

FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO



FEUP

Differentiator Factors in the Implementation of Social Network Sites

António Pedro Pinto Bessa de Melo Cerqueira

FINAL VERSION

Report of Dissertation
Master in Informatics and Computing Engineering
Supervisor: Professor Associado António Manuel Lucas Soares

July 2009

Differentiator Factors in the Implementation of Social Network Sites

António Pedro Pinto Bessa de Melo Cerqueira

Report of Dissertation
Master in Informatics and Computing Engineering

Approved in oral examination by the committee:

Chair: Jorge Manuel Gomes Barbosa (Professor Auxiliar)

External Examiner: António Manuel Ferreira Rito da Silva (Professor Associado)

Internal Examiner: António Manuel Lucas Soares (Professor Associado)

31st July 2009

Abstract

Social networks' huge growth enables great opportunities for business development, but also challenges in developing new platforms due to constant necessity of innovation, creativity and distinction. This dissertation's main objective is to conceive and present differentiator social network website features that apply to the *Cardmobili's* business model and environment. The *Cardmobili's* product is a solution that, ultimately, will ease the process of storing all physic cards in a mobile phone, through an online platform and a mobile application that enables simple and fast membership adherence of both individuals and companies with card loyalty programs. This online platform will provide users with the possibility of physic cards virtualization through mobile phone and it will be based on a social network of individual adherents and companies that desire to integrate their loyalty programs.

The *Cardmobili's* solution is a project in its early days of development and will comprise different product releases along its way. Use cases and requirements for early versions of the solution are already well defined, but there is space for new ideas that could make sense for future releases. It is in this context that the *Cardmobili's* project envisions the necessity of having people working on this particular subject. In this manner, this dissertation's main objective is to study the universe of social networks and its features, in order to design, conceive and perform non-functional prototyping of social network components that adapt to the *Cardmobili's* business model for possible future releases of the *Cardmobili's* solution.

Expected results include the systematization and study of several social networks' characteristics and the identification and non-functional prototyping of social-network-like components for the *Cardmobili's* web solution. This study was accomplished through a detailed analysis of features and characteristics of several representative social networks of each type: General Purpose, Professional and Specialized social network websites. The identification and non-functional prototyping of social network components that adapt to the *Cardmobili's* business model domain was accomplished through the use of a scenario-based requirements engineering methodology for requirements elicitation and some techniques which objective was to identify requirements in creative contexts. This process resulted in a set of scenarios presented in the form of storyboards that illustrated several social network components for *Cardmobili's* future web releases.

This dissertation identifies individual and social participation as examples of some of the most valued social network websites' features/functionalities by users. It also identifies business advantages in using social networks, such as the creation of a bi-directional stream of communication between customer and company/brand. Ultimately, tries to group valued social network features from users and companies, in order to suggest several features/functionalities for future *Cardmobili's* web releases.

In conclusion, this dissertation establishes the basis for the next phase of implementation of social network website features in the *Cardmobili's* website.

Resumo

A enorme proliferação de redes sociais constitui uma oportunidade para o desenvolvimento dos negócios, mas também desafios na concepção e desenvolvimento de novas plataformas, pela constante necessidade de inovação, criatividade e distinção. O principal objectivo desta dissertação prende-se com a identificação e concepção de funcionalidades e características diferenciadoras em redes sociais que possam ser aplicadas ao modelo e contexto de negócio da *Cardmobili*. O serviço *Cardmobili* facilita o processo de armazenamento de cartões físicos no telemóvel, recorrendo a uma plataforma *online* e a uma aplicação móvel que permitam a adesão fácil e rápida de indivíduos e empresas com programas de fidelização de cartões. A plataforma *online* permite aos seus utilizadores a virtualização dos seus cartões físicos através do telemóvel e será baseada numa rede social de aderentes individuais e companhias que desejem integrar os seus programas de fidelização com esta solução.

O serviço *Cardmobili* encontra-se ainda nos primórdios do seu desenvolvimento e será constituído por diferentes versões de lançamento do produto. Os casos de uso e requisitos para o lançamento de versões mais imediatas desta solução já estão bem definidos, mas ainda há a necessidade de identificar novas ideias que façam sentido para futuros lançamentos. É neste contexto que a *Cardmobili* reconhece a necessidade de ter recursos humanos a trabalharem com este objectivo. Desta forma, entende-se a motivação desta dissertação, cujo objectivo passa pelo estudo do universo das redes sociais e suas características, de modo a identificar, conceber e realizar prototipagem não-funcional de componentes que se adaptem ao modelo de negócio da *Cardmobili*, especialmente para versões futuras da solução.

Os principais resultados esperados incluem a sistematização e estudo de características de redes sociais e a identificação e prototipagem não-funcional de componentes de redes sociais que possam ser aplicadas à solução *web* da *Cardmobili*. O estudo e sistematização de características de redes sociais foi efectuado através da análise detalhada das características e funcionalidades de diversas redes sociais representativas de cada um dos tipos existentes: Generalistas, Profissionais e Especializadas. A identificação e prototipagem não-funcional de componentes para redes sociais que se adaptem ao domínio do modelo de negócio da *Cardmobili* foram efectuadas recorrendo a uma metodologia de engenharia de requisitos baseada em cenários para a elicitación de requisitos. Adicionalmente recorreu-se também a técnicas de identificação de requisitos em contextos criativos. Este processo resultou num conjunto de cenários apresentados sob a forma de *storyboards* que ilustram diversos componentes de redes sociais orientados para futuros lançamentos da versão *web* da solução da *Cardmobili*.

Esta dissertação identifica a participação individual e colectiva como exemplos de características bastante valorizadas pelos utilizadores quando utilizam uma rede social *online*. Adicionalmente, também identifica diversas vantagens que advêm da utilização de redes sociais no desenvolvimento de negócios, tais como a possibilidade de criação de comunicação bi-direccional entre consumidor e companhia/marca. Em suma, existe a tentativa de agregar características de redes sociais que são valorizadas por utilizadores e empresas, de modo a sugerir diversas funcionalidades para futuras versões *web* da solução da *Cardmobili*.

Concluindo, esta dissertação estabelece uma base sólida para uma próxima fase que seria de implementação destas funcionalidades no *website* da *Cardmobili*.

Acknowledgements

I would like to thank all the help I have got at *Cardmobili*, specially from: Catarina Maia, for the guidance and all the information provided; my current manager Helena Leite and all the elements of the *Cardmobili* Development Team for the ideas, comments and help provided.

I would also like to thank everyone at FEUP that made this dissertation possible, particularly: MIEIC's current director Prof. António Augusto de Sousa for all the arrangements and information provided; MIEIC's former director Prof. Raul M. Vidal for his commitment to improve our course; and my supervisor António Manuel Lucas Soares for all the help and guidance throughout my dissertation.

I need to thank all the support provided by my friends and family, specially to my parents, António and Maria José Cerqueira and my brother Nuno Cerqueira who supported me through this whole process.

António Pedro Pinto Bessa de Melo Cerqueira

Contents

Chapter 1	1
Introduction	1
1.1. Context	1
1.1.1. Documento Crítico – Desenvolvimento de Software S.A.	1
1.1.2. Cardmobili	1
1.2. Objectives and Motivation	1
1.3. Structure of Dissertation	4
Chapter 2	5
Social Networks and Social Network Sites in Business	5
2.1. Social Network Theory	5
2.1.1. What is a Network?	5
2.1.2. Social Networking Six Degrees Theory	6
2.1.3. Types of Social Networks	7
2.2. Social Network Websites	7
2.2.1. SNS Definition	7
2.2.2. Purpose and Features of SNS	8
2.2.3. Types of SNS	9
2.2.3.1. Professional Networks	10
2.2.3.2. General Purpose Networks	11
2.2.3.3. Specialized Networks	11
2.2.4. Conclusions about Social Network Websites	11
2.3. Universe of Social Network Sites	12
2.3.1. General Purpose Social Network Sites	12
2.3.1.1. <i>Hi5</i>	12
2.3.1.2. Conclusions about General Purpose Social Network Sites	17
2.3.2. Professional Social Network Sites	18
2.3.2.1. <i>The Star Tracker</i>	18
2.3.2.2. Conclusions about Professional Social Network Sites	21
2.3.3. Specialized Social Networks Sites	21
2.3.3.1. <i>Mercedes-Benz</i>	21
2.3.3.2. Conclusions about Specialized Social Network Sites	23
2.3.4. Conclusions about the Universe of Social Network Sites	24
2.4. Social Networks in Business	27

2.4.1. The Competitive Advantage of Social networks	28
2.4.2. Conclusions about Social Networks in Business.....	29
2.4.3. <i>Cardmobili's</i> Business Motivation	29
Chapter 3.....	31
Requirements Elicitation	31
3.1. Requirements Engineering	31
3.1.1. Requirements	32
3.1.2. The Importance of Requirements	33
3.1.3. A Good Requirement.....	34
3.1.4. Literature Review on Requirements Engineering Process Models	34
3.1.5. Requirements Engineering Activities in the Software Life Cycle	36
3.1.5.1. Requirements Gathering/Elicitation from Various Sources	38
3.1.5.2. The Process of Requirements Elicitation.....	40
3.1.5.3. Requirements Elicitation Problems.....	42
3.1.5.4. Requirements Elicitation Framework.....	47
3.1.5.5. Techniques for Requirements Elicitation	49
3.1.5.6. Requirements Gathering/Elicitation Models	60
3.1.5.7. Conclusions about the Requirements Engineering Process.....	61
3.2. Creativity and Innovation in Requirements Engineering	62
3.2.1. Creative Methods and Techniques for Requirements Elicitation	63
3.2.1.1. Group Brainstorming Method	63
3.2.1.2. Integrating Creativity Workshops into Structured Requirements Processes - RESCUE	64
3.2.1.3. Creative Thinking Process Solving	64
3.2.1.4. The Simplex CPS Approach.....	65
3.3. <i>The Star Tracker's</i> Process of Requirements Elicitation - Case Study	66
3.3.1. The Interview: Requirements Elicitation in the Requirements Engineering Process	66
3.4. Conclusions about the Chapter of Requirements Elicitation	67
Chapter 4.....	68
<i>Cardmobili's</i> Social Network Website	68
4.1. Problem and Approach Description	68
4.1.1. <i>Cardmobili's</i> Project Overview	68
4.1.2. Approach Description.....	68
4.2. The Requirements Elicitation Process for the <i>Cardmobili's</i> Website.....	69

4.2.1. The Requirements Elicitation Session	71
4.2.1.1. The First Phase	71
4.2.1.2. The Second Phase.....	71
4.2.1.3. The Third Phase.....	72
4.3. Scenarios	72
4.3.1. <i>Cardmobili's</i> Social Network Website Environment	72
4.3.2. Scenario 1: Send card to network connection	74
4.3.2.1. Storyboard 1: User sends cards to friends	74
4.4. Creative Ideas for <i>Cardmobili's</i> Social Network Website.....	77
4.5. Conclusions about the Chapter of <i>Cardmobili's</i> Social Network Website	79
Chapter 5.....	80
High-Level Design of <i>Cardmobili's</i> Social Network Platform.....	80
5.1. Social Network Development Platforms	80
5.2. "White-Label" Social Network Development Platforms	80
5.2.1. "Do-it-yourself" Platforms.....	80
5.2.2. Social Networking Software Packages	84
5.2.3. Customized Social Network Solutions.....	85
5.2.4. Conclusions about "White-Label" Social Network Development Platforms.....	86
5.3. The <i>Cardmobili's</i> Social Network Solution	86
5.3.1. High-Level Functional Architecture.....	87
5.3.2. Platform's Data Model	88
5.4. Conclusions about the Chapter High-Level Design of the <i>Cardmobili's</i> Social Network Platform.....	90
Chapter 6.....	91
Conclusions and Future Work	91
6.1. Conclusions	91
6.2. Future Work	92
References.....	95
Appendix A	104
Techniques for Requirements Elicitation	104
Appendix B	113
SNS Comprehensive Analysis	113
Appendix C	146
Interview - Requirements Elicitation in the Requirements Engineering Process	146

Appendix D	149
The Requirements Elicitation Session Guide.....	149
Appendix E.....	153
The Conceptual Map	153
Appendix F.....	154
Scenarios and Storyboards.....	154
Appendix G	194
<i>Cardmobili's</i> Social Network Platform Database Model	194
References.....	195

List of Figures

Figure 1: Simple connection between nodes	5
Figure 2: Example of a Network of People [Community09]	5
Figure 3: Six degrees Theory [Celaya08]	6
Figure 4: Kotonya and Sommerville (1998) Linear Requirements Engineering Process Model [MAJP02]	35
Figure 5: Macaulay (1996) Linear Requirements Engineering Process Model [MAJP02]	35
Figure 6: Loucopoulos and Karakostas (1995) Iterative Requirements Engineering Process Model [MAJP02]	36
Figure 7: Components of Requirements Elicitation (Kotonya and Sommerville 1997) [Reinikainen01]	40
Figure 8: Four Quadrant Model of the Difficulties in Requirements Engineering [DC08]	44
Figure 9: Four dimension view on a methodology [CM02]	47
Figure 10: The Requirements Elicitation Process for the <i>Cardmobili</i> 's Website.....	69
Figure 11: Storyboard 1: User sends cards to friends – Scene 1.....	75
Figure 12: Storyboard 1: User sends cards to friends – Scene 2.....	75
Figure 13: Storyboard 1: User sends cards to friends – Scene 3.....	76
Figure 14: Storyboard 1: User sends cards to friends – Scene 4.....	76
Figure 15: Storyboard 1: User sends cards to friends – Scene 5.....	77
Figure 16: Storyboard 1: User sends cards to friends – Scene 6.....	77
Figure 17: <i>Cardmobili</i> 's Social Network Platform High-Level Functional Architecture.....	87
Figure 18: <i>Cardmobili</i> 's Social Network Platform Database Model	89

List of Tables

Table 1: General Purpose Social Network Site – *Hi5*..... 12

Table 2: Professional Social Network Site – *TheStarTracker*..... 18

Table 3: Specialized Social Network Site – *Generation-Benz* 21

Table 4: Types of Requirements..... 32

Table 5: Characteristics for a good requirement 34

Table 6: Requirement Activities in the Software Development Life Cycle 37

Table 7: Scenario 1: Send card to network connection 74

Abbreviations

ACRE Acquisition of Requirements
CAT Computer Aided Team
CEO Chief Executive Officer
CI Contextual Inquiry
CMM Capability Maturity Model
CMMI Capability Maturity Model Integration
CSEM Collaborative Software Engineering Methodology
CORE Controlled Requirements Expressions
CPS Creative Problem Solving
CPT Creative Pause Technique
CSCW Computer Supported Cooperative Work
CSS Cascading Style Sheets
CTO Chief Technology Officer
EMS Electronic Meeting Systems
FAQ Frequently Asked Questions
FEUP Faculdade de Engenharia da Universidade do Porto
FQL Facebook Query Language
GDSS Group Decision Support Systems
GORE Goal-Oriented Requirements Engineering
GPS General Problem Solver or Global Positioning System
GSS Group Support Systems
HTML HyperText Markup Language
IBIS Issue Based Information Systems method
IS Information System
JAD Joint Application Development
J2EE Java Platform Enterprise Edition
MBA Master Business Administration
MFC Most Frequent Contributors
MIEIC Mestrado Integrado em Engenharia Informática e Computação
NASA U.S. National Aeronautics and Space Administration
OTSO Off-the-Shelf Option
QFD Quality Function Deployment
RE Requirements Engineering
RESCUE Requirements Engineering with Scenarios for User-Centred Engineering
RUP Rational Unified Process
SBRE Scenario Based Requirements Elicitation
SBREngineering Scenario Based Requirements Engineering
SCRAM SCenario Requirements Analysis Method
SE-CMM Software Engineering Capability Maturity Model
SMS Short Message Service
SNS Social Network Sites
SOW Statement of Work
SPICE Software Process Improvement and Capability dEtermination
SSM Soft System Methodology
TST *The Star Tracker*
UGC User Generated Content
ULRC User-Led Requirements Construction
UML Unified Modelling Language
URL Unique Resource Locator
US United States
VP Vice President
VOC Voice of the customer
VORD Viewpoint-Oriented Requirements Definition
VOSE Viewpoint-Oriented System Engineering

Chapter 1

Introduction

This Chapter introduces the project being described in this report, and provides context for understanding its purposes and usages.

1.1. Context

This dissertation was developed under the scope of the Dissertation course, 5th year, 2nd Semester of the Master in Informatics and Computing Engineering (MIEIC) of the Faculdade de Engenharia da Universidade do Porto (FEUP). It took place in an external institution named *Documento Crítico – Desenvolvimento de Software S.A.* for a period of twenty weeks under the supervision of Professor António Manuel Lucas Soares, professor at FEUP.

This dissertation was developed and integrated by the student with a multidisciplinary team (marketing and software developers).

1.1.1. Documento Crítico – Desenvolvimento de Software S.A.

Documento Crítico – Desenvolvimento de Software S.A. is a company founded by António Murta (ex-*Sonae*, *Mobicomp* investor), Carlos Oliveira (*Mobicomp* co-Founder, former CEO) and Tomás Azevedo student and entrepreneur.

1.1.2. Cardmobili

Cardmobili is an innovative project working on computer and mobile technologies, with focus on the software development area. This project is done by *Documento Crítico – Desenvolvimento de Software S.A.* and explores knowledge areas like Interaction and Multimedia and Information and Communication Technologies.

Cardmobili's product is under development and is described by the corporation as a solution that, ultimately, will make our lives simpler, by making it easier and more convenient to store all our cards in a mobile phone. *Cardmobili* is a service based on an online platform and a mobile application that enables simple and fast membership adherence to multiple companies' loyalty programs. This platform will provide its users with the possibility of physic cards virtualization through the mobile phone. *Cardmobili*'s solution bases itself in a social network of individual adherents and companies partnerships that desire to integrate their loyalty programs in a common platform or to create a brand new loyalty program.

Cardmobili aims to be a global solution: a loyalty cards' virtualization proposal, available and focused on consumers and companies from all around the world.

1.2. Objectives and Motivation

Social networks' huge growth enables great opportunities for business development, but also challenges in developing new platforms due to constant necessity of innovation, creativity and distinction.

Introduction

As mentioned above, this dissertation is integrated under the scope of a start-up project named *Cardmobili*. *Cardmobili* is a project in its early days of development and will comprise different product releases along its way. Use cases and requirements for early versions of the solution are already well defined, but there is space for new ideas that could make sense for future releases. It is in this context that the *Cardmobili*'s project envisions the necessity of acquiring knowledge and experience on this particular subject.

As stated before, this dissertation is developed concurrently with the initial phase of the *Cardmobili*'s solution development. As its title suggests (*Differentiator Factors in the Implementation of Social Network Sites*), this dissertation's objective is basically to study the universe of social networks and its features, in order to design, conceive and perform non-functional prototyping of social network components that adapt to the *Cardmobili*'s business model in possible future releases of the *Cardmobili*'s solution. This is accomplished by integrating the student in a multidisciplinary team (marketing and software development) through a period of approximately 5 months of internship.

As mentioned above, this dissertation is motivated by *Cardmobili*'s determination to benefit from the advantages of having social network or community-like features applied to its business model and consequently to its website. As a result, an important contribute of this dissertation lies in identifying in what way the *Cardmobili* website can create and offer value to consumers so they adopt the CM solution. In other words, what are the characteristics/functionalities which differentiate the *Cardmobili* Social Network Site from others existent in business? This is the central investigation's theme of this dissertation and in order to accomplish it, this dissertation follows a linear study of different areas.

Initially is made an introduction to the social networks and social network websites' main theme with the purpose of assuring a solid basis to enact the study the several social network websites and their main characteristics/features. Here are defined the three different main types of social network sites. Then, follows the study of several social network sites from the different types identified earlier, which allows for concluding about social network sites' success factors and differentiator characteristics. This dissertation confers special focus to the role of social networks in business, so as to explain why *Cardmobili* wants to enter the social networks' scene.

Since that one of the main results expected from this dissertation is a detailed list of social network functionalities that adapt to the *Cardmobili*'s business model and context, this dissertation also focus on the process of requirements elicitation as a methodology to identify, generate and perform non-functional prototyping of the functionalities generated. The study of the state of the art on requirements elicitation focuses especially on scenarios techniques that are commonly accepted as one of the efficient methods for eliciting, clarifying and prototyping systems requirements and functionalities. Scenarios are also said to have great potential in solving many requirements problems in the software industry, providing users and other stakeholders with the ability to easily describe the way they do their work and to ease the process of requirements discovery and alternative solutions [HDN99]. In addition, this dissertation also mentions the subject of creativity in requirements identification, as a way to promote innovative and differentiator characteristics, mainly as strong input in the process of requirements engineering.

Next follows the process held in the context of this dissertation in order to perform requirements elicitation of future possible *Cardmobili*'s functionalities through scenarios and storyboards.

To finalize, there is the study of the state of the art on social network development platforms which objective is to establish the existent possible solutions that *Cardmobili* could adopt to support its social network website. Based on this study of the state of the art on social network development platforms, one possible solution for the *Cardmobili*'s social network support platform is briefly presented. This is accomplished through the definition of this proposed solution's high-level functional architecture and database model.

Introduction

Actually, this line of thought leads to this dissertation's objective which is to study and characterize Social Networks and identify differentiator functionalities/components for the *Cardmobili*'s business model domain. In summary, the main objectives and expected results are:

- Systematization and Study of Social Networks' characteristics.
- Identification and non-functional prototyping of social network like components for the *Cardmobili*'s solution.

These main objectives and expected results must be accomplished through completion of a set of sub-objectives including:

- Familiarization with the Company and its business model.
 - Familiarization with the Company's solution.
- Literature review on Social Networks.
- Study of the Universe of Social Network Sites.
- Literature review on Requirements Engineering.
 - Literature review on Requirements Elicitation.
 - Literature review on Scenario-Based Requirements Engineering.
 - Literature review on Requirements Elicitation in Creative Contexts.
 - Study of a practical case of a Requirements Elicitation and Identification Process in Social Network Website development.
- *Cardmobili*'s Social Network components conception.
- Elicitation and identification of social network like components for the *Cardmobili*'s solution.
 - *Cardmobili*'s Social Network components specification (scenarios and storyboards).
- Results and practical applications discussions (within the team).

The main benefits that the *Cardmobili*'s project will retain from this dissertation are:

- Higher level of knowledge on Social Networks in general.
- Higher level of knowledge on Social Network Sites and features that users value.
- Higher level of knowledge on client loyalty programs and the way in which they can interact with *Cardmobili*'s software solution (Social Networks in Business).
- Higher level of knowledge on the process of requirements engineering, specifically on the requirements elicitation/identification phase.
- Higher level of knowledge on techniques for requirements identification on creative contexts.
- Higher level of knowledge on scenarios and storyboard techniques.
- Higher level of knowledge on the Requirements Elicitation and Identification Process in practical cases of Social Network Website development.
- List of detailed ideas for possible future *Cardmobili*'s social network components (scenarios and storyboards):
 - Major scenarios identifying different functionalities and features.
 - Storyboards identifying different alternatives of major scenarios.
- Higher level of knowledge about Social Network components.

So as to ensure the accomplishment of these objectives and enable these benefits to the company, there are some support methodologies that should be used. Study of information that is related to *Cardmobili* was mostly attained through the review of the company's documentation (e.g. business model documents, market overview documents, competitors'

document, use cases document, identity documents, etcetera). Complete and efficient review of literature on Social Networks and on Requirements Engineering will be assured through search and study of articles, studies, dissertations, thesis and other documents considered relevant on these particular areas. The establishment of a well based description on the state of the art of Social Network Sites and its universe will be assured through a detailed analysis of some of the most popular and/or relevant social network sites' characteristics and main features. This analysis will be performed to a given number of relevant social network sites with the use of a template that later might permit comparisons and conclusions about them. The identification and non-functional prototyping of components will be mostly made using detailed scenarios and storyboards.

1.3. Structure of Dissertation

This dissertation is divided in Chapters and begins in Chapter 1 with an introduction to both the proposal and context of this project.

Chapter 2 describes and presents some concepts related to Social Networking, Social Networks in Business and a comprehensive analysis of Social Network Websites. This analysis is a review of the state of the art on social networking sites and its main characteristics and features. Chapter 2 also presents *Cardmobili*'s social networking general requirements and motivation to come into the social networking scene.

Chapter 3 includes the state of the art on requirements engineering, specifically regarding the requirements elicitation phase. As part of the state of the art on requirements elicitation, this chapter provides deeper insights on scenario-based requirements engineering techniques and creative techniques for requirements identification. This chapter also presents one case study that depicts the process of requirements elicitation on this particular case of social network website development.

Chapter 4 provides information about a requirements elicitation session hosted in the context of this dissertation, as well as its results. This Chapter also provides the scenarios and storyboards built for the future *Cardmobili*'s social network website.

Chapter 5 presents the state of the art on "*White-Label*" Social Network Development Platforms, as well as the high-level functional architecture and database model of the platform that may support the *Cardmobili*'s social network website.

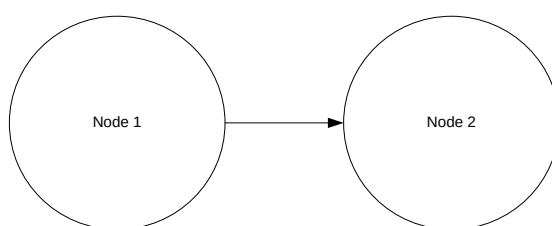
At last, Chapter 6 presents major conclusions of this dissertation, plus future improvements and development.

The Appendix section provides information considered to be crucial and indispensable to support this document. More important information provided includes: the comprehensive analysis of the Social Network Sites' Universe and the scenarios and storyboards generated.

Social Networks and Social Network Sites in Business

2.1. Social Network Theory

A Network is a set of relationships/connections. Formally, a network contains a set of objects (nodes) and a mapping or description between them (relationship, link, connection, edge, tie, etcetera). The simplest network of all is constituted only by two objects and one relationship between them, as can be seen in Figure 1 (e.g. two people in a room). These relationships can be directional (e.g. person 1 likes person 2). Additionally, these relationships can also be symmetrical or even non-directional. A relationship can be seen from different flow perspectives (information, material, etcetera) [Kadushin04].



A social network can be defined and represented as a set of nodes or actors (persons or organizations) linked by social relationships or ties of a specified type (Figure 2). In fact, social

network analysis views social relationships in terms of nodes and ties. Nodes are the individual actors within the networks, and ties are the relationships between the actors.

Usually, a tie/relation between individuals is characterized by strength and content. Content can derive from information, advice or friendship, shared interest or membership, and typically some level of trust. The level of trust in a given tie is a very important matter, mainly when talking about social networks in business [CHGG07].

Sometimes there are misunderstandings about two somewhat alike terms: Virtual communities and Social Networks. The main difference lays in the fact that Virtual communities are defined as a group of people with shared interests that desire to interact (e.g. sharing experiences/opinions) through the network. Basically, virtual communities are constituted by a group of people contributing to attain common goals. Meanwhile, a social network may not necessarily result in a group of people “*working*” for a common goal or objective. Virtual communities can be defined as Social Networks, but the opposite is not always true [Celaya08]. An example of a virtual community is the non-profit healthcare maintenance organization *Kaiser Permanente* that supports on virtual community’s characteristics to improve member services and to promote preventive healthcare.

2.1.2. Social Networking Six Degrees Theory

Social Networking is such a popular phenomenon because its concept is an approximation of what happens in our day-to-day social life.

According to the sociologist Duncan Watts [Watts03] the great majority of people maintain a direct and sort of permanent contact with approximately one hundred people (average), including friends, family and co-workers. According to this theory, if each one of our contacts has one hundred contacts, then we are connected in second degree to at least ten thousand people (second degree connection). Applying the same algorithm, we are then connected in third degree to at least one million people. If we would go until sixth degree in which we were meant to be connected to 1.000.000.000.000 people (Figure 3). The latter means that anyone can contact and meet (know) any individual in the world (approximately 6.000.000.000 people), with only its initial contact network.

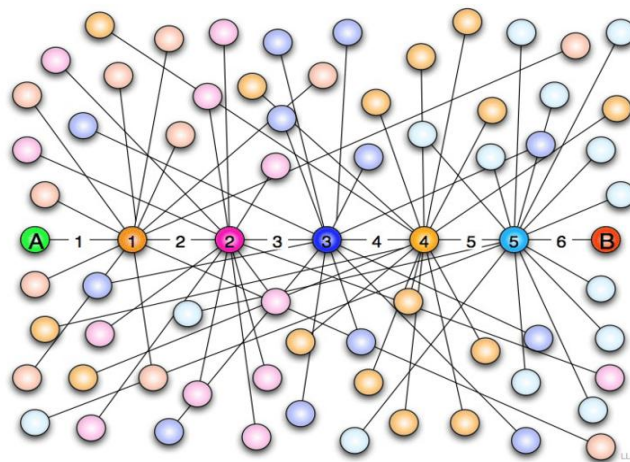


Figure 3: Six degrees Theory [Celaya08]

A 2008 *Microsoft* study about social connections, through the use of Social Web tools, supports this theory which revealed that from the 30.000 millions of conversations from that particular social network users, 78% of them had a 6,6 degree of separation from any other user (some had 29 degrees of separation). This means that the average distance between any two persons in the world is approximately six or seven degrees. A practical and easy way to measure

a personal social network's range consists in summing up the total number of contacts in the phone book [Celaya08].

2.1.3. Types of Social Networks

Usually, social scientists identify and study three different kinds of Social Networks. At this phase it is important to distinguish between Social Networks and Social Network Sites. When referring to Social Networks, usually we are alluding to the phenomenon from the sociological point of view, meaning that Social Networks are a given set of relationships from a generic view point. Social Networks Sites refer to the specific case of web-based systems that imitate real Social Networks.

Given that, Social scientists identified and studied three kinds of different Social Networks:

1. Ego-Centric: *“Ego-centric networks are those networks that are connected with a single node or individual, for example, my good friends, or, all the companies that do business with Widgets, Inc. (the favourite name of organizations studied in business schools). To be considered networks these connections must not only be lists of people or organizations, but information must be available about the connections between these people or organizations.”* [Kadushin04]
2. Socio-Centric: *“Socio-centric networks are, in Russell Bernard's term (personal communication), networks in a box. Connection between children in a classroom, between executives or workers in an organization are closed system networks and the ones most often studied in terms of the fine points of network structure.”* [Kadushin04]
3. Open-System: *“Open system networks are networks in which the boundaries are not necessarily clear, they are not in a box - for example, the elite of the United States, or connections between corporations, or the chain of influencers of a particular decision, or the adoption of new practices. In some ways these are the most interesting networks. They are also the most difficult to study.”* [Kadushin04]

2.2. Social Network Websites

2.2.1. SNS Definition

Social Network Sites (SNS) are web places in which its participants (users) publish and share all kinds of information, from day-to-day to professional, amongst totally strangers, family or friends [Celaya08].

There are a huge number of definitions regarding Social Network Sites. The following three are a very good way to introduce the topic [Stroud07].

“Social networking refers to systems that allow members of a specific site to learn about other members' skills, talents, knowledge or preferences.”

- *“How businesses are using Web 2.0”*, The McKinsey Quarterly, March 2007.

“A social networking site is an online location where a user can create a profile and build a personal network that connects him or her to other users.”

- *“Social Networking Websites and Teens”*, January 2007.

So, in the vernacular sense of the term, Social Networks are basically systems/websites/online locations where users/members/participants/people can create personal profiles and build personal networks, in order to connect people, share/learn/communicate skills, talents, knowledge, preferences, interests, activities and everything one can think of.

Social Networking is all about online interaction between people through various ways: chat, messaging, email, video, file sharing, blogging, discussion groups, etcetera.

2.2.2. Purpose and Features of SNS

Internet supports at least two different levels of communication: micro level (e.g. a two way private conversation) and macro level (e.g. creating a global social online network). The Web enables the creation of a virtual identity that can flourish in long term social interaction. Internet enabled communication can exist at different levels [DHW08]:

- Synchronous versus Asynchronous.
- Text versus Multimedia.
- Anonymous versus Authenticated.
- Individual versus Group.
- Mobile versus Situated.

In the past, these modes were available solely in standalone tools. From 1997 (at the launch of the first recognizable SNS, *SixDegrees.com*) until the present, Social Network Sites have experienced great evolution, and today they are capable of providing all the above mentioned features in one place. Additionally, people are entitled to a virtual entity, that could be managed by the him/herself through several existent communication channels (e.g. blogs, social networks sites, video hosting services, etcetera) [DHW08].

In order to create and deliver value to its users, Social Network Sites are composed by different features/functionalities/characteristics. The owner of the SNS sets the rules (theme, style, content, functionalities) but the members are in charge of all the activity and content. Social Networks are inherently user-driven sites.

Usually Social Network Sites are defined as web-based services that allow individuals to [Ellison07]:

1. Construct a public (available to anybody as well as to search engines), private (only available to approved people) or semi-public (combination of the last two) profile within a bounded system. Profiles are usually the main characteristic in Social Networks as they play a critical role. Through profile, members provide information about themselves. Knowing that social interaction initiates with the collection of information about the other communication entity, a profile is a crucial pre-requisite for Social Networking. The creation of a profile by a user enables its identification by another in digital space (exception made to *fake* profiles). Profiles enable individuals to describe themselves in terms of their age, gender, location, interests and a host of other variables. The profile might also contain rich content such as photos, sound and video.
2. Articulate a list of other users with whom they share a connection. A profile also allows others to see which users' are their friends through the "*contacts list*". In this context, this list of users means that this particular user authorized, at some point, other user as a communication party in its Social Network environment, adding him to its personal "*list of contacts*". This might also involve assigning contacts "*privileges*" for the type of content they can exchange.
3. View and traverse their list of connections and those made by others within the system.

The nature and nomenclature of such relations/connections may differ from site to site. The uniqueness of SNS is not that they allow individuals to meet strangers, rather they provide users with the capability of articulating and making visible their own social networks. Additionally, user profile update and maintenance in Social Networks is a key issue because it is an analogy to our personal evolution in real life [Stroud07].

As mentioned above, Social Network Sites provide each user with a single profile, an articulated list of “*friends*” that are also members of the system and some other features/functionalities/embedded-applications.

When registering in a SNS, the user is asked to fill its profile with personal information, which later he may choose to turn public or private (user discretion). Although most SNS require registration and authentication to interact with other users, some are open-systems and allow communication between members and non-members. Some SNS also encourage their users to upload photos, and some provide the capability of adding multimedia content and enhancing their profiles with applications. After joining a given Social Network, the users are able to identify and establish connections with other users in the system, with which they might have a relationship (e.g. “*friends*”, “*contacts*”, “*fans*”, etcetera).

