearance won't be supporting the argument of the positive effect for user familiarity with native elements, but it can be an advantage for the developers in terms of differentiating their services from competitors that have similar services.

Another key parameter for UI design is system updates of mobile operating systems. Some of these system updates contain major UI changes for natively launched apps. For example, Apple has updated the UI elements of the iOS by version 7, where almost everything is changed in terms of dynamics of user experience. Providers who preferred to use the native development strategy did not have any major problems about this evolutionary change of iOS; most of the parameters and variables being used had the same exact names. However, most web-based and hybrid mobile apps that replicate the native user experience had to be revised dramatically to catch up with the new UI/UX dynamics. The time and financial cost of the transition was higher than the native or hybrid (2nd category) strategies.

Depending on these arguments, using native development or the 2nd category of the hybrid strategy is a better option for developing applications for mobile OSs like iOS and Android than

using the 1st category of the hybrid or directly web-based development strategy to provide a better user experience with native UI elements.

5.4.3. Location Services

For native development, both iOS and Android operating systems offer location services to identify the mobile user's geographical position. These systems offer different accuracy settings depending on the capability of mobile OSs.

iOS provides six different accuracy parameters through *Core Location framework*, which can be reviewed through Table 13. The lowest possible accuracy level identifies the position of the device within 3 kilometers. As the level of accuracy increases, the power consumption goes up as well. The highest accuracy enables the application to identify a device within a few meters. Some properties, like the *kCLLocationAccuracyBest* and *kCLLocationAccuracyBestForNavigation* consume power dynamically depending on the best possible accuracy use.

OS	Parameter	Description	Power Consumption
iOS	<i>kCLLocationAccuracyBest</i>	The device will be geographically identified within highest possible accuracy	Dynamic
	<i>kCLLocationAccuracyNearestTenMeters</i>	The device will be geographically identified within 10 meters	High
	<i>kCLLocationAccuracyHundredMeters</i>	The device will be geographically identified within 100 meters	Medium
	<i>kCLLocationAccuracyKilometer</i>	The device will be geographically identified within 1 kilometer	Medium
	<i>kCLLocationAccuracyThreeKilometers</i>	The device will be geographically identified within 3 kilometers	Low
	<i>kCLLocationAccuracyBestForNavigation</i>	The device will be geographically identified within highest possible accuracy and will use additional sensors for navigation	Dynamic
Android	<i>ACCURACY_HIGH</i>	The device will be geographically identified within less than 100 meters	High
	<i>ACCURACY_MEDIUM</i>	The device will be geographically identified within 100-500 meters	Medium
	<i>ACCURACY_LOW</i>	The device will be geographically identified with the accuracy greater than 500 meters	Low

Table 13: Location Accuracy Parameters of iOS and Android

Android also provides three accuracy levels through *android.location* package. The lowest level identifies the device with the accuracy of greater than 500 meters, while the highest level provides less than 100 meters of accuracy. Since many applications periodically track mobile users throughout the user experience, location services may need to be active all the time. Unlike

for iOS, developing the required location-based service for Android requires a bit more coding to use the battery and data consumption optimally.

For web-based development, getting the location information is performed by gathering the user's IP address through the used mobile browser (Mirkazemi 2010). With the help of HTML5 and jQuery mobile, W3C⁶⁰ provides the Geolocation API for mobile web apps to gather the user's current location (Popescu 2013). The *enableHighAccuracy* property is also provided to utilize the accuracy level to meet the needs.

Since both native and web-based development strategies include the ability to identify the user, developers who prefer the hybrid strategy can also perform the related tasks regardless of the 1st and 2nd category. Identifying the user through current solutions like Global Positioning System (GPS) or Assisted-GPS (uses GPS and the personal network at the same time to increase the level of accuracy) provides satisfying results for native and 2nd category of the hybrid development strategies. On the other hand, identifying the user through the IP address may cause some problems as the address may be associated with a broader geographical range such as an area or a town, instead of a specific device. Rarely, some IP addresses are not recognizable; thus the location may not be identified properly (Mirkazemi 2010). Considering this fact, choosing Web-based or the 1st category of the hybrid development strategy may be problematic if the location-based service is the primary value for the mobile app.

5.4.4. Map Services

As each operating system has different native map providers, the delivery of the map services requires different properties for native development. The *iOS Map Kit* framework is ready to be used for devices like iPhone and iPad. Since the iOS Map is designed and provided by Apple, developers can implement the required code to display the map throughout the application. It is also possible to identify the location of the device on a map as well as creating annotations to pin desired locations. Specific routes between two annotations can also be displayed. Android requires a set of procedures for developers to use the map features and annotations since it uses

⁶⁰ <http://www.w3.org/>

Google Maps as the native service. Developers need to install the Google Play Services SDK to activate the Google API key to utilize the map functionality. Just like iOS Map Kit, Google Maps also enables users to create annotations and locate their current position.

Businesses whose priority is to integrate and use location-based services will spend more time and effort on Android development than iOS which offers more efficient and practical development.

Web-based development and the 1st category of the hybrid development strategy can also enable developers to use Google Maps (Jenkins 2013). Map services can be delivered generically instead of the need for using different services for each mobile OS. Other strategies like native and the 2nd category of hybrid development need more time and effort to provide the required functionality for each OS.

5.4.5. Notification Services

Notification Services can be used by native, hybrid and web-based mobile applications to communicate with the users on demand (push/remote notification) or by specific time periods (local notification). The feature is used as the reminder of an ongoing event when the application is running in the background. For iOS, Apple provides *UILocalNotification* class for developers to send *local notifications* at a scheduled time. The same feature is provided by the *NotificationCompat.Builder* class for Android. W3C also has a documentation called Web Notifications⁶¹ for developers to send local notifications for mobile web app users.

The use of *push notifications* requires a third-party server where the app provider sends the notification to, and that server delivers the notification to all mobile app users. Developers of iOS can use Apple Push Notification Service (APNS)⁶² to send push notifications as it performs the role of third-party server. Also, Google encourages Android developers to use Google Cloud Messaging (GCM)⁶³ to send push notifications to mobile apps installed on customers' devices.

⁶¹ <http://www.w3.org/TR/notifications/>

⁶² https://developer.apple.com/library/ios/documentation/NetworkingInternet/Conceptual/RemoteNotificationsPG/Chapters/CommunicatingWithAPS.html#//apple_ref/doc/uid/TP40008194-CH101-SW1

⁶³ <http://developer.android.com/google/gcm/gcm.html>

For mobile web apps and iOS-based hybrid apps, Apple gives developers the flexibility of using APNS. Through their own servers, app providers can directly send messages to their customers with a link to open the related app. Other third-party service providers like Xtify⁶⁴ and Pushover⁶⁵ also deliver notifications to mobile devices on behalf of their client profiles, as the mobile app owners sign up and pay the related service fee.

5.4.6. Final thoughts

Overall, we believe that the *hybrid application development strategy* satisfies better the key requirements of our design and development process and our proposed design model. Table 14 summarizes the comparison of the three mobile development strategies with respect to these key requirements.

Development Strategies	Programming Languages	UI/UX Design	Location Services	Map Services	Notification Services
Native	Objective-C, Java, C, C++	UIKit, Building Blocks	Native Services (Table 13)	iOS Map Kit, Google Maps	APNS, GCM
Hybrid	<i>1st Category</i>	HTML, CSS, JavaScript	IP address	Google Maps	APNS, GCM
	<i>2nd Category</i>	JavaScript, Java, Ruby	UIKit, Building Blocks	Native Services (Table 13)	iOS Map Kit, Google Maps
Web-based	HTML, CSS, JavaScript	Custom	IP address	Google Maps	APNS, Xtify, Pushover

Table 14: Comparison of Mobile Development Strategies

Businesses that aim to provide ms-commerce services can use the 2nd type of the *hybrid development strategy* to take advantage of the native elements of mobile operating systems. Being able to access native UI elements, identifying the location of the user with the highest possible accuracy, having the possibility to reach users through native local/push notification services and using native facilities like microphone and camera inputs are significant advantages of using hybrid development.

⁶⁴ <https://www.xtify.com/>

⁶⁵ <https://pushover.net/>

Chapter 6. Conclusion

6.1. Summary of the Research

Throughout this research, we performed a literature review to identify the main characteristics and features of concepts like e-commerce, m-commerce, s-commerce and B2C e-commerce business models.

The findings of this literature review enabled us to, first, identify the building blocks of ms-commerce based on the commonly accepted fundamentals of the related concepts along with devising the brief understanding of the mobile social commerce (ms-commerce) concept. Every building block constituted had the critical role of increasing the value and efficiency of the product/service being delivered.

The first block consists of B2C e-commerce business models such as E-tailer, Portal, Content Provider, Transaction Broker, Market Creator, Service Provider and Community Provider, which are suitable for ms-commerce. It is significantly important for businesses to select the right business model on which to build the right strategy for delivering ms-commerce services.

The second building block includes the characteristics of m-commerce. These were identified through the requirements of current mobile services. Such characteristics like *mobility* and *ubiquity*, which are inherent to mobile technologies, enable a business to deliver a service to mobile users regardless of the time and location. The other characteristic, *context-sensitivity*, which includes three features called *personalization*, *interactivity* and *localization*, enables ms-commerce businesses to construct differentiated services for their customers. Personalization is designed to deliver personalized content to customers depending on their personal information and previous transactions. Interactivity is critical for increasing real-time communication between the customers and mobile content with respect to the following constructs: *user control*, *two-way communication*, *synchronicity*, *connectedness*, *playfulness* and *interpersonal communication*. Finally, localization refers to different location-based services like *indoor-outdoor*, *proactive-reactive*, *cross-self referencing*, *single-multi target* and *central-P2P* to provide innovative services depending on the users' and/or different places' location information.

The third building block includes social solutions that are used to increase the interactivity between customers; with the consequence of increasing brand/service awareness and trust. One or combination of these solutions can be used to deliver the social functionality for the ms-commerce service. Businesses can implement *ratings and reviews* for their customers to share their opinions about the products or services. Also, *forums and community* toolsets like bulletin boards and Q&A forums can be used to enable customers to share and discuss their personal experience with others to create a knowledge base over time. With *recommendation and referral systems*, customers can share specific content with others and let them know about the existence of such service in exchange for monetary/non-monetary benefits. *Social media optimization* (SMO) can also be used by businesses to enable their customers to share the content with others through their social media profiles to increase trust and awareness. With the help of *social ads and apps*, businesses can also let users know about their products, services, promotions and special offers on social networks to attract more customers.

We also proposed an *ms-commerce design framework*. First, from a *conceptual perspective*, successful e-commerce companies were investigated to see what elements in the ms-commerce layers (layers are a visualization of the ms-commerce building blocks) have been implemented. Second, from a *design perspective*, we proposed a design model consisting of a generic class diagram that can be used for designing and developing ms-commerce applications that fit the specific needs of businesses. Indeed, with the help of abstract and concrete classes, businesses can choose the right elements to integrate in their ms-commerce app with the purpose of increasing the efficiency of the app and integrating the social participation of customers.

Three different scenarios were proposed and discussed. Prototypes of ms-commerce apps to support the three scenarios were developed and deployed using the design model of our proposed framework.