Most SNS require bi-directional confirmation of friendship, in order to avoid what some identified as the compulsive behaviour of “*collecting friends*”. When referring to Social Networks, it is common to use the term “*friend*” that can be, at certain point, misleading. This happens because one given connection could not mean friendship in the everyday vernacular sense. Many times, a Social Network “*friend*” refers to one member of our social network (this user may/may not be our friend in the most common sense of the word).

Most SNSs also provide a messaging system between users that range from profile comments to individual/group messages (similar to e-mail services). Additionally, many SNS are also providing Instant Messaging Services (IM) based on embedded-applications or *widgets*. In a broader sense, most SNS provide photo-sharing or video-sharing capabilities, *built-in* blogs, wikis and other Web 2.0 oriented features. More and more social networking sites are partnering with providers of content and *widgets* (modules of computer code) to enrich users' profiles (added-value content).

Many SNS target people based on specific geographical, region, age or linguistic groups. Some sites are designed with specific ethnic, religious, sexual orientation, political, or other identity-driven categories in mind. There are even SNS for dogs (*Dogster*) and cats (*Catster*), although their owners are responsible for maintaining their profiles. While SNSs are often designed to be widely accessible, many attract homogeneous populations initially, so it is not uncommon to find groups using sites to segregate themselves by nationality, age, educational level, or other factors that typically segment society, even if that was not the initial intention of the designers [Ellison07].

Social Networks are a powerful way to change our social lives, both on an interpersonal and community level. As interaction patterns and social connections are already notorious in young people, the tendency is that these changes disseminate between all age groups. Similar to what happened to new communication technologies, Social Networks replicate features found in earlier communication tools. For instance, a profile resembles a personal web page. The main distinctive aspect that distinguishes this technology is its articulated network which allows virtual representation of our connections. Social Networks enable what was before the difficult task of connect with people that we met at some point in our lives and we simply lost touch with. Above all, Social Networks enable out-of-the-box socialization. Since they were introduced in the market, Social Network Sites have attracted millions of users, many of whom use these sites in their day-to-day lives for a great variety of purposes [Ellison09].

2.2.3. Types of SNS

Nowadays, Social Network Sites are divided into three distinct groups, depending on network's scope, purpose and target. The three main types are [Celaya08]:

1. Professional Networks (e.g. *LinkedIn*, *Xing*, *Viadeo*, *Yahoo! Kickstart*, etcetera).
2. General Purpose Networks (e.g. *MySpace*, *Facebook*, *Tuenti*, *Hi5*, etcetera).
3. Specialized Networks (e.g. *Ediciona*, *eBuga*, *CinemaVIP*, *11870*, etcetera).

Inherently, the human being makes, both in its professional and personal life, part of groups formed based on affinities or expertise. We tend to enter groups in which we share interests with other members. Most of people belong to real world networks that form organically. Naturally, the next obvious step was transforming these real life networks in Web applications/services, the social network websites.

2.2.3.1. Professional Networks

Professional Networks are networks specially envisioned to reach the enterprises' world in a very peculiar way. They can be used by employers and employees. The employer can use them so as to find people to fill specific job position or just to search for talented workers and to promote company events. The employee can use them to display its core competencies, skills and achievements, look for job opportunities or even to get jobs, participate in events, establish new professional connections and know other professional viewpoints. Most users use them to manage their professional contacts list. Professional Networks' growth is more homogeneous than the one in General Purpose Networks (explained in sub-chapter 2.2.3.2. General Purpose Networks) and the number of users is usually much lower.

Despite its core competencies, is usual that many online networks exhibit a predefined number of basic features: *"Each member in a network has an online profile that serves as the individual's identity in the network. In the professional context, profiles often contain information regarding the individual's experience, education, interests and affiliations, as well information about the individual's skills and resources."* *"Online social networks typically enable individuals to make connections with others in the network. In some cases, these connections are implicit, and derived from past professional actions (such as sending an email to another member of the network). In other cases, the connections are explicit, and are set up and created by the members themselves."* [Celaya08]

Although General Purpose Social Networks such as *MySpace* and *Facebook* have well pre-defined target groups, like students, social networking is also being used at a more professional level by companies. At this level, companies use social networks mainly for personal recruiting reasons. Companies willing to hire capable people navigate through a given professional social network of known individuals, inspecting their profiles. Professional Networks can also be used as internal company networks in order to facilitate communication, share knowledge and enable a company's objective shared vision. Additionally, companies can use Professional Social Networks to develop customer-company relationships, providing customer support and help, integration of products/services and differentiation from competitors.

One of the most critical differences between Professional and General Purpose Networks lies in the fact that General Purpose Networks are usually constituted by an infinity of fictitious profiles lacking control over them. Most Professional Networks are strict imposing rules like the number of invitations per member, so as to avoid compulsive contacts' collection behaviours.

Professional Networks are characterized by different revenue models. The main model is based in the purchase of subscriptions by users (premium accounts with added functionalities and capacities). Furthermore, 20% to 30% of the revenue usually comes from online advertising, mainly from companies interested in finding and acquiring talented professionals through the social web. Additionally, there is a great effort from social networks in selling out private and customized solutions of their frameworks to enterprises (sub-chapter 5.2. *"White-Label" Social Network Development Platforms*) [CC06] [Celaya08].

2.2.3.2. General Purpose Networks

General Purpose Networks are usually constituted by a large number of users with lots of different profiles and behaviours. Nevertheless, these networks allow their users to create common interest sub-groups, so they can feel as a part of a “community” and to satisfy different certain segment's specific necessities. Usually, the only revenue comes from advertising, so they benefit from high levels of web traffic. Many of these networks have very different levels of growth and they usually reach a much broader audience than other types of Social Networks. Many of these networks allow their users to share photos, music, videos, personal diaries and opinions about an infinity of subjects. These networks are affected by some serious security issues. The most annoying security problems identified by users are: *fake* profiles, collection of “*friends*” and *bullying*. Some Social Networks try their best to avoid compulsive actions from their users, such as invitations with the only objective of enlarging its contact list and to fake reputation. For instance, in *LinkedIn*, a user that wants to connect to another is asked to provide the other person's e-mail, in order to guarantee that they know each other. *Xing* asks for information about where that user knew that particular person and why is he/she trying to connect with her. *Tuenti* only allows new members under invitation from another member assuring that they know each other. Although these processes slow down the growth of a particular Social Network, they assure the creation of real and credible relationships. The overall traffic of a platform is important, but in the end of the day what matters to the advertisers is the behaviour of users, and that is the real deal when it comes to measuring the Social Network's trust base.

These kinds of networks are evolving, and their users are demanding the possibility to decide which users can view their profiles and which content is accessible to others, although it is true that these new privacy rules will certainly restrain these networks' capability to grow. In this manner, many expect that General Purpose Networks transform into more specialized networks providing much more specific content and events, in order to create a solid users' trust base with determined behaviours and affinities [Celaya08].

2.2.3.3. Specialized Networks

Specialized Networks make it easier for users to find other users with similar interests, affinities and necessities. Knowing that users' interest areas in the Web are so diversified, it is normal to find a lot of Social Networks that cover a wide range of interest areas. Every day, new Specialized Networks relating different social activities are launched. This happens because human beings have the inherent necessity of joining communities that share similar values and habits.

There are Specialized Networks that focus on cinema, winter sports, dating, or pretty much everything one can think of. These networks have the advantage of attracting main companies from the same interest area and to get increased revenue from that. Specialized Networks are usually named as vertical networks. Some think that the vertical networks' emergence will definitely result in the horizontal networks disappearance (e.g. *MySpace* and *Facebook*). Others think that horizontal networks will have to set strategic alliances with vertical ones, in order to provide value-added services in particular areas and maintain their huge number of users (vertical networks' nodes) [Celaya08].

2.2.4. Conclusions about Social Network Websites

In the end, people use Social Networks to do things they used to do in their day-to-day lives (e.g. look for job opportunities, being connected, keeping with friends/colleagues) and as an alternative to e-mail and other means of communication. In conclusion, Social Networks provide a new meaning to Social Recognition (Virtual). In fact, since our childhood we are

taught to be rewarded in any way for our effort and/or intelligence and this is a crucial factor for development in any Social Network [Celaya08].

2.3. Universe of Social Network Sites

This sub-chapter's goal is to describe the state of the art on SNS, divided in the categories presented in 2.2.3. *Types of SNS*. This sub-chapter contains detailed description of features (e.g. Primary Features, Secondary Features and Added-Value Content Features) of social network sites from the three different categories. Given the length of the SNS comprehensive analysis made, it was decided that only a representative extract and major conclusions should be included in this section (the complete SNS comprehensive analysis can be consulted in Appendix B). The SNS comprehensive analysis has a particularly important role in supporting the process of identification and generation of future functionalities to the *Cardmobili*'s web platform.

2.3.1. General Purpose Social Network Sites

This sub-chapter is a short extract of the SNS complete comprehensive analysis which goal is to describe the state of the art of General Purpose Social Network Sites, which definition was presented in sub-chapter 2.2.3.2. *General Purpose Networks*.

2.3.1.1. *Hi5*

Currently, *Hi5* is one of the world's largest General Purpose Social Networks, with particular success in some European countries like Portugal, Romania and Cyprus, Central/Middle Africa (e.g. Angola) and most countries from Latin America [Hi509]. The board of directors is constituted by Karen Richardson (Chairman of the Board), Jonhatan Feiber (Board Member), Ramu Yalamanchi (Founder and CEO) and Akash Garg (Co-Founder and CTO). *Hi5* is owned by *Sona Networks*.

This Social Network Site was launched in December 2003 and as of 2009, it is ranked as a top 20 website globally and it is the first social network in over 30 countries across Latin America, Europe, Asia and Africa [Hi509]. According to *ComScore* (market research company), more than 56 million individuals visit the online site every month. *Hi5* has at least 80.000.000 registered users and is open to registration to people over 13 years old. Accordingly to the *Global Alexa Page Ranking* [AlexaHi509], *Hi5* occupies the 17th position. In July 2004, the Social Network Site reached one million registered users. In August 2008, *Hi5 Mobile* was launched worldwide in 26 different languages. The online website is available in 37 languages and growing.

Table 1 presents a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 1: General Purpose Social Network Site – *Hi5*

Name	Description
Name/Designation	<i>Hi5</i>
URL	www.hi5.com
Purpose	<i>Hi5</i> is a General Purpose Social Network Site specially envisioned to reach large audiences. As mentioned in the introductory text, <i>Hi5</i> has had particular success and reach in Latin America and some European countries. <i>Hi5</i> requires registration, is a multilingual website and is used also for commercial purposes. Its main features allow its

	registered users to find friends or other people from all parts of the world, share photos and music, rekindle with classmates and build a web page/profile with personal information.
Target	
Geographically	This Social Network Site was created and is headquartered in the United States, but it gained popularity mainly in other countries (e.g. Portugal, Romania, Angola, Latin America Countries, etcetera) Firstly, <i>Hi5</i> was envisioned to reach a large audience in the United States and then spread to other countries as well. A great majority of its users were from outside the United States and were reached through a differentiation strategy for international markets. According to <i>Alexa</i> [AlexaHi509], most of <i>Hi5</i> users come from Mexico, Thailand, Peru and Portugal. One of the success key points is related to the fact that <i>Hi5</i> is available in 37 different languages and it tries harder to embrace each language, releasing local/region/country versions of the platform with region-oriented features (e.g. dialects, advertising for different local markets and region-oriented applications) [Celaya08].
Age Group	<i>Hi5</i> is specially designed to a young population. Its website has a modern look and interface, as well as features and functionalities oriented to the above mentioned age-group. However, lately <i>Hi5</i> has been gaining popularity among an older audience that wants to connect with other people, mainly from the same age and the website is updating itself and releasing many features to that specific age-group.
Gender	<i>Hi5</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Education / Family / Life Style	<i>Hi5</i> allows its registered users to choose and join groups of people of schools/universities/colleges/family members/shared interests (e.g. Group of people who attended Princeton College from 2004 to 2009).
Primary Features / Functionalities	
Registry	The registry module was conceived to appeal to new users due to its ease of use and simple interface design. This module only asks for the strictly necessary information: first name, last name, email account, <i>Hi5</i> password and birth date to assure that legal age policies are in concordance with <i>Hi5</i> terms of usage (e.g. Only users with over 13 years old can register and be members). After registering, <i>Hi5</i> users immediately receive an activation account email for security reasons. When properly registered and logged in, <i>Hi5</i> users have the ability to complete their profile with more personal information, such as: hometown, religion, reasons for using the platform, relationship status, languages, etcetera. Though, users have the capability of denying others with access to their personal information.
Sign In	The login module follows the same concept of the registry module. It is very simple and easy to use. To sign in into a personal account, members only have to enter their associated email and <i>Hi5</i> password. To ease the users' experience, the login module also has functionalities that allow its users to stay logged within a session (e.g. " <i>Keep me logged in.</i> "), as well as to retrieve its password (e.g. " <i>Forgot your password?</i> "). The latter functionality allows its users to receive an email in its associated email account with the actual password. When signed in, users display a status message that other users can see and informs them that this user is online at that moment. The latter can be

		altered to not provide this information.
Friends Engine	Search	After registration, <i>Hi5</i> users have the ability to find friends in two different manners: by email or by name in the network. Finding friends by email is a fast way to start building one's social network, because <i>Hi5</i> has collaboration partnerships with the most popular email providers. Besides collaboration with worldwide major email providers like <i>Gmail</i> , <i>Hotmail</i> and <i>Yahoo</i> , the <i>Hi5</i> website also collaborates with the most popular email providers by country, in accordance to its multilingual strategy. Finding friends by name is a more intuitive form of search, but is somehow limited, because it based its friends' search system in the name that the users have chosen to identify their accounts in the system (the system screen name could be different from the real life's name).
Profile		A <i>Hi5</i> profile allows its users to upload photos, add descriptions to them and create photo albums. Additionally, users can provide personal information in different areas: <i>About me</i> (e.g. " <i>I am outgoing!</i> ") and <i>Interests</i> . The information provided by users in the registration module is automatically available, but it can be managed through the account privacy settings that will be addressed later in this document. Normally, creating a new <i>Hi5</i> account implies that the system creates a URL for that same account. The <i>Hi5</i> profile provides the possibility for each user to create its own unique personal profile URL to facilitate search and access. The <i>Hi5</i> profile also provides a <i>Twitter like feature</i> named <i>Scrapbook</i> that enables its users to say what they are doing in any given moment and be commented by others (e.g. " <i>What are you doing now?</i> "). Obviously, similarly to any other SNS, <i>Hi5</i> displays the actual social network of each user in its profile allowing him/her to add new users at any time. Additionally, <i>Hi5</i> allows choosing between 0 and 15 friends to appear in its profile as that user's top 15 friends. Moreover, <i>Hi5</i> profiles also allow their users to see their first-degree (first order zone) friends' profile updates. <i>Hi5</i> profiles are very rich in content/functionalities/features and also allow their users to display and use <i>Hi5 Games</i> (e.g. allows for other users to play games out of their own profiles), associated groups, personal journals, widgets and other applications (some will be addressed later in this document's relevant Secondary Features or Added-Value Content of <i>Hi5</i>). An important characteristic of the <i>Hi5</i> profile is that it enables a well-designed friends' management system, allowing users to pick their favorites and saving them for later access, adding new ones and creating social circles of friends. <i>Hi5</i> profiles also have a strong collaborative concept for designing each user's site, because they allow their users to search for profiles' skins created by other members and use them, as well as to customize one's profile through <i>HTML</i> and <i>CSS</i> . At last, profiles can be commented by other users, but the commentary settings can all be configured in the account privacy settings. These profile comments can be solely plain text, or use other multimedia content ranging from <i>HTML</i> embedded code, applications, music, images, videos, etcetera.
Privacy Settings		The <i>Hi5</i> SNS takes special care with privacy and security issues. Thus it has a module only designed for users' configuration of their privacy settings. These settings are separated by account areas. Profile settings are related to the other users' level of access to a user's profile (e.g. " <i>My Profile can be viewed by all users/my friends only</i> "), to the extent in which others can see that a given user saw their profiles (e.g. " <i>All</i>

	users/No users can see that I viewed their profiles”), to comments’ acceptance settings (e.g. all users, friends only or not receiving) and, finally to the level of automation of comments’ acceptance (e.g. auto-accepting, not auto-accepting). Photo settings allow <i>Hi5</i> users to configure tags and comments sent by others to their photos. At last, Friend Update settings and Online status settings permit managing other users’ access to a given user updates and online status, respectively. Additionally, <i>Hi5</i> users have the ability to block other users (e.g. misbehaviour), and blocked users will be displayed in the privacy settings account module. Only registered users have access to the network, so <i>Hi5</i> is not considered to be an open access network.
Secondary Features / Functionalities	
Search Engine	Considered to be one of the most popular and visited social network sites and because of its dimension and high levels of traffic, <i>Hi5</i> has to provide its users with access to a built-in search engine. This search engine is often chosen automatically by the system, having into account the region or country of the user (e.g. Portugal – <i>sapo.pt</i>).
Friends Suggestions	<i>Hi5</i> provides its users with suggestions for possible new network friends. This mechanism is based on social network connections between friends.
View as Another	<i>Hi5</i> users can easily view their own page as others see it, just by the click of a button. This feature allows <i>Hi5</i> users to see what other users can see, facilitating the customization process.
Fives	<i>Hi5 Fives</i> are basically a bunch of predefined tags that other users can send to each other. <i>Fives</i> are a great way to describe or simply connect to others and they are mostly related to personal characteristics that one might have (e.g. Best Friend, Better Half, Cute, Nerd, etcetera).
Profile Stats	<i>Hi5</i> Profile stats display some basic network account statistics, such as: number of friends, number of profile comments, number of photo comments, number of <i>fives</i> and number of <i>Scrapbook</i> comments. Additionally, profile stats displays information about the total number of visitors, as well as people who visited a given profile (if they agreed to be shown as visitors in their own privacy settings). This statistic mechanism has triggered some particularly interesting spamming phenomenon (e.g. collection of friends or comments).
Online Advertising	The <i>Hi5</i> revenue model is based on online advertising and allows the company to provide marketing solutions for global brands, as well as to national and regional advertisers, by using IP and profile based demographic targeting. <i>Hi5</i>’s advertising products range from: targeted display banners, rich media placements and custom sponsorships.
Added-Value Content	
Hi5 Games	<i>Hi5 Games</i> are a special module of the <i>Hi5</i> platform where users can play online games alone or with other <i>Hi5</i> users. Additionally, users can add their favorite games, displaying them on their own profiles and making them available for other users to play as well.
Widgets	<i>Hi5</i> allows its users to add <i>widgets</i> to their profiles. Through many partnerships, <i>Hi5</i> aims at providing added-value content and services like: slideshows (e.g. <i>slide</i>, <i>RockYou</i>), photos and video hosting services (e.g. <i>FlickrR</i>, <i>YouTube</i>, etcetera), games, customization applications and other multimedia content.

Hi5 Gifts	Sending <i>Hi5 Gifts</i> was one of the most recent ideas to monetize the website. Basically, any user can purchase virtual money (<i>coins</i>) through <i>PayPal</i> or other services (e.g. <i>ClickandBuy</i>) and then send gifts with associated messages for different amounts of virtual money (e.g. <i>Hi5</i> 's virtual pink t-shirt for 80 coins) to other users. Despite the good idea of creating new revenue models for the site, this is considered to be somewhat doubtful since this is a very similar concept to the sharing multimedia content one, which was already available for free in the website. The only difference is that these gifts are designed only for the site. This could be seen as the start of e-commerce in <i>Hi5</i> . Additionally, there are different ways to earn virtual money (e.g. online advertising), which can lead to new strategies that can be used by merchants.
Applications	<i>Hi5</i> is directly involved in the <i>OpenSocial</i> Project, so it has direct access to an infinity of applications that could be embed in its platform. Basically, <i>Hi5</i> has access to at least 2000 different applications from 20 categories (e.g. <i>Business and Money</i> , <i>Dating</i> , <i>Photos</i> , <i>Videos</i> , etcetera). The most popular applications that can be browsed into ones profile are: <i>Zoosk</i> , <i>YouTube Greetings</i> , <i>Music iLike</i> , <i>Poker Texas Holdem</i> and <i>ineem</i> . Each application offers the possibility to be customized, allowing <i>Hi5</i> users to choose which features or functionalities they want to display.
Languages	<i>Hi5</i> provides translation of the platform in at least 37 languages and dialects (e.g. <i>Español (Argentina)</i> , <i>Español (Colombia)</i> and <i>Español (Costa Rica)</i>) of America, Europe, Africa and Asia.
Mobile	Through the URL www.m.hi5.com the <i>Hi5</i> platform is accessible through phone web browsers. The site's design changes a little, but most of the core functionalities are available or being developed to be in a near future. Additionally, mobile social networking provides valuable and interesting GPS services.
Some Associated Brands	
Events / Small Businesses	In this subject, <i>Hi5</i> is slightly different from other General Purpose Social Network Sites. Basically, other major Social Network Sites like <i>MySpace</i> or <i>Facebook</i> are chosen by major brands to create their own profiles and applications. <i>Hi5</i> is searched by small event planners (<i>Hi5</i> does not have an event handler like, for example, the one on <i>MySpace</i>) or even by small businesses in order to create profiles and connect with people.
Technology	
Architecture	With 80.000.000 registered users and 46 million unique users per month, <i>Hi5</i> is clearly a good example of a scalable, resilient and robust architecture.
Server Information	As a Web Server, <i>Hi5</i> adopted <i>Apache</i> , considered to be the most popular Web Server on the Internet since April 1996. Additionally, <i>Hi5</i> also adopted <i>Google Webmaster</i> tools in order to provide a free and easy way to make its website more <i>Google</i> -friendly [BWHi509].
Framework and Language	<i>Hi5</i> uses <i>J2EE</i> as its main platform to develop portable, robust, scalable and secure server-side <i>Java</i> applications [BWHi509].
Database	Similarly to what happens in most successful and proven Web 2.0 applications, Relational DB is the mostly used system (e.g. <i>Facebook</i> , <i>LinkedIn</i> , <i>Ebay</i> , <i>YouTube</i> , etcetera.). <i>Hi5</i> uses <i>PostgreSQL</i> .

Analytics and Tracking	For analytics and tracking purposes, <i>Hi5</i> uses <i>Google Analytics</i> and <i>Quantcast Tracking</i> .
Advertising	<i>Hi5</i> advertising is based on <i>DoubleClick.net</i> .
Other technologies	From the long list of technologies used by <i>Hi5</i> the following are worth mentioning: <i>squid</i> (caching proxy for the Web supporting <i>HTTP</i> , <i>HTTPS</i> , <i>FTP</i>), <i>resin</i> (Javascript engine), <i>Apache Struts</i> (creating Java Web applications), <i>iBatis</i> (Data Mapper Framework), <i>Spring</i> (building and running Java Applications) and <i>Memcached</i> (distributed memory object caching system).

Most of the information was gathered through the intensive utilization of the *Hi5*'s social network website. The creation of a new *Hi5* account was a crucial fact to accomplish this review.

The *Hi5* platform is a good example of a General Purpose Social Network that is always evolving. As mentioned earlier in this document, this type of networks are growing to adapt to specialized sectors, and this platform is doing exactly that by providing new services for groups and benefiting from collaborative projects like the *OpenSocial* one. Plus, it shows great effort in evolving towards mobile in order to provide new services and a *Hi5* new mobile oriented platform.

The way in which it geographically expanded continues to be sort of a mystery, but it could have something to do with some of its dating/flirting features that are more in tune with the cultures and personalities of people from Latin countries. As well as most social network sites, *Hi5* also experienced early adoption by younger users. Later, *Hi5* spread massively to older audiences. This could be explained since that, at first, *Hi5* provided youth oriented simple features, and then it grew and developed in order to provide thousands of applications and *widgets* that certainly started to look more appealing to a much broader audience in terms of age. Although having some type of group targeting (e.g. schools), the *Hi5* platform does not try to reinforce that aspect. It simply tries to deliver more options to its users, and it cannot be distinguished as a specialized social network site.

2.3.1.2. Conclusions about General Purpose Social Network Sites

Despite the fact of being part of the same type of networks, the three major General Purpose Social Network Sites studied in the SNS comprehensive analysis, have shown slightly different characteristics. The latter could be explained as some of them were more popular in some regions of the World (e.g. *Hi5*). Primary features were often the same, with little differentiation. General Purpose competitive advantages were generally associated with added-value content features or with different levels of attention from brands and media. Some of these networks had, in partnership with some brands, viral marketing campaigns that lead to the networks' leverage and popularity increase (e.g. *Burger King Whooper's Campaign*, *MyJobs*, etcetera).

Some General Purpose Social Networks have shown significant changes when progressing from generalist networks to specialized ones by concentrating in some kind of particular area/sector (e.g. *Mocospace*). Others, despite their tendency to specialize on a given area (e.g. music), were considered to be General Purpose due to their huge number of users with different interests (e.g. *MySpace*). These network sites were obligated to build more generalist features to maintain or promote their own success.

2.3.2. Professional Social Network Sites

This sub-chapter is a short extract of the SNS complete comprehensive analysis which goal is to describe the state of the art of Professional Social Network Sites, which definition was presented in sub-chapter 2.2.3.1. *Professional Networks*.

2.3.2.1. The Star Tracker

The Star Tracker (TST) is an invitation-only professional niche social network that was launched in 2007. This social network was built for professional purposes and has at least 25.000 registered Portuguese members from worldwide. *The Star Tracker* founder is Tiago Forjaz.

This is a professional oriented social network constituted by Portuguese talented persons, working and living mainly in Europe and the United States. Nevertheless it has users from all over the world including South America, Africa and Asia.

Table 2 presents a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 2: Professional Social Network Site – *TheStarTracker*

Name	Description
Name/Designation	<i>TheStarTracker</i>
URL	www.thestartracker.com
Purpose	<i>The Star Tracker</i> is a Professional Social Network Site exclusively designed to focus on empowering global Portuguese talent. <i>The Star Tracker</i> members help each other attain success, get expertise on different subjects and promote networking with likeminded and good willed global citizens [Jason09].
Target	
Geographically	<i>The Star Tracker</i> was initiated with a trip around major world capitals where Portuguese talent communities exist. This trip's objective was to promote and empower the <i>talent networking concept</i> and to mobilize Portuguese talents all over the world to collaborate and help each other in attaining success in different areas. According to the associated blog, most users come from the United States and various parts of Europe [Jason09].
Age Group	This social network site is designed for experienced and talented adults. Another of its objectives is to find young talents, who maybe initiating their professional careers.
Gender	<i>The Star Tracker</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Education	This is considered a niche professional site, since it is specially developed for Portuguese talents all over world. <i>The Star Tracker</i> users are mainly people with an academic degree. This site assures the maintenance of its purpose by allowing each user with only three invitations. The supposed user must then choose people that he knows and really considers to be talented in a given area.
Primary Features / Functionalities	

Registry	First, in order to register you must have an invitation from a member. Then, the invitation code is introduced in the initial login page. The user has access to the registry module, where he/she enters basic information about him/herself: first name, middle name (optional), last name, email account, telephone number (optional) and birth date.
Sign In	The login module is very simple and similar to others already described in this document (e.g. <i>Hi5</i> , <i>Facebook</i> , <i>LinkedIn</i> etcetera)
People Search Engine	This module is similar to the one presented in the <i>LinkedIn</i> case (see Appendix B). Additionally, <i>The Star Tracker</i> Social Network Site allows two different forms of displaying search results for users: on a list or through a map view (geo-referenced view using <i>Google Maps</i>).
Profile	Once logged in, users have access to their own profiles. Besides displaying basic information, work experience and interests of the user, each profile also has three types of tag systems: <i>talent tags</i> (e.g. critical, thinking, etcetera), <i>power tags</i> (e.g. commander, achiever, creator, etcetera) and <i>passion tags</i> (e.g. sports, science). <i>The Star Tracker</i> profile also provides information about which user has invited the user whose profile is being viewed, and also the users he/she invited. Profiles have users' activities information, such as: group participation levels, topics discussed, replies to <i>Star Powers</i> (explained later) and information about future, ongoing and interesting events. Finally, user profiles allow users to see their own network in the form of a list or through map view (similar to the search results' display). The network's list-like display always includes information about the users (e.g. photo, name and job).
Settings	<i>The Star Tracker</i> settings allow its users to configure their basic profile information, work experience, information about the user's interests and the user's private photo (basically information that is displayed in the profile area). Additionally, it also allows privacy settings configuration (e.g. phone number and email visibility in the network), password management and, finally, administration of e-mail alerts, newsletters received and account deletion.
Message System	The message system is very simple and only allows searching, reading, composing and sending messages.
Secondary Features / Functionalities	
<i>New Members</i>	This functionality provides users with a fast and simple way to be aware of new members that joined the network. Basically, this is the list of the newest members at <i>The Star Tracker</i> . On average, a new Portuguese global talent joins <i>The Star Tracker</i> every 20 minutes [Jason09].
<i>Companies with associated members</i>	This functionality grants user with access to all the members in the network. These are ordered by work company. This functionality also displays the total number of companies listed in the professional network.
<i>Talent Alike</i>	This is another secondary feature that presents users with a list of other users that share common characteristics, based on interests and geographical information.
<i>Connection Requests</i>	<i>Connection requests</i> is the module responsible for handling sent and received users' requests for connection (<i>Outbox</i> and <i>Inbox</i> respectively).

Added-Value Content	
Star Power	<i>Star Power</i> was one of the huge ideas that helped this Professional Social Network in mobilizing Portuguese talent and trying to accomplish their main objectives. Essentially, each user is entitled to one wish that he might post on the <i>Star Power</i> dashboard. The entire TST community has the obligation to look out for wishes from network members and try to help with ideas.
Groups	The groups' feature is very similar to others presented and described in other Social Networks (e.g. <i>Hi5</i> and <i>Facebook</i>).
Events	The events' module is a very simple functionality to help handling events (e.g. create, search and join).
Opportunities	The TST <i>Opportunities</i> module offers different value perspectives about three distinct forms that can be used to leverage and use the network in the user's behalf and own benefit. These three perspectives are: <i>Market Place</i> (e.g. create a digital place in order to buy/sell/rent), <i>Business</i> (e.g. look for different business opportunities in various categories) and <i>Job Search</i> (e.g. create and look for job positions).
Talent TV	TST <i>Talent TV</i> provides a variety of videos in different categories. Actually, some of them are specially created by actual members of this Professional Social Network. The only option available is browsing through the videos' collection. Video Upload is responsibility of the website's administrator.
Languages	As mentioned before, the only language available is English. This is an interesting fact, since this social network's is designed for Portuguese users. However, the objective of this social network is to gather talented people from all over the world, despite its language of choice.
Some Associated Brands	
Oje Journal	Similarly to what happens with <i>LinkedIn</i> , and most Professional Social Network Sites, brands are not allowed to join the network (unless through the offering of job opportunities). <i>Oje</i> is a Portuguese generalist newspaper and it is a "brand" that is directly associated with this network. <i>The Star Tracker</i> allows its users to access the <i>Oje</i> 's website and get the online daily newspaper (or just its cover page).
Technology	
Architecture	Although being considered a relatively small and secluded Social Network Site, <i>The Star Tracker</i> is a good example of a website that exploits some of the most known media technologies.
Server Information	<i>The Star Tracker</i> uses the <i>Microsoft</i> Internet web server services of <i>IIS6</i> .
Framework and Language	Its main development framework is <i>ASP.NET</i> and the language platform is <i>.Net</i> . This website also makes use of <i>Shockwave Flash Embed</i> without the use of <i>Javascript</i> .
Document Information	<i>The Star Tracker</i> claims to use <i>XHTML Transitional</i> . In addition, it uses <i>CSS</i> and <i>Javascript</i> , as well as <i>Revisit After</i> which is a meta tag used by search engines to find out when they should revisit a certain page.
Encoding	The preferred encoding for <i>The Star Tracker</i> web pages is <i>UTF-8</i> .
Analytics and	Analysis and tracking is done using <i>Google Analytics</i> .

Tracking	
Other technologies	<i>The Star Tracker</i> frequently relies on embedded videos from <i>YouTube</i> [BWTheStarTracker09].

The Star Tracker is a network categorized as a Professional Network. Even though, it could have been identified as a specialized network (Portuguese Talent Network), its main purpose is to get talented people together in order to interact for business-oriented purposes. At the end of the day, Professional Networks can be seen as Specialized Networks, because they focus on a very specific subject: business.

2.3.2.2. Conclusions about Professional Social Network Sites

As one might expect, the Professional Social Network Sites presented in the SNS comprehensive analysis appear to share a significant amount of common features. Their users were often from the same age-group, no matter the Social Network in study. Furthermore, the purpose of this kind of Social Networks was found to be very similar among the studied websites. From the studied networks, most of them have shown no associations at all with brands, excluding the ones that offered job opportunities through the websites' functionalities.

Basically, business oriented networks share most of their main features with little differentiation.

2.3.3. Specialized Social Networks Sites

This sub-chapter is a short extract of the SNS complete comprehensive analysis which goal is to describe the state of the art of Specialized Social Network Sites, which definition was already presented in this document (sub-chapter 2.2.3.3. *Specialized Networks*).

2.3.3.1. Mercedes-Benz

Mercedes-Benz is an invitation-only Specialized Social Network Site, designed specifically focusing on potential future *Mercedes's* clients. Basically, this site was created to approximate both customers and the *Mercedes-Benz's* team. According to the website information, this is the chance to have an impact and help shape the future of the brand.