Finally, in light of our experience in developing ms-commerce apps for this project, we discussed and contrasted the three different mobile development strategies, namely *native*, *hybrid* and *web-based*.

6.2. Research Contributions

Depending on the recent characteristics of mobile commerce and social commerce, the most suitable definition for mobile social commerce can be given as *the set of e-commerce activities performed in a mobile environment with the participation of users in content generation and sharing*. The user-generated content can originate on popular social media platforms or companies' own social toolsets.

This definition also enables us to distinguish ms-commerce from other similar concepts like *mobile social networking* and *mobile social media*. Even though these terminologies *partially* cover the fusion of m-commerce and s-commerce concepts, it does not give a direct and clear indication on the commercial part of the activities. With respect to this definition and findings of this research, the following questions that were defined in the first chapter were answered.

- What are the major components that constitute the Mobile Social Commerce Design Framework?

The *business models*, *mobile* and *social* layers (representing the major components or building blocks) of mobile social commerce constitute the basis for our proposed ms-commerce design framework. A generic design model was proposed consisting of three levels. On the bottom level we have the B2C e-commerce *business models*. On top of that, the *mobile infrastructure* level represents the mobility and ubiquity characteristics. The top level is the *design and development* level where the context-sensitivity characteristic and the social solutions or toolsets are located as abstract classes. Concrete classes are connected to these abstract classes since they contain the functional code that can be integrated in a modular way depending on the needs of the business in terms of ms-commerce services.

- Which mobile development options/strategy (native, hybrid, web-based) is better suited for delivering the required ms-commerce services?

Throughout the discussion consisting mainly of a comparison of three major mobile development strategies, we concluded that the *hybrid development strategy* satisfies best the requirements for designing and developing ms-commerce solutions/applications. Having the capability of using native UI elements, accessing and using notification and location services, and being able to use

local properties like device contacts, camera and microphone can be assured when using the second category of hybrid development; where a single programming language can be used to get the native functionalities for more than one mobile platform.

6.3. Limitations and Future Work

The e-commerce business models that we considered in this research only cover business-to-customer (B2C) e-commerce due to the fact that social integration is directly dependent on customers. Other types of e-commerce business models, especially B2B and C2C, can also be investigated.

Also, social commerce is seen from two perspectives: ‘putting water-coolers next to cash tills’ and ‘putting cash tills next to water-coolers’ P. Marsden (2010). In this research we opted for the first perspective. In other words, we focused on integrating the social functionality into online commercial activities. The other perspective, where businesses propose their products and services on social media platforms can also be investigated as a future research topic.

Moreover, the design and development of ms-commerce raises limitations in terms of hardware and software requirements. In order to investigate the different development strategies, at least two mobile devices that run different mobile OSs (i.e., iOS and Android) were needed to test the performance of the used components for native, hybrid and web-based mobile development. In addition to the required hardware needs, available development environments (IDE) for hybrid development are quite various, yet have different standards and capabilities. Depending on the selection, different requirements for each mobile OS can emerge in terms of providing the mobile and social functionalities.

Finally, the utilization of our proposed design framework can further be validated by getting feedback from focus groups and real world businesses. Depending on the feedback, libraries and programming packages in various languages can be prepared for each development environment to easily deliver the ms-commerce components for businesses and developers.

Appendix A. Logic of the Used Hybrid Platform

Platforms like Appcelerator Titanium, Worklight⁶⁶ and PhoneGap enable developers to design mobile apps for all mobile operating systems. As the primary development tool, we preferred to use Appcelerator Titanium SDK which is classified as the 2nd category of *hybrid mobile development strategy*.

Titanium is built on two assertions. The first one is called *Core Mobile Development*, which includes the core code written in JavaScript API and intends to handle the back-end functionality of the mobile app. The code is only written once and used for any platform, i.e. iOS, Android and Web. The other assertion is more about the front-end appearance and UI design of the mobile app.

As in Figure A-1, Titanium can use to native elements of mobile OSs by building a bridge between the core code in JavaScript (called *JavaScript land*) and native programming interface (called *native land*) through proxy objects. When the developer writes the code in JavaScript, these proxy objects compile the paired code in the native language, i.e. Objective-C, and generate the native code with the ability to use native features.

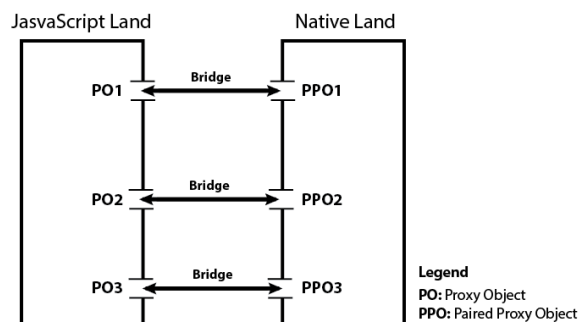


Figure A- 1: Bridge between JavaScript Land and Native Land

Titanium enables us to use many mobile features as discussed above and more for social integration. Since the platform builds bridges between the JavaScript and native land, the native *UI elements* can be easily used for supported mobile operating systems, i.e. iOS and Android.

⁶⁶ <http://www-03.ibm.com/software/products/en/worklight/>

Thus, regardless of the mobile operating system, the user experience is considered as more satisfactory for the customers considering the familiarity to native elements. Titanium also enables developers to use the location accuracy parameters mentioned in Table 13 for each platform. The parameter given in JavaScript Land is being converted to the native parameter of the relevant mobile OS to use the accuracy properties. Same logic applies to accessing native apps by using the Map module that converts written JavaScript code into the native alternative in Titanium SDK.

Local notifications can also be used through Titanium by identifying the notification properties such as the type, title, content, triggering property and the time it will be triggered. Titanium provides its own third party push notification service; Appcelerator Cloud Service (ACS)⁶⁷. Mobile app providers can use this service to send notifications in exchange of a certain amount of subscription fee. Natively supported services like Apple Push Notification (APN) and Google Cloud Messaging (GCM) can also be integrated into ACS.

For social integration, which directly reflects to the *social* layer of ms-commerce, Titanium offers various resources to integrate the required functionality. Many social elements like discussion boards, reviews, forums, and user-dependent activities like rating a specific item/content can be utilized with personal coding skills as well as other open source code/components developed by third-party developers. For the integration of social media platforms, the Facebook module by Titanium can be used to enable users to share the mobile app content through their Facebook profiles with others. Although the platform doesn't support other social media platforms like Twitter or Google Plus yet, there are plenty of open-source and paid modules which are provided by third-party companies and developers through Appcelerator Marketplace⁶⁸ and other online repositories⁶⁹.

⁶⁷ <http://www.appcelerator.com/cloud/>

⁶⁸ <https://marketplace.appcelerator.com/home>

⁶⁹ <https://github.com/>

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

Reflecting Class: Application

```
// this sets the background color of the
master UIView (when there are no
windows/tab groups on it)
Titanium.UI.setBackgroundColor('#999');
var
win=Ti.UI.createWindow({backgroundColor:'white'});
//To include the map module
Ti.include('map.js');
Ti.include('discountOffer.js');
// create tab group
var tabGroup =
Titanium.UI.createTabGroup();
// create base UI tab and root window
//////////////////////WINDOW 1
var win1 = Titanium.UI.createWindow({
    title:'Personal Information',
    backgroundColor:'white'
});
var tab1 = Titanium.UI.createTab({
    icon:'KS_nav_views.png',
    title:'Personal Information',
    window:win1
});
//Initiation of Labels and TextFields
//First Name
var textFieldFName =
Ti.UI.createTextField({
    borderStyle:
Ti.UI.INPUT_BORDERSTYLE_ROUNDED,
    color: '#336699',
    top: 10, left: 110,
    width: 190, height: 30,
    value:Ti.App.Properties.getString('propName',' ') //Query the last input of the user.
});
var labelFName = Titanium.UI.createLabel({
    color:'#999',
    text:'First Name',
    font:{fontSize:15,fontFamily:'Helvetica Neue'},
    top: 1, left: 5,
    width: 250, height: 60
});
//Last Name
var textFieldLName =
Ti.UI.createTextField({
    borderStyle:
Ti.UI.INPUT_BORDERSTYLE_ROUNDED,
    color: '#336699',
    top: 55, left: 110,
    width: 190, height: 30,
    value:Ti.App.Properties.getString('propLName',' ')//Query the last input of the user.
});
var labelLName = Titanium.UI.createLabel({
    color:'#999',
    text:'Last Name',
    font:{fontSize:15,fontFamily:'Helvetica Neue'},
    top: 45, left: 5,
    width: 250, height: 60,
});
//Email Address
var textFieldEmail =
Ti.UI.createTextField({
    borderStyle:
Ti.UI.INPUT_BORDERSTYLE_ROUNDED,
    color: '#336699',
    top: 100, left: 110,
    width: 190, height: 30,
    value:Ti.App.Properties.getString('propEmail',' ')//Query the last input of the user.
});
var labelEmail = Titanium.UI.createLabel({
    color:'#999',
    text:'Email Address',
    font:{fontSize:15,fontFamily:'Helvetica Neue'},
    top: 90, left: 5,
    width: 250, height: 60
});
//Postcode
var textFieldPostCode =
Ti.UI.createTextField({
    borderStyle:
Ti.UI.INPUT_BORDERSTYLE_ROUNDED,
    color: '#336699',
    top: 145, left: 110,
    width: 190, height: 30,
    value:Ti.App.Properties.getString('propPostCode',' ')//Query the last input of the user.
});
var labelPostCode =
Titanium.UI.createLabel({
    color:'#999',
    text:'Post Code',
    font:{fontSize:15,fontFamily:'Helvetica Neue'},
    top: 135, left: 5,
    width: 250, height: 60
});
//Button to save all the personal information
var buttonSave=Ti.UI.createButton({
    Title:'Save/Update Personal Information',
    font:{fontSize:15,fontFamily:'Helvetica Neue'},
    top: '44%',
});
//Event listener for button to inform the user
buttonSave.addEventListener('click',
function (e) {
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
//These codes below will save the input to
the properties of the application so that
it won't be missed next time.
Ti.App.Properties.setString('propName',
textFieldFName.value);
Ti.App.Properties.setString('propLName',
textFieldLName.value);
Ti.App.Properties.setString('propEmail',
textFieldEmail.value);
//Ti.App.Properties.setString('propPhoneNum
ber', textFieldPhoneNum.value);
Ti.App.Properties.setString('propPostCode'
, textFieldPostCode.value);

alert('Your Personal Information is
Saved');
});
//Scrolled ads for restaurants
var imageRest1=Ti.UI.createImageView({
image:'map.PNG',
top:'54%',
});
var imageRest2=Ti.UI.createImageView({
image:'meal.PNG',
top:'54%',
});
var imageRest3=Ti.UI.createImageView({
image:'fb.PNG',
top:'54%',
});
var
scrollableView=Ti.UI.createScrollableView(
{
views:[imageRest1, imageRest2,
imageRest3],
showPagingControl:true
});
win1.add(scrollableView);//Adding Labels
and TextFields to the Window for First Tab
win1.add(textFieldFName);
win1.add(labelFName);
win1.add(textFieldLName);
win1.add(labelLName);
win1.add(textFieldEmail);
win1.add(labelEmail);
win1.add(textFieldPostCode);
win1.add(labelPostCode);
//win1.add(textFieldPhoneNum);
//win1.add(labelPhoneNum);
win1.add(buttonSave);
//////////WINDOW 2
//Creatin the second tab and related
window
var win2 = Titanium.UI.createWindow({
title:'Desired Items',
backgroundColor:'#fff',
});
var tab2 = Titanium.UI.createTab({
icon:'KS_nav_ui.png',
title:'Desired Items',
window:win2
});