Table 3 presents a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 3: Specialized Social Network Site – Generation-Benz

Name	Description
Name/Designation	<i>Generation-Benz (Mercedes-Benz)</i>
URL	www.generationbenz.com
Purpose	<i>Generation Benz</i> is the name of the online community network, created by <i>Mercedes</i> to encourage online collaboration and communication between customer and brand. This network's objective is to get feedback from the market about product development and the <i>Mercedes-Benz</i> brand. The main objectives of this social network are: promoting discussion about the <i>Mercedes's</i> future, learning about opinions on luxury brands, learning about customers' interests, enabling and fostering open and honest conversation between both parties involved, sharing ideas and thoughts and providing members with the

	possibility of knowing other like-minded members.
Target	
Geographically	<i>Generation-Benz</i> is focused on the US market. Usually, this website only accepts people living in America. The network does not show any intention to expand to other countries.
Age Group	The main age target of this Social Network is to bring “ <i>younger customers into the brand while giving Mercedes insights about the 20-somethings.</i> ” [Greenberg08]
Gender	<i>Generation-Benz</i> does not make particular target distinction between genders. The website is built with features that generally please both. Despite this, the network is mostly constituted by male members.
Life Style	This social network is designed for people that currently have or are thinking of acquiring a <i>Mercedes</i> .
Primary Features / Functionalities	
Registry	<i>Generation-Benz</i> registry module can be accessed only by email invitation after answering a quick survey. Being a specialized network, designed to a niche, it is important to select future members and that is the main reason to only invite after responding to the survey. Basically, the survey asks for age-range, possible relations with the automotive business, willingness to purchase a <i>Mercedes</i> car and current home location (only US members). If a given user is accepted in the network, he will receive an email with username and password that will allow him to signing into the website. After logging in, the website provides an introductory video with the Marketing VP & Product Manager of <i>Mercedes-Benz USA</i> . Afterwards the real registration process begins. The registration includes giving information in a range of different areas: personal (e.g. name, email, username, password, location, photo), demographic (e.g. profession, marital status, ethnicity, income, etcetera, owned vehicles, other Social Network Sites, interests, etcetera) and privacy settings (e.g. public or private profile).
Sign In	The sign in system is simple and identical to, as an example, the <i>LinkedIn</i> ’s sign in system.
Member Search	In the <i>Generation-Benz</i> social network, searches can be made based only on keywords or location in the US.
Profile	The profile page in the <i>Generation-Benz</i> network is very simple. It provides access to other members and to all ongoing network activities (e.g. messages, discussion and polls). The profile page also provides information on personal activities that were or are being performed. The contacts list is similar to others described in this document (e.g. <i>Hi5</i>). When registering in the website, users become automatically connected to the moderator (the moderator becomes part of one’s list of contacts).
Account Settings	These settings are accessed through the link <i>Profile</i> and basically allow users to change information added in the registry module.
Message System	This message system allows users to communicate between them (e.g. <i>inbox</i> , <i>outbox</i> , compose, delete). Usually, communication between brand and customers is made through activities that will be later described in this document.
Secondary Features / Functionalities	

Contact Moderator	This is just a simple way to contact the Social Network's moderator and share something with him.
Added-Value Content	
Activities	<i>Generation-Benz's</i> activities are different kinds of actions that normally lead to collaboration and sharing of experiences and ideas between brand and its customers. There are diverse forms of activities in this Social Network: discussions, pools, tasks and sessions. Discussions are organized by topics and can be either made by the moderator or suggested by members (after moderator approval) (e.g. Do you like the new <i>Mercedes CLK?</i>). Polls allow users to express their opinions in relation to certain topics and see what the majority of members think about a given subject. Polls can only be put available by the moderator. Tasks refer to interactive activities, such as designing a new logo or answering to online surveys. Finally, sessions are real-time live moderated chats. These are usually based on community demographics and its specific needs.
Showroom	This feature is beyond doubt considered to be added-value content. It provides media and documents on different subjects considered relevant by the brand. These subjects can later be commented using the discussion forum or other types of activities.
Languages	This Social Network Site is only available to US users, so the only language available is English.
Technology	
Document Information	<i>Generation-Benz</i> claims to make use of <i>XHTML Strict</i> , <i>CSS</i> and <i>Javascript</i> .
Other technologies	Other significant technologies used on this website's development are: <i>Javascript Libraries</i> (<i>script.aco.lus</i> , <i>Prototype</i> and <i>Dojo Toolkit</i> which is a <i>DHTML toolkit</i>) and <i>ISO/IEC 8859</i> for webpage encoding [BWGenerationBenz09].

Mercedes Generation-Benz's Specialized Social Network Site is a very good example of how companies and brands can use Web 2.0 and Social Network concepts on their behalf. This social network really serves the company's interests in getting feedback and trying to capture and retain loyal clients in the brand's own interest.

A great number of brands and companies are creating personalized Social Networks for their clients. Particularly, brands are creating Social Network Sites to trigger viral marketing (e.g. *word-of-mouth*) on specific products (e.g. *Mercedes-Benz* and *Hybrid Toyota*) (see Appendix B).

2.3.3.2. Conclusions about Specialized Social Network Sites

Specialized Social Networks cover an infinite range of subjects and areas. In this manner, this chapter presents one of them, considered to be illustrative of the Specialized Social Network Sites' Universe. Most of them share basic social networking features (e.g. friends' list, message system, etcetera), but then its features are as diverse as its themes. Basically each Social Network Site specializes on features that most please a given type of user (their target users). For instance, there is not much sense in making a website, specially envisioned to old people, with kids games. Or not, depends on the view point, but these choices clearly have a strong impact on a given Social Network Site's success.

Another important tendency that was discovered is related to brands creating Social Network Sites to relate to their customers. Many brands have or are currently creating SNSs in order to: learn customers' behaviours, opinions, tendencies, interests, needs. In addition, customers can connect and communicate with brands in a way which was never possible in the past making them feel more important and involved.

At last, this chapter identified a very specific case of Social Network Sites: reviews and rating communities. Some call them social networks, but they are often described as online communities, because they share a common interest of reviewing products/services/items. These can be used by companies and brands to survey/explore customers' needs, and effectively as Web 2.0 networking tools to common people to take decisions or simply for the taste of trading experiences.

The Specialized Social Network Sites' Universe is immense, but this chapter plus Appendix B present and describe some websites that serve this document's different interests: make a general portray of this universe of Social Network websites and describe the main features and loyalty systems that brands and companies use to communicate with their customers.

2.3.4. Conclusions about the Universe of Social Network Sites

This sub-chapter about the Universe of SNS focused on main features and characteristics of different types of Social Network Sites.

Most General Purpose Social Network Sites revealed spending additional attention in the process of acquiring new members. In order to accomplish that, these websites tend to provide simple, intuitive and easy to use registry modules. Basically, these types of sites only ask their users for the information that is strictly necessary (e.g. username, name, age - for age limit policies -, email account and password). This is a way to facilitate the registration process and to avoid individuals quitting the website in the early phase of this process. Most General Purpose Social Network Sites ask for detailed information later, after registration and login, and this is normally optional information. The registration process is mandatory, and a great part of these types of websites do not allow for non-members to access. Others allow for non-members to access, but only with read/search permissions (not write/modify). In order to ease the registration process, a large amount of these websites provide a process divided in steps to easily and intuitively create a complete social network account (e.g. step 1: basic information; step 2: upload photo; step 3: search for friends; etcetera).

For security reasons, some of these websites only allow their users to perform particular actions in a pre-defined number of days after registration. They also provide terms, email account confirmation and other security mechanisms (e.g. CAPTCHA).

The sign in module is often located on visible parts of the website, allowing its users rapid recognition and access. This system is adopted by most of these types of websites and is based on input pairs: email account/password or username/password. Ultimately, the General Purpose Social Network Sites' sign in module has functionalities that provide their users with the ability to later remember their passwords or to stay logged in.

As mentioned earlier, one of the typical steps on the registration process includes finding friends in order to build a network of "*friends*" from scratch. To facilitate that and to avoid searching randomly through an immense network of people, these websites provide mechanisms to search friends by email (partnerships with major email providers and most important email providers of each region/country). In addition, most websites provide contacts list import, as well as basic and advanced search modes (the search fields depend on the site's available information).

The user's profile is one of the main features of these kinds of websites. Its features range from: uploading of photos, videos (with descriptions, titles, comments, tags, etcetera),

creation of photo/video albums, micro-blogging (e.g. status), availability status, basic and detailed information (e.g. about me, interests, etcetera), profile's URL modification, network views (e.g. top friends, random, etcetera), other users' updates (at the extent of n degrees), *widgets*, applications, games, videos, music, social circles, favorite friends, profile free and guided customization, notifications, alert, profile statistics and much more.

An important factor related to social network profiles that is often considered of great importance by website designers is online advertising. On one hand, users often do not like sites filled with advertising blocking and spanning their vision, but on the other hand, advertising is one of the main revenue sources (specially for general purpose websites). Online advertising is surely a subject that needs attention from the people who create social network services.

Another important subject is related to account settings. These include privacy settings and are usually a decisive factor for users to continue using a given network site. Settings frequently include: access settings (e.g. profile, comments, photos, videos, personal information, message, email, notifications, requests, tags, updates, status, blockage, account deletion or cancel, spam, etcetera), modification of information, application configuration options and Virtual ID management.

Other primary features, such as message systems are much appreciated by social network sites' users, mainly because they allow them to directly communicate with other users (*inbox*, *outbox*, groups/circles, spam handlers, invitations to events, etcetera).

General Purpose Social Network Sites also have secondary features: search engine (e.g. Google), suggestions/tips, profile view, event handler (mobile), walls/journals/notes/forums, nudges, tour, news, moods and etcetera. At last, added-value content features include: games, plug-ins/applications/widgets, online gifts, online market places, different translation languages and mobile features (e.g. mobile oriented website, functionalities), statistics tool, chat, instant messaging, Open ID, specific spaces (e.g. *MyMusic*), blogs, help, white board applications, book shelf, scrapbook (offline/online), geo-referenced system integrator, etcetera.

Another subject associated with the General Purpose Social Network Sites' analysis is the relations between these websites and brands. Two major trends were identified for this matter: first, websites like *Hi5* were searched by small events' organizers, small-brands and businesses for publicity and promotion purposes; secondly, popular websites like *MySpace* and *Facebook* were searched by major brands (e.g. *Burquer King*, etcetera). These brands offer services, applications and even have profiles on those websites with the aim of reaching their target audiences. Additionally, some major companies, such as *Microsoft* are also associating themselves with these kinds of networks in an attempt to offer job opportunities.

Professional Social Network Sites share common features with General Purpose ones. However, they present some key differences. In opposition to what happens with General Purpose Social Network Sites, Professional websites ask their users for detailed information. Basically, Professional Networks are not designed for everyone, so it is considered important to know each user well. Users are not bothered by registry modules asking for detailed information, because these websites are really envisioned to present users' professional experience (which could be long) (e.g. company, title, industry, current employment state, etcetera). These websites are only available for registered users and take particular attention into security issues (e.g. email confirmation, invitation limit, methods to prevent obsessive behaviours, etcetera). For instance, some Professional websites ban users that have more than three rejected network connection requests. Additionally, the registration module of Professional Network Sites usually provides information about the network (e.g. opinions, statistics and tags), as well as information about each user's networking goals (e.g. look for job). This information ultimately will shape the network and its purpose.

The sign in module is practically identical to the model presented for General Purpose Social Network Sites. The same is true for the People Search Engine that enables users to find other known users and build their own network. The only differences are that Professional

Networks treat connections between users as professional and searches could be made by school or companies, often supported by geo-referenced systems.

Most Professional Network Sites' profiles allow for: single photo upload, detailed information (personal and professional, country, industry, current and past education, recommendations from other users, work experience, technical and social skills, potential websites, blogs, personal presentations and personal contact, etcetera), willingness to accept opportunities, applications (presentations, blogs and websites), network (map or list), network statistics, tag systems, groups, topics and events.

Account settings on Professional Network Sites are a serious matter, since people use personal and professional information that is not meant to be provided just to anyone. First, most of these types of sites provide configuration on accounts and membership services that enable users to get added-value content services. Other settings they offer are related to: profile settings (e.g. Photo, Privacy Profile Settings, recommendations' Management, Status Visibility and Member Feed Visibility), personal information (e.g. name, location, email account, password and account management), email notifications (e.g. contacts, messages and invitations), homepage settings, RSS settings, privacy settings (e.g. possibility of receiving invitations to participate on market research surveys, profile views, partner advertising, connections browse, profile and status update, service provider listing, authorized applications, etcetera) and configuration of settings related to network purposes (e.g. use the network to: find a job, consult or hire, sell products/services to companies, investigate deals with companies, find professional information and find interested professional in a given product or venture).

Most Professional Social Network Sites do not allow for connection requests from people separated by more than a given number of separation degrees (e.g. more than 3 degrees), in contrast with General Purpose SNSs.

Other primary feature that contributes with more differences between General Purpose and Professional Social Network Sites is the message system. The professional message system is truly a way to connect professionals, depending on their objectives for using the website. In addition to plain text messages, Professional SNSs allow for their users to send: proposals, invitations, consults, profiles, introductions (Presentations), questions to experts and recommendations.

Secondary features on Professional Social Network Sites are regularly simple functionalities to facilitate their users' experience: mechanisms to save recent searches, status bar (work – *Twitter* like), profile completion, new members on the website, list of members by company/institution, suggestions and classifieds, opportunities, video hosting and much more. Added-value content features normally offer capabilities that enable Professional websites to produce and provide a more integrated and interactive user experience: partnerships with other websites/newspapers (e.g. Amazon), Questions & Answers, jobs & education, events, groups (e.g. Alumni), applications (e.g. Google Presentation, *MyTravel*, etcetera), languages and mobile. Recently, services related to online networking video conferencing and e-commerce emerged to enhance the relation between users and network developers and managers.

It is rare to find profiles from brands or companies on Professional Social Network Sites. Websites in which this is allowed, require very expensive account upgrades. This happens because these actions are, in some way said to be adulterating these websites' purpose. Usually, companies only associate with these sites in order to offer job opportunities or to recruit people.

The last type of Social Network Sites studied in this comprehensive analysis is related to Specialized Social Network Sites. Most features studied for this particular type are identical to the ones studied for the other two. The only difference is that those features apply to specific cases, depending on network's context and objectives. There is huge variety of sites, and as a result so is the variety of features' usage on them, depending on site's subject.

Considered as a sub-type of the Specialized Social Network Sites, Social Network Brand Sites are, as suggested by their designation, social network sites specially envisioned and

designed by brands to reach their current or potential customers. These websites offer their users the possibility to interact with the brand in a two-way stream of communication. This is accomplished by a number of different online activities that allow companies to know their customer base, as well as their opinions, ideas, needs and expectations. Additionally these activities can be used by brands to help in the process of creating and designing new products.

Ultimately, Social Network Sites offer a great diversity of features and capabilities that can be used by practically everyone on Earth with an online connection for almost any purpose.

2.4. Social Networks in Business

Social networks and virtual communities are often used in both profit and non-profit contexts contributing to major social and economic advance [LYM06]. According to [EP04], these digital environments are crucial in increasing individuals' creativity and in enabling them *"to develop interaction and establish socio-economic forces at higher standards."* "... *"Social networks also play an important role in commerce activities and economic development."* [LYM06] It is a known fact that the use of online social networks also allows their users to share information about the wide variety of products/services offered, as well as their prices and quality levels [HA04]. This could lead to an increase in popularity of the business website and its offered services. In the end, it is expected that social networks and virtual communities stimulate economy through the facilitation of transactions between *"loosely connected diverse communities of individuals and small businesses."* [LYM06]

Today's business environment is characterized by the daily emergence of new paradigms. New paradigms demand new rules. Business companies face competitive forces that narrow their time to build confidence by traditional means. Besides, this trust and confidence should be built while the business undergoes rapid and successive changes imposed by the environment. This phenomenon forces both employees and customers *"to consistently find or build new affinity groups that reaffirm their current values and inspire their confidence."* [BG00]

A great example of how business companies adapted to this social networking cycle is the increase of collaborative filtering software usage. This kind of software allows potential customers to gather information about other users who have made similar buying decisions or inquiries for information. For instance, websites like *Amazon* and *Ebay* use this type of software and are able to *"fill the need for establishing an instant community."* [BG00] This is not a recent event and, in fact, many online companies are doing this for years by offering suggestions based on recommendations by people with similar interests (e.g. *Amazon*, *CDNow* and *Movie Critic*). Business companies that are adapting to these changes are the ones that are gaining an interesting competitive advantage by making customers feel that the company and brand is making a huge effort to embrace values consistent with their own. The latter leads to reinforce the customers' confidence and makes them feel more like a part of the company's community.

Another advantage of adopting social networks and communities in business is related to the fact that companies are often seen as a solution by its customers. This means that customers are no longer expecting for total support from vendors. Instead, affinity groups and communities are being formed to support vendors by *"filling in the missing pieces and help product users to help themselves."* [BG00] In fact, the shift from anonymous, powerless consumers to unique members of powerful buying communities is one of the most powerful business drivers of this new economy.

When applied to the business context, social networks seem to generate benefits for every party involved. Business companies benefit from: online-community based marketing, sales and support solutions, professional production, moderated environment, reduced customer acquisition and maintenance costs. Consumers benefit from: a friendlier culture, family-oriented

environment, a variety of interactive programming, advertisers and positive effective branding venue, segmented, targetable and mainstream audience and loyal engaged viewers. At last, partners benefit from: professional production, moderated environment, critical mass of traffic and variety of programming and co-branding and customization of community services [BG00] [Rubicon08].

So, communities are major business drivers, but they also are business themselves. Actually, several websites specialize on building services backed up by thriving online communities and that makes all the difference when compared to traditional means of business.

2.4.1. The Competitive Advantage of Social networks

Social networks and virtual communities can deliver several competitive advantages when properly applied to the core business or business logic of a company.

Flexibility is always one inherent characteristic to almost every community. Basically, the leader of a community can choose individual members (*“atoms”*) and rearrange them in a manner that forms a business *“molecule”*. This *“molecule”* can be easily shaped to respond to the clients' needs. These virtual communities also *“allow users to participate in the communities as they aspire to, allowing them to create their ideal environment.”* [LYM06] Flexibility is truly an important competitive advantage provided by social networks because it permits survival in a business environment characterized by fast changes and uncertainty.

Expertise is related to the potential and knowledge that a community can provide. This is particularly relevant when the subject in matter is the Internet, where the pace of technological change exceeds the learning curve of any individual. Communities provide this set of technological expertise because of their models and the density of their members' connections. In fact, social networks are known for their capability of fostering dissemination activities. This means that they facilitate the process of spreading knowledge, experience and best practices through multiple communication media [LYM06].

Maturity is another intrinsic characteristic of communities in business. Usually communities that support businesses are formed by people with a considerable amount of years of experience, which is an initial attractive factor to potential clients. Businesses can also expect to benefit from this maturity and influence of certain individuals to promote their products/services and brand. Social networks are known as an efficient way to endorse word-of-mouth and viral marketing phenomenon.

According to [LSK04], there are several factors that explain the success factors behind social networks and communities in business. One of the main factors suggested is related to the fact that social networks capture users' profiles and preferences to facilitate collaborative environments giving the user a sense of belongingness in the digital community or network. The latter also encourages users to generate content and new knowledge which is usually used for business improvement.

These days everyone talks about social networks. Indeed, social networks are a new way of communication and can be seen as a new kind of technology. Businesses can rely on social networks to offer a completely new experience, both in terms of commerce and entertainment. Businesses can explore the capabilities of social networks to deliver a funnier and more interesting experience between brand and customer. For example, this could be accomplished by developing a service associated with a social network that fosters sense of game and addiction in the customer (game-theoretic perspectives) [GLNGT04].

Another competitive advantage provided by social networks is their ability to facilitate resources needed for business growth. What happens is: *“access to resources through person-to-person social networking has a high opportunity cost in terms of time and effort.”* [LYM06]

Nevertheless, communities supporting businesses should be treated carefully when it comes to their growth. According to [BG00], there is an average number related to how many people one can form substantive social relations with. This optimum number seems to be somewhere around 150 and 200 people. When achieving this number, communities should be split into sub-communities to grow on their own and develop unique identities. Actually this theory seems to contradict traditional wisdom that says *“bigger is better”*. However, there is a *“trade-off point at which absolute size begins to cost more in terms of coordination and costs that can be realized in reduced administrative overhead.”* [BG00]

One of the crucial aspects that enable companies to benefit so much from social networks and communities is the feeling that clients gain when using them. Social networks key social value is the capacity of providing members with a sense of identification. In fact, individual identity gains real meaning within the context of a group. Social networks allow its users to see to whom they are connected and which the relations that really matter to them are. This means that users are able to construct an idea about which people they can rely on for support, guidance and help within a community.

At last, companies relying on social networks or communities can benefit from their communication and social services. In fact, important features that characterize social networks and virtual communities *“are to support communication and collaboration among large groups of people over computer networks.”* [LYM06] The goal of this features is also to encourage the participation of key players of the network based on cooperation and information transfer. This way, social networks provide a framework that enables exchange between members seeking information on other member’s expertise and experience. This allows individuals to implement their own plans with a smaller degree of risk associated.

According to [Rubicon08], most of web users are consumers, not creators. In fact, 80% of UGC (User Generated Content) on the Web (including comments and questions) is created by less than 10% of Web users (most frequent contributors - MFCs). Despite these facts, online communities and social networks have a huge influence on almost all Web users. For instance, online reviews and comments posted by these MFCs *“are second only to word-of-mouth as a purchase driver for all Web users.”* [Rubicon08] In reality, these types of reviews are considered to be more as an influencer than official comments or reviews published by websites or magazines. These facts support the idea that MFCs are, in reality, the influencers (have strong influence on purchase and behaviour decisions).

Regardless the fact that online discussion between companies and clients is still somehow neglected, literature suggests that companies should identify these influencers (the MFCs) and partner with them in a positive manner.

2.4.2. Conclusions about Social Networks in Business

Social networks and communities can bring competitive advantages for businesses, so it is not a surprise that businesses are starting to think of them as a very attractive concept.

In effect, several companies relied on these to build not only products, but also lifestyle philosophies. The classic examples are: *Harley-Davidson*, *BMW*, *Rolex*, *Tommy Hilfiger*, etcetera. Similarly to what these companies did, more and more companies are adapting the community model so as to: narrow the communication gap between both suppliers and clients, be more creative and get the products to market more quickly.

2.4.3. Cardmobili’s Business Motivation

Cardmobili is developing an identification and client loyalty card virtualization solution. This solution’s goal is to allow its clients to store and transfer cards from their wallets to their mobile phones. However, not all types of cards are currently under the scope of this

solution. For instance, official ID (e.g. Passport, Driver's License) and payment cards (e.g. Visa, Multibanco) are still left out of it.

Basically, *Cardmobili's* solution aims at being supported by a social network of individual adherents. This solution is focused on building an online community or social network like web-based service which provides individual and group utilization experiences (e.g. profile maintenance, loyalty card programs management, benefits from card points trade, etcetera).

Cardmobili's solution is based on a web platform, which holds an interface for both users (clients) and merchants. However, users can also access it through the mobile platform.

Users are allowed to register their cards, and it is expected that, in the near future, they could be able to leave and share opinions on products' purchase experiences. Furthermore, the process of subscribing new loyalty programs will be eased, saving the time and effort (and cost for the merchants) of getting cards in the physical format.

Merchants will be able to perform web and mobile marketing campaigns by sending messages to the *Cardmobili* users' mail box, SMS or even MMS. *Cardmobili's* solution will allow merchants to target different types of clients (e.g. gender, age, location, etcetera). On the other hand, merchants will also be able to integrate their personal social media profiles (e.g. *Twitter*, *Facebook*) with *Cardmobili's* web platform. Finally, merchants will be able to create their own closed virtual communities, where they could strengthen the bonds between their clients and their brand through various tasks (e.g. surveys, focus groups, etcetera).

Cardmobili's solution is yet in its early stages of conception and development, so there are no boundaries or limits to what can be done in terms of social networking. There is still not a clear definition of what the *Cardmobili's* website is really going to be, if it will be a new complete social network, or just a web-based service with social-network-(community)-like functionalities. Either way, it is a clear statement that the *Cardmobili's* solution aims at benefiting from the competitive advantages of these new communality means of communication and collaboration in order to satisfy its users' needs and provide them with added value content.

Chapter 3

Requirements Elicitation

This Chapter introduces and presents the state of the art on requirements elicitation as one of the most important activities of the requirements engineering process.

3.1. Requirements Engineering

Requirements Engineering is at the very heart of Software Engineering and systems development. Basically, it narrows the gap between stakeholder goals and constraints, and eventually their realization in systems that inevitably combine technology and human processes with the aim of changing organizational or social context. Technologists and Engineers often ignore the social context in which its technology will be deployed, and for humans and organizations is very common to be unaware of opportunities and difficulties that technology brings [MS03]. According to [NE00], Requirements Engineering should be aware of the way in which people perceive the world that surrounds them and how they interact with it.

The main variable that distinguishes a project's success is its ability to meet its users' expectations.

Very often, missed requirements in early stages, result in massive expenditures in later development stages. These are some reasons why is important to rely on Requirements Engineering and effective Requirements Engineering Practices that are essential to solve modern requirements analysis' problems [Young03]. In fact, several studies of management information systems research about the importance and the difficulty of developing complete and accurate information systems requirements. For instance, many report system failures that have been attributed to requirements problems [Standish95] and others show that problems are *"200 times more expensive to correct during testing than during the requirements phase [Boehm81]"* [HDN99].

In essence, human communication is imprecise and biased. Basically this means that *"we fail to understand each other completely"* [Young03]. This phenomenon of human miscommunication is usually compared to our childhood game *"Whispers"*, where someone started a short whisper statement around an immediate circle of friends. This statement was passed around only through whispering from person to person, and the result was that, after only a few transfers the original statement was modified beyond recognition [Young03]. As well, requirements are also an important form of human communication, since they allow people to transfer really complex ideas from one mind to another. Requirements are the most effective and efficient method of conveying the complexity of a technical idea [Young03].

Requirements are used as tools with different purposes. First, they are a contractual tool, because they allow definition of technical scope of a development contract between two parties. Second, requirements are a configuration management tool, because their form defines the configuration of a given system (e.g. valid functionalities and bounds). Controlling requirements means controlling configuration definition. Third, requirements are obviously an engineering tool, because they comprise: communication (between development team, acquirers, users and other stakeholders), description and understanding of operational needs, capturing of technical solution decisions, defining product architecture and checking product elements and product completion [Young03].

Requirements are crucial to the success or failure of a project, and requirements analysis on software engineering is vital to the initiation, conduct and completion of needed work and in achieving customers and users' objectives [Young03]. *"Requirements Engineering is generally*

accepted as the most critical and complex process within the development of sociotechnical systems.” [Siddiqi96] [MS03] [ST03] The main reason to explain the latter is that requirements engineering has the most dominant impact on the capabilities of the resulting product [MS03].

3.1.1. Requirements

One of Requirements Engineering (RE) main characteristic is its focus on the end-user. Systems are developed for any kind of users. The type of users can range from the most knowledgeable in terms of technology with the capacity to perform complex tasks to users that only know how to perform trivial and easy tasks with low degree of knowledge needed. Having this in consideration, it is possible to infer the importance and complexity of correctly specifying requirements.

“A requirement is a condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification or other formally imposed documents.” [IEEE90]

“A well-formed requirement is a statement of system functionality (a capability) that must be met or possessed by a system to satisfy a customer’s need or to achieve a customer’s objective, and that is qualified by measurable conditions and bounded by constraints.” [IEEE98]

A good example that illustrates the importance given to the process of eliciting, stimulating, analysing and communicating customer user needs and expectations and translate them into a verifiable set of requirements is the Process Area 06 of the SE-CMM, which designation is *“Understand Customer Needs and Expectations”* [Young03].

Usually, requirements are divided into different types, in order to provide consistent meanings for requirements in projects and organizations to avoid misunderstandings and lengthy debates about terminology. It is important to ensure that everyone working and involved with and around a common objective as the same understanding about a given requirement.

There are some variations in the matter of requirements’ categories, but, in the end, they are pretty much the same. This way, the requirements types presented in this document follow the ideas of Jeffrey O. Grady, the known author and instructor of systems engineering and requirements courses [Grady06], also presented in the Requirements Handbook [Young03]. According to these, requirements are divided into two main types: hardware and software. Hardware requirements are then characterized into performance requirements or constraints. *“Performance requirements define how well the system must perform a requirement.”* [Young03] Constraints are characterized as interface requirements, specialty engineering requirements and environmental requirements. Software requirements are characterized as functional or non-functional (Table 4) [IEEECS98]:

Table 4: Types of Requirements

Requirements Type	Description
Functional	Functional requirements specify an action that a system must be able to perform. These requirements do not have into account physical constraints and must specify an action that a system must be able to perform.
Non-functional	Non-functional requirements specify system properties. These requirements specify: system properties (e.g. environmental and implementation constraints, performance, platform dependencies, maintainability, extensibility, and reliability). Non-functional requirements are divided in the following categories: Performance requirements, External interface requirements, Design constraints and Quality attributes. Performance requirements specify

	performance characteristics that a system or system component must possess (e.g. maximum CPU-usage, maximum response time, etcetera). External interface requirements specify hardware, software or database elements that a system or a system component must interface. Design constraints are requirements that affect or constraint the design of a system or system component (e.g. language, software standards, software quality assurance standards, etcetera). Finally, Quality attributes specify the degree to which a system possesses attributes that affect quality (e.g. correctness, reliability, maintainability, portability, etcetera).
--	--

Simultaneously with the arising of a given idea, business requirements emerge. Business requirements are the reason to develop systems and software in the first place. They depict the essential activities of an enterprise and derive from business goals and vision.

In the process of requirements identification there is also an important distinction between two types of requirements, according to their true value: “*stated requirements*” and “*real requirements*”.

“*Stated requirements*” are those provided by a customer/client at the beginning of a system or software development effort (e.g. request for information, proposal or statement of work - SOW). “*Real requirements*” are those that reflect the verified needs of customers for a particular system or capability [Young03]. Analysis of “*stated requirements*” is crucial in determining and refining real customers and user needs expectations of the system under development.

3.1.2. The Importance of Requirements

As mentioned before, Requirements Engineering is commonly accepted as an inherently difficult process. It is far beyond writing what the customer says he wants [Young03].

In the business world, requirements are dynamic and can change or be remodelled throughout the development process. This happens because the understanding of the problem being solved is very likely to change as the development process moves forward, because the people involved gain better insights (or for other external reasons). In order to improve projects’ success rates, it is important to have flexible requirements and to have a disciplined approach to requirements development and management [Young03].

Requirements are important because they provide the basis for all the development work that follows. Once the requirements are set, developers initiate the other technical work (e.g. system design, development, testing and implementation).

The human nature impels us to get on with the needed work without doing much planning. In Software Engineering, some tend to start to do what is often referred as the “*real work*” (e.g. developing or programming) too quickly, giving less importance to the requirements specification phase. This happens because many project managers consider that coding (programming) indicates that progress is being made. Actually, industry experience confirms that a better approach involves more time spent on requirements (gathering, analysis and management). Too often, coding work starts earlier than it should be, because additional time is needed to truly identify real requirements. This, added to misunderstandings in the requirements (communication problems) often result on wasted effort and rework. The industry average investment in the requirements process to a typical system is 2% to 3% of total project cost [Young03]. According to data from NASA, this amount of investment is inadequate, insufficient and root cause of many project failures. Projects that expended that amount of investment resulted in requirements process experiencing an “*80% to 200% cost overrun, while projects that invested 8% to 14% of total project cost/effort in the requirements process had 0%*”

to 50% overrun.” [Young03] Other problems are related to unprecedented requirements emerged from new capabilities to be provided in the new system.

The identification of “*real requirements*” requires an interactive and iterative requirements’ process, which is supported by different practices, processes, mechanisms, methods, techniques and tools.

3.1.3. A Good Requirement

In order to guarantee that the final product will meet the customers’ needs, just identifying requirements is not enough. These requirements should satisfy a list of criteria that are indispensable to make a good requirement.

This way, each individual requirement must respect the following list of characteristics (Table 5) extracted directly from [Young03]:

Table 5: Characteristics for a good requirement

Characteristic	Description
Necessary	<i>“If the system can meet prioritized real needs without the requirement, it isn’t necessary.”</i>
Feasible	<i>“The requirement is doable and can be accomplished within budget and schedule.”</i>
Correct	<i>“The facts related to the requirement are accurate, and it is technically and legally possible.”</i>
Concise	<i>“The requirement is stated simply.”</i>
Unambiguous	<i>“The requirement can be interpreted in only one way.”</i>
Complete	<i>“All conditions under which the requirement applies are stated, and it expresses a whole idea or statement.”</i>
Consistent	<i>“It is not in conflict with other requirements.”</i>
Verifiable	<i>“Implementation of the requirement in the system can be proved.”</i>
Traceable	<i>“The source of the requirement can be traced, and can be tracked throughout the system.”</i>
Allocated	<i>“The requirement is assigned to a component of the designed system.”</i>
Design independent	<i>“It does not pose a specific implementation solution.”</i>
Non redundant	<i>“It is not a duplicate requirement.”</i>
Written using the standard construct	<i>“The requirement is stated as an imperative using “shall”. ”</i>
Assigned a unique identifier	<i>“Each requirement shall have a unique identifying number.”</i>
Devoid of escape clauses	<i>“Language should not include such phrases as “if”, “when”, “but”, “except”, “unless” and “although”. Language should not be speculative or general.”</i>

3.1.4. Literature Review on Requirements Engineering Process Models

Literature presents numerous models that depict the requirements process. In this brief literature review, three main models were selected for their different structure: linear, linear with iterations between activities and iterative.

“The RE process is often depicted with a linear, incremental model.” [MAJP02] These models’ RE activities, such as elicitation and analysis are combined under different headings, but they still follow a linear transition. Kotonya and Sommerville [KS98] propose a conceptual linear RE process model with iterations between activities (Figure 4). Kotonya and Sommerville also suggest that the activities in the model overlap and are usually performed iteratively.

Requirements Elicitation

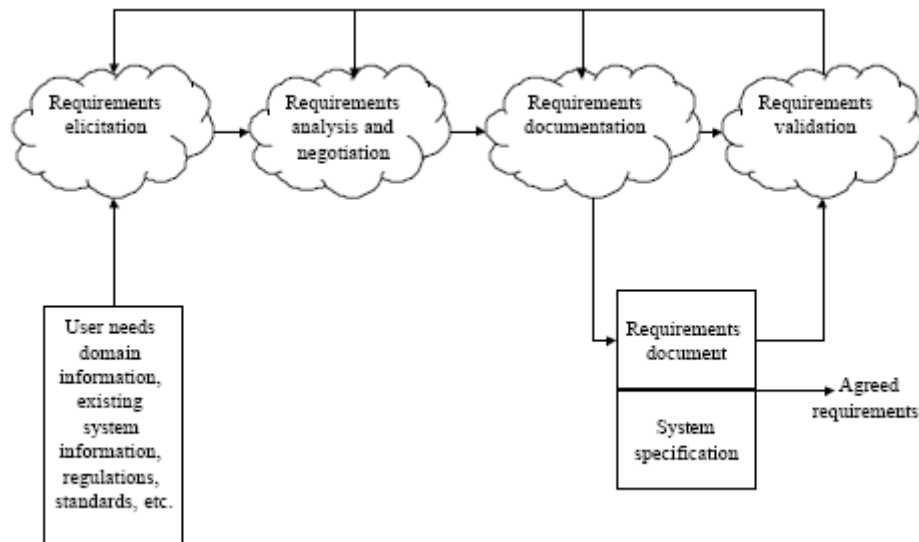


Figure 4: Kotonya and Sommerville (1998) Linear Requirements Engineering Process Model [MAJP02]

Macaulay [Macaulay96] proposes a linear RE process model, which is shown in Figure 5. In opposition to the model proposed by Kotonya and Sommerville (Figure 4), this does not specify activity overlapping or iterations. Both models have linear progression that results in documentation, but the RE activities are categorised under different headings. Additionally, Macaulay indicates that the RE process is situation dependent, specifying seven different customer-supplier relationships and the respective RE processes.

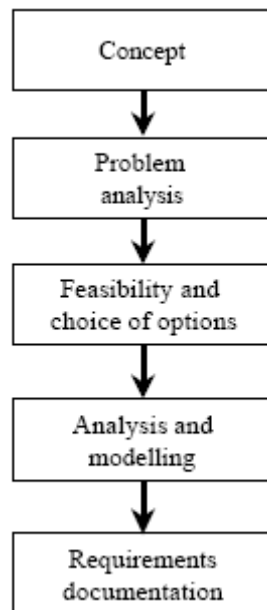


Figure 5: Macaulay (1996) Linear Requirements Engineering Process Model [MAJP02]

The tendency on current literature is to picture the RE process as linear, however some non-linear models have also been suggested. One example of a non-linear model was proposed by Loucopoulos and Karakostas [LK95]. This model depicts the RE process as iterative and cyclical (Figure 6). According to [LK95], the model clearly “*demonstrates the interactions between elicitation, specification, validation, the user and the problem domain.*” [MAJP02] The activities in this model were already discussed for the other two models, but they occur in a non-linear order and Loucopoulos and Karakostas suggested that a cause and effect relationship between them exists.

Requirements Elicitation

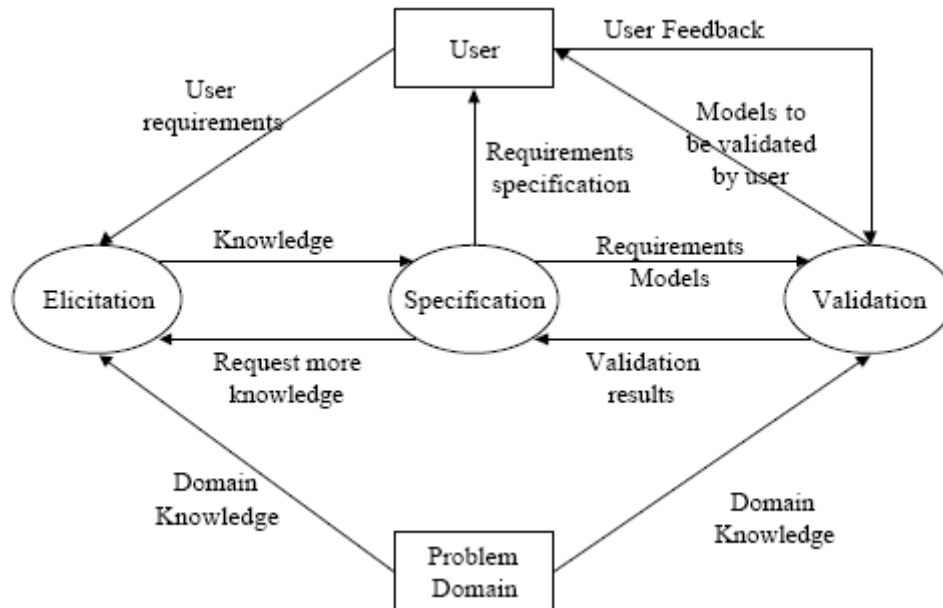


Figure 6: Loucopoulos and Karakostas (1995) Iterative Requirements Engineering Process Model [MAJP02]

Other studies, such as the Nguyen and Swatmann [NS00] one, discovered that the current RE process in their case study did not occur “*in a systematic, smooth and incremental way.*” [MAJP02] Rather the RE process was opportunistic and adapted to different situations, especially when it reached points of high complexity. Houdek and Pohl [HP00] were not able to produce a monolithic RE process model of RE activities as they performed a case study in the field. This happened as Houdek and Pohl find out that the RE activities were too indivisible and participants were not able to view them as separate tasks.

Other RE field studies, like the one of Hofmann and Lehner [HL01], presented results related to the status of RE process standards in organizations. They studied fifteen RE processes in industry. Their findings revealed that most participants saw the RE process as an *ad hoc* process. Only a few cases used an explicitly defined RE process. In the web development field, some studies [Dang00] [LE01] shown that the RE process also occurs in an *ad hoc* manner. In opposition, for instance, the finding in [EM95] concluded “*that organizations tend to use standard RE processes.*” [MAJP02]

3.1.5. Requirements Engineering Activities in the Software Life Cycle

Requirements Engineering contains a set of activities for discovering, analyzing, documenting, validating and maintaining a set of requirements for a system [SS97]. Requirements Engineering is divided in two main groups of activities: requirements development and requirements management. Requirements development includes activities related to: discovering, analyzing, documenting and validating requirements. Requirements management includes activities related to: maintenance (e.g. identification, traceability and change management) of requirements [MS03].

It is usual to find misunderstandings about the concept of requirements validation and verification. Requirements validation is used to ensure that the system meets customers’ needs, meanwhile requirements verification is used to confirm that the product developed is in conformity with technical specifications. These two types of activities include [MS03]:

- Definition of principles of how a system will be tested (validation and verification requirements).
- Planning both activities.
- Capturing criteria for both activities.

Requirements Elicitation

- Plan of test methods and tools.
- Planning and conducting reviews.
- Implementing and performing the tests and managing the results.
- Maintaining traceability.
- Auditing.

Requirements Engineering activities cover the entire system and software development life cycle [MS03]. The process of Requirements Engineering for socio-technical systems is usually performed in the beginning of the software development life cycle [Royce70]. However, for the development of large and complex systems in practice, it was proven to be impossible to create a set of requirements that would remain stable for the time being of development (e.g. months or years) [DT90]. From that point on, Requirements Engineering started to be treated as an incremental and iterative process, performed in parallel with other life cycle activities (e.g. design).

Requirements activities throughout the software life cycle are often roughly summarized as gathering and managing, but, in fact, there are other requirement related activities (Table 6) that need to be undertaken in this life cycle [Young03]:

Table 6: Requirement Activities in the Software Development Life Cycle

Activities	Description
Identifying Stakeholders	This activity implies the identification of anyone that is somehow affected or affects the project, in which the Engineering Requirements Process is being undertaken. This may include parties that have interest in the system/software or in its qualities that meet particular needs.
Requirements Elicitation	This activity implies gaining an understanding of the customers' and users' needs for the planned system and their expectations of it. It is common to refer to this activity as requirements elicitation. This activity includes gathering different types of requirements through diverse techniques.
Identifying Requirements	This activity implies the statement of requirements in simple sentences grouping them as a set. An important factor directly related to the success of a given system, is its capability of supporting essential activities of an enterprise (represented by business requirements or needs) and facilitating in achieving them.
Clarifying and Restating Requirements	This activity aims to assure that requirements describe the users' and customers' real needs. This clarification and restatement must be presented in a form that anyone can understand them, primarily the system developers.
Requirements Analysis	This activity's objective is to ensure that requirements are well defined and in accordance to the standard definition of requirements.
Requirements Definition	This activity implies defining the requirements in such way that all stakeholders involved gain shared understanding of them. Stakeholder groups can emerge from different areas, so different groups can have different perspectives of the system and its requirements. This could lead to "waste" of time in learning special vocabulary or project jargon. This activity usually takes significant time and effort to guarantee common understanding.
Requirements Specification	This activity requires including all needed detail for each requirement. Normally, this activity results in a Specification

Requirements Elicitation

	Document, depending on the size of the project.
Requirements Prioritizing	This activity is based on the principle that not all requirements have the same importance to the stakeholders (e.g. users and customers). In fact, some requirements are critical to the project and others are just accessory. Usually requirements are categorized in: high priority, average priority and low priority. Prioritizing all the requirements is important because projects are dependent of time and money, variables that are not always available for the total completion of the system's defined requirements. Prioritizing enables developers to launch different releases or versions of the same product and assures that an appropriate amount of effort and investment is put in meeting various customer needs.
Requirements Derivation	This activity helps stakeholders to understand which requirements become visible from specificities on the system's design. Usually, they do not provide any direct benefit to its users, but they are essential (e.g. requirement for disc storage when there is the prominent need of storing a lot of data).
Requirements Partitioning	This activity implies dividing requirements in different categories. For example, categories can be: hardware, software, training and documentation. It is possible that some requirements satisfy two different categories.
Requirements Allocation	This activity is used to allocate requirements to its respective system components or modules. Similarly to the Requirements Partitioning case, sometimes requirements can be assigned to more than one component or module.
Requirements Tracking	This activity is usually accomplished through the usage of an automated requirements tool (ARM – Automated Requirement Management). This is important to ensure that stakeholders know where requirements are traced and tracked in the system, in order to verify if each requirement is being addressed.
Requirements Management	This activity allows the following actions: add, remove or modify requirements when needed during every one of the system's design phases. To accomplish this activity, it is common to recur to a requirements repository of a set of artefacts and databases.
Requirements Test and Verification	This activity allows checking requirements, designs, code, test plans and system products to ensure that requirements are met.
Requirements Validation	This activity provides confirmation that “ <i>real requirements</i> ” are implemented in the system. The order of validation is usually prioritized (due to limited available amount of funding).

Literature on Requirements Engineering categorizes the above described activities into four main high-level groups of activities: system requirements development, requirements allocation and flow-down, software requirements development and continuous activities [MS03].

From all the Requirements Engineering activities in the software lifecycle, this paper focuses on the process of requirements gathering/elicitation.

3.1.5.1. Requirements Gathering/Elicitation from Various Sources

“The hardest single part of building a software system is deciding precisely what to build... No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later.” [Brooks87]

“The elicitation of requirements can be broadly defined as the acquisition of goals, constraints, and features for a proposed system by means of investigation and analysis. Furthermore it is generally understood that requirements are elicited rather than captured or collected.” [Goguen96] [MS03] The CMMI Development Guide [CMMI06] briefly describes Requirements Elicitation as the process of: *“Using systematic techniques, such as prototypes and structured surveys, to proactively identify and document customer and end-user needs.”* This activity’s main objective is to describe a future or target system. This process involves all parties that are affected directly or indirectly by the development or implementation of this system, the stakeholders. Stakeholders must be integrated and involved from an early stage and throughout the project. This is truly a critical factor for its success. However, some stakeholders have a stronger impact on the project. For example, the sponsor of the project and the end users are usually indispensable to a project’s success. Equally crucial for the project’s success is the produced requirements’ quality. So, the characteristics of a good requirement presented in the sub-chapter 3.1.3. *A Good Requirement*, must be taken into account when eliciting (e.g. completeness, correctness, consistency and clarity).

If elicitation is considered to be the initial phase in requirements engineering, then it could be also addressed in the first stage of system development. It is at this moment in time of the project where the needs of the users and the goals for the system are determined and stated. Requirements elicitation is regarded as a particularly major problem area in projects for computer-based systems [MS03]. Requirements elicitation has significant social relevance and it cannot be handled solely accounting on technical solutions. This activity must be supported on a structured and rigorous approach. This activity comprises an incremental and iterative process which is strongly dependent on the requirements engineers’ capabilities, as well as in the level of commitment and cooperation of stakeholders. Techniques and methods applied to complete this activity will always be dependent of various factors, such as time, cost and availability of resources [MS03].

Gathering requirements always begins with the identification of the stakeholders of the system and with the collection (elicitation) of raw requirements. These types of requirements are those which have not yet been analysed or written in a well formed requirements notation. In this phase, user requirements are often misunderstood due to miscommunication between both user and requirements analyst.

According to SPICE [SPICE98]: *“the purpose of the Requirements elicitation process is to gather, process and track evolving customer needs and requirements throughout the life of the software and/or service so as to establish a requirements baseline that serves as the basis for defining the needed software work products. Base practices include:*

- *CUS.3.BP1: Obtain customer requirements and requests.*
- *CUS.3.BP2: Agree on requirements.*
- *CUS.3.BP3: Establish customer requirements baseline.*
- *CUS.3.BP4: Manage customer requirements changes.*
- *CUS.3.BP5: Understand customers’ expectations.*
- *CUS.3.BP6: Keep customers informed.”*

The Requirements Elicitation Process is directly influenced by the budget and schedule of the project, and these variables have a significant effect on the way in which it will be performed. Typically this process begins with an informal and incomplete high-level mission statement for the project.

The process of requirements elicitation has been studied in literature and some different process models were proposed [SS97] [KS98] [CL99]. Most of these models are propositions that provide only a generic road map of this process. This happens because it is necessary that these models provide enough flexibility so they could be adapted to different individual projects. Additionally, these models are not capable of providing definitive guidelines because

of the great variety of activities and sequence sets that can be performed through the process of requirements elicitation. Most models on the Process of Requirements Elicitation defend that this should be performed incrementally over multiple sessions, iteratively to increasing levels of detail, and at least partially in parallel with other system development activities (e.g. modelling and analysis). In reality, this process is strongly affected by cost and schedule constraints and it results in the production of a detailed “*set of requirements in natural language text and simple diagrammatic representations describing the sources, priorities and rationales.*” [MS03]

According to [KS97], the process of requirements elicitation is composed by four dimensions (Figure 7):

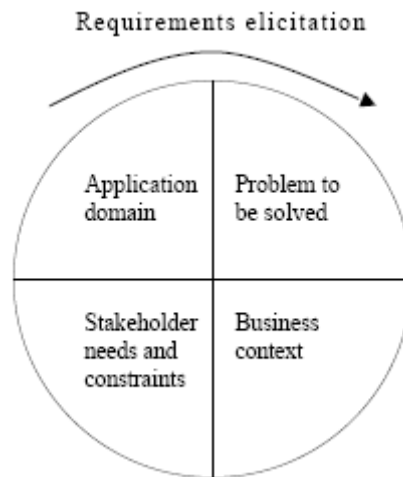


Figure 7: Components of Requirements Elicitation (Kotonya and Sommerville 1997) [Reinikainen01]

The first dimension is *Application domain understanding*. This means: having knowledge about the general area where the system is applied. The second one is *Problem understanding*. This involves understanding about the specific customer problem where the system will be applied. The third dimension is *Business context*, which means that the way in which the system will contribute to the development of the business or the organization must be understood, as well as interaction with business parts. Finally, *Understanding the needs and constraints of system stakeholders* is the fourth dimension and means that specific needs of stakeholders must be understood in detail. Both work processes and role of existing systems in these must be also understood [Reinikainen01].

As a final note about requirements elicitation it is important to distinguish between the different roles that the requirements engineer may perform. The requirements engineer work may be related to: project management (as manager), process and requirements analysis (as analyst), conduction of interviews or group sessions related to the elicitation phase (as facilitator), conflict resolution in the elicitation phase (as mediator), documentation of the results of the elicitation process (as documenter), validation of elicited requirements (as validator) and in the role of taking the part of the developer community’s viewpoint (developer).

3.1.5.2. The Process of Requirements Elicitation

The process of requirements elicitation is issued in the CMMI Process Area of Requirements Development, which “*purpose is to produce and analyze customer, product, and product component requirements.*” [CMMI06] The related specific practice is part of the specific goal 1. *Develop Customer Requirements* and its designation is: *Specific Practice 1.1. Elicit Needs*. According to the CMMI Development Guide [CMMI06] the needs of stakeholders are the basis for determining customer requirements. The specific practice that is associated with the process of requirements elicitation states: “*Eliciting goes beyond collecting*

requirements by proactively identifying additional requirements not explicitly provided by customers. Additional requirements should address the various product lifecycle activities and their impact on the product.” [CMMI06] According to SPICE in Practice [HMDZ08], the requirements elicitation process should “gather, process, and track evolving customer needs and requirements throughout the life of the product and/or service so as to establish a requirements baseline that serves as the basis for defining the needed work products.” This guide also provides valid reasons to perform careful elicitation. Among the most important, [HMDZ08] identifies that lack of a proper elicitation phase would leave the project without a solid basis and this could lead to future problems.

According to [Rzepka89], the requirements engineering process can be decomposed into three main activities [CK92]:

1. “Elicit requirements from various individual sources;”
2. “Insure that the needs of all users are consistent and feasible;”
3. “Validate that the requirements so derived are an accurate reflection of user needs;”

This way, elicitation of requirements will figure in the initial phase of this sequential order of activities. However, requirements elicitation cannot be divorced from the subsequent activities and it is more likely to be iterative with these other activities during the whole process of requirements development.

Within the process of requirements development, the process of requirements elicitation can be divided into activities like fact-finding, information gathering and integration. An example of this is the decomposition of the elicitation process presented in [Rzepka89]:

1. Identification of relevant parts that are sources of requirements (e.g. end user, interface system or environmental factors).
2. Gathering of needs and expectations for each relevant party. This set of needs is often little organized, ambiguous, infeasible, unstable and incomplete.
3. Documentation and refinement of each set of needs for each relevant party. The outcome of this activity must be a high-level self-consistent list specified according to the problem domain. This list must also be specified in user-specific terms.
4. Integration of the list across the various relevant parties, resolving possible conflicts in viewpoints. This activity must be checked for inconsistencies and feasibility.
5. Determination and documentation of non-functional requirements (e.g. performance and reliability).

These activities are common to most of the process definitions for requirements elicitation found in the literature [CK92]. The output from the elicitation phase is a subset of goals from the various parties (stakeholders) describing a number of possible solutions.

“The goal of requirements engineering is the production of a good requirements specification.” [CK92] According to the IEEE Guide to Software Requirements Specifications [IEEE84] a good software requirements specification should be: unambiguous, complete, verifiable, consistent, modifiable, traceable and usable during operations and maintenance. [Cordes89] and [Schouwen90] add that requirements should also be necessary. A good requirements elicitation process must support the development of a specification with the attributes above mentioned [CK92]. This way, when the process of requirements elicitation faces problems, it is harder to guarantee the definition of requirements with these attributes.

The process of requirements elicitation can be seen through different perspectives, but “the most obvious dichotomy” [CM02] emerges between the rationalistic problem-solving view, characterized by structured methodologies, versus the user-centred (problem-finding) view from the socio-technical school [CM02]. The rationalistic perspective is based on the existence of a definable problem assumption. This problem can be solved through specification of requirements and with the development of the target system. A more socially oriented and complementary view defends that the problem area is vague and ambiguous needing to be

located and defined in context [CM02]. *“This viewpoint advocates an emergent and collaborative nature to requirements, suggesting that they do not simply exist in the social setting awaiting capture, but emerge as part of ongoing interactions and negotiations between participants in the setting and outsiders such as requirements engineers.”* [CM02] Some studies address the requirements elicitation process as a process of mutual education of consultant and client [DC08]. In these studies, researchers take current educational theory and apply it to improving requirements elicitation. According to this theory, the learning process *“takes place by interaction between people.”* *“This view leads to investigations of a technique called collaborative elaboration, in which two or more people interact in a conversation in a structured way.”* [DC08] Education theory has been studied by researchers from different perspectives on the requirements elicitation process:

- Collaborative elaboration – from education theory [MBLC05].
- Mental imagery used in the elaboration process [ZAS93].
- Collaborative requirements negotiation (Easy WinWin) – group communication theory [GB01].

The two broad perspectives presented above have a main characteristic that distinguishes them from one another: the degree of communication between designers and users. Requirements elicitation as a process of requirements engineering, is inherently a social and communicative activity [CM02]. Nevertheless, major assumptions behind these *“two conflicting views are product-centred in nature on one hand and human-centred on the other hand so tend to discriminate by the degree and quality of communication.”* [CM02] According to [DD96], there are key main assumptions between both perspectives that highlight relevant differences. These assumptions were divided into three categories: goals, derivation of specification and the nature of user-analyst communication. The main goal of the product-centred perspective is to attain a complete system. The human-centred perspective’s main goal is to attain customer satisfaction. The product-centred perspective suggests that specification is given and/or extracted from the customer/user, in opposition to the user-centred perspective, in which specification is accomplished through collaboration between analyst and user. Finally, the product-centred perspective suggests that the nature of the communication relationship is contractual versus the continual nature of the user-centred perspective.

Regardless of the perspective agreed, it is common sense that there are numerous problems that may emerge when developing a *“complete”* system. These problems are not just technical in nature but also social and will be presented in this next sub-chapter.

3.1.5.3. Requirements Elicitation Problems

Some research studies use theories of cognition (Cognitive Science) to address and explain that the process of communication between people (e.g. analyst and client in the requirements elicitation process) is restricted *“by limitations of human cognition and problems that arise when communication needs to be conducted by language.”* [DC08] According to this theory applied to the requirements elicitation process, three classes of problems can arise [PB07]: (1) limitations of humans as information processors, (2) the complex nature of requirements and (3) the obstacles encountered in user and analyst interaction. This specific study presents some cognitive limitations, such as: limited working memory capacity, simplification of models of problems, difficulties in recall, etcetera. The Pitts and Browne research [PB07] found that *“using procedural prompting strategies designed to overcome cognitive difficulties produced significantly better results than other prompting techniques.”* The area of cognitive science has also been addressed in investigating the stopping behaviour. The stopping behaviour is often described as the point in which the elicitation of requirements should seize [PB04].

Other research studies present different types of problems when eliciting requirements to specification. For instance, according to [LH87] system failures can be categorized into four

types: correspondence, process, interaction and expectation. In [Macaulay96], Macaulay identifies five possible causes that typically lead to system failure: poor communication between people (process, interaction and expectation), lack of appropriate knowledge or shared understanding (interaction and expectation), inappropriate, incomplete or inaccurate documentation (interaction and expectation), lack of systematic process (process) and poor management of people or resources (process). These studies suggest that communication is a key factor for successful systems' specification, primarily in the requirements elicitation phase. This study defends that in order to "*foster understanding between users and analysts*" is adequate that exchange of domain knowledge between all parties involved take place.

Other studies focused on elicitation difficulties to explain why system design fails so often. These studies propose three problem areas, which are described in detail further in this document (in the sections *Problems of Scope*, *Problems of Understanding* and *Problems of Volatility*) [CK92] [BG94]: scope, understanding and volatility. All three problem areas are affected for communication problems. These problems revealed to be critical in the requirements elicitation stage of the requirements process, because they ultimately mean that user needs will not be addressed [CM02]. In the [AE96] field study, three major communication problems were identified: ineffective communication channels, restrictive notation languages and social and organizational factors. These problems can lead to poor communication, which manifests in three different ways: articulation, misunderstanding [Sutton00] and conflict [WEC93]. These can be briefly described as such: "*articulation – the ability to express information; misunderstanding – divided interpretations on the same piece of information; conflict – multi-perspective viewpoints and/or disagreements.*" [CM02] However, manifestation of poor communication sometimes can enable the learning process. In fact, several creative methods that are used for requirements elicitation and identification use conflict situations to foster creative thinking to solve problems and generate new ideas for requirements.

According to [CK92], problems can be divided into three categories: problems of scope, problems of understanding and problems of volatility. [McDermid89] presented a list of ten elicitation problems classified according to these categories:

- Problems of scope
 - the boundary of the system is ill-defined;
 - unnecessary design information may be given;
- Problems of understanding
 - users have incomplete understanding of their needs;
 - users have poor understanding of computer capabilities and limitations;
 - analysts have poor knowledge of problem domain;
 - user and analyst speak different languages;
 - ease of omitting "*obvious*" information;
 - conflicting views of different users;
 - requirements are often vague and un-testable;
- Problems of volatility
 - requirements evolve over time;

According to [MS03] the list of major challenges of the requirements elicitation process is the following:

- Project's initial scope not well defined.
- Stakeholders do not know what they really need / do not know how to communicate their needs / do not understand/appreciate the needs of other stakeholders / overlook ordinary aspects of their daily lives / present inconsistent levels of cooperation and commitment to the project.

- Analysts are unfamiliar with the problem or solution / do not share a common understanding with the stakeholders / lack of experience or expertise.
- Requirements are inherently volatile / vague / incorrect / incomplete / unclear / inconsistent.

A more recent study compared techniques typically used in the requirements elicitation process and identified twenty-two different sources of difficulties associated with requirements [TT06] [DC08]: incomplete requirements, incomplete domain knowledge, overlooking tacit assumptions, ill-defined system boundaries, ambiguous requirements, un-testable terms, inconsistent requirements, different views of different users, fluctuating requirements, excessive requirements, too many requesters, incomplete understanding of needs, poor user's collaboration, incorrect requirements, misunderstanding of system purpose, synonymous and homonymous terms, unnecessary design considerations, non-solid intentions of requesters, unfixed requirements, continuous acceptance of additional requirements, unorganized bulky information sources and over-commitment by sales staff. This list covers problems from the three categories presented above.

[DFTB06] presents a four quadrant model (Figure 8) illustrating some of the difficulties and challenges in RE, particularly in the requirements elicitation phase. The following figure (Figure 8) is the representation of a model from the Personal Construct Theory:

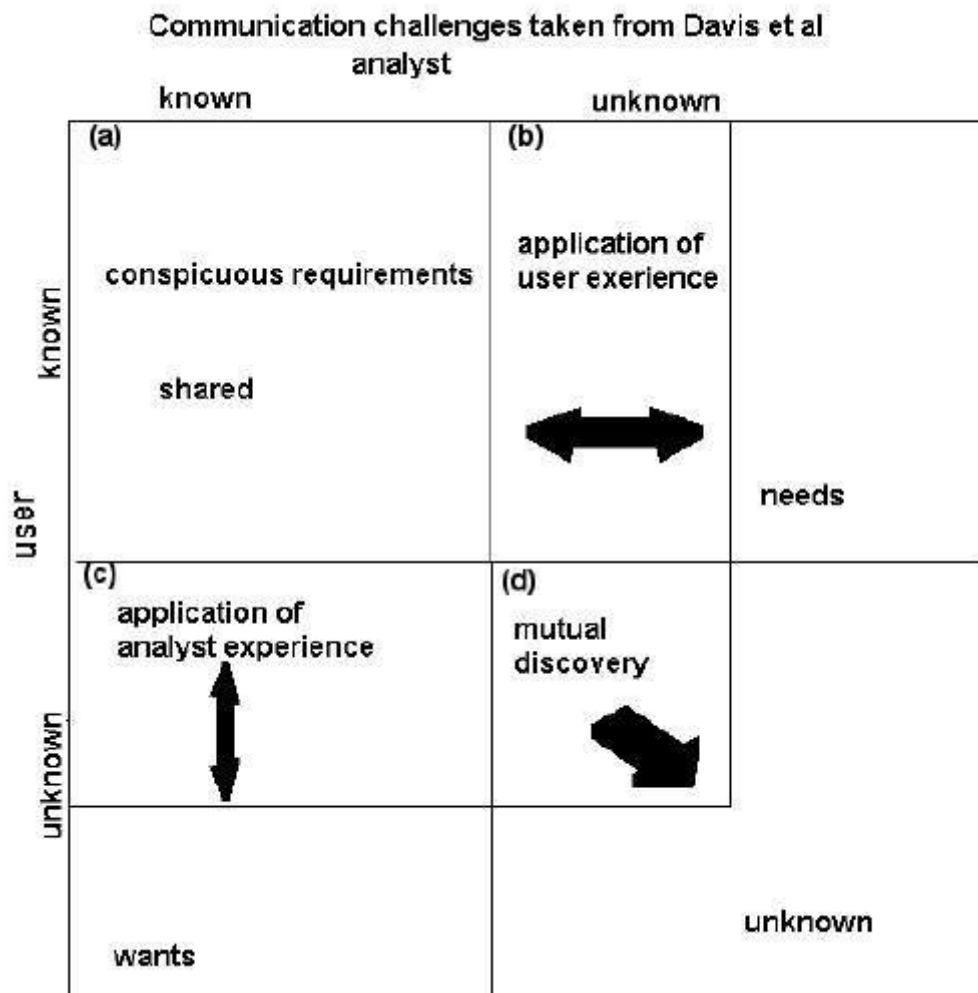


Figure 8: Four Quadrant Model of the Difficulties in Requirements Engineering [DC08]

The “quadrant (a) represents that knowledge that is common to both analyst and client.” [DC08] The size of this quadrant can be augmented, for example through the use of repeated interviews or other elicitation techniques. The quadrant (c) “represents that knowledge

that the analyst has that the client does not yet. This would include knowledge of the analyst product and skills as well as that knowledge gained from education and training." [DC08] The normal behaviour in the requirements elicitation process would be an analyst trying to teach part of this knowledge to the client. *"Quadrant (b) represents knowledge that the client has but the analyst does not."* [DC08] This includes the client knowledge about the business model that he wishes to view in the implemented system. The objective of the analyst is to learn this knowledge from the client. Finally, the *"quadrant (d) represents new knowledge that will be created from the interaction of client and analyst."* [DC08] This knowledge results from mutual discovery when the analyst asks questions. Normal behaviour would include the client understanding the analyst's questions and answering them. This interaction should result in mutual acquisition of knowledge on a specific subject. According to [DFTB06], the quadrant (d) should be supported by an analytical, communication tool.

Problems of Scope

"Elicitation techniques need to be broad enough to establish boundary conditions for the target system." [CK92] Even though, elicitation techniques should focus their attention in the creation of requirements in opposition to design activities. In projects, contextual issues are often neglected leading to deficient definition of requirements (e.g. incomplete, not verifiable, unnecessary, unusable, etcetera). On the other hand, excessive focus on design activities may result in over emphasis on developers' issues over the users' needs, which also can result in poor requirements. This way the process of requirements elicitation should issue both organizational and context analysis in order to identify the boundary and the objectives of the target system [CK92].

As already mentioned, elicitation strategies which aim is to produce requirements in the form of high-level designs have the associated risk of creating requirements that are considered ambiguous by users. These requirements may not be verifiable by users, as they do not understand the design language at use. Additionally, when requirements are expressed through the use of a design language, the tendency for them to incorporate additional decisions which not reflect user needs increase. In the end, requirements will not be precise and necessary.

According to [CK92], there are three broad contexts that affect the requirements engineering process: organization, environment and project.

First, the requirements elicitation process should have an understanding about the organization in which the target system will exist, as well as its mission in the organizational context. In practice, organizational context is often neglected and the requirements elicitation process focuses on the computer system. Organizational factors may include: *"submitters of input to the target system, users of the target system's output and ways in which the target system will change the organization's means of doing business."* [CK92] When the requirements elicitation process overlooks organizational factors it is normal to make a number of assumptions that will restrain the final system [MRRP90].

Environmental factors also have major influence on the process of requirements elicitation [MFKH90]. These include: *"hardware and software constraints imposed on a target system, the maturity of target system's domain and the certainty of the target system's interfaces to the larger system."* *"Environmental constraints are introduced because the system under development is rarely a stand-alone system but instead must interface with a larger system."* [CK92]

At last, the project context also affects the requirements engineering process. Main project factors include attributes from different stakeholder communities and the constraints imposed by the people involved in the elicitation process. Attributes from different stakeholders include: management style and hierarchy, domain experience and computer experience. The constraints imposed can be expressed in terms of: cost, time and quality, for example.

The understanding of these three broad contexts provides a stable starting point for the requirements elicitation process [CK92].

In conclusion and although in literature studies suggest that separation of requirements elicitation from design activities is a noble goal, this may be difficult to achieve in practice. According to [CK92], this separation allows the creation of complete and necessary requirements that fully cover stakeholders' needs. However, in practice, initial requirements are often incomplete, unnecessary, underspecified or over specified.

Problems of Understanding

A Savant Institute study found that *"56% of errors in installed systems were due to poor communication between user and analyst in defining requirements and that these types of errors were the most expensive to correct using up to 82% of available staff time."* [GO90]

During the requirements elicitation process, problems of understanding often lead to bad requirements (e.g. ambiguous, incomplete, inconsistent and incorrect), mainly because they do not address elicitation stakeholders' real needs. According to [CK92], problems of understanding can be divided into three categories. The first includes situations where the communities of stakeholders involved in the process of requirements elicitation have different backgrounds and experience levels. This could lead to different interpretations of the same subject, as well as increased difficulty to requirements analysts, which have to interpret and integrate the information gathered from the different communities. The second category is related to the language used to express requirements to the stakeholders. The language used could be too formal/ informal to meet the needs of different stakeholders' communities. Finally, the third category includes the difficulties that different communities of stakeholders have in understanding the way in which the information is structured.

To overcome these issues, the requirements should be expressed in order to: promote communication and understanding between customers and users, allow the development team to determine if an expressed requirement is susceptible of implementation and to let the quality team know the correspondence between requirements implemented and requirements specified. However, information gathering is not an easy task, and both system developers and users have limitations. For instance, system developers could not have the necessary knowledge for a specific domain, while system users *"may not know design methods for the development of systems with a significant software component. The customer may not understand what can be done to solve a given problem, nor have full appreciation for the difficulty in getting the analyst and developer to understand the problem in the customer's domain."* [CK92] Usually, the requirements elicitation process starts with informal knowledge and involves people with barely any knowledge at all of software systems. To avoid miscommunication due to knowledge differences between both analysts and customers, requirements are traditionally expressed using natural language text. Nevertheless, and as stated in [Milson89], using natural language text could lead to problems, such as ambiguity: *"The use of natural language to express requirements inhibits automated analysis and verification of requirements. Requirements specified using natural language can be misinterpreted."*

Traditionally, requirements are the product of many people from different communities expressing their needs. This multiple-input nature provided by the requirements elicitation process can result in problems related to redundancy of data, inconsistencies and viewpoint conflicts [CC89]. The process of requirements elicitation and analysis is inherently social. Techniques and methods that fail in dealing with this have a lower probability of gathering all the needed and relevant information [Leite87] [Deutsch88].

Problems of Volatility

“Requirements change. During the time it takes to develop a system the users’ needs may mature because of increased knowledge brought on by the development activities, or they may shift to a new set of needs because of unforeseen organizational or environmental pressures.” [CK92] If these changes are not followed, controlled and resolved, the original set of requirements will become incomplete and inconsistent with the new situation. One of the main causes that lead to requirements volatility is the users’ needs evolution over time [SP90]. For this reason it is important that requirements engineering process functions iteratively with activities of elicitation, specification and validation during system development. The latter is stated in [MFKH90], which defends that the requirements engineering methodologies should be iterative in nature, *“so that solutions can be reworked in the light of increased knowledge.”* Other main cause for requirements volatility is related to the social nature of the requirements elicitation process. As stated earlier (sub-chapter *Problems of Understanding*), requirements are the result of many individual contributions from different stakeholders. In practice, these individuals often present conflicts in terms of needs and goals. This way, in the requirements elicitation process, needs from one stakeholder can be overemphasized for a given reason (e.g. political climate factors) and then, later, the *“priorization of the elicitation communities’ needs may correct this oversight and result in requirements changes.”* [CK92] If not correctly anticipated, these changes could lead to inconsistency of requirements and problems related to its traceability. At last, organizational complexity could be another valid cause to explain requirements volatility. As the system development progresses, organizational aspects may change, directly affecting the system’s requirements.

According to [DBCS92], these kinds of problems can be addressed through an iterative process of requirements development. Nowadays, both requirements’ capture and design are symbiotic [CK92]. This means that the initial set of requirements is refined during the development and concurrently with design refinement.

3.1.5.4. Requirements Elicitation Framework

To deal with the problems presented above, [CM02] proposes a methodological approach for the process of requirements elicitation. This methodological approach is constructed and adapted from a classification scheme proposed in [RARS MJHPDH98]. *“This framework is advocated as a way of presenting a synthesis of the literature in these different areas for comprehensive discussion on a methodological approach to requirements elicitation.”* [CM02] This framework’s four dimensions are the ones illustrated in Figure 9: user participation and selection, user-designer interaction, communication activities and techniques.