//Parent Menu:Burgers and it's children
rows.
var
section1=Ti.UI.createTableViewSection({
headerTitle:'Burgers',
height:60
});
section1.add(Ti.UI.createTableViewRow({
title:'Barbeque Burger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Blue Cheese Burger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Ham & Cheese Burger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Italiano Burger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Veggie Burger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Chicken Cheeseburger'}));
section1.add(Ti.UI.createTableViewRow({
title:'Buffalo Burger'}));
//Parent Menu:Drinks and it's children
rows.
var
section2=Ti.UI.createTableViewSection({
headerTitle:'Drinks',
height:60});
section2.add(Ti.UI.createTableViewRow({
title:'Diet Coke'}));
section2.add(Ti.UI.createTableViewRow({
title:'Regular Coke'}));
section2.add(Ti.UI.createTableViewRow({
title:'Root Beer'}));
section2.add(Ti.UI.createTableViewRow({
title:'Mineral Water'}));
section2.add(Ti.UI.createTableViewRow({
title:'Orange Juice'}));
section2.add(Ti.UI.createTableViewRow({
title:'Regular Coffee'}));
section2.add(Ti.UI.createTableViewRow({
title:'Cappucino'}));
section2.add(Ti.UI.createTableViewRow({
title:'English Tea'}));
//Parent Menu:Salads and it's children
rows.
var
section3=Ti.UI.createTableViewSection({
headerTitle:'Salads',
height:60});
section3.add(Ti.UI.createTableViewRow({
title:'Greek Salad'}));
section3.add(Ti.UI.createTableViewRow({
title:'Green Salad'}));
section3.add(Ti.UI.createTableViewRow({
title:'Special Salad'}));
section3.add(Ti.UI.createTableViewRow({
title:'Bacon & Cheese Salad'}));
//Parent Menu:Deserts and it's children
rows.
var
section4=Ti.UI.createTableViewSection({
headerTitle:'Deserts',
height:60});
section4.add(Ti.UI.createTableViewRow({
title:'Cheesecake'}));
section4.add(Ti.UI.createTableViewRow({
title:'Chocolate Brownie'}));
section4.add(Ti.UI.createTableViewRow({
title:'Ice Cream'}));
section4.add(Ti.UI.createTableViewRow({
title:'Baklava'}));
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
//to control the 'checks'for each row
included in the menu.
var tableMenu=Ti.UI.createTableView({
data:[section1,section2,section3,section4]
});
// create table view event listener
tableMenu.addEventListener('click',
function(e)
{
// event data
var index = e.index;
var section = e.section;
var row = e.row;
var rowdata = e.rowData;
//row.hasCheck = true;
var check = true;
//row.hasCheck=
Ti.App.Properties.getString(rowdata,
false);
if(row.hasCheck === true) {
row.hasCheck = false;
// Ti.App.Properties.setString(
rowdata,false);
Ti.API.info("unchecked");
}
else {
row.hasCheck = true;
// Ti.App.Properties
s.setString(rowdata,true);
Ti.API.info("checked");
}
Ti.API.info("click");
Ti.API.info(row.hasCheck+' ' +
row.title);
//To offer the personalized
content, the title is being sent to
defineDiscount to chek if the items are
suitable for the customers' needs.
defineDiscount(row.title);
});
win2.add(tableMenu);
//Button to save all the selected desired
items in the list
var buttonSaveItems=Ti.UI.createButton({
Title:'Save/Update the Desired Items',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
bottom: '1%',
});
//Event listener for button to inform the
user
buttonSaveItems.addEventListener('click',
function (e) {alert('Selected Desired
Items are Saved');});
win2.add(buttonSaveItems);
//////////////////////WINDOW 3
var win3 = Titanium.UI.createWindow({
title:'Daily Offers',
backgroundColor:'#fff'
});
var tab3 = Titanium.UI.createTab({
icon:'KS_nav_ui.png',
title:'Daily Offers',
window:win3
});
//At initial start, no daily offers are
being sent to the user, this is for
informing the user on third tab.
var labelOffer = Titanium.UI.createLabel({
color:'#999',
text:'No Daily Offers For Now',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
});
win3.add(labelOffer);
//The Area that the details of the offer
will be reviewed in Tab3.
var offerZone=Titanium.UI.createView({
//borderRadius:10,
//backgroundColor:'#99FF99',
width: 316,
height: 282,
top: '51%',
left: 2,
});
//The Discount message for the user.
var labelDiscount =
Titanium.UI.createLabel({
color:'#999',
text:'',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
top: '52%',
left: 3,
width: 315,
});
//The Meal message for the user.
var labelMeal = Titanium.UI.createLabel({
color:'black',
text:'',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
top: '62%',
left: 95,
width: 220,
});
//The Price message for the user.
var labelPrice = Titanium.UI.createLabel({
color:'#999',
text:'',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
top: '69%',
left: 95,
width: 220,
});
//To ask user if s/he wants to share it
with social media.
var labelShare = Titanium.UI.createLabel({
color:'black',
text:'Share if you want to get 10% more
discount!',
font:{fontSize:15,fontFamily:'Helvetica
Neue'},
top: '77%',
});
//Image files for Menu Items are
identified here.
var blueCheese=Ti.UI.createImageView({
image:'bluecheese.jpg',
top:'62%',
left:0
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
});
//Adding components to the main window
tabGroup.addTab(tab1);
tabGroup.addTab(tab2);
tabGroup.addTab(tab3);
// open tab group
tabGroup.open();

if (Titanium.Platform.name == 'iPhone OS')
{
// register a background service. this JS
will run when the app is backgrounded
var service =
Ti.App.iOS.registerBackgroundService({url:
'bgLogic.js'});
Ti.API.info("registered background
service = "+service);
// listen for a local notification
event
Ti.App.iOS.addEventListener('notificat
ion',function(e)
{
Ti.API.info("local notification
received: "+JSON.stringify(e));
});
// fired when an app resumes for
suspension
Ti.App.addEventListener('resume',funct
ion(e){
Ti.API.info("app is resuming from
the background");
});
Ti.App.addEventListener('resumed',func
tion(e){
Ti.API.info("app has resumed from
the background");
});
Ti.App.addEventListener('pause',functi
on(e){
Ti.API.info("app was paused from
the foreground");
});
}
```

Reflecting Class: Background (Core) Logic

```
//To include the map module
Ti.include('map.js');
//To include the app module
Ti.include('app.js');
//To include location module
Ti.include('location.js');
//To include the Facebook integration
//Ti.include('facebook.js');
Ti.include('discountOffer.js');
Ti.include('notificationService.js');
//The message for console
Ti.API.info("The application is now on
background and waiting for trigger");
var discountRate=30;
var discountMessage=discountRate + "
percent discount on Burbeque Burgers! Take
a look at it ASAP to get the offer!";//The
discount message variable.
var qrCodeMessage= "Here is your QR code,
please show it at payment to get the
discount!";
```

```
var mealMessage="Comes with super-size
French Fries and Diet Coke!";
var priceMessage="Price: $7.99 - Your
Discount (" +discountRate+"%)";
//The actual notification properties that
will appear when application is on
background.
var notification =
Ti.App.iOS.scheduleLocalNotification({
alertBody:discountMessage,
alertAction:"Re-Launch!",
sound:"pop.caf",
date:new Date(new Date().getTime() +
3000) // 3 seconds after backgrounding
});
Ti.App.iOS.addEventListener('notification'
,function(){
notification.alertBody=discountMessage+dis
cMessage;
Ti.App.currentService.unregister();
Titanium.API.log("ADDEVENT LISTENERDAN
GELDI");
});
Ti.App.currentService.addEventListener('st
op',function()
{
Ti.API.info("background service is
stopped");
});
var isItClose= closerThanTwoKM();//To get
the boolean variable if the customer is
closer than 2 KM
//Facebook Button to Share on Social Media
through User Accounts
var buttonFacebook=Ti.UI.createButton({
// Title:'Save/Update the Desired Items',
// font:{fontSize:15,fontFamily:'Helvetica
Neue'},
backgroundImage:'facebook.png',
top: '85%',
left:'10%',
width:113,
height:31
});
buttonFacebook.addEventListener('click',
function(e){
//burda takildik kanka.
});
//Twitter Button to Share on Social Media
through User Accounts
var buttonTwitter=Ti.UI.createButton({
// Title:'Save/Update the Desired Items',
// font:{fontSize:15,fontFamily:'Helvetica
Neue'},
backgroundImage:'twitter.png',
top: '85%',
left:'55%',
width:113,
height:31
});
//Initiation of twitter integration
var twitMessage= "Just got 40% discount
offer from CapitalBurger! If you also want
to get it, visit:
http://www.capitalburger.com for
details!";
function tweetUpdate(_args){
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
var social= require('twitter');//calling
the social.js file to support the twitter
integration
var twitter=social.create({
consumerSecret:'L3mQe6dPDYZmzUeOhEIK2ZX4W
u3hN4oozQN59HUiTs',
consumerKey:'DnQpxlJ218p7rWJ2N76kQA'
});
twitter.share({
message:twitMessage,
success: function(){
alert('Tweeted! Here is the message:' +
twitMessage);
},
error: function(e){
alert('Error'+e);
}
});
buttonTwitter.addEventListener('click',
function(e){
tweetUpdate();
priceMessage=priceMessage +"- Your
Discount 10% !";
labelPrice.text=priceMessage;//update the
price message
});
//The required button for the user to
generate the unique QR code
var buttonQR= Ti.UI.createButton({
title:'Generate your QR Code',
top: '90%'
});
buttonQR.addEventListener('click',
function(e){//Once the user clicks to QR
button...
var qrcode =
require('qrcode').QRCode(//the qrcode.js
file will be called to generate the QR
code.
typeName: 4,
errorCorrectLevel: 'M'
});
var qrcodeView = qrcode.createQRCodeView({
width: 200,
height: 200,
margin: 7,
text: 'The user name: '+
Ti.App.Properties.getString('propName', '
')+ ' Last name: '
+
Ti.App.Properties.getString('propLName', '
')+ ' Discount Rate: 40'
});
win3.add(qrcodeView);
});
//If the customer is closer than 2 Km,
the function will activate the
notification on background.
function checkDistanceForNotification(){
if(isItClose==true){
notification;
Titanium.API.log('BUNU notification icin
bildiriyorum');
map.addRoute(route);
win3.add(map);
```

```
alert('Please go to "Daily Offers" tab to
see the Discount Offer');
labelOffer.text="";
labelDiscount.text=discountMessage;
labelMeal.text=mealMessage;
labelPrice.text=priceMessage;
win3.add(offerZone);//Added offerZone to
the Window
win3.add(labelDiscount);
win3.add(blueCheese);
win3.add(labelMeal);
win3.add(labelPrice);
win3.add(labelShare);
win3.add(buttonFacebook);
win3.add(buttonTwitter);
win3.add(buttonQR);
Titanium.API.log('The customer is within 2
KM, so notification is HERE!');
} else if (isItClose==false){
Titanium.API.log('SORRY ABI, the
customer is not within 2 KM');
labelOffer.text= "Sorry, we think you
are not close enough to get this offer on
time. If you want to get it anyways,
please click here!";
}
}
checkDistanceForNotification();
Ti.App.currentService.stop();
```