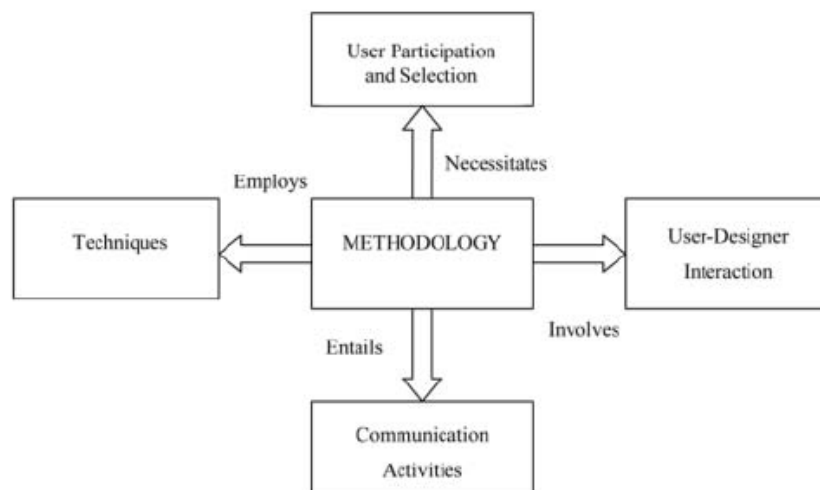


Figure 9: Four dimension view on a methodology [CM02]

User Participation and Selection

The existence of this dimension is explained since one of the requirements elicitation process's vital pre-requisites is involvement of a representative audience of stakeholders. In this manner, user participation and selection is defined *“as the early focus on user participation and selection of appropriate candidates, who are expected to participate in an active and direct manner (ideally) so as to establish workable communication links.”* [CM02] The main problem associated with the selection of a set of representatives is in identifying which users to involve and each one's difficulties in articulating requirements (users' knowledge that is relevant or necessary to the design of the target system). This knowledge is often divided in two major types [Polanyi66]: tacit and explicit. When it comes to requirements communication, explicit knowledge is easily expressed and articulated. Tacit knowledge is held by users, has great value to engineers and derives from the users' involvement with the world. A sentence that fully describes this kind of knowledge is: *“Knowing more than you can tell.”* [Polanyi66] This is the reason why tacit knowledge is so hard to elicit. The main objective and challenge in requirements elicitation is to gather and organize both tacit and explicit knowledge needed for the system's design and development.

There are other aspects that must be taken in consideration when selecting stakeholders' representatives. This way, the process of selection should involve users ranging from frequent to those who might be affected by the system, managers of high-low status that will have a role in ensuring implementation and acceptance of the system and people who are responsible for the design and development of the system, as well as for calculating the budget finance availability [CM02].

The process of *“user/stakeholder selection should be on the basis of domain knowledge that requirements engineers lack.”* [CM02] However, some *“studies have shown that representatives tend to be chosen on the basis of their position and status rather than their knowledge per se.”* [BRP98]

User-Designer Interaction

User-Designer interaction focuses on the different roles that might be assumed in this relationship, which is considered problematic by nature and characterised by a considerable cultural gap [CM02]. This happens because designers or requirements analysts lack on domain or business knowledge, resulting in misunderstanding or ignoring of some requirements, as well as their social context. On the other hand, users usually lack of knowledge in technical details that are needed to the specification and development of the target system.

Literature on requirements elicitation and requirements engineering identifies different models that explain the process of communication between users and designers/analysts. One of these models expands on the idea of problem-finding and interaction [KM93]. This model opposes to traditional models that are generally founded on the concept of *“transmission”*, that is, the interaction between user and requirements analyst only exists as a manner of obtaining information to be passed to the next phase of design. Instead, this model is based on the concept of interaction. Other studies, such as [BH95] address this relationship *“as one enabling learning.”* [CM02] Consequently, the proposed model treats the designer/analyst as an apprentice. This perspective includes taking users and treating them as experts in their work. This way, designers/analysts can learn from users' experience. This model is claimed to foster very satisfactory levels of understanding and connection between requirements analysts and users.

Nevertheless, the models presented in this sub-chapter imply cooperation from every party involved in order to promote effective communication and success in allowing knowledge share and gathering of requirements [CM02].

Communication Activities

In [HB01], “*communication activities*” are identified as an important dimension of users’ participation in the system development process. According to it, they are defined as “*activities involving formal or informal information exchange between stakeholders in a project.*” [CM02] When referring to the requirements elicitation process, any activities are defined as communication activities. The only additional aspect to considerate is the way in which these activities are structured to promote effective communication. Basically, reliable communication of requirements implies shared understanding, “*which can only occur through cooperation and negotiation.*” [CM02]

In accordance to [WEC93], communication activities are characterised by the following behaviours:

- Knowledge Acquisition: This behaviour involves links that should be made between user’s and designer’s realms of knowledge and experience and of the technological options. The objective of these is to attain a shared understanding and common vision of the target system.
- Knowledge Negotiation: This behaviour involves negotiation of requirements as a part of the iterative process of requirements engineering. This would help to define requirements according to the understanding of each one of the stakeholders involved.
- User Acceptance: This behaviour includes integration of both user and analyst viewpoints, plus cooperation in understanding the scope of the system.

According to [CM02], real problems derive from disregarding users in the design process. Communication with these individuals is crucial, because they are the ultimate users of the system. Ignoring users means ignoring valuable requirements for the target system. The basis of interaction between engineers and users should be cooperative and both should have equal input in the process of identification and specification of requirements. This type of interaction may lead to “*sense of ownership and keep abreast of changes that take place in the system.*” [CM02]

Communication activities provide structure, but they cannot be seen without their “*relation to the techniques that are used as mediators for communication.*” [CM02] Techniques that are typically used in the process of requirements elicitation are presented in the next sub-chapter.

3.1.5.5. Techniques for Requirements Elicitation

Techniques used in the requirements elicitation process have huge importance, because they provide a variety of useful ways that facilitate communication. In [KC95], these techniques are described as links between customer and developer that allow information exchange. “*In essence, an elicitation technique can be defined as a method for mediating communication.*” [CM02] Nuseibeh and Easterbrook [NE00] describe six broad classes of elicitation techniques for requirements of systems:

- Traditional;
- Group;
- Prototyping;
- Model-driven;
- Cognitive;
- Contextual;

As it is fairly stated in the next sub-chapter, some techniques are most suited for some situations when compared to others, depending on the context. The CMMI Development Guide

[CMMI06] proposes some examples of techniques that could be used to elicit needs. This list of examples includes: technology demonstrations, interface control working groups, technical control working groups, interim project reviews, questionnaires, interviews, operational scenarios, task analysis, operational walkthroughs, prototypes, models, brainstorming, *QFD*, market surveys, beta testing, document review, observation, use cases, business events, reverse engineering (for legacy products) and customer satisfaction surveys. As a sub-practice of the specific practice 1.1. *Elicit Needs*, the CMMI Development Guide [CMMI06] also proposes that relevant stakeholders should be engaged through the usage of methods for eliciting needs, expectations, constraints, and external interfaces.

This sub-chapter presents some of the most popular methods and techniques for requirements elicitation. These are properly divided according to the six broad classes of elicitation techniques for requirements described above (it is important to notice that the methods and techniques presented in this Chapter could also be applied to other requirements activities). This sub-chapter only describes one technique for each one of the six broad classes. The remaining techniques can be consulted in Appendix A.

- Traditional
 - Questionnaires
 - Interviews
 - Mind Mapping
 - Neurolinguistic Programming
 - Document Review
 - Contextual Inquiry
 - Introspecting
- Group
 - Brainstorming
 - Group work & Meetings
 - Focus Groups
 - JAD
 - Group work and meetings
 - Group support systems
 - Abstraction
 - Family Therapy
- Prototyping
 - Prototyping
- Model-driven
 - Scenarios
 - Scenario-based Requirements Engineering – *SCRAM*
 - Storyboarding
 - Business Events
 - Quality Function Deployment – *QFD*
 - *Volere* Requirements Resources
 - Viewpoint-Oriented Methods
 - Controlled Requirements Expression – *CORE*
 - Viewpoint-Oriented Requirements Definition – *VORD*
 - Viewpoint-Oriented System Engineering – *VOSE*
 - User-Led Requirements Construction - *ULRC*
 - Requirements Reuse
 - *REVEAL*
- Cognitive
 - Observation
 - Mind Mapping
 - Neurolinguistic Programming
 - Card Sorting
 - Laddering

- Repertory Grids
- Contextual
 - Observation
 - Apprenticing
 - Soft System Methodology – SSM

Traditional - Questionnaires and Surveys

Questionnaires are used in early stages of requirements elicitation. Questionnaires imply common understanding of terms, concepts and boundaries of the system by all parties involved in the process. Questions must be focused and must aim at getting the essential, avoiding redundant information. They are a great way for collecting information from different stakeholder sources, but they are limited in terms of the depth of the knowledge gathered. Additionally, they do not provide a way for participants to expand ideas, to request clarification or to correct misunderstandings. Most questionnaires also involve some kind of reward system, with the aim of stimulating people to participate [MS03].

Questionnaires allow for early pre-definition of questions with the possibility of question pattern creation. Additionally, questionnaires could be used in order to take statistical conclusions. On the other hand, and due to their nature, questionnaires minimize interaction and the range of final answers is very restrained. According to [LW00] a questionnaire cannot be substituted by an interview process, mainly because there is no substitute for personal contact and the free-form interaction of an interview. However, this not means that questionnaires are useless. They are actually powerful tools to gather user needs, for instance, when applied as an additional technique after an interviewing or analysis activity [Reinikainen01]. Additionally, and for example, in cases where statistical input is important due to the large number of existing or potential users, questionnaires and surveys are valid and very effective tools.

Group - Brainstorming

Brainstorming is a group technique which objective is to generate new useful ideas through promotion of creative thinking. Its main objective is to gather a large number of ideas in a short period of time. In RE, brainstorming is usually utilized to discover unidentified requirements and for requirements elicitation from stakeholders [PHKTT03]. This technique takes advantage of the group effect, getting together a group of people willing to collaborate creatively with ideas. No matter how crazy these generated ideas are, they are all welcome, and the objective is to be as imaginative as possible. After validation from the client, the most useful ideas may become requirements [Reinikainen01]. This technique is described further in this document in the context of creativity techniques for requirements identification (sub-chapter 3.2. *Requirements Identification in Creative Context*).

Prototyping - Prototypes

Prototypes are quick and inexpensive forms of creating a version of the system, so stakeholders are given the chance to have a more intuitive perspective about the final system. They are usually build on early stages of the development process, and can be used to help elicit and analyse requirements. Prototypes are often built using preliminary requirements or existing examples of similar systems. There are diverse prototyping techniques, but they are categorized into two main classes: throwaway prototyping and evolutionary prototyping. According to [KS98], the difference between these is that, throwaway prototypes are disposable and built for elicit and analyse requirements that are hard for the customers to understand, while evolutionary prototypes are workable system prototypes with limited functionality available to users in early stages. This type of prototypes should be extended in an evolutionary way throughout the project in order to produce the final system [PHKTT03]. This technique is particularly popular

and effective when constructing human-computer interfaces or when stakeholders are not very familiar with available solutions in a given area. Prototypes encourage stakeholders to have a more proactive attitude in the requirements statement elaboration and they are considered to be extremely helpful in the development of entirely new applications [MS03]. In requirements software engineering, prototypes are often used to help elicit and validate system requirements [Reinikainen01]. In the software development process, prototypes allow end-users and customers to experiment with the software in early stages [KS97]. This is considered to be a huge advantage since users often have difficulties in *“visualizing how a written statement of requirements will translate into an executable software system.”* [Reinikainen01] This process also helps users in finding errors or making suggestions of how the system should really work. This technique has been used for elicitation where there is a great deal of uncertainty about requirements or when early feedback from stakeholders is needed [Reinikainen01]. Prototyping can also be combined with other techniques and, according to [KS97] *“most organisations have found that taking the time to develop a system prototype is worthwhile. Although initial development costs are higher, the requirements are more likely to reflect the real needs of the customer. There is less need for requirements rework after the system has gone into service.”* [Reinikainen01]

Model-driven - Scenarios

This technique is explained in more detail than the others described in this Chapter, because this is the requirements elicitation technique chosen to be used in the elicitation of creative requirements for the *Cardmobili*'s social network site.

“Scenarios are examples of interaction sessions, and consist of descriptions of sequential actions.” [PHKTT03] According to [Glinz00], scenarios are a new way of representing requirements. *“Scenarios describe a system from a user’s perspective, focusing on user-system interaction.”* [Glinz00] Wexelblat [Wexelblat87] states that scenarios can be thought out as *“stories that illustrate how a perceived system will satisfy a user’s needs.”* [Holbrook90] So, a scenario is an ordered set of interactions between partners. Usually, these interactions occur between a system and a set of actors that are external to it. Scenario representations could have a sequence of interaction steps (instance scenario) or a set of possible interaction steps (type scenario). Scenarios are usually considered as one of the easiest ways to understand a system’s functionality. As Crowley observed, *“through stories we are able to have events brought before our minds..., since they constitute a nearly universal form for the organization and dissemination of experience, they are an important means for creating social meaning and a shared sense of participation.”* [Crowley82] In fact, stakeholders find it easier to relate real-life examples in opposition to abstract descriptions of the functions. In this way, scenarios are clearly an efficient way for eliciting and clarifying system requirements. As a final point, scenarios have great potential to help solving many requirements problems in the software industry, providing users and other stakeholders with the ability to easily describe the way they do their work and to ease the process of requirements discovery and alternative solutions [HDN99].

This technique necessarily includes: entering/completing the scenario state, normal flow of events and eventual exceptions and possible concurrently ongoing things. When applying this technique and *“when end-user simulates the use of the system by following the scenarios the engineer does memos of user’s comments, problems and suggestions at the same time.”* [KS98] [SS97]

According to [MH97], there are three different ways how to generate scenarios by the analyst: elicit them in the context of a small group or interview, discussion and analysis of video taped events in the workplace environment and through document review and analysis. Usually, scenarios are recorded in a *“visual/verbal format, with narrative text and graphics depicting activities within each segment of the scenario.”* [Reinikainen01] Scenarios can be used to highlight more in-depth information about work processes, tasks and other aspects. Scenarios

are considered to be very flexible, because they are presented in various forms: text, pictures or diagrams. These can be structured in: dialogs or narrative descriptions [Holbrook90].

The scenarios technique provides different advantages and benefits. One of its most important advantages is to provide a view of the system from the end user's viewpoint. This is particularly relevant when validating requirements and its adequacy to a given problem. In comparison to other requirements elicitation traditional methods, scenarios provide users with a feel about what they will get when the development of the target system seizes. When using scenarios, engineers have the possibility of decomposing the system into functions from the user's perspective. This allows them to treat each function separately. As mentioned above, the scenarios' technique simplifies both processes of elicitation and validation, because of its straightforward and easy way to present requirements. This particular aspect eases the process of understanding and discussing requirements with stakeholders. Other advantage in using scenarios is related to the fact that, this technique allows requirements engineers to have early and constant access to short feedback cycles from users throughout the whole software development cycle. At last, this technique is often used as an ideal base for system testing. In fact, Ryser and Glinz [RG99] state that test cases can be derived from the scenarios improving the verifiability of requirements [Glinz00]. According to [Glinz00], using scenarios for requirements specification could have a strong positive impact on requirements qualities (e.g. adequacy, partial completeness, modifiability and verifiability). In effect, *"scenarios situate requirements in the environment where a system will be used and describe them in a user-oriented way."* [Glinz00]

There are other techniques that are similar to scenarios by the fact that they also describe the series of actions and events the system and users perform during operation. The only difference is in terms of focus and usage. For instance, task analysis methods perform a *"top-down approach where high-level tasks are decomposed into subtasks until all actions and events are detailed."* [MS03] Other examples are the use cases, in which its diagrammatic and tabular representations facilitate understanding of context-specific information [Cockburn01].

Scenarios, task analysis and use cases are particularly effective in projects that have high-level of uncertainty or when the analyst is not an expert in that particular domain. The drawback in using the above mentioned techniques is related to the fact that they imply a great amount of effort in detailing steps and sequences for all possible process combinations [MS03]. Other prominent problem when using scenarios in the requirements elicitation process is: *"when to stop the requirements elicitation process using scenarios?"* Generally, scenario developers do not have difficulties *"in writing down the most obvious or nominal scenarios that capture a system's core functional use cases or most important interactions."* [WK04] Additionally, nominal scenarios are often enough to trigger communication and discussion between designers and stakeholders. However, the problem lies on eliciting non-nominal scenarios, which are those that *"represent alternative, exceptional, similar or simply less likely scenarios."* [WK04] A set of nominal and non-nominal scenarios offers a more complete description of a system, and some studies are based on using nominal scenarios to generate non-nominal scenarios [WK04]. Other problem with scenarios is that they are instances (e.g. specific examples of behaviour), which means that reusing scenario based knowledge is difficult [SMMM98]. In addition, is a known fact that scenarios are unlikely to be complete. Basically, an infinite number of scenarios are possible in the presence of loops [Stéphane05].

Scenarios: Definition

Scenarios are partial descriptions, because they do not need to specify all states or state attributes of a given behaviour. Scenarios are especially effective in showing only the bits that are really relevant to the case. For instance, it is possible to use a scenario to describe a car moving through a road intersection without mentioning details, such as the number of people in the car or the description of buildings surrounding it. This way is possible to focus on the

relevant details of the behaviour, which in this case would be, for example, the intersection lights' colour [BFJZ93].

According to [BFJZ93], scenarios are formed by two parts: behaviour and situation. These are expressed using the same constructs, but they differ in their focus' purpose. A scenario could be used to describe the behaviour expected in a given situation, or the situation in which a given behaviour is expected to occur. Both are partial ordering of states and transitions. Ordering between states and composition of partially ordered states are specified by the follow relations [Johson86]: *sequentiality* (e.g. one state/behaviour must follow another), *partial* and *total concurrency* (e.g. two events must take place at the same time), *repetition*, *permutation*, *inclusive*, *exclusive* (e.g. event1 or event2 but not both), *negation* (e.g. event3 is not to occur), etcetera. Again, the behaviour of the car moving through the intersection could be described as a sequence of states: car in front of the intersection, car inside the intersection and car beyond the intersection. As an alternative to the sequence of states, the sequence of transitions: car approaches the intersection, car enters the intersection and car is to south of the intersection. These alternatives allow the communicator to describe the same partial behaviour focusing on different attributes of the system and environment. Another aspect of behaviours is the rationale of the scenario. The formulation of rationale is accomplished using relations between states and transitions: *triggering*, *enabling* and *restraining*. These provide further detail to the behaviour. For example, when approaching the intersection the car is only supposed to enter it when the green light is on. There are both enabling (e.g. green light) and restraining (e.g. red light) conditions that affect this specific behaviour.

Determining what is important to a specific scenario includes setting its abstraction level. This means that is important to express scenarios in concrete terms, although with different levels of abstraction. Regarding the example of the car moving, the concept of intersection is a generic instance of an intersection which is used instead of some specific intersection. However, if some distinctive aspects of a given intersection are needed, then the more specific instance could be used [BFJZ93]. Abstraction is an option that one has when using scenarios, but they should not be too abstract or general, because important factors of the situation could be missed. Also it is difficult to know a priori which factors have impact on a scenario.

Scenarios: Approaches

The systematic representation of scenarios has been studied in literature according to different perspectives. These perspectives contemplate both representation of a single scenario and the structuring of a set of scenarios [Glinz00]. For instance, scenarios represented through use cases are addressed and proposed in different studies [Jacobson92] [RAB96] [Cockburn97]. Scenarios have been also adopted in object-oriented methods as projected visions of interaction with the designed system [Cockburn95] [Graham96] [JCJO92]. With this approach, scenarios are defined as paths of interaction which may occur in a given use case. Additionally, there are other interpretations of scenarios that range from description of system usage to help understand socio-technical systems [Kyng95] and experience based narratives for requirements elicitation and validation [PTA94] [Sutcliffe97]. Scenarios are being used both in human-computer interaction and software engineering communities throughout all phases of development, including requirements elicitation [BFJZ93] [HSGK94] [PTA94] [LRBMKH97] [WPJH98].

UML is one of the approaches when representing a single scenario. Usually using UML involves plain narrative text, especially when scenarios are elicited. This type of scenarios is particularly adequate for writing and reading. On the other hand, plain narrative text scenarios are said to face serious quality problems (e.g. imprecision) [Glinz00]. This happens because they do not present a clear sequence of actions, exceptional cases are often unspecified and there is no clear distinction between user actions and system responses. The latter does not permit engineers and stakeholders to have a clear distinction between system and environment. Cockburn [Cockburn97] proposed a step-by-step description specified in natural language. This

approach includes specification of scenarios with normal and alternative flows, its steps and the users involved. Other studies propose both semi-formal and formal representations. Examples include: flow diagrams [Firesmith94], state charts [Glinz95] and regular languages [HSGK94]. As mentioned before, the Cockburn's style provides clear distinction between normal cases from exceptional ones, but non-linear flow of actions are not treated in a systematic way. Semi-formal and formal representations can provide very precise descriptions however this only could be accomplished at the expense of readability and effort to write the scenarios. These approaches' advantage relies on the ability to structure a set of scenarios.

UML and related approaches do not provide a *“reasonable concept for structuring the scenarios that together form a requirements specification.”* [Glinz00] UML use case diagrams provide two kinds of structures: (1) a model of the relationships between both scenarios/use cases and their associated actors and (2) relations between scenarios (e.g. <<include>>, <<extend>> and <<generalize>>). This way, UML does not provide hierarchical structure or even simple sequential composition [Glinz00].

[Glinz00] presents *“a style for the representation of scenarios that combines a state chart-based structure of the set of scenarios with a structured textual representation of single scenarios.”* According to it, the representation of single scenarios is characterized by: clear separation of actions from a user and responses of the system, existence of structuring constructs (e.g. if, go to step and terminate) and a straightforward way of transforming this representation to a state chart. This representation allows joining the readability of natural language and the precision and rigor of state charts.

When the matter in cause is structuring a set of scenarios, state charts are often the choice. They provide *“powerful mechanisms for structuring and abstraction”* [Glinz00], which is precisely what is needed for systematic organization of a set of scenarios. Structuring mechanisms allow for expressing relations between scenarios (e.g. scenario A is followed by scenario B). Abstraction allows for the usage of scenarios both at high or detailed level, as well as to relate them with each other. In this context arises a clear distinction between different types of scenarios: elementary scenarios and composite and abstract scenarios. Elementary scenarios are specified textually. *“In composition structures, the elementary scenarios are represented as simple states.”* [Glinz00] Composite and abstract scenarios are represented as state charts. Each state chart representing a scenario has exactly one start state and one exit state.

Wexelblat investigated the general application of scenarios as a behavioural form of specification for systems [Wexelblat87]. In his opinion, scenarios are a natural and informal way to describe and communicate requirements both for users and designers. He states that *“it is clear that the effort required to converse via scenarios will be more than repaid by drastically lowering the cost of failed prototypes.”* [Wexelblat87]

Scenario-Based Requirements Engineering

The driving methodology for Scenario-Based Requirements Engineering is scenario analysis and its main goal is to complement goal modelling. This approach allows for turning abstract intentions clearer to all stakeholders by providing examples of how the system will work in certain situations (attain users' goals). Example methodologies are, for instance *SCRAM* and *SceneIC* (presented in sub-chapter *Scenario Requirements Analysis Method - SCRAM* and in sub-chapter *SceneIC Method*). Misra [MKK05] summarizes Scenario-Based Requirements Engineering steps as such: *“domain familiarization and initial requirements capture, storyboarding and design visioning, requirements exploration, prototyping and requirements validation.”*

This methodology for requirements engineering is often compared to Goal-Oriented Requirements Engineering. For example, GORE's purpose is to focus on abstraction that

describes the intentions of users, mainly through use cases. This is considered to be a less complex methodology than SBREngineering, because it requires less use cases than scenarios in scenario-based RE and the time spent on analysis is lower. However scenario-based RE provides scenario examples, less complexity in details, easier validation and the possibility of models/specification testing [MKK05].

Scenario Requirements Analysis Method - SCRAM

“Develop requirements (whole RE) using scenarios. The scenarios are created to represent paths of possible behaviour through use cases, and these are then investigated to develop requirements.” [MS03]

In SCRAM, *“scenarios are used with early prototypes to elicit requirements in reaction to a preliminary design. This approach is based on the hypothesis that technique integration provides the best avenue for improving RE and that active engagement of users in trying out designs is the best way to get effective feedback for requirements validation.”* [Sutcliffe98] SCRAM is a method that combines use cases approaches with object-oriented development. The SCRAM method is based on four techniques for requirements capture and validation [SR98]. According to [SR98], the SCRAM method uses prototypes or concept demonstrators, scenarios, design rationale and whiteboard summary of requirements. The SCRAM method is characterized by an analysis session, which objective is to encourage participants to collaboratively build requirements. Sutcliffe and Ryan [SR98] state that this requirements capture session should be performed *“between two, possibly three, users and two requirements engineers.”* This way, one engineer acts as the operator of the concept demonstrator and the other is responsible for explanations. The presence of two users helps in avoiding total control from engineers and to produce conversation. Typically, a SCRAM session is constituted by three main stages. The first stage is envisioned to relax the users involved and to enlighten them about the specificities of the session and the problem at hand. The second stage is based in a structured process of demonstration of the concept by scenario run through (storyboarding). During key points in this scenario run through, probe questions are asked and the design rationale is given. At last, in the third stage, the engineers summarize the session by writing key facts learned in a white board and ask for comments to the other participants. After this session, video, data and audio are analysed accompanied by notes that were taken during the session. To solve problems related to bias towards the option implemented in the demonstrator is usual to use storyboards of the other options [SR98]. According to [Sutcliffe03], the SCRAM method, similarly to other requirements elicitation methods, encounters several problems. Particularly, when collecting a set of scenarios: (1) users tend to miss steps that they think analysts are well aware, (2) it is possible to have a group of common problems from users with different view points, (3) complete coverage of the system can be very demanding in terms of work and (4) it is normal that stakeholders exaggerate problems and forget unusual examples [MKK05].

This method supports RE activities from requirements gathering, passing through requirements documentation and finishing with requirements validation [PHKTT03].

Storyboards

It is a common practice to create storyboards from a sub-set of usage scenarios gathered during the stage one of the SCRAM method. This technique is specially popular and used in the human-computer interaction area to demonstrate the target system interaction interfaces and its functionalities. *“Storyboards are mock up screens that show key steps in user system interaction.”* [Sutcliffe93] So, storyboards derive from generated scenario scripts. Basically, the analyst runs through the *“storyboard explaining what happens in each stage in terms of system functionality, and asks for the user’s opinion.”* [Sutcliffe03]

This technique involves the use of: textual elements, users, different degrees of detail and levels of abstraction, number of boards and timeline.

Storyboards have some drawbacks. For example, they provide poor interactivity, when they are asked to simulate possible actions that they would carry out, but mimics of the system response are very difficult. On the other hand, similarly to scenarios, storyboards also encourage user involvement in design. This could lead to improvement and refinement actions towards different functionalities.

SceneIC Method

The *SceneIC* method was proposed by Potts [Potts99] and is composed of “*goals, obstacles, objectives, tasks and actors.*” [MKK05] Scenarios are composed of episodes and actions. Actors can be people or machines. Goals could be (1) achieving states, (2) maintaining states or (3) avoiding states. Obstacles inhibit the successful completion of tasks. A cycle of scenarios is expressed in a semi-structured format. Each cycle involves a phase which objective is to criticize, other for inspection of scenarios which should lead to refinement and other for specification of requirements.

This method offers a set of guidelines to help formatting scenario narratives and to identify goals, actions and obstacles. Usually, episodes are evaluated by recurring to challenges to assert if goals are attainable with the help of system tasks. However, assurance that the system will meet its requirements implies examination of dependencies in this way “*among goals, tasks, resources and the actors.*” [MKK05]

Inquiry Cycle of Potts

The Inquiry Cycle Model, also known as Inquiry Cycle of Potts supports the process of requirements identification through “*a form structure for describing discussions about requirements. The model follows analysis activities from requirements elicitation and documentation through refinement.*” [PTA94] One of the main premises in which the Inquiry Cycle Model is based on is the study of requirements practices that suggest that major problems on project teams are related to communication and agreement about requirements, as well as in change management activities [LPR93].

According to the description presented in [PTA94], the users of the Inquiry Cycle Model are called stakeholders. “*A stakeholder is anyone who can share information about the system, its implementation constraints, or the problem domain.*” [PTA94] The adoption of this general term to identify people involved is explained by the fact that this model is intended to serve market-driven projects for which there may be no customer authority.

This model is constituted by three main phases: requirements documentation, requirements discussion and requirements evolution. After the brief explanation of each phase, it is important to mention that the Inquiry Cycle Model is a hypertext model, because information pieces used in the process are recorded and exchanged in textual and interrelated form. In the requirements documentation phase, stakeholders write proposed requirements (each requirement is a separate node in the hypertext). There are several ways to enact this phase, however one of the most valuable consists in reviewing documents, such as scenario documents. This process of documentation could be done in different ways, such as use cases or scripts/action table (e.g. tables or diagrams). In the requirements discussion phase, the stakeholders challenge proposed requirements through annotations. This phase is typically made of three elements: questions, answers and rationale. Once more, the use of scenarios often encourages stakeholders to pose “*what-if*” questions when challenging tentative requirements. In the requirements evolution, stakeholders are supposed to attach requirements requests for change to each requirement in discussion. The requirements evolution phase should lead to requirements refinement once the change is settled [PTA94].

The Inquiry Cycle of Potts is not a rigid process model and it is not meant to be followed strictly. This model can be adapted to each situation. For example, a given requirement could be changed with little or no discussion at all and choice may lack of rationale if considered obvious by stakeholders. This model uses scenarios to identify obstacles or problems in requirements analysis, but it is not a detailed guide of how to discover problems through requirements. In fact, this task is assigned to human judgement [HDN99].

Scenario Based Requirements Elicitation - SBRE

According to [Brooks87], *“the most important function that the software builder performs for the client is the iterative extraction and refinement of the product requirements.”*

In this context, SBRE is a methodology which objective is to structure the early interaction between users and designers in order to develop a set of initial requirements. This methodology uses scenarios to communicate the behaviour of a given design specification. SBRE is specially suited for highly uncertain situations by providing an *“effective and relatively inexpensive way to develop an initial set of requirements from which evolutionary prototypes may be developed.”* [Holbrook90]

SBRE is specially envisioned to perform requirements elicitation based on the use of scenarios as means of communication between designers and users. The conceptual architecture of SBRE *“is comprised of four sets of information that are captured and manipulated during the requirements elicitation process.”* [Holbrook90] These four sets are named: goal, scenario, design and issue sets. This architecture could be used at any point of the requirements elicitation process to reflect the current information related to the target system. *“More specifically, the goal set represents the plan (or plans) to meet the requirements, and the scenario set illustrates how a design achieves the goals. The issue set regulates the process by providing a mechanism for recording and organizing the issues that arise in the requirements elicitation process.”* [Holbrook90]

The set of scenarios represents the designer’s vision of how the target system will be when implemented and how it will accomplish the objectives defined within the goal set.

Scenarios in Collaborative Software Engineering Methodology

Scenarios are used in CSEM mainly for supporting collaborative requirements elicitation. *“The goal is to use scenarios to support an evolutionary process that starts with rich descriptions of business processes, and then evolves those contextual scenarios into specific system use cases, prototypes, and finally into behavioural requirements specifications.”* [HDN99] This whole evolutionary process includes: individual user scenario definition, group refinement of scenarios, development team analysis, implementation, group review and feedback until final agreement on behavioural requirements. Scenarios evolution on the CSEM requirements elicitation process pursues the following steps [HDN99]:

1. Parallel development of rich contextual business scenarios that describe current work processes for each of the business activities with automation potential identified during high-level business activity model.
2. Group convergence to a common definition of business processes. This task undergoes iterative refinement of the contextual scenario descriptions. Scenarios are usually utilized to achieve group consensus [WPJH98].
3. Usage of scenarios and data modelling *“to assess how recommended data integration changes the business scenarios”*.
4. Analysis of the system through the interaction with user representatives to define alternative interaction scenarios and use cases.

5. Development of prototypes based on the generated use cases. Business scenarios are used to prototype evaluation.

CREWS-L'Ecritoire Approach

This approach explores “*bi-directional coupling between goals and scenarios to support the requirements elicitation process [RSA98].*” [TAV99]

The bi-directional coupling means: “*when a goal is discovered, the approach proposes to author a scenario to illustrate it (forward direction).*” [TAV99] On the other hand, “*the approach proposes to analyse every scenario to yield new goals (backward direction).*” [TAV99]

The CREWS-L'Ecritoire requirements elicitation process has the following exact sequence of steps:

1. Initial Goal Identification.
2. Repeat Goal Analysis.
3. Scenario Authoring.
4. Goal Discovery.

until all goals have been elicited.

This approach has been detailed [RA97] [RSA98] [Achour98] [Achour99], its process was modelled [SaïdR98] [RB99], it was implemented in a software prototype [TS99] and the scenario guidelines were evaluated [ARMS99]. The CREW-L'Ecritoire approach also provides a set of hypothesis and respective outcomes when following the tools provided by it.

Cognitive - Observation

This technique is based on the requirements engineer observation of stakeholders in the field, interacting with the system. This should result in the requirements engineer learning about user's tasks and needs [KS98] [PHKTT03]. “*Observing methods use techniques that may help to understand the thoughts and needs of the users, even when they cannot describe these needs or they do not exactly know what they want.*” [MS03]

A popular example of observation techniques is Ethnography [Suchman83]. *Ethnography* is a genre of writing that uses field work to provide a descriptive study of human societies, presenting results of a holistic research method which was founded on the idea that a system's properties cannot be accurately understood independently from each other. This technique is based on the observation of users in real-life or simulated operating situations. Ethnography is used to evaluate strengths and weaknesses of an existing system, in order to capture design requirements for the system under development. This technique is usually utilized in the identification of system interfaces, but its main objective focus on requirements gathering [PHKTT03]. Ethnography is known for creating an inside-out vision and context, but is usually considered as a high cost and low systematization technique.

Other example of a popular observation method is Protocol Analysis. Protocol Analysis [ES93] is a rigorous methodology for eliciting verbal reports of thought sequences as a valid source of data thinking. “*Protocol analysis asks a subject to engage in some task and concurrently talk aloud, explaining his/her thought process.*” [GL83] This observation method is based on the GPS (General Problem Solver), which was originally developed for problem solving in artificial intelligence [GL83] [ES84]. This methodology emerged as one of the principal methods for studying thinking in Cognitive Psychology [Crutcher94], Cognitive Science [SK89] and Behaviour Analysis [AD98]. Nowadays, *Protocol Analysis* plays a central role in the design of surveys and interviews. Used for forming an understanding of user's thought patterns when performing a given task, this technique “*explains their thought*

processes, while an observer records the verbal data. After the session the verbal data is analysed, and the real thought process can be compared to the system's process." [MS03] In RE, this technique is clearly used and suited for gathering requirements from users.

Usually, observation techniques require low costs and are considered to be low-complexity tasks. On the other hand, they are directly affected by the capacity of the person observing and by the fact that users have minimum exposure to informational data.

Contextual - Apprenticing

"Apprenticing uses the idea of a master craftsman and an apprentice. The apprentice observes what the master does, asks questions and then tries to learn the work by doing some of it." [Robertson01] In RE, the requirements engineer plays the part of the apprentice by learning the work of the stakeholder well enough to be in a comfortable position to ask relevant questions and make useful suggestions. Apprenticing is best suited in situations where stakeholders manifest their lack of time to be involved in the project. With this technique, the requirements analyst will involve itself in the stakeholder's work. This technique is also considered to be effective when the stakeholders are not capable of expressing their goals or have the necessary knowledge just to a limited part of the system [Robertson01].

3.1.5.6. Requirements Gathering/Elicitation Models

The process of requirements elicitation is influenced by a number of different factors, and there is no technique or method that applies to all situations. This way, it is important to study which models are most effective depending on environment characteristics.

Viewpoints

Viewpoint models divide a domain from different perspectives, so as to generate a complete and correlated description of the target system. These models are particularly effective for projects in which system entities are especially detailed and possess complex relations with each other. In opposition, these models are often criticized for their inability to represent non-functional requirements and by the fact that they are usually expensive in terms of required effort.

There are different approaches to viewpoint models presented in literature [NFK96] [SSV98] that provide *"a multiple-perspective model for systems, using different viewpoints to elicit and arrange requirements from a number of sources."* [MS03]

Goal-Based

These kinds of models have been gaining increasing popularity amongst researchers and practitioners in the requirements elicitation field area. Goal-based models focus on high-level goals representing objectives for the target system and decomposing them into sub-goals developed from their individual requirements. The advantage of these models is that they provide detailed representation of relationships between system entities and requirements. On the other hand, there is always the risk that erroneous early generated high-level goals have major effect in the target system. Goal-based models are particularly suited for cases where only the high-level requirements and needs for the system are well known.

In literature, there are some studies related to these types of models for requirements elicitation [DLF93] [Yu97]. Additionally, there has also been studies related to the use of goals in collaboration with scenarios to elicit requirements [HPW98] [PTA94].

Domain-Based

Approaches based on this type of domain knowledge in the form of guidelines are usually used with other elicitation techniques. Requirements analysts use previous similar experience in similar domains to perform those techniques. Analogies are often used to find and identify possible solutions. This way, it is usual to reuse specifications and validate new requirements against other domain instances [SN98].

Combinational Approaches

It is a general assumption that the combination of complementary diverse elicitation techniques could help in avoiding or minimizing some issues that are often associated with this process. The process of choosing the methods and the techniques to combine has been studied from the perspective of *“developing and validating a set of tentative relationships between the characteristics of a project and the methods to be used as a guideline for selecting technique combinations [HD03] [MR96].”* [MS03]

3.1.5.7. Conclusions about the Requirements Engineering Process

Requirements Engineering for socio-technical systems has a considerable degree of complexity and includes a vast number of viewpoints, roles, responsibilities and objectives. This Chapter focused on the Requirements Engineering process as a whole, but with special emphasis on the requirements elicitation phase and existent methods and techniques.

Requirements Engineering is an important phase of the process of system development, as RE is considered the process with stronger impact on the end product. In fact, literature suggests that companies should increase the time and effort spend on the RE process in industrial environment, particularly on the requirements elicitation phase.

Requirements Engineering aims at achieving different purpose objectives throughout project development [Young03]. For example, one of the RE's objectives is to provide customers with the assurance and acknowledge that the final system meets their expectations. Other examples include: task and project requirements completeness and control in order to ensure a stable basis for project development and systems. In addition, software development projects incur in less than 15% unplanned rework and less than 10% wasted resources [Young03].

Some organizations, projects and tasks perform at high levels of process maturity, as measured by industry standards, such as the *CMM*, *CMMI* and *Six Sigma*. However, according to organizations, such as the *Gartner Group* and *The Standish Group International*, industry average is still performing at a lower performance rate losing great business opportunities.

This Chapter fairly stated that RE is a difficult process and it is not just a simple matter of writing what the customer says. Basically, customers and users do not thought out of their real needs and are not able to communicate them in a proper way. This proves the importance of the process of requirements elicitation in the whole cycle of software systems' development. Additionally, requirements are inherently dynamic and it is important to manage them in a way that enables suitable continuation of the project without significant delays or over costs that can lead to project failure.

3.2. Creativity and Innovation in Requirements Engineering

The development of our World is the result of over time creative and innovative thinking of many individuals. Though some discoveries happen by accident, past experience indicates that both discoveries and inventions are generally not accidents [Dhillon02]. These are often the result of intense efforts and determination of intelligent individuals.

Nowadays, engineering and technology organizations are much dependent of creative thinking and innovation to survive. Statistically, “80% of companies’ total sales are due to products that were not on the market a decade earlier.” [Dhillon02]. This is a clear fact that proves the importance of creativity and innovation in this particular matter.

Creativity is described as “*the ability to produce interesting, useful and new results.*” [Dhillon02] An effective process of creative thinking often results in the generation of ideas about something novel and useful, an invention [Dhillon02].

Many literature studies focused on inventions and grouped them over the years [Dieter83] [Kivenson77]. According to this categorization, inventions can be the result of: simple or multiple combinations of existing inventions, application of a new principle to an old problem, improvements of old inventions, adaptation of an old existing principle to an old problem to achieve brand new results, application of a new principle to a new use, direct solution to a problem and accidental inventions.

A known important factor in facilitating the creative thinking process in individuals is the surrounding work environment and its climate. Enhancing creativity is a process that implies that creative individuals have some “*privileges*”, such as: appropriate facilities, opportunity, freedom to act, low resistance to new ideas, rewards, thoughts exchange, motivation and recognition [Dhillon02].

As any normal process, creative thinking is also restrained by some barriers. Over the years, many studies addressed this issue, providing classification groups [Mason60] [KM69] [Adams86] [Dhillon87] [Dhillon02]: perceptual barriers, environmental barriers, emotional barriers and cultural barriers. Perceptual barriers result of an individual’s failure in recognizing “*each situation’s components as individual elements.*” [Dhillon02] Environmental barriers are related to the degree of development of a certain individual (e.g. a person that is used to be fed with solutions to his/her problems). Emotional barriers could be: greed, fear, hate, poor self-esteem, etcetera. Cultural barriers are those imposed by the society in which a given individual is embodied (e.g. conformity, competitiveness and cooperation). In addition, some studies identify some possible management actions as creativity barriers (e.g. strict rules, changes to key decisions, improper credit of new ideas, etcetera).

Over the years, requirements engineering has tried to adapt creative techniques and methods to their structured processes. The fact is that requirements engineering research, with its focus on elicitation, analysis and management, offers little to support the creation or invention of requirements. Requirements Engineering is not recognized as a creative process [NE00], but the role of creativity in software development is undeniable, particularly in the field of requirements engineering where some studies focus their attention [BR01] [Robertson01] [CNT03] [MM03] [MAB05]. Moreover, the appearance of new systems and products means that stakeholders are continuously creating and inventing ideas that they express as requirements [MRG04]. Nowadays, the Creativity Theory has been applied to the information systems development domain, providing a variety of creative techniques and methods that assist: problem definition, idea generation, selection of alternatives and implementation [SG91]. Creativity is considered truly valuable in the requirements engineering identification process, especially in the development of innovative and novel products for new and unknown markets, because customers do not know what their set of requirements is and need to be supported by creative techniques in the identification of solutions for themselves.

3.2.1. Creative Methods and Techniques for Requirements Elicitation

Over the years many studies dedicated to the field of creativity, having developed new methods and techniques to generate new ideas. Literature articles identified various methods designed and created to solve different problems. Obviously, these methods can be applied to an important phase of the Requirements Engineering process: the requirements identification phase.

According to [VanGundy81], the general classification of these methods and techniques is oriented towards: problem definition, idea generation, evaluation and choice and implementation [SG91]. Problem definition techniques recur to strategies that help participants looking at a given situation through different lens. Some include the use of analogies, wishful thinking and reconsideration of goals. VanGundy described these techniques as most suited when attempting to *“make dramatic and undefined changes in the status quo.”* [SG91] Idea generation methods could be used both at individual or group level and have the intent of making innovator participants to consider as many problem-solving factors as possible. Individual idea generation techniques include: *“listing attributes, reviewing checklists and forcing consideration of relationships between the problem situation and mundane.”* [SG91] Group techniques often involved verbal or written list of ideas (single or multiple sessions) following a certain set of rules. According to [VanGundy81] these methods were considered most effective when a general problem statement is available. Evaluation and choice techniques use methods *“for weighting and scoring alternatives, finding weaknesses and voting.”* [SG91] These are most appropriate when alternatives have been specified in some detail.

The website Mycoted [Mycoted06] alone describes around two hundred creative techniques. According to [GS08], a paper that studied the Mycoted website, these techniques could be categorized in the following main six groups: brainstorming, checklists, different perspectives, structuring, expert knowledge and random input. The brainstorming group is named after the popular creativity technique and aims at the broad exploration of ideas. The checklist group includes sets of questions that support the idea generation process. The different perspectives group includes techniques that are based on approaching the problem from multiple different perspectives. The structuring group includes techniques which main goal is not to generate ideas, but to create a meaningful structure for organization purposes. The expert knowledge group includes techniques which *“explicitly refer to the inclusion of outside (expert) knowledge as a basis for organizing and validating ideas.”* [GS08] Finally, the random input group includes techniques which principal objective is to create new ideas, *“by exposing the subjects to random input from an environment.”* [GS08] According to this same source, these groups are not disjoint, so a given technique could be categorized in two distinct groups.

3.2.1.1. Group Brainstorming Method

Group brainstorming methods are probably the most widely used methods to generate ideas in the industrial sector [Dhillon02]. The term *“brainstorming”* means *“using the brain to storm a problem.”* [Dhillon02]

Brainstorming sessions are usually held in a closed physical environment where a group of individuals build on each other's ideas in order to find a solution to a given problem. Despite having different backgrounds, the people involved in the process have the same common interest. The average time for a session lies around 15 to 60 minutes. Despite the relatively short duration of these sessions, they are characterised by their high-level of concentration on the problem at hand. According to [Dhillon02], the objective of each session is to come up with, at least, fifty ideas for problem, and past experience says that best results are obtained with groups of eight to twelve people. Some studies identified guidelines to effective brainstorming sessions [Dhillon87] [Dhillon96] [BC73]:

- Do not allow criticism.
- Welcome Freewheeling.
- Keep the ranks of participating individuals fairly equal.
- Record all ideas.
- Select the timing of the session with care.
- Combine and improve ideas.
- Think of some possible solutions to the problem under consideration ahead of time.

3.2.1.2. Integrating Creativity Workshops into Structured Requirements Processes - RESCUE

“Requirements engineering is a creative process in which stakeholders and designers work together to create ideas for new systems that are eventually expressed as requirements.” [MMRG04] Creativity is surely a characteristic that must be introduced in the process of encapsulating ideas for more innovative products. In this manner, creative product design is a trend that both requirements engineering researchers and practitioners have been acknowledging over the last years. Their main focus lays on requirements elicitation, analysis and management. The main objective is to turn current software development in a more creative thinking process. For instance, the RESCUE (Requirements Engineering with Scenarios for User-Centred Engineering) process aims at integrating new and creative thinking techniques and methods into mainstream requirements processes and methods, mainly for socio-technical systems’ design. RESCUE was developed by multi-disciplinary researchers [MJF03a] [MJF03b]. *“It supports a concurrent engineering process in which different modelling and analysis processes take place in parallel.”* [MMRG04] The RESCUE is structured into four streams that play different roles in the socio-technical system’s specification: human activity modelling, system goal modelling, use case modelling plus scenario-driven walkthroughs and requirements management. Human activity modelling aims at providing understanding of how people work. System goal modelling helps the team in modelling the future system boundaries. Use case modelling and scenario-driven walkthroughs enable communication and requirements elicitation process improvement between both development team and stakeholders. Finally, requirements management is used to ensure that the team handles the output from the other three streams in an effective way, as well as for documenting them.

RESCUE’s sub-processes are coordinated during these four streams through five synchronisation stages. These stages enable the project team to have different perspectives and view-points that will have a fundamental impact in the analysis of system boundaries, goals and scenarios. These four streams are backed up by two additional processes: ACRE for requirements acquisition from stakeholders and creativity workshops that are ran after the first synchronisation stage, in order to *“discover and surface requirements and design ideas that are essential for system modelling and use case description in stage 2.”* [MMRG04]

3.2.1.3. Creative Thinking Process Solving

In spite of the general idea that the requirements process needs more creative thinking, just a few processes, methods and techniques are described in general literature explicitly addressing this issue. For example, only brainstorming techniques and RAD/JAD workshops [FMRSW89] make brief references to creative thinking. *“Most current brainstorming work refers back to Osborn’s text [Osborn53] on principles and procedures of creative problem solving.”* [MMRG04] Alex Osborn developed brainstorming as a creative problem solving method when he worked in an advertising agency and he felt frustrated by their employees’ lack of ability to come up with new and innovative ideas. In this context he sponsored and hosted group-think sessions and noticed that the quality and quantity of ideas was much greater compared to those produced by individuals. According to his rules, a brainstorming session

would not permit idea judgment (this was later accomplished) and he strongly encouraged the outlandish of a large number of ideas preferentially created by participants building on one another's ideas.

The Creative Process Solving (CPS) method describes six main stages for problem solving: mess finding, data finding, problem finding, idea finding, solution finding and acceptance finding. This model was initially designed to help people understand and use their creative talent in a more effective way. The mess finding stage involves looking at the “mess” of interrelated issues, challenges, problems and opportunities to find a focus area. Data finding includes exploring needed information to expand understanding of the “mess”. Problem finding includes the discovery of the problem with the opportunity for unusual or novel solutions. Idea finding is the stage where are generated a large number of ideas related to the problem. Solution finding is the stage where are studied useful solutions. Finally, acceptance finding involves the generation of potential action steps to move the solutions through acceptance and into implementation. This model suffered some new developments over the years and, in order to increase its flexibility, the six stages were re-arranged into three groups (understanding the problem, idea generation and planning for action) [ID93]. *“A recent CPS manual [Daupert02] describes activities for supporting each of model stage.”* [MMRG04] An example of a method to support combinatorial creativity is *the matrix*. *The matrix* consists of list making and items random selection from each list combining them to generate ideas. Other example method is *parallel worlds*, *“which uses analogical reasoning to generate new ideas.”* [MMRG04] In spite of these examples, there are no reported applications that support the CPS model to requirements engineering.

In the requirements domain, [Robertson02] defends that requirements analysts need to have innovative approaches in order to establish competitive advantages. According to [Robertson02], requirements do not necessarily emerge from direct questions to stakeholders. Requirements are often the result of unexpected insights or ideas triggered by sub-problem solving or restructure of the requirements model during a development project.

CPS is a highly structured method. Literature on this subject presents a simpler method named Creative Pause Technique (CPT) which advises simply to *“interrupt your routine in order to pay deliberate attention to some particular issues.”* [Bono93]

3.2.1.4. The Simplex CPS Approach

“Simplex is a group process for finding and solving problems; identifying and overcoming challenges; and establishing and achieving goals.” [Vidal04] This process is known for allowing both individuals and organizations to be creative and innovative. Simplex is a process for creative problem solving constituted by four stages and eight discrete steps. Simplex provides a framework that enables the use of various tools, methods and techniques. The first stage is related to the *“creation of options in the form of new possibilities/problems that might be solved”* [Vidal04] and is composed by two steps: problem and fact finding. The second stage is characterized by the *“creation of options in the form of alternate ways to understand and define a problem and good ideas that help in solving it”* [Vidal04]. This stage is composed by two steps: problem and idea finding. The third stage is related to the optimization of options to go for successful implementation. This stage is composed by two steps: evaluation and selection plus action planning. At last, the fourth stage involves *“creating options in the form of actions that get results and gain acceptance for implementing a change or a new idea.”* [Vidal04] This last stage is composed by two steps: gaining acceptance and taking action. As mentioned earlier, the Simplex approach supports the use of other creative methods or techniques [Vidal04].

3.3. *The Star Tracker's* Process of Requirements Elicitation - Case Study

The Star Tracker (TST) is an invitation-only professional niche social network that was launched in 2007 (see sub-chapter 2.3.2.1. *The Star Tracker*). This is a social network with professional purposes and has at least 25.000 registered Portuguese members from worldwide. *The Star Tracker* founder was Tiago Forjaz and this social network website is exclusively designed to focus on empowering global Portuguese talent. *The Star Tracker* members help each other attaining success, providing expertise and promoting networking with like minded and good willed global citizens [Jason09].

3.3.1. The Interview: Requirements Elicitation in the Requirements Engineering Process

The interview was based in the document which title is *Requirements Elicitation in the Requirements Engineering Process* (see Appendix C) and was completed with the collaboration of Tiago Forjaz, founder of *TheStarTracker*.

At first, Tiago Forjaz defined *TheStarTracker* as a professional social network website and explained that, from its point of view, social networks are infrastructures that symbolize an anarchical country. He added that their value comes from community chaos and that functionalities in social networks are not always measured by the real value they generate. According to him, users usually tend to get some functionalities for granted and do not completely understand their true value.

When responding to the first question that asked if *TheStarTracker* uses or used a structured way for eliciting requirements for new functionalities/features for its social network website, the TST founder immediately answered that this process was totally *ad hoc* and improvised. According to him, the process of requirements elicitation performed during the initial phase of the social network development lifecycle had no restrictions at all and the idea of building such network emerged from two different factors. The first one was related to the ideas expressed in several *TED* (Technology, Entertainment, Design) conventions about influencers and their impact on the World. The second factor was related to the founders' idea and will to create a new social network constituted by Portuguese talents from all around the world that should cooperate and contribute to social and innovative causes. The objective of this social network should be to energize this new talent community to achieve a greater good.

The second question asked which methods or techniques are or were used for eliciting requirements for new functionalities/features for the TST social network website. The TST founder stated that main techniques used included: brainstorming sessions and meetings. Although, he confirmed that these sessions were no part of a structured process and were scheduled when needed. Tiago Forjaz also mentioned that most of the initial concept for *TheStarTracker* social network emerged from founders' individual introspecting actions.

The third question asked how does or did they choose the stakeholders that must be involved in the requirements elicitation process. Tiago Forjaz said that, given the initial proposed objective of creating a social network within 15 days, only founders and developers were involved in the requirements elicitation process (e.g. brainstorming sessions).

The fourth question asked about which problems do or did they identify as more frequent or critical in the requirements elicitation process. When answering to this question, Tiago Forjaz mentioned that they did not found any problems during this process, mainly due to the fact that they were not developing a social network for a specific stakeholder, but rather creating something to help serve the specific interests of a community of people. The TST

founder added that problems appeared later when the website was already built and users got exigent and demanding for new functionalities and alterations.

The fifth and last question, asked if they used creative techniques to come up with ideas in the requirements elicitation and identification phase. Tiago Forjaz immediately said that there were no specific techniques used for this purpose, but to better respond to this question he mentioned the case of a new widget that the TST team was thinking of developing in order to integrate with the social network website. He explained the widget in detail and said that its main objective was to evaluate, find and recruit talent around the world. He demonstrated the idea and its creativity and explained that it had emerged from a conjunction of interests: cinema, design and diplomacy. To answer to this last question, Tiago Forjaz also mentioned the case of one of the main functionalities in the TST website: *Star Power*. *Star Power* is the name of the website feature that enables users to use their talent and ideas to contribute to other users' wishes. He said that this functionality was innovative and creative and was the result of creative thinking and social network's "*core business*" tailoring.

TheStarTracker was presented by one of its founders as a social network website that had no structured process for requirements elicitation or identification. Although he did not think that this jeopardized the success of the system, he admitted that some problems that came next could have been avoided. He mentioned that the website had a "*bug report*" area in which developers were advised of website bugs or users' frustrations. This "*bug report*" area's objective was to solve some website errors, but in fact, they find out that if users were first involved as stakeholders in the requirements elicitation and identification process, some of these errors/frustrations could have been easily avoided. Tiago Forjaz also admitted that projects like this could actually benefit from structured processes. At last, he collaborated on the idea that creativity is essential in today's business world, especially in such a demanding environment like the Web and Social Networks.

In conclusion, this interview with the founder of the first talent social network in the world shows the benefits that a structured process of requirements elicitation could bring to a system, even though this case was still considered to be a success. It is important to mention that the TST case study could have generated more interesting conclusions if the website's requirements elicitation process involved final users. This way, the founders of TST would have been obligated to elicit requirements from them and to draw more conclusive ideas about their value in this process.

3.4. Conclusions about the Chapter of Requirements Elicitation

This Chapter presents the state of the art on Requirements Elicitation techniques and methods, with particular emphasis on scenario-based techniques, as a part of the Requirements Engineering lifecycle. Additionally, this Chapter also presents techniques for requirements identification in creative contexts, as well as a study case of the process of requirements elicitation of one of the most popular Portuguese social network websites. This Chapter reinforces the importance of requirements elicitation in the process of software/systems development and presents the advantages of using scenario-based requirements engineering and creativity techniques in identification, conception and non-functional prototyping of functionalities.

Chapter 4

Cardmobili's Social Network Website

This Chapter introduces and presents the problem, the approach methodology and the summary of the requirements elicitation session, as well as its main outputs.

4.1. Problem and Approach Description

4.1.1. Cardmobili's Project Overview

One of the main goals of this dissertation is to elicit, discover and identify requirements for possible social network oriented functionalities for *Cardmobili*. One of the main parts of the *Cardmobili* service is a website that will be used both by common users and card merchants. To turn it even more appellative, interactive and to foster the connection between clients and merchants, the website was thought out as containing a few social network characteristics. A more extreme idea considers creating a complete social network for *Cardmobili's* website. However and having in consideration that the *Cardmobili's* website is still in its initial development phase, these proposals are not meant to be part of the *Cardmobili's* website beta version, but rather for future version releases.

It is not a goal for *Cardmobili* to become a social network as its core business, so common social network functionalities will be probably out of its scope. It is specially important to focus on its core business, by eliciting and identifying functionalities that result in possible competitive advantages when compared to what already exists in terms of social networks applied to the business context. Also, this social component should provide additional value when compared to traditional loyalty solutions (e.g. plastic cards, paper coupons), in order to help driving the users' switch towards the virtual solution that *Cardmobili* provides.

Cardmobili wants its users to use the website in a collaborative way through sharing and communication. Additionally, the website should foster viral propagation and the word-of-mouth phenomena to spread the concept and attract new users. Users should be able to store their cards and manage them via web and recur to social-network-like functionalities to share and communicate whatever they think is relevant in this particular utilization business context. On the other hand, *Cardmobili's* website is also designed to be used by merchants, who will be given the chance to communicate with their clients in a new way and benefit from this closer connection. This kind of communication should be enhanced by social network oriented functionalities that will bring an innovative way for merchants to communicate whatever they want within *Cardmobili's* space. Both clients and merchants should benefit from this partnership provided by the *Cardmobili* service of card virtualization via web.

This whole concept (The *Cardmobili* Concept) is easily understandable by looking at scenarios and storyboards originated and refined as a result of the requirements elicitation process presented further in this document (see sub-chapter 4.2. *The Requirements Elicitation Process for the Cardmobili's Website*).

4.1.2. Approach Description

The literature suggests that in order to generate ideas that will be transformed in requirements for information systems, such as *Cardmobili's* website, each requirement should be elicited, analysed and negotiated. This should guarantee that these requirements are fully

understood and that they will result in functionalities that will attend and satisfy users' needs and expectations.

The approach chosen to conduct the social network oriented requirements elicitation process for the *Cardmobili's* website was mainly based in a process of scenario-based requirements engineering (see sub-chapter *Scenario Requirements Analysis Method - SCRAM*). First, the requirements were specified in use cases that were further developed in scenarios and storyboards to take part on the requirements elicitation process. Scenarios were chosen because they consider both technological and users' behavioural aspects when developing an information system. The scenario technique is one of the most commonly used to assure that behavioural aspects are considered. Additionally, scenarios are one of the most effective techniques in eliciting and refining requirements for the target system.

The requirements engineering process views the scenarios technique as a recommendable way to elicit requirements, because it allows requirements engineers to present possible future functionalities to stakeholders in a more understandable, interactive and appellative way. This technique also allows for the use of other creative techniques that allow eliciting the so called non-nominal scenarios.

The approach chosen to address the problem described above is explained in further detail in the next following sub-chapters.

4.2. The Requirements Elicitation Process for the *Cardmobili's* Website

The driven methodology chosen for the requirements elicitation process to be used in conducting social-network-oriented requirements elicitation for *Cardmobili's* website was a process of scenario-based requirements engineering. The process chosen was a modified approach of *SCRAM* presented in [SR98].

The objective of scenario-based requirements engineering is to elicit requirements by turning abstract intentions clearer to stakeholders. This is usually accomplished through the use of examples (e.g. textual or visual) of how the system will work in certain situations.

In *SCRAM* four techniques are combined through four different phases in order to capture and validate requirements (see *SCRAM* process description in sub-chapter *Scenario Requirements Analysis Method – SCRAM*). To elicit and validate requirements for *Cardmobili's* website, *SCRAM* was tailored and adapted to the context of this dissertation.

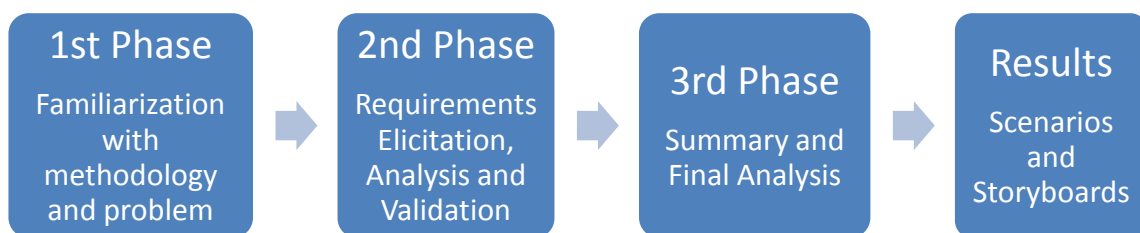


Figure 10: The Requirements Elicitation Process for the *Cardmobili's* Website

The tailored process comprises various techniques through three phases guided by only one requirements engineer. The method consists of the following phases (Figure 10):

1. The first and initial phase consists of getting stakeholders familiar with the objective, domain and the methodology (e.g. phases and participants' roles). The objective is to introduce and brief users through the upcoming session. In addition, this phase can be seen as a warm-up for what comes next, by putting users at ease and predisposing them to participate actively. One of the most important keywords used in this initial phase is creativity. The requirements engineer should try to transmit the thought that one of the most prominent objectives of this

process is to generate new ideas from the built storyboards and scenarios. In order to do this, the requirements engineer should set the following rules:

- Criticism is not allowed.
- All ideas must be recorded.
- Combine and improve ideas.
- Be imaginative.

Other important aspect of this process is related to a specific characteristic of the group of users chosen to enact this process. The chosen users work together and know each other, so the creative process should not benefit from anonymity. In this way, it is initially settled that the whole session should be characterized by open and sincere discourse. Another aspect worth mentioning is related to the fact that the context in which requirements should be built is pretty straightforward and known by the users involved. This aspect intends to move away from *metaphoric thinking*. However, the users should be initially informed that *wishful thinking* is expected. This means that, during the second phase, the requirements engineer should ask each participant “*to develop fantasy statements about the future using formulation as: In the future, it would be nice if...*” [Vidal04]

2. The second phase consists of requirements elicitation, analysis and validation of the different concept demonstrators build by the requirements engineer before the session. The concept demonstrators are presented in the form of storyboards built from major scenarios. First, each major scenario is briefly presented. Then, the respective storyboard presenting one possible path of user behaviour is run through as a script to illustrate a typical task undertaken by the user. Stakeholders are invited and encouraged to critique the concept demonstrator (storyboard or even scenario) and interview the requirements engineer about his choices and possible alternative solutions. Despite this, probe questions are asked at key points in the demonstration script and design rationale is provided by the requirements engineer. This phase is intended to encourage cooperative requirements capture between two users and one requirements engineer. *SCRAM* proposes that each session should involve “*two, possibly three, users and two requirements engineers.*” [SR98] This is one of the differences between the method used for this case and *SCRAM*, and is explained because of the limitations that are inherent to the project at hand (e.g. time, focus, etcetera). The requirements engineer performs two different roles: demonstrator of the concept demonstrator and explainer of the design rationale. The presence of two users helps in balancing the distribution of participants' speech.

3. The third phase consists of a brief session analysis which involves the construction of a conceptual map to organize and summarize all changes and new ideas, as well as to ease the process of requirements refinement. Basically, this phase is conducted by the requirements engineer that summarizes key facts learned during the session with interactive validation with users through the construction of a conceptual map. As a final step, the requirements engineer proposes one last method to keep the problem alive and to foster idea generation after this session. This can be used under the restrictions of this project in order to promote creative thinking. Basically this technique groups two different methods: notebook and brute think. Basically, the requirements engineer should hand over to each participant a little paper notebook with several keywords written through its pages (e.g. music, radio, etcetera). Then, as a last request, the requirements engineer should ask each participant to take the notebook with him/her and try to think of things that could be associated with the keywords in it. Then, each user should force connections between the words and the problem at hand and vice-versa listing them on the notebook. The requirements engineer should specify a deadline date to collect the notebook and all the ideas generated.

4.2.1. The Requirements Elicitation Session

The Requirements Elicitation Session was held in a conference room and involved two persons very familiarised with the *Cardmobili's* project and I as a requirements engineer. The complete session lasted one hour and a half: first phase (5 minutes), second phase (1 hour and 20 minutes) and third phase (5 minutes).

The requirements engineer used a Requirements Elicitation Session Guide (see Appendix D).

4.2.1.1. The First Phase

In the first phase, the requirements engineer settled the session's high-level objectives:

- Requirements elicitation;
- Generation of new ideas;
- Creative thinking;
- Refinement and improvement of requirements (scenarios and storyboards).

Then, the requirements engineer explained the domain of the problem in a very brief way, since both participants were already familiar to it. Next, the session's methodology was presented: *"The methodology used to enact this session was adapted from SCRAM (Scenario-Based Requirements Engineering). This methodology is constituted by three phases. This is the first phase and its objective is to introduce and brief users through the upcoming session. In addition, this phase could be seen as warm-up for what comes next, by putting users at ease and predisposing them to participate actively. Second phase's objective is requirements elicitation, analysis and validation of the different concept demonstrators built by the requirements engineer before the session. Third phase's objective is to summarize the information gathered in the form of a conceptual map and evaluate the session."*

There are three participants in this session: two users and one requirements engineer. Users should contribute to the process by participating actively and the requirements engineer participates as demonstrator and explainer." To finalize the first phase of the session, the requirements engineer decided to present some keywords that should characterize it: active participation, creativity and wishful thinking (e.g. *"to develop fantasy statements about the future using formulation as: In the future, it would be nice if..."* [Vidal04]).

4.2.1.2. The Second Phase

The second phase of the session started when the requirements engineer explained what the concept demonstrators were and what their origin was. So, the requirements engineer explained that the concept demonstrators were storyboards that derived from scenarios. Then, the requirements engineer explained the concept of scenarios and storyboards and how would they be utilized in this session for requirements elicitation: *"Brief presentation of scenario followed by run through the associated storyboards (12 scenarios)."*

At last, and right before start running up scenarios and storyboards, the requirements engineer advised the participants that they should not focus excessively on interface and human-computer interaction details, but rather on the value of each functionality.

Afterwards, the requirements engineer started by presenting the first scenario and associated storyboard. This phase followed the Requirements Elicitation Session Guide that provides the order in which each scenario and storyboard was addressed in the session (see Appendix D).

The second phase lasted 1 hour and 20 minutes and helped in generating several scenarios and storyboards' modifications which are shown in the scenario specifications (see Chapter 4.3. *Scenarios*). This phase also aided in the creation of new scenario ideas.

4.2.1.3. The Third Phase

Third phase's objective was to summarize and organize the ideas generated on the second phase through the use of a concept map. This originated a new and upgraded version of the session's conceptual map (see Appendix E).

To end this session, the requirements engineer proposed a creative method to both participants. The objective of this method was to use the knowledge acquired during this session to foster the creation of new ideas for the problem at hand. This way, each participant received one little paper notebook with several web 2.0 keywords written in its pages (e.g. photo, music, video, etcetera). Then, the requirements engineer explained that each participant should force connections between the words written on the notebook and the problem at hand (and vice-versa). The connections/ideas should be written in the notebook. Additionally, the requirements engineer advised both participants to write anything which came to mind and to perform this session in a calm place for a maximum period of 15 minutes.

Before the ending of the session, both participants provided some suggestions of new functionalities for the *Cardmobili's* social network.

Finally, the requirements engineer closed the session by thanking the participants for the time spent, as well as for their valuable contributions.

4.3. Scenarios

This Chapter presents the results of the process of requirements elicitation, identification and non-functional prototyping.

Next follows a sub-chapter describing the base functionality to correctly understand each scenario and associated storyboards.

4.3.1. Cardmobili's Social Network Website Environment

The scenarios presented in this sub-chapter were thought off considering the existence of the *Cardmobili's* social network, instead of a website with just a few social-network or community-like features. In this manner, it is assumed that *Cardmobili's* social network provides each user with the capability of maintaining a personal profile. Each user has the ability of deciding if he/she wants to turn its personal profile public or private (private profile means that only users from its personal network can see it). Consequently, each user has a personal network of contacts (each network contact is called a "*friend*"). Other characteristic of *Cardmobili's* social network is the existence of a personal network of cards which contains the cards of a given user. The name of the logged user appears on the right up corner in order to identify which user is currently performing a given task.

Cardmobili's website allows for its users to add products or services. Each product/service has a general profile. Each product/service general profile can have more than one "*vision*" of the product/service associated (different "*visions*" have different authors). The product/service general profile presents the compilation of all users' "*visions*" for that specific product/service (contributions).

Products/services can be reviewed by *Cardmobili* users. The process of reviewing implies that the product/service already exists. Reviews are limited to a maximum of 140

characters because they are supposed to be short, simple and exportable to *Twitter*. When creating a review, users are associating it with the product/service they created. If a given user is reviewing some product/service he did not create, the review will be displayed in the general profile of that product/service. A user can create an online survey about a product/service, but this will only be available for the group of that user's "*friends*".