Reflecting Class: Discount Offer

```
var discMessage='mi acaba';
function defineDiscount(selectedTitle){
//to control the 'checks'for each row
included in the menu.
if(selectedTitle == 'Blue Cheese
Burger') {
discMessage="percent discount on
Blue Cheese Burgers! Take a look at it
ASAP to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle ==
'Buffalo Burger'){
discMessage="percent discount
on Buffalo Burgers! Take a look at it ASAP
to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Chicken Cheese
Burger'){
discMessage="percent discount
on Chicken Cheese Burgers! Take a look at
it ASAP to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Barbeque
Burger'){
discMessage="percent discount
on Burbeque Burgers! Take a look at it
ASAP to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Ham & Cheese
Burger'){
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
        discMessage="percent discount
on Ham & Cheese Burgers! Take a look at it
ASAP to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Italiano
Burger'){
        discMessage="percent discount
on Italiano Burgers! Take a look at it
ASAP to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Veggie
Burger'){
        discMessage="percent discount
on Veggie Burgers! Take a look at it ASAP
to get the offer!";
setMessage(discMessage);
}
else if (selectedTitle == 'Ham & Cheese
Burger'){
        discMessage="percent discount
on Ham & Cheese Burgers! Take a look at it
ASAP to get the offer!";
setMessage(discMessage);
}
else discMessage="percent discount on any
Burgers! Take a look at it ASAP to get the
offer!";
Titanium.API.log('the offer is now'+
discMessage);
setMessage(discMessage);
};
function returnMsg(){
return discMessage;
}
}
```

Reflecting Class: Facebook

```
fb.appid = 279330228883974;
fb.permissions = ['publish_stream']; //
Permissions your app needs
fb.forceDialogAuth = false;
fb.addEventListener('login', function(e) {
    if (e.success) {
        alert('Logged In');
    } else if (e.error) {
        alert(e.error);
    } else if (e.cancelled) {
        alert("Cancelled");
    }
});
fb.authorize();
fb.requestWithGraphPath('me/feed',
{message: "Trying out FB Graph API and
it's fun!"},
    "POST", function(e) {
    if (e.success) {
        alert("Success! From FB: " +
e.result);
    } else {
        if (e.error) {
            alert(e.error);
        } else {
            alert("Unkown result");
        }
    }
}
```

```
    }
});
fb.appid = 279330228883974;
fb.permissions = ['publish_stream']; //
Permissions your app needs
fb.requestWithGraphPath('me', {}, 'GET',
function(e) {
    if (e.success) {
        alert(e.result);
    } else if (e.error) {
        alert(e.error);
    } else {
        alert('Unknown response');
    }
});
var data = {
    link : "http://www.appcelerator.com",
    name : "authorizes deneme",
    message : "Let's see whats going on
here ",
    caption : "Appcelerator Titanium
Mobile",
    picture :
"http://developer.appcelerator.com/assets/
img/DEV_titmobile_image.png",
    description : "This is just a trial
code for testing the Titanium Studio
here. " +
                "your hard won web
skills into native applications..."
};
fb.dialog("feed", data, function(e) {
    if(e.success && e.result) {
        alert("Success! New Post ID: " +
e.result);
    } else {
        if(e.error) {
            alert(e.error);
        } else {
            alert("User canceled
dialog.");
        }
    }
});
```

Reflecting Class: Twitter

Taken from Dawson Toth⁷⁰; where the JavaScript file can be accessed through <https://gist.github.com/dawsonth/2eabc31db388144b3abc>

Reflecting Class: Current Location

```
//determining the current location
Ti.Geolocation.purpose='Determine the
current location';
//Getting the current location
function getLocation(_args){
if(Ti.Geolocation.locationServicesEnabled)
{
Ti.Geolocation.purpose='Get the current
location';
```

⁷⁰ <https://gist.github.com/dawsonth>

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
Ti.Geolocation.accuracy=Ti.Geolocation.ACCURACY_BEST;
Ti.Geolocation.distanceFilter=10;
Ti.Geolocation.preferredProvider=Ti.Geolocation.PROVIDER_GPS;
Ti.Geolocation.addEventListener('location', function(e){
  if(e.error){
    alert('Error: '+ e.error);
  } else {
    Ti.API.info(e.coords);
    _args.success(e.coords);
  }
});
} else {
  alert('Please enable the location services');
};
```

Reflecting Class: Map

```
var MapModule= require('ti.map');
//Current location of the User
var user= MapModule.createAnnotation({
  latitude:45.38531, //closerthan2KM
  longitude: -75.724554, // closerthan2KM
  //latitude:45.430142, //far
  //longitude: -75.633659, //far
  title: 'Current Location',
  pincolor: MapModule.ANNOTATION_PURPLE,
  subtitle: 'The location of your device'+ 'Latitude: 45.357082' + 'Longitude: -75.800153',
  leftButton:
  Ti.UI.iPhone.SystemButton.INFO_DARK
});
//Location of the Downtown Restaurant
var partner1= MapModule.createAnnotation({
  latitude: 45.39845,
  longitude: -75.73288,
  title: 'CapitalBurger Downtown',
  pincolor: MapModule.ANNOTATION_BLUE,
  subtitle: 'Providing the best burgers for over 23 years! Check out our new meals.',
  leftButton:
  Ti.UI.iPhone.SystemButton.INFO_DARK
});
//location of the West-end Restaurant
var partner2= MapModule.createAnnotation({
  latitude: 45.367102,
  longitude: -75.787125,
  title: 'CapitalBurger West-end',
  pincolor: MapModule.ANNOTATION_BLUE,
  subtitle: 'Providing the best burgers for over 23 years! Check out our new meals.',
  leftButton:
  Ti.UI.iPhone.SystemButton.FLEXIBLE_SPACE
});
//location of the East-end Restaurant
var partner3= MapModule.createAnnotation({
  latitude: 45.449052,
  longitude: -75.589371,
  title: 'CapitalBurger East-end',
  pincolor: MapModule.ANNOTATION_BLUE,
  subtitle: 'Providing the best burgers for over 23 years! Check out our new meals.',
  leftButton:
  Ti.UI.iPhone.SystemButton.INFO_DARK
```

```
});
//Finding the shortest distance with 4 parameters that get latitude and longitude of two specific destinations
function deg2rad (degree){
  return degree/180 *Math.PI;
};
function rad2deg(radian){
  return radian * 180 / Math.PI;
};
function distance (lat1, lon1, lat2, lon2 ){
  var theta=lon1-lon2;
  var dist=Math.sin(deg2rad(lat1))
  *Math.sin(deg2rad(lat2))
  + Math.cos(deg2rad(lat1)) *
  Math.cos(deg2rad(lat2))
  *Math.cos(deg2rad(theta));
  dist=Math.acos(dist);
  dist=rad2deg(dist);
  var miles = dist *60 *1.1515;
  return miles;
};
//Finding the closest annotation's Latitude variable.
function findTheClosestLat(userLatitude, userLongitude){
  var p1= distance(userLatitude, userLongitude, partner1.latitude, partner1.longitude);
  var p2= distance(userLatitude, userLongitude, partner2.latitude, partner2.longitude);
  var p3= distance(userLatitude, userLongitude, partner3.latitude, partner3.longitude);
  var closest=Math.min(p1,p2,p3);
  if (closest == p1){
    return partner1.latitude;
  }
  if (closest == p2){
    return partner2.latitude;
  }
  else return partner3.latitude;
}
//Finding the closest annotation's longitude variable
function findTheClosestLong(userLatitude, userLongitude){
  var p1= distance(userLatitude, userLongitude, partner1.latitude, partner1.longitude);
  var p2= distance(userLatitude, userLongitude, partner2.latitude, partner2.longitude);
  var p3= distance(userLatitude, userLongitude, partner3.latitude, partner3.longitude);
  var closest=Math.min(p1,p2,p3);
  if (closest == p1){
    return partner1.longitude;
  }
  if (closest == p2){
    return partner2.longitude;
  }
  else return partner3.longitude;
```

Appendix B. JavaScript Code for Scenario 1: CapitalBurger

```
}
//Assigning the losest restaurant's
latitude and longitude values to external
variables
var closeLat=
findTheClosestLat(user.latitude,user.longi
tude);
var closeLong=
findTheClosestLong(user.latitude,user.long
itude);
//The function that checks if distance
between the customer and the closest
restaurant is below 2 KM.
function closerThanTwoKM(){
var
theDistance=distance(user.latitude,user.lo
ngitude,closeLat,closeLong);
if (theDistance<1.24274){//1.24274 is the
equal Miles for KM
return true;
}
else return false;
}
//Initializing the route on map. Distance
will be shown here.
var route= MapModule.createRoute({
width:4,
color:'#f00',
points:[
{latitude: user.latitude, longitude:
user.longitude},//user's lat and long
{latitude: closeLat, longitude:
closeLong}, //closest annotation's lat and
long
]
});
//The map is created here.
var map= MapModule.createView({
userLocation:true,
mapType: MapModule.HYBRID_TYPE,
animate:true,
region:{latitude: user.latitude,
longitude:user.longitude,
latitudeDelta:0.5, longitudeDelta: 0.5},
height:'50%',
top: 0,
width:Ti.UI.FILL,
annotations: [user, partner1, partner2,
partner3]//required annotations including
the user
});
map.addEventListener('click',
function(evt) {
Ti.API.info("Annotation " + evt.title
+ " clicked, id: " + evt.annotation.myid);
// Check for all of the possible names
that clicksouce
// can report for the left
button/view.
if (evt.clicksource == 'leftButton' ||
evt.clicksource == 'leftPane' ||
evt.clicksource == 'leftView') {
alert('Have you tried our new BBQ
burger? It is AMAZING! Check it out on our
website or simply click this message to
access one-time-only 40% discount!');
}
}
```

```
});
```

Reflecting Class: Notification Service

```
//The message for console
var discountMessage;
var discountRate=30;
var qrCodeMessage= "Here is your QR code,
please show it at payment to get the
discount!";
var mealMessage="Comes with super-size
French Fries and Diet Coke!";
var priceMessage="Price: $7.99 - Your
Discount (" +discountRate+"%)";
function setMessage(message){
discountMessage=discountRate +
"+message;//The dicsount message variable.
}
function getMessage(){
return discountMessage;
}
```

Reflecting Class: QR Generator

Taken from D-Project⁷¹; where the JavaScript file can be accessed through <http://d-project.googlecode.com/svn/trunk/misc/qrcode/qrcode.js>

⁷¹ <http://www.d-project.com/>

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