Cardmobili's website has two main tag clouds: the general and the daily tag cloud. Tag clouds are visual weighted lists of user-generated tags. The general tag cloud provides the most frequent keywords (e.g. keywords, cards, people and products/services) from day zero, while the daily tag cloud provides the same service, but on a day to day basis.

Cardmobili's website allows its users to have virtual money. Virtual money is *Cardmobili's* currency and provides users with the ability to perform different tasks that involve transactions (e.g. trade card points, send online gifts, etcetera). Usually, each card has real money or points (e.g. *TAP* card miles, *Continente* €, etcetera). The "*content*" of a card can be transformed through a conversion rate into *Cardmobili* virtual money. *Cardmobili* virtual money is the only way of performing transactions in the website. The only case in which is possible to turn *Cardmobili* virtual money into real money is when using it to contribute to merchant's wishes. Users can earn *Cardmobili* virtual money by: responding to *Cardmobili* surveys, participating in other *Cardmobili* activities or as rewards for their participation performance (e.g. best reviews).

Users of the *Cardmobili* social network can send online gifts to any other users registered in the website. Sending online gifts is one of the ways that *Cardmobili* may use to get back some of the virtual money that flows through the website. Users can trade virtual money with other users in their network, but this transference involves transaction costs. This is another way that *Cardmobili* has to get back some of the virtual money flowing in the website.

The social network website has a bar that is always visible. That is the shout bargain bar and provides users with the ability to advise other users about bargains they discovered.

The *Cardmobili* social network should allow a given user to transfer points from one of his cards to another. However, this operation is only possible if the two cards involved in the transaction are partner merchant cards. Partner merchant cards are those which established a previous partnership relation that enables transactions within *Cardmobili's* environment. The transference of points between partner merchant cards is not direct. First, the points from the first card are converted internally into virtual money. Then, this virtual money is converted into points for the second card. This is an important fact to mention, because the value of points from different cards can be different and depends on each merchant and its agreement with *Cardmobili* (*Cardmobili* may also charge a fee for each transaction performed in the website).

Users can get or send prizes/discounts provided from merchants. One user can only send a prize or discount to another when the other user also has the card which provided it in the first place.

These are the assumptions needed to ensure full understanding of the scenarios and storyboards. Due to the considerable number of scenarios and storyboards built, this Chapter only presents one major scenario and its associated storyboard as an example (Table 7). The rest of the scenarios and storyboards produced are presented in Appendix F.

4.3.2. Scenario 1: Send card to network connection

Table 7: Scenario 1: Send card to network connection

Type scenario: Send card to network connection

Primary actor: User

Goal: A user wants to send a card to one of his network connections. When a user is sending a card to another, this really means that the user is suggesting a card to the other user. When the other user receives the card suggestion, becomes aware of the card's existence. Additionally, the process of getting a card for him is facilitated. A user can send more than one card to more than one different person in his network.

Pre-conditions: User is registered in the website; Receivers do not have the suggested card(s);

Normal Flow

- 1) Choose card receiver(s) from network
- 2) System checks for receivers' availability to receive card(s)
- 3) Select send card(s) option
- 4) Choose card(s) to send
- 5) Write message to attach
- 6) Choose to notify receiver(s) by email
- 7) System checks for receivers' availability to receive notification emails
- 8) Select send option
- 9) System sends card(s) to chosen receiver(s)
- 10) The chosen user(s) receive(s) card(s)

Alternative Flow

- 1.1) User does not have any friends in his network: terminate
- 2.1) Receiver is not accepting cards: deny sending to that receiver: continue or repeat 1)
- 4.1) User does not have any cards associated to its account: terminate
- 5.1) User does not want to attach message: continue
- 7.1) Receiver is not accepting notification emails: deny sending notification email to that receiver, continue
- 10.1) User(s) receive(s) or not email notification of card(s) reception: terminate

4.3.2.1. Storyboard 1: User sends cards to friends

This first storyboard illustrates the case in which the user wants to suggest cards to some of his network friends.

Pedro is a registered user of the *Cardmobili's* social network website. He is already logged into the website and he wants to send cards' suggestions to some of its network connections because he knows that they do not have these cards. He chooses Ana (1), Eva (2) and Gustavo (3) from its network of connections (Figure 11).

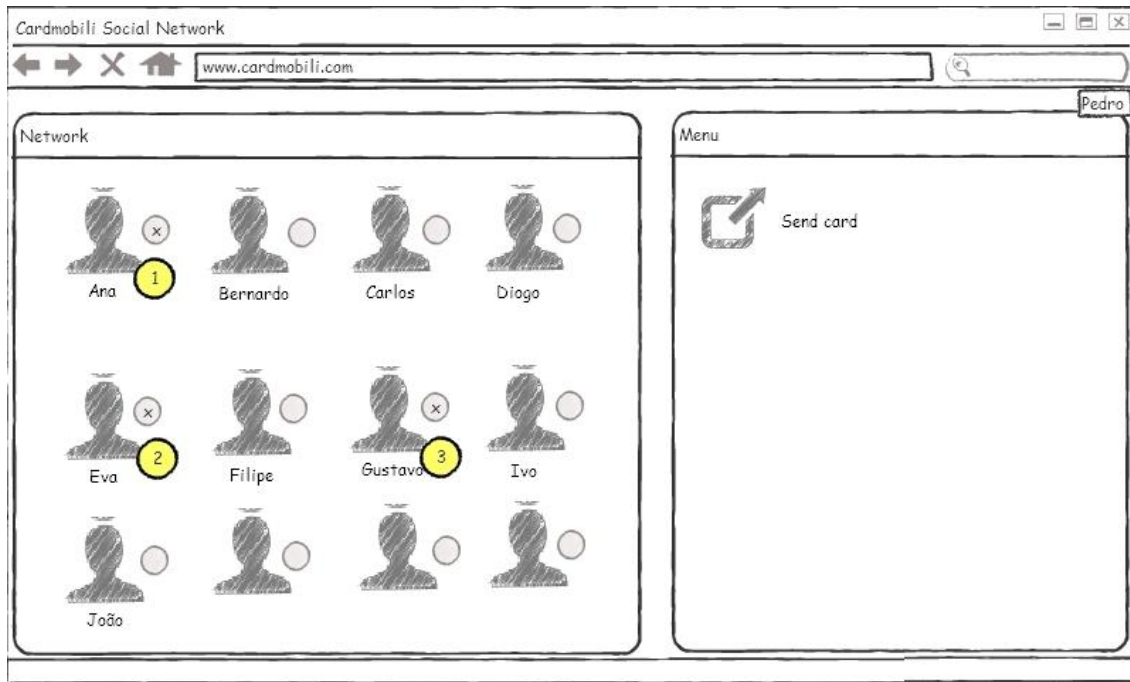


Figure 11: Storyboard 1: User sends cards to friends – Scene 1

The system recognizes which of the network connections selected by Pedro are willing to accept card suggestions. The system recognizes both Ana and Gustavo as eligible to the specified operation (tick for eligible and cross for not). Then, Pedro selects the option to send card (1) to Ana and Gustavo. At this moment, Pedro cannot send card suggestions to Eva, because the system showed that she was not eligible for this operation (Figure 12).

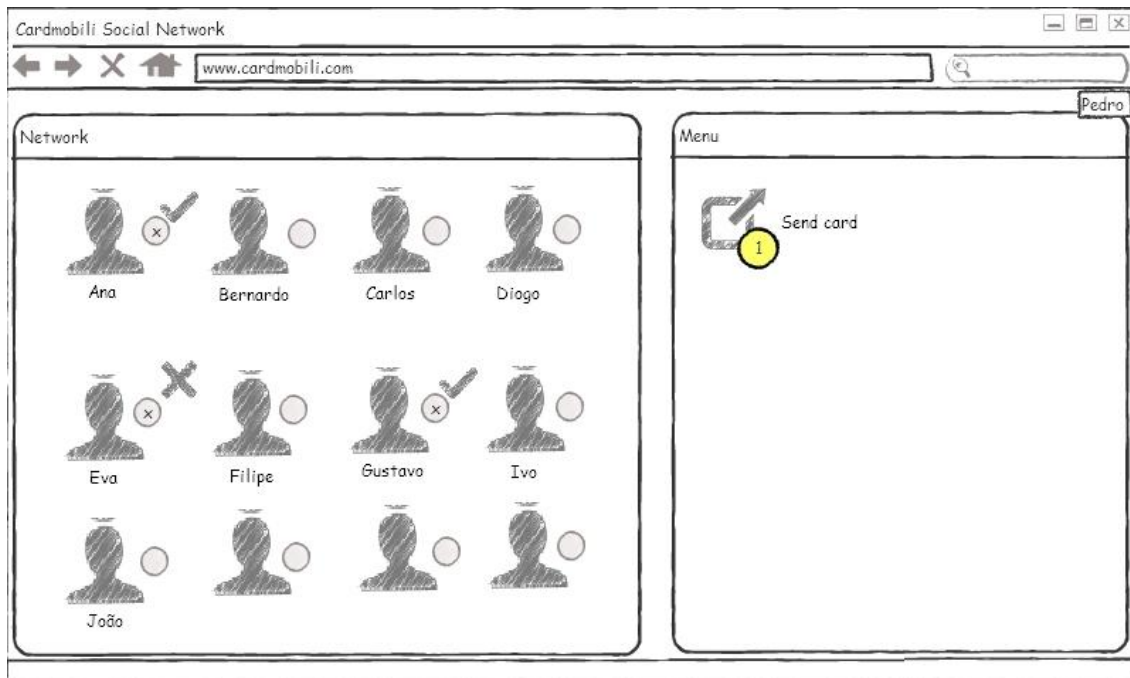


Figure 12: Storyboard 1: User sends cards to friends – Scene 2

Pedro's network of cards is now visible. Pedro chooses the cards that he wishes to send to Ana and Gustavo. He chooses *Continente* (1), *D-Mail* (2) and *CEPSA* (3). After that he wishes to attach an invitation message written by him (4). At last, he chooses to email notify both Ana and Gustavo (5) (6) (Figure 13).

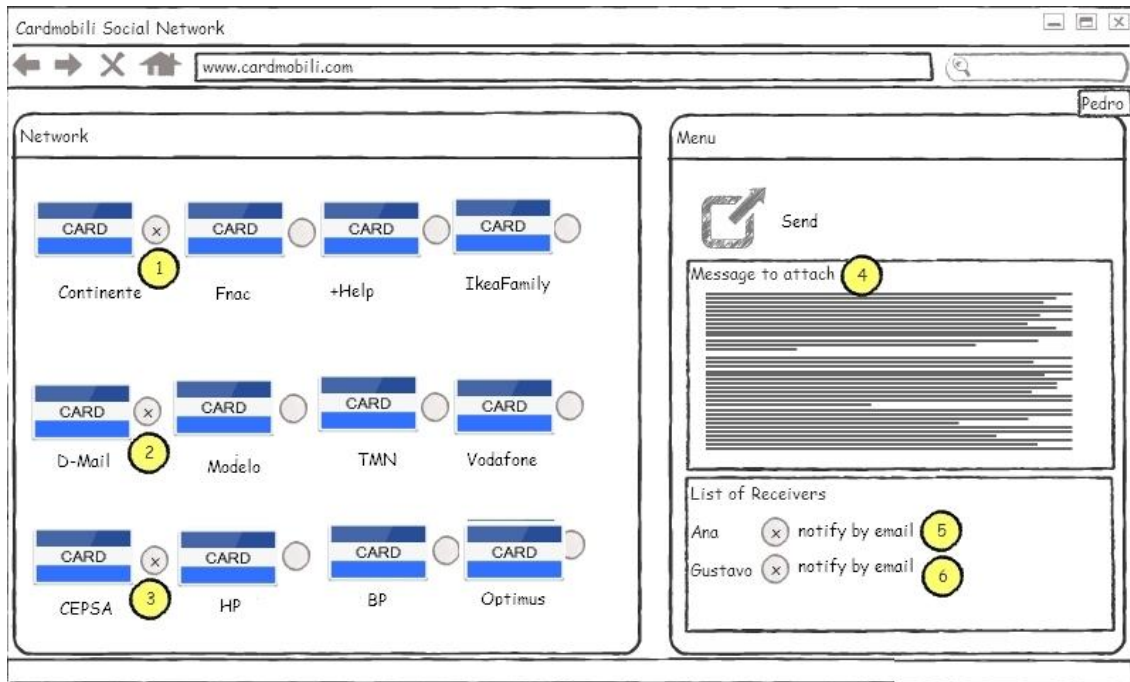


Figure 13: Storyboard 1: User sends cards to friends – Scene 3

The system warns Pedro that only Ana is willing to accept email notifications. This way, Gustavo will not receive an email notification of the cards invitation reception. Now, Pedro terminates his task by selecting the send option (1) (Figure 14).

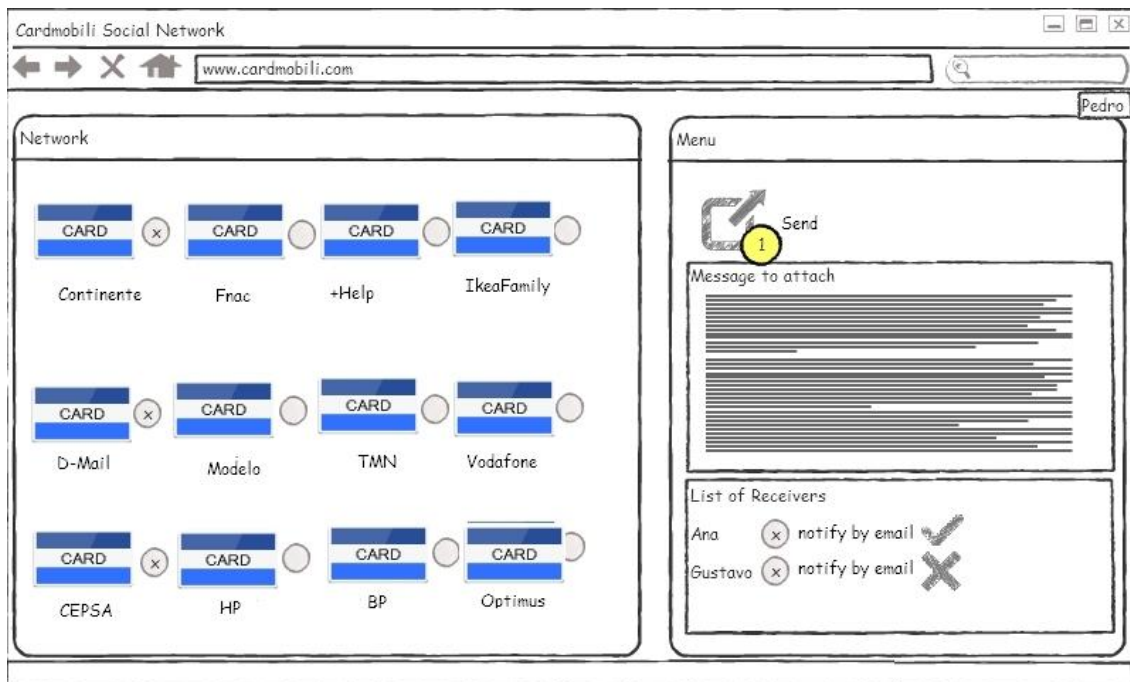


Figure 14: Storyboard 1: User sends cards to friends – Scene 4

The system sends the cards to the chosen receivers. Ana receives Pedro's cards suggestion with the message he wrote. Ana also receives the cards invitation notification email. On the other hand, as expected, Gustavo did receive the suggestion but not the email notification (Figure 15 and 16).

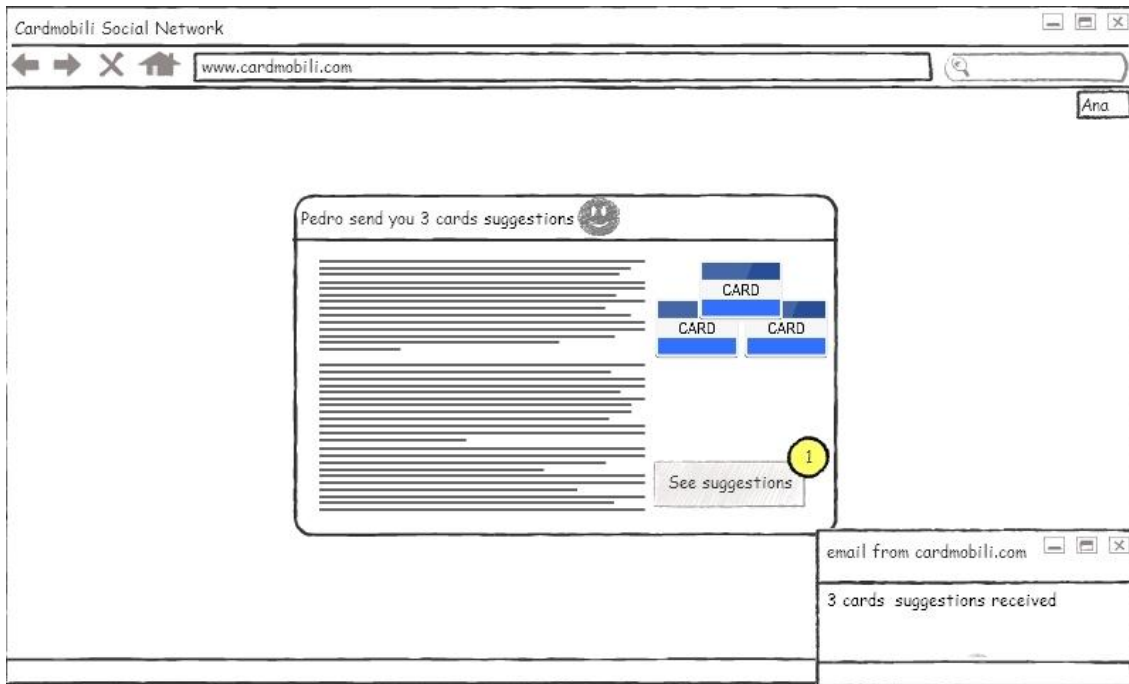


Figure 15: Storyboard 1: User sends cards to friends – Scene 5

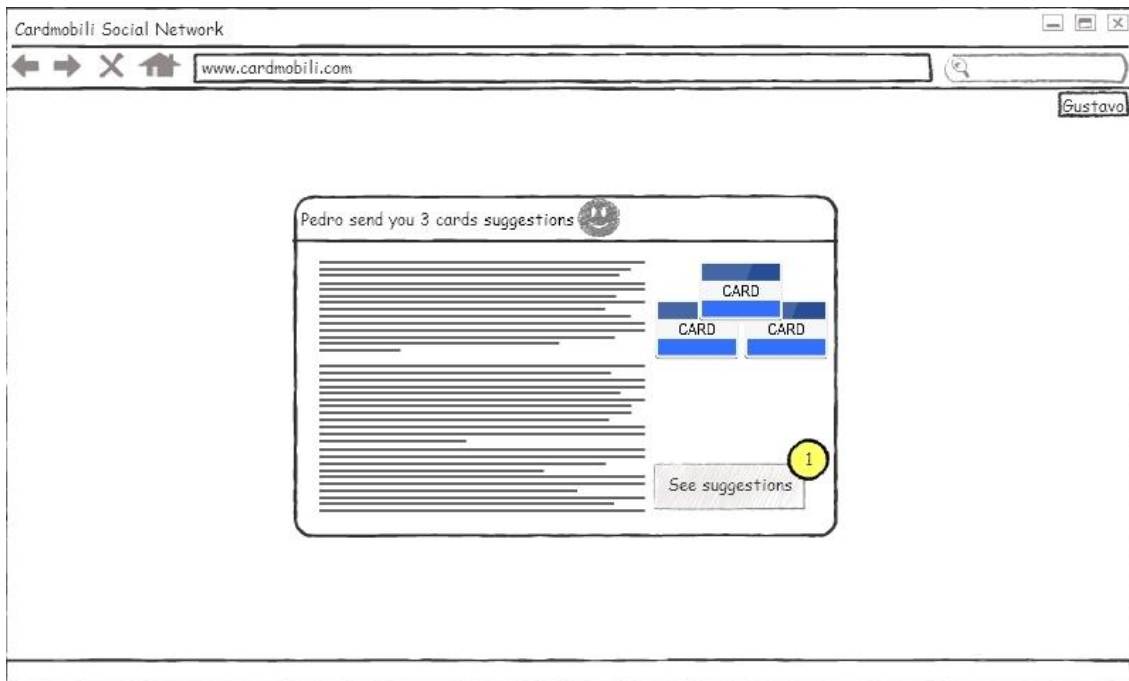


Figure 16: Storyboard 1: User sends cards to friends – Scene 6

4.4. Creative Ideas for *Cardmobili's* Social Network Website

The ideas presented in this sub-chapter are the direct result of the creative technique proposed by the requirements engineer in the third phase of the requirements elicitation process (see sub-chapter 4.2.1. *The Requirements Elicitation Session*). The main goal of this sub-chapter is to list and briefly explain the creative ideas generated, as well as to give details about their future possible utilization.

Idea 1: Mood photos of the user's face

Idea title: Mood photos of the user's face

Description: The *Cardmobili* user uploads three different photos of his face picturing different moods (e.g. happy, neutral and sad). This way, the user could automatically associate each one of his photos to the following tasks: reviews, ratings, amount of virtual money, prizes/discounts/online gifts received.

Idea 2: Associate video to wish

Idea title: Associate video to wish

Description: The *Cardmobili* associated merchant who created a given wish should have the possibility of attaching the respective promotional video in order to foster viral spreading of the cause.

Idea 3: Communication between Cardmobili associated merchants and Cardmobili users

Idea title: Communication between *Cardmobili* associated merchants and *Cardmobili* users

Description: *Cardmobili* associated merchants should have the option of performing real-time video-conferences with any users of the website that might be interested. Other feature that could also promote this relation between client and brand is related to the existence of live chats and showrooms for each merchant.

Idea 4: Rewarding System

Idea title: Rewarding System

Description: *Cardmobili* users with higher rates of card suggestion acceptance should be rewarded with virtual money or card points.

Idea 5: Collaboration features - Forums

Idea title: Collaboration features

Description: *Cardmobili* users should have access to website forums. These forums' objective is to foster collaborative behaviour between *Cardmobili* users about different subjects, such as: cards, products/services, etcetera.

Idea 6: Profile Customization

Idea title: Profile Customization

Description: *Cardmobili* users' profile could have an area designed in order to permit users free customization. This feature could make sense if we have into account that *Cardmobili* users' profiles will not be customizable by default.

Idea 7: Blogging Features

Idea title: Blogging Features

Description: *Cardmobili* associated merchants should have the possibility of creating their own blogs on the website.

Idea 8: Communities

Idea title: Communities

Description: The *Cardmobili* website should have invitation-only communities for users with a good level of social participation (e.g. best reviews, products, etcetera). Users can only participate if invited, but all *Cardmobili* users should have view access.

Idea 9: Virtual Wallet Application

Idea title: Virtual Wallet Application

Description: The *Cardmobili* website could provide an offline application for card management and storage that would synchronize with the user's *Cardmobili* account.

Idea 10: Merchants Event Manager

Idea title: Merchants Event Manager

Description: The *Cardmobili* website could provide an event handler to offer *Cardmobili* associated merchants the possibility of posting and publicizing their events.

4.5. Conclusions about the Chapter of *Cardmobili's* Social Network Website

This Chapter presented an overview about the *Cardmobili's* project and the problem to be solved, as well as a description of the requirements elicitation methodology chosen to solve it. This way, this Chapter includes the explanation of the Requirements Elicitation process to use and a descriptive explanation of the requirements elicitation session. To finalize, this Chapter presents an extract of the results of the elicitation session in the form of scenarios and storyboards of the functionalities identified and conceived.

The process held to address requirements elicitation for the *Cardmobili's* website resulted in a set of different major functionalities: create reviews, manage card points, manage virtual money, send cards, view tag clouds, shout bargains, send prizes/discounts, create wishes, a rating system, share an idea, create online surveys and add product/services. These are explained in more detail in Appendix F.

Chapter 5

High-Level Design of *Cardmobili*'s Social Network Platform

This Chapter introduces and presents the state of the art on social network development platforms, as well as a possible solution of the high-level functional architecture design the *Cardmobili*'s Social Network Platform.

5.1. Social Network Development Platforms

Social networks such as *Facebook*, *MySpace* or *Hi5* have been fairly stated in the news. In fact, several papers have been dedicated to the study of these popular social networks. However, a considerable number of companies have been trying to create platforms that enable the development of the so called “*white-label*” social networks. These platforms’ goal is “*to reduce the fundamental features of these websites to mere commodities*” by enabling “*their customers to build their own social networks (often from scratch) and to tailor those networks to a range of purposes.*” [Boulton08] [Hendrickson07] Also, these platforms usually include the ability for media outlets to let their customers create blogs, wikis, discussion forums and even *mashups* of various applications [Boulton08].

The concept behind “*white-labelling*” a social network is to make the platform provider as invisible as possible to the social network’s users and to brand it with the builder’s identity or intent.

Companies in the area of “*white-label*” social networking can be divided into three different types.

The first type relates to those companies that provide hosted, “*do-it-yourself*” solutions, in which their users “*click their way into a brand new social network.*” [Hendrickson07] These companies have minimal interaction with their customers focusing on providing the necessary tools for network building. Examples of companies from this type are: *Ning*, *KickApps*, *CrowdVine*, *GoingOn*, etcetera.

The second type of companies are those which provide social networking software for download and installation onto one’s server.

The third type of companies works very closely with customers in order to build a custom made social network based on their needs. These are especially adequate to build customized solutions and they are usually more efficient than any “*do-it-yourself*” social networking service. Examples of this type of companies are, for instance, *Social Platform* and *phpFox*.

5.2. “*White-Label*” Social Network Development Platforms

5.2.1. “*Do-it-yourself*” Platforms

There are numerous “*do-it-yourself*” platforms for social network development. The following sub-chapters present some of the most popular platforms of this category, as well as their main features and characteristics.

5.2.1.1. Ning

Ning is a “white-label” social network platform provider and it is considered to be “*the best platform for setting up fully functional and visually appealing social networks from scratch.*” [Hendrickson07]

Ning’s standard package allows its affiliates to build a free ad-supported network with all typical features. Ning’s process to build a network from scratch is based on a “*point-and-click setup*” that starts when its affiliates choose their network’s theme and features to include (e.g. photos, videos, groups, blogging, etcetera).

Ning’s premise is based on people creating new social experiences by themselves. Ning’s social networks are fully customizable, designed and very easy to create and moderate [Ning09].

A comprehensive evaluation of “white-label” social networking platforms [Hendrickson07] presents several features that characterize Ning. Following there are presented some of the most important features that Ning provides in the context of social network development for business companies.

First, the Ning platform provides a “*point-and-click*” process for customization, as well as its own API. Ning provides its clients with the ability to build social networks with typical features, such as: members’ profiles, network of friends, multimedia content (e.g. photos, videos, music, etcetera), forums and message boards, blogging, groups messaging, search and email notification settings. On the other hand, Ning does not provide the possibility of creating chats, pools, reviews’ systems, file sharing and different categories of relationship types. These are functionalities that are usually essential for social networks in business contexts, because they are crucial in providing interaction between clients and merchants (e.g. chats for communication between customers and brands).

One of the competitive advantages that Ning presents when compared to other “white-label” social network platforms is its ability to integrate with different applications and services for a variety of purposes: collaboration (e.g. Wiki, GoogleDocs, WordPress, Zoho Office Suites), communication (e.g. Twitter Tracker), e-commerce (i.e Amazon Wishlist), fund raising and entertainment. Ning’s focus on integrating such a variety of Web applications “*is an impressive endeavour that firmly solidifies them as a platform worthy of competing for developer attention.*” [Groove09]

5.2.1.2. KickApps

KickApps is envisioned to be used for web developers “*who want to incorporate social networking features into their existing websites without going through the hassle of coding and maintaining those features on their own.*” [Hendrickson07]

KickApps provides its users with some control over the design of their social network by providing the possibility of modifying the header/footer code and CSS styling. This happens in opposition to what happens in Ning, where users are given the chance of choosing between a variety of design templates. This characteristic could be ideal for business companies with minimum technology experience when creating their KickApps networking look. Additionally, KickApps focus on trying to integrate social networks with existing sites, which can be a major advantage to business companies that are trying to create their own social network.

KickApps is also known for providing a robust set of widget creation tools, which helps affiliates in promoting their networks through viral marketing. This characteristic is seen as a very powerful method for marketing in today’s business world [Hendrickson07].

As mentioned above, *KickApps* does not provide theme templates as would be expected, but provides extensive CSS control in a “*point-and-click*” process of network customization. Similarly to *Ning*, *KickApps* also has its own API. In terms of the range of typical social network features offered, *KickApps* is very similar to *Ning*.

5.2.1.3. *CrowdVine*

CrowdVine provides a simple and basic solution for setting up social networks. *CrowdVine*'s main features are: member profiles, blog posts and public messaging. In fact, this “*white-label*” social network platform provider does not offer rich media sharing capabilities (e.g. photo, video, etcetera). *CrowdVine* is based on the simple premise of connecting people rather than sharing their forms of self-expression [Hendrickson07].

CrowdVine is specially designed for conference organizers and attendees, as well as for alumni, intranet users and professionals. This platform is seen more as a utility provider. Actually, *CrowdVine* does not provide any control over the look and feel of the social network.

In comparison to *Ning* and *KickApps*, *CrowdVine* offers the possibility of creating social networks characterized by different types of relationships between their members, which is a feature valued by business companies. However, *CrowdVine* provides few features and its main focus lies on public communication between members [CrowdVine09].

5.2.1.4. *GoingOn*

GoingOn's process of building a network is similar to *Ning*'s “*point-and-click*” easy network setup and to *KickApps*'s partnerships with media companies which objective is “*to integrate social networks into existing websites.*” [Hendrickson07] However, *GoingOn* does not provide neither of these services as well as *Ning* or *KickApps*.

GoingOn provides a wider range of features when compared to *Ning* or *KickApps*. Nevertheless, this platform is still in beta version, so several features are not fully implemented.

GoingOn, the community on demand provider does not offer CSS customization or other style functionalities. On the other hand, *GoingOn* has an extensive list of social network features. From this list, *GoingOn* only does not allow the creation of chats, reviews and wiki features within social network [Cashmore06] [GoingOn09].

5.2.1.5. *CollectiveX*

CollectiveX is a “*white-label*” social network platform known for its small range of customization options [Hendrickson07]. *CollectiveX* bases on the premise that everyone within a group knows each other, so it lacks a basic social network: *CollectiveX* group members cannot friend each other.

However, *CollectiveX* provides a refined way for people to share information and content within a controlled social network environment. This characteristic is specially valued by business companies that want to create a controlled social network environment. *CollectiveX* is based on the feeling that “*groupsites are meant primarily for business professional who are looking to network.*” [Hendrickson07]

CollectiveX supports the “*point-and-click*” customization style. *CollectiveX*'s basic social network features include: profile, members (but not “*friend*” relationships between them), photos (but not video and music) and messages. Functionalities that support reviewing, blogging and wiki activities are not contemplated by this “*white-label*” social network platform [Cole07].

5.2.1.6. *Me.com*

Me.com's objective is to set up a network in a minimal number of steps (like *Ning*). However, and in opposition to *Ning*, each *Me.com*'s theme is very poor in terms of design and elements' organization. Despite these factors, *Me.com* is characterized by a huge number of features, although many of them poorly implemented [Hendrickson07].

Me.com provides an interesting chat applet that allows integration with each network. *Me.com* has all the basic user features, such as: profiles, network of members and "*friends*", but does not provide different types of relationships between members. This "*white-label*" social networking platform is often compared to *Ning* and is directly after the *MySpace* crowd because of its customization freedom (e.g. add tools). These tools include: chats, media albums, forums, groups, pools, *ecards*, bookmarks and top users [Nicole07].

5.2.1.7. *PeopleAggregator*

PeopleAggregator focus in building social networks around open standards. The objective is to facilitate people in moving between networks, no matter their owners or features [Hendrickson07]. Additionally, *PeopleAggregator* tries to embrace open standards that facilitate integration between social networks and non-social networks, such as *Google Calendar*, *YouTube* and *Yahoo Messenger*.

PeopleAggregator uses the process of "*point-and-click*" style customization and guarantees extensive CSS control. In terms of basic social network features, *PeopleAggregator* does not allow the use of wikis, file sharing or reviews. On the other hand, *PeopleAggregator* allows the use of blog features, groups, media content (e.g. photos and videos) and is often compared to *MySpace*.

However, *PeopleAggregator*'s strategy is based on leveraging APIs to connect all the existing social software sites together. This project aims at tying every identity system (e.g. *Sxip*, *OpenID*, *i-names*, *YAD* IS, etcetera) [Cashmore06PeopleAggregator].

5.2.1.8. *Haystack*

Haystack is "*white-label*" social network platform designed to build simple visually and functionally networks. *Haystack* is social networking oriented to business and associations [Haystack09]. Main features include personal profiles and blogging. *Haystack*'s simplicity is the result of its focus on providing visitors and members with information about people in a particular organization. *Haystack* has a good tag searching system based on different criteria that presents its results through the use of a geo-referenced map of people's location [Cerado09] [Hendrickson07].

Haystack provides its API to developers, but it is very limited in term of functionalities. *Haystack* does not allow the use of multimedia content (e.g. photo, video, music, etcetera), forums, message boards, groups, messaging, events, reviews, chat and pools.

5.2.1.9. Conclusions about "*Do-it-yourself*" Platforms

There are numerous "*white-label*" social network platforms that provide users with the ability to create their own social networks and re-brand them. These are specially designed for typical Internet users that want to create a group or community around a certain subject or interest area. Most business companies do not use these services, because they usually need solutions with a greater level of customization in terms of features. This happens because companies need to adapt their social networks to the specificities of their business models.

In conclusion, the so called *do-it-yourself*" platforms are ideal for easy amateur and rapid creation of social networks.

5.2.2. Social Networking Software Packages

There is a wide range of social networking applications that users can download and install onto one's server. The following sub-chapters present some of them, as well as their main features.

5.2.2.1. AlstraSoft

AlstraSoft is one of the companies that develops and provides software, including social network software. This company provides a range of components for organizations, including the *E-Friends* which is a downloadable "*white-label*" social networking platform [AlstraSoft09]. Main technologies used include: *PHP*, *MySQL*, *Ajax* and *Ruby-on-Rails*. *AlstraSoft* does not provide tailoring of the software, excluding some changes to add extra add-ons for clients' websites and removal of the *AlstraSoft* Company's copyright.

The deployment of the software provided by *AlstraSoft* is pretty straightforward since it only implies purchase of the software, installation on server and edit of site configurations. Clients have the option of customizing the design through template edition [TechCrunch09].

This software allows for "*point-and-click*" style customization through the use of template themes. All basic social network features are contemplated. Although, this software does not allow its users to have a message system, tagging, group blogging or transportable widgets.

5.2.2.2. GoLightly

GoLightly is a company that "*develops community-building software for organizations and enterprises that includes features for social networking, collaboration and fund raising.*" [GoLightly09] This software provides social networking features that include blogs, groups, wikis and much more.

This company uses *PHP* and *MySQL* as its main technologies. This company offers social network tailoring services that match its clients' existing brand, style and identity.

GoLightly does not provide "*friends*" or different types of relationships between members of the social network. Additionally, this software does not offer chat or instant messaging features, but it provides other social network basic functionalities [TechCrunch09].

5.2.2.3. Webligo

Webligo "*develops software with web-based interfaces including software for building social networks.*" [Webligo09] This corresponds to *Webligo*'s "*white-label*" social networking platform called *SocialEngine* which is developed in *PHP*. Other technologies used by *Webligo* include *PHP*, *MySQL*, *Ajax*, *HTML*, *Smarty*, *CSS*, *Linux* and *Apache*.

According to [TechCrunch09], *Webligo* does not yet provide any tailoring due to lack of technical personnel. The *SocialEngine* deployment process is all made by customers when installing the program and customizing the look and feel of their own social network.

This software version only offers basic social networking features, such as: profiles, network of friends, different types of relationships, multimedia content and groups [TechCrunch09].

5.2.2.4. Conclusions about Social Networking Software Packages

Social networking software packages are not the best approach for the majority of business companies which want to benefit from social networks' advantages. Although, and when compared to *"do-it-yourself"* platform solutions, social networking software is usually preferred by business companies, because it provides a higher-level of customization and a wider range of features.

In conclusion, social network software is an adequate solution to business companies which need fast-built and sustainable social network support.

5.2.3. Customized Social Network Solutions

The market is filled with companies that specialize in creating custom made social network solutions on demand. The following sub-chapters present some of them, as well as their main services.

5.2.3.1. Crowd Factory

Crowd Factory is a company that *"provides social networking services primarily for media companies."* [CrowdFactory09] *Crowd Factory* services work well with large media companies, because of their services' ability to handle multiple site properties, as well as scale massively.

The *Crowd Factory Platform* offers a considerable level of deployment flexibility to its customers. *"Customers have the option of Crowd Factory supplying only the back end software, completely developing and deploying both the front end and back end, or hybrid."* [CrowdFactory09] *Crowd Factory* supports three different types of deployment processes: back end, hybrid or back end and front end [TechCrunch09].

5.2.3.2. Affinity Circles

Affinity Circles *"provides social networking software for alumni and trade organizations."* [AffinityCircles09] This kind of software is designed and developed *"to help members of these organizations locate career opportunities by facilitating contact with other members."* [AffinityCircles09]

The process of deployment is supported by an account manager whose function is to work with the customer to collect a set of deliverables needed to build their community and back end manager tool [TechCrunch09].

5.2.3.3. Kwiqq

Kwiqq is a social networking solution specially designed for satisfying the needs of corporations and entrepreneurs [Kwiqq09].

Kwiqq tailors the *"software to the clients needs, developing or integrating extra modules as required."* [TechCrunch09] Right after launch, *Kwiqq*'s team organizes meetings to discuss the website's progression [TechCrunch09].

5.2.3.4. Conclusions about Customized Social Networks Solutions

Customized social network solutions are provided by companies which usually focus on one area of their choice (e.g. media companies, learning institutions, business corporations, etcetera). This kind of solution seems to be most suited to business companies that demand tailoring of their own social networks to their business specific needs.

In conclusion, companies that offer development of customized social networks on demand are seen as a trustworthy and viable solution to business companies that need half or fully customized networks.

5.2.4. Conclusions about “*White-Label*” Social Network Development Platforms

Companies that provide social network software or those who develop custom social networks on demand have some advantages over those who provide “*do-it-yourself*” solutions when it comes to support and provide well-established organizations (business). The reasons that support this statement are presented next.

First, these companies are able to protect and enhance their clients' brands “*by delivering highly-tailored social network components that integrate seamlessly into existing websites.*” [TechCrunch09] This is especially verifiable for the subset of social networking companies that provide customized social networks rather than social network software packages. Nevertheless, even these can be tailored by the clients' developers to match an existing look and feel.

Secondly, these companies provide greater ownership of social network data. This way, clients know that their data is safe and traceable. Ownership is often accomplished by putting the software and data management on clients' servers.

Thirdly, the majority of these companies ensure closer and longer-lasting relationships with their clients, providing support throughout the whole social network's lifecycle.

Fourthly and last, these companies can offer great flexibility in terms of the amount of work to develop from both sides (client and developers). Most of these provide complete social network packages, but some may also support the creation of widgets of their “*features so clients can embed social networking functionality in regular pages.*” [TechCrunch09]

Some companies that provide “*white-label*” social network platforms present unique features not found in average social networks and this is considered to be an important feature to business companies that need to tailor social networks so as to maximize their business potential.

5.3. The *Cardmobili*'s Social Network Solution

The emergence of Web 2.0 technology resulted in huge success for social networking in the consumer world. In this context, more and more enterprises are starting to embrace this form of technology as a new way to enable communication within business environment, both for customers and suppliers. In this aspect, *Cardmobili* is no different from others and wants to benefit from these new paradigms to create its website in a way that it offers rich and better user experience to its customers.

In this context, *Cardmobili* wants to rely on “*white-label*” social networking services in order to build its own social network. Given the actual state of the art on “*white-label*” social network platforms and the conclusions drawn from the analysis made, *Cardmobili*'s solution must necessarily embrace the use of social network customized services (see sub-chapter 5.2.3.

Customized Social Networks Solutions). This is explained mainly because *Cardmobili* embodies a very particular and unique business model with several distinctive social network functionalities that only these kind of “white-label” services seem to provide.

Consequently, it becomes crucial to specify the high-level functional architecture of the platform that should support the *Cardmobili*'s social network website.

5.3.1. High-Level Functional Architecture

The high-level functional architecture of the *Cardmobili*'s Social Network Platform that should support the *Cardmobili*'s social network system is shown in Figure 17. Users of the system are drawn in ellipses (e.g. CM User and CM Merchant). The modules that are part of the system are represented in grey rectangular figures. These are the modules that support the *Cardmobili*'s social network website. The relations between modules are explained further in this Chapter and are represented in Figure 17 through black arrows. Data structures to be used by the system are presented in Figure 18 that shows the platform's data model.

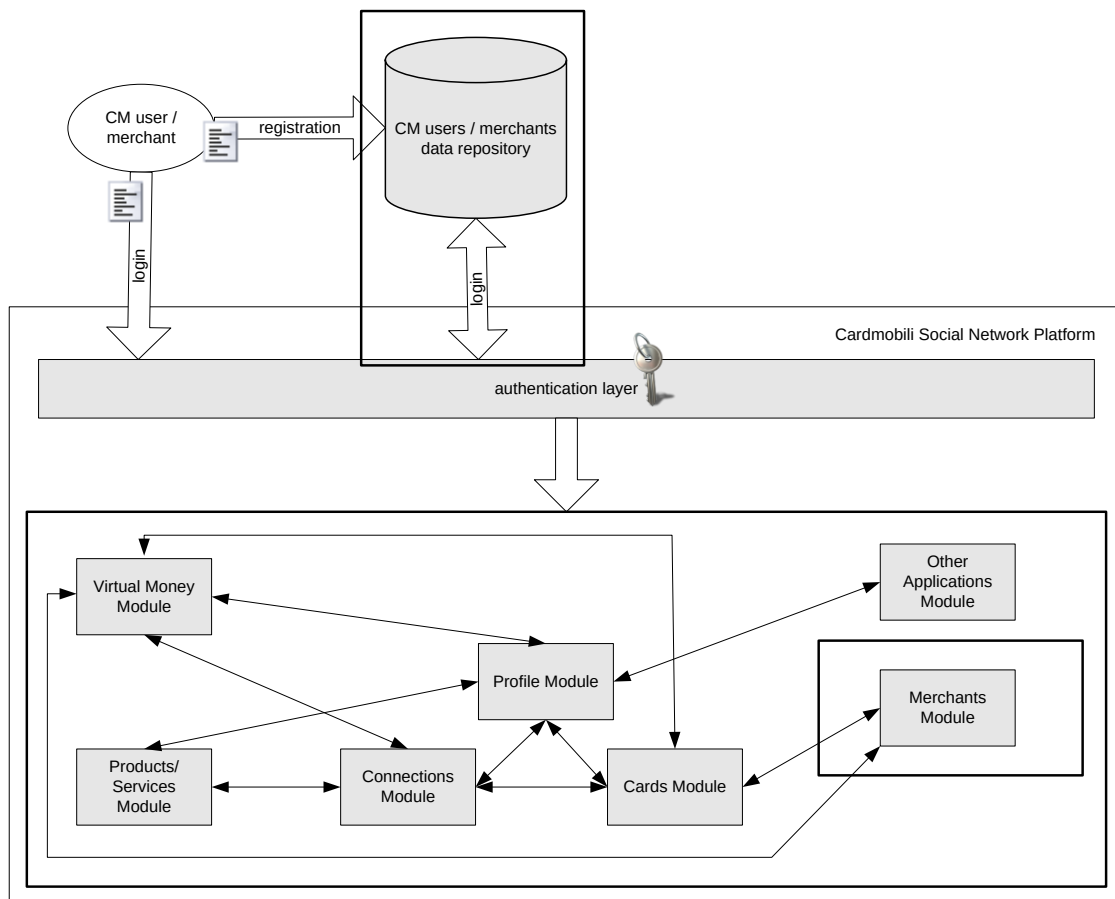


Figure 17: *Cardmobili*'s Social Network Platform High-Level Functional Architecture

Cardmobili users' data is recorded in the CM Users data repository. Each different user can create its own login through the process of registration in the *Cardmobili*'s website. Once registered, each user can use its login to authenticate and access to its private account in the CM system. The login remains valid until the user decides to cancel its account. The *Cardmobili* merchants' process of registration and authentication in the website is identical to the one described above for users. The only difference is that the process of registry cares for validation from *Cardmobili* managers and those merchants should only have access to the Merchants Module after authentication in the system.

When a given user logs into the social network website he should have immediate access to its own profile (**Profile Module**) and other basic social network applications, such as: personal settings, message system, etcetera (**Profile Module - Other Applications Module**). The profile module provides users with the ability of sharing their personal information with other users of the website, as well as direct access to a personal network of “*friends*” and other of cards (**Profile Module – Connections Module and Profile Module – Cards Module**). The profile module also provides each user with information about their current amount of virtual money (**Profile Module – Virtual Money Module**).

Each user can add new “*friends*” to his network of connections. This way, one is able to send/receive cards to/from other friends in his network (see Appendix F) (**Profile Module - Connections Module – Cards Module**). Users can also use their virtual money to different networking tasks like: sending online gifts to other users (see Appendix F) and trade virtual money with other users (see Appendix F) (**Profile Module – Virtual Money Module – Connections Module**).

Other feature that this platform should provide is related to the personal network/list of cards that each user owns. Each user can add their cards and then perform a variety of different actions with: exchange points for prizes/discounts (see Appendix F) (**Profile Module - Cards Module – Merchants Module - Virtual Money Module**), send card points to other users (see Appendix F) (**Profile Module - Cards Module - Connections Module**) and trade points for virtual money (see Appendix F) (**Profile Module - Cards Module – Virtual Money Module - Profile Module**). The Cards Module is connected to the Merchants Module. This way, merchants that are associated with *Cardmobili* can provide different actions using loyalty cards: transfer points between partner merchant cards (see Appendix F) (**Profile Module - Cards Module – Merchants Module - Virtual Money Module**). Merchants can also create wishes that are visible to all users who want to contribute with virtual money (see Appendix F) (**Profile Module – Cards Module - Merchants Module – Virtual Money – Profile Module**). It is important to mention that CM users do not have total permission to access to functionalities on the Merchants Module.

At last, the Products/Services Module is related to all actions that have something to do with the website’s reviewing features. Each user can add products/services (see Appendix F) (**Profile Module – Products/Services Module**). Consequently and after the addition of the product/service, the user should be able to write reviews about it (see Appendix F) and attach online surveys (see Appendix F) (**Profile Module – Products/Services Module**). Additionally, users should be able to rate reviews/products/services/surveys (see Appendix F) and use the shout area to write about bargains (see Appendix F).

The platform that supports the *Cardmobili*'s Social Network Website should be based on the typical Client-Server Architecture three-tiered Model over the Internet.

CM users should be able to use the features on the *Cardmobili*'s social network website through any computer’s desktop web browser (Client side – 1st tier).

The server side is constituted by at least one application server which hosts the API that exposes business logic and business processes (Server side – 2nd tier). The logic architecture of the application server should be constituted by three layers: presentation, logic and data. The presentation layer provides a service oriented front end, as well as a web front end. This layer also shares the application framework with the logic layer that treats all aspects of the business logic (objects and methods). The platform’s third tier should be constituted by at least one database server (Server side – 3rd tier), which should provide database services.

5.3.2. Platform’s Data Model

Figure 18 presents a simplified version of the social network platform’s UML database model. This model includes the classes needed to build the architecture shown in Figure 17, as

well as the relations between classes. The database model with the respective classes' attributes is shown in Appendix G. Each relationship between classes presented in the database model contains a word that explains it (e.g. One generic user has none or multiple photos.).

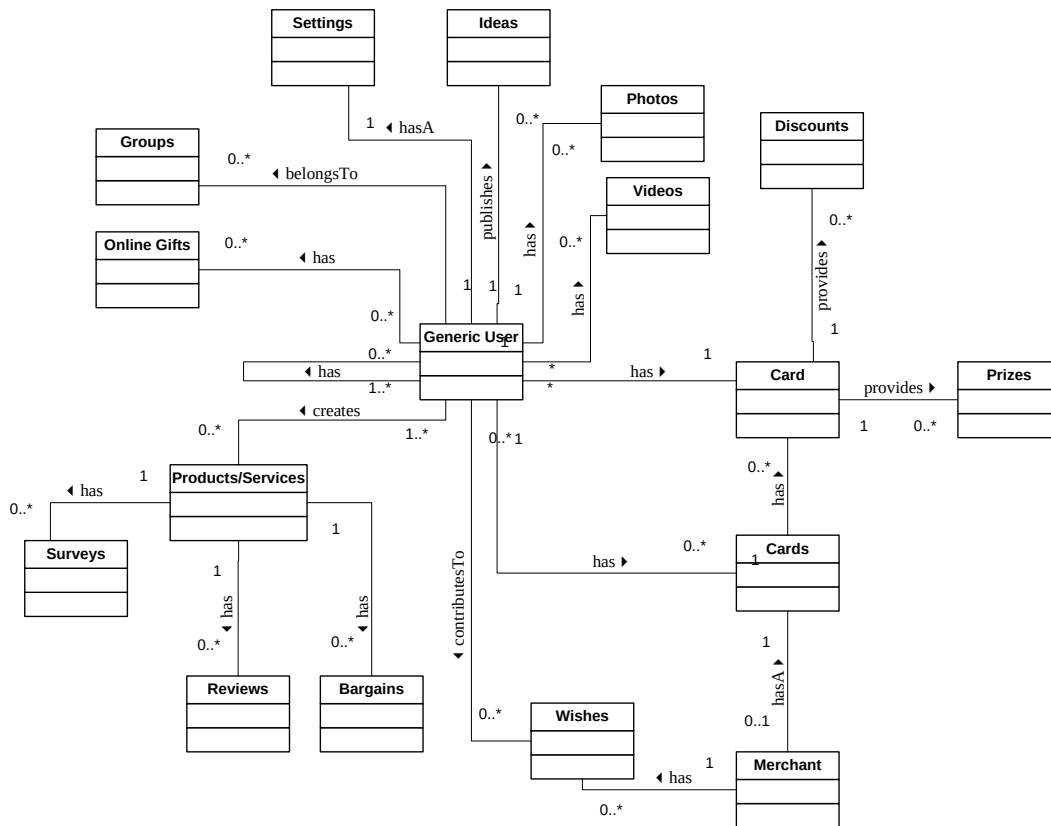


Figure 18: Cardmobili's Social Network Platform Database Model

The main class of this database model is named Generic User. This class represents the profile of *Cardmobili* social network website's users. This class should include information about the user (e.g. name, age, amount of virtual money, etcetera). The profile of a user is virtually connected to most of the classes in the database model. This means that the profile of a user allows virtual access to all functionalities. Each profile has two different networks associated: network of cards and network of "*friends*". Users can use their profiles to access to various networking actions, such as: add multimedia content (e.g. photos and videos), define personal settings (e.g. privacy and account settings), create and participate in groups, send online gifts to other users, publish ideas, etcetera. This model also shows the relationships between products/services, surveys, reviews and bargains. These relationships are the base of the review community within the *Cardmobili*'s social network website. The other type of users of the system is represented through the class of merchants. This class is directly linked to the class that represents cards. This allows merchants to provide cards and associated discounts and prizes. Users can trade card points for these discounts and prizes. Merchants are also able to create wishes. CM users can contribute with virtual money to these wishes.

5.4. Conclusions about the Chapter High-Level Design of the *Cardmobili*'s Social Network Platform

This Chapter presents the state of the art on Social Network Development Platforms to support a possible example solution for the *Cardmobili*'s social network platform. Then, it presents the high-level functional architecture of a possible *Cardmobili*'s solution and its respective database model.

Chapter 6

Conclusions and Future Work

This Chapter presents the main conclusions taken from the development of this dissertation. It also contains some significant topics for developing upon the work done in this project, and make the most of it in the future.

6.1. Conclusions

The main goal of this dissertation was basically to study the universe of social networks and their features, in order to identify, conceive and perform non-functional prototyping of social networking features that adapt to *Cardmobili*'s business model. These features may be the base for possible future releases of *Cardmobili*'s solution. This goal was successfully achieved since a considerable number of interesting solutions for social network components were identified, conceived and prototyped in the form of scenarios and storyboards. An important factor that contributed to achieving this goal is related to the fact that the social network solutions identified and prototyped can be applied to *Cardmobili*'s environment and business model. They integrate characteristics that were identified as being valued by social network users, and also the advantages provided by social networks in business.

The social network features generated are doable and potential differentiator options for future *Cardmobili*'s web version releases. The process of generating these network features was mainly based and supported in the study of the state of the art on social network websites and in the process of requirements elicitation. The social networking features were conceived in accordance to the business model and environment of *Cardmobili*.

The study of the state of the art on the social network websites' universe resulted in some general conclusions about several of the most important and valued features in social network websites. According to this study, users have shown to have a clear idea of what they expect a social network website to be. In fact, social network's users appreciate the following characteristics: easiness, security, privacy, ability to customize, intuitive networking, free individual and social participation (communication) and simplicity in general.

Other important part of this study was related to the role of social network websites in business. Social networks play a major role in today's business environment, particularly in enabling and enhancing a two-way stream of communication between business and consumers (B2C). This way, business companies may benefit from the different advantages provided by social network websites: capture of new members, increase clients' loyalty towards the company/brand, increase knowledge about clients' opinions, ideas, needs and expectations, increase flexibility of response to clients' needs, benefit from community knowledge (*"Wisdom of Crowds"*), foster influence, viral marketing and word-of-mouth phenomenon and benefit from a new and revolutionary way of doing business.

Cardmobili is creating a solution for client loyalty card virtualization. During the period of this dissertation, *Cardmobili* was in its early stages of development. Its main objective is to store and use cards from a mobile phone, moving the physical cards out from the users' wallets. It will be supported by a web social networking platform of individual adherents (customers) and merchants (brands/companies). The final concept was not completely defined as the time this document was finished, so the web platform could be a social network website built from scratch or just a website with social-network-like features. The only things clearly defined were its high-level requirements. According to them, the *Cardmobili*'s solution should allow customers to register cards, share opinions about products/purchase experiences and to easily

subscribe new loyalty programs. As well, merchants should be able to perform marketing campaigns, target advertising and communicate with their customers.

The study of the state of the art on requirements engineering, particularly on requirements elicitation had a preponderant role in this work. This was specially true when taking and organizing all the information (social network differentiator factors, advantages of social networks in business and the high-level requirements for *Cardmobili's* solution) to conceive the non-functional prototype of the social networking features, for future releases of *Cardmobili's* solution. Requirements elicitation has proved to be an important part of the whole process of requirements engineering, particularly when trying to identify requirements for a target system. This was also the part where an actual session of requirements elicitation was held, contributing with some improvements to the scenarios and storyboards already generated.

At this phase, some general assumptions about the *Cardmobili's* web platform had to be made, in order to allow the coherent elicitation and conception of the scenarios and storyboards. These general assumptions included the following: *Cardmobili's* solution should be supported by a social network built from scratch. Its main features would include a personal profile, a network of “*friends*” and other of cards. These were features that each user registered in the social network must have access to.

Then, major scenarios and storyboards focused on social networking differentiator features were built, refined and validated, always keeping in mind *Cardmobili's* business model and solution.

The final result was a set with a considerable number of scenarios and storyboards that illustrated different social network features that could be easily applied to the *Cardmobili's* concept.

The objectives of this dissertation were successfully accomplished, since the study and characterization of social networks, as well as the identification of differentiator features for the *Cardmobili's* business model domain were successfully concluded. All the sub-objectives presented in the Introduction (sub-chapter 1.2. *Objectives and Motivation*) were also achieved, resulting in the benefits described in that section. Nevertheless, it is important to mention that the most important benefit taken from this dissertation is the set of scenarios and storyboards describing social network features generated for future version releases of *Cardmobili's* web solution.

Actually and reinforcing the fact that the objectives of this dissertation were successfully achieved, *Cardmobili's* project may benefit from a set of creative and distinctive functionalities, that either alone or as a whole provide an innovative proposition to *Cardmobili's* website. This way, it may be stated that this project has fulfilled *Cardmobili's* necessity of acquiring knowledge and experience in the particular subject of social networks and their differentiator factors. This set of new functionalities provides *Cardmobili* with the possibility of differentiating its concept and web proposal from the rest. Additionally, this set is also the best possible answer to the central investigation's theme of this dissertation.

Although neither identified in the *Cardmobili's* proposal nor in the Introduction (sub-chapter 1.2. *Objectives and Motivation*) of this document as an objective, this dissertation also contributed with a high-level proposal of the functional architecture for a possible solution for the *Cardmobili's* social networking platform, as an additional and complementary objective.

6.2. Future Work

This dissertation ends up with two different streams of possible future work: future investigation and future development.

The stream of future investigation work involves possible future studies and alternatives related to the diverse themes addressed in this dissertation. The stream of future development

work involves the different possibilities for the future implementation of the set of functionalities generated.

Future investigation work may include answering to questions in different area subjects: Social Network Sites and Requirements Elicitation.

In the area of SNS, future investigation work could involve the study and analysis of new SNSs that are arising in a day-to-day basis, as well as their new features and functionalities that benefit from technology most recent advances. In fact, what is impossible now may not be tomorrow. This study could also embrace other types of community or social-network-like-websites (i.e. *YouTube*) in order to identify and conceive innovating and creative functionalities. Still in the area of SNS, future investigation work could include the study of the near future role of social networks in business and how they are or will shape the way in which the humans do business, always with an eye on new technology advances. At last, future investigation work could focus on understanding if general purpose social networks are actually transforming into specialized ones, like it was predicted by some and in what way this factor might influence *Cardmobili's* business model.

In the area of Requirements Engineering, future investigation work could lean over the subject of the increasing importance given to the process of requirements and try to understand how this will affect the software industry. As an alternative approach to the work developed in this dissertation, other techniques for requirements elicitation could be used in order to generate and elicit requirements. This could lead to a comparison study between different techniques, resulting in a more detailed and complete set of new functionalities for *Cardmobili's* future web platform. Still in this area, future investigation work could include the study of more cases of business companies that are building social networks to adapt to their business model. This kind of study could be focused on the process of requirements elicitation, in order to understand if there are really benefits to draw from this type of process. Additionally, these case studies can also focus on the adoption of creative techniques to elicit innovator features.

Future development work may include three distinct focus areas: scenarios/storyboards, Social Network Development Platforms and future implementation of the functionalities proposed in this dissertation.

The scenarios/storyboards area would include development of new functionalities and features using scenario-based requirements engineering methodologies. As alternative, different requirements elicitation techniques could be used.

In the area of Social Network Development Platforms, new and alternative solutions to *Cardmobili's* social network platform could be proposed. This may lead to comparison between the different proposals and their results.

At last, in the future implementation area and knowing that the execution of this dissertation provided *Cardmobili* with a set of future features/functionalities that may make sense for its web platform, as well as an overview about the way in which these could interact as part of a major web system, future work could involve the implementation of the features/functionalities in the *Cardmobili's* website. This way we could access them in a “real” environment. This would be their ultimate evaluation test as differentiator factors fostering competitive advantages for *Cardmobili*. Another way to prove their degree of innovation could be based on user tests over their functional prototypes. The next step to implementation would be the specification of the functionalities generated in detailed use cases and functional prototypes for specification and validation purposes.

This dissertation provided information about new features for *Cardmobili's* website. Additionally, it also provided insights about one possible solution for future implementation of its social-networking web platform. In fact, one possible path of implementation to take from now on would be in trying to merge *Cardmobili's* web platform with a fully customized solution of a social network, regarding the characteristics presented in section 4.3.1. *Cardmobili's Social Network Website Environment* and in section 5.3. *The Cardmobili's Social*

Conclusions and Future Work

Network Solution. This way, *Cardmobili* could benefit more rapidly from all the advantages of a social network adapted to its business model.

References

- [Achour98] C. B. Achour. Proceedings of the 8th European – Japanese Conference on Information Modelling and Knowledge Bases. *Guiding Scenario Authoring*, 1998.
- [Achour99] C. B. Achour. PhD Thesis University of Paris. *Extraction des Besoins par Analyse de Scénarios Textuels*, 1999.
- [AD98] J. Austin and P. F. Delaney. Analys. Verb. Behaviour. *Protocol analysis as a tool for behaviour analysis*, 1998.
- [Adams86] J. L. Adams. Addison-Wesley. *Conceptual Blockbusting. A Guide to Better Ideas*, 1986.
- [AE96] A. Al-Rawas and S. Easterbrook. Proceeding of the first Westminster Conference o Professional Awareness in Software Engineering. *Communication problems in requirements engineering: a field study*, 1996.
- [AffinityCircles09] CrunchBase. *Affinity Circles* , Last access on 29 May 2009. <http://www.crunchbase.com/company/affinitycircles>
- [AlexaHi509] Alexa. *Hi5.com*, Last View: 9 March 2009. http://www.alexa.com/data/details/traffic_details/hi5.com
- [AltraSoft09] CrunchBase. *AltraSoft Company Profile*, Last access on 29 May 2009. <http://www.crunchbase.com/company/altrasoft>
- [ARMS99] C. B. Achour, C. Rolland, N. Maiden and C. Souveyet. Proceedings of the 4th IEEE International Symposium on Requirements Engineering. *Guiding Use Case Authoring: Results of an Empirical Study*, 1999.
- [BC73] G. C. Beakley and E. G. Chilton. MacMillan. *Introduction to Engineering Design and Graphics*, 1973.
- [Berlack92] H. Berlack. John Wiley & Sons. *Software configuration management*, 1992.
- [BFJZ93] K. M. Benner, M. S. Feather, W. L. Johnson and L. A. Zorman. Proceedings of the IFIP WG 8.1 Conference on Information System Develop Process. *Utilizing Scenarios in the Software Development Process*, 1993.
- [BG94] G. Beckworth and B. Gamer. School of Computing and Mathematics. *An analysis of requirements engineering methods*, 1994.
- [BG00] S. E. Bressler and C. Grantham. McGraw-Hill. *Communities of Commerce: Building Internet Business Communities to Accelerat Growth, Minimize Risk and Increase Customer Loyalty*, 2000.
- [BH95] H. R. Beyer and K. Holtzblatt. Communications of the ACM. *Apprenticing with the customer*, 1995.
- [Boehm81] B. W. Boehm. Prentice-Hall. *Software Engineering Economics*, 1981.
- [Bono93] E. D. Bono. Harper Collins. *Serious creativity: using the power of lateral thinking to create new ideas*, 1993.
- [Boulton08] C. Boulton. eWeek.com. *Consolidation Time for White-label Social Networks*, 2008. http://www.eweek.com/c/a/Messaging-and_Collaboration/Consolidation-Time-for-Whitelabel-Social-Networks/
- [BR01] G. J. Browne and M. Rogich. *An empirical of user requirements elicitation: comparing the effectiveness of prompting techniques*, 2001.
- [Brooks87] P. F. Brooks. The Mythical Man-Month. *No Silver Bullet: Essence and Accidents of Software Engineering*, 1987.
- [BRP98] M. Beirne, H. Ramsay and A. Panteli. Behav. Inform. Tech. *A Participating informally: opportunities and dilemmas in user-driven design*, 1998.
- [BWGenerationBenz09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.generationbenz.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.generationbenz.com>
- [BWHi509] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.hi5.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.hi5.com>
- [BWTheStarTrakcer09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.thestartracker.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.thestartracker.com>
- [Cashmore06GoingOn] P. Cashmore. *Mashable – The Social Media Guide. GoingOn Network – Build Your Own Social Network*, July 2006.

- [Cashmore06PeopleAggregator] P. Cashmore. Mashable – The Social Guide. *People Aggregator Launches – Build Your Own MySpace*, June 2006. <http://mashable.com/2006/06/27/people-aggregator-launches-build-your-own-myspace/>
- [CC89] D. W. Cordes and D. L. Carver. Information and Software Technology. *Evaluation Method for User Requirements Documents*, 1989.
- [CC06] Christopher Carfi and Leif Chastaine. Cerado, Inc. *Social networking for businesses & associations*, 2006.
- [Celaya08] Javier Celaya. Gestión 2000. *La Empresa en la Web 2.0: El impacto de las nuevas redes sociales en la estrategia empresarial*, Chapter 6: *La empresa en las redes sociales*. 2008.
- [Cerado09] CrunchBase. Cerado, Last access on 29 May 2009. <http://www.crunchbase.com/company/cerado>
- [CHGG07] Emilio J. Castilla, Hokyu Hwang, Ellen Granovetter and Mark Granovetter. *Social Networks in Silicon Valley*, January 2007.
- [CK92] M. G. Christel and K. C. Kang. Software Engineering Institute. *Issues in Requirements Elicitation*, 1992.
- [CL99] L. Constantine and L. A. D. Lockwood. Addison-Wesley. *Software for use: A practical guide to the models and methods of usage-centered design*, 1999.
- [CM02] J. Coughlan and R. D. Macredie. Springer-Verlag. *Effective Communication in Requirements Elicitation: A Comparison of Methodologies*, 2002.
- [CMMI06] CMMI for Development. *CMMI-DEV*, V1.2, 2006.
- [CNT03] J. L. Cybulski, L. Nguyen and T. Thanasankit. Proceedings of RE 7th Pacific Asia Conference on Information Systems. *Understanding Problem Solving*, 2003.
- [Cocco87] G. C. Cocco. Franco Angeli. *Creatività ricerca e innovazione Individui e imprese di fronte alle sfide della società post-industriale*, 1987.
- [Cockburn95] A. Cockburn. *Structuring Use Cases with Goals*, 1995.
- [Cockburn97] A. Cockburn. Journal of Object-Oriented Programming. *Using Goal-Based Use Cases*, 1997.
- [Cockburn01] A. Cockburn. Addison-Wesley. *Writing effective use cases*, 2001.
- [Cole07] K. Cole. Mashable – The Media Social Guide. *CollectiveX Launches GroupSites to Manage Business and Social*, August 2007. <http://mashable.com/2007/08/20/collectivex-groupsites/>
- [Community09] ImageSpark. Community, Accessed on 23 June 2009. http://www.spurstream.com/uploads/jesus_social_network.png
- [CrowdFactory09] CrunchBase. CrowdFactory Company, Last access on 29 May 2009. <http://www.crunchbase.com/company/crowdfactory>
- [Crowley82] D. J. Crowley. Gordon and Breach Science Publishers. *Understanding Communication: The Signifying Web*, 1982.
- [Crutcher94] R. J. Crutcher. Psych. Sci.. *Telling what we know: The use of verbal report methodologies in psychological research*, 1994.
- [Dang00] T. K. Dang. School of Information Systems. *Understanding the Requirements Engineering Process for Hypermedia Systems*, 2000.
- [Daupert02] D. Daupert. *The Osborn-Parnes Creative Problem Solving Manual*, 2002. www.ideastream.com/create
- [DBCS92] J. E. Dobson, A. J. C. Blyth, J. Chudge and M. R. Strens. Proceedings of the Sixteenth Annual International Computer Software & Applications Conference. *The ORDIT Approach to Requirements Identification*, 1992.
- [DC08] B. Davey and C. Cope. Issues in Informing Science and Information Technology. *Requirements Elicitation – What's Missing?*, 2008.
- [DD96] P. Denning and P. Dargan. Addison-Wesley. *Action-centred research*, 1996.
- [Deutsch88] M. S. Deutsch. IEEE Software. *Focusing Real-Time Systems Analysis on User Operations*, 1988.
- [DFTB06] C. J. Davis, R. M. Fuller, M. C. Tremblay and D. J. Berndt. Journal of Computer Information Systems. *Communication challenges in requirements elicitation and the use of the repertory grid technique*, 2006.

- [Dhillon87] B. S. Dhillon. Technomic Publishing Company. *Engineering Management*, 1987.
- [Dhillon96] B. S. Dhillon. IL: Irwin. *Engineering Design: A Modern Approach*, 1996.
- [Dhillon02] B. S. Dhillon. Artech House, Incorporated. *Engineering and Technology Management Tools and Applications*, 2002.
- [DHW08] Catherine Dwyer, Starr Roxanne Hiltz and George Widmeyer. Proceedings of the 41st Hawaii International Conference on System Sciences. *Understanding Development and Usage of Social Networking Sites: The Social Software Performance Model*, 2008.
- [Dieter83] G. E. Dieter. McGraw-Hill. *Engineering Design*, 1983.
- [DLF93] A. Dardenne, A. van Lamsweerde and S. Fickas. Science of Computer Programming. *Goal-directed requirements acquisition*, 1993.
- [DT90] M. Dorfam and R.H. Thayer. Introduction to tutorial – *Standards, guidelines and examples on system and software requirements engineering*, 1990.
- [Ellison07] Nicole B. Ellison. School of Information University of California – Berkeley. *Social Network Sites: Definition, History and Scholarship*, 2007.
- [Ellison09] Nicole B. Ellison. Michigan State University. *Social Network Sites and Society: Current Trends and Future Possibilities*, 2009.
- [EM95] K. El Emam and N. H. Madhavji. Second International Symposium on Requirements Engineering. *A Field Study of Requirements Engineering Practices in Information Systems Development*, 1995.
- [EP04] E. Einemann and M. Paradiso. Proceedings of the Winter International Symposium on Information and Communication Technologies. *Digital cities and urban life: a framework for international benchmarking*, 2004.
- [ES84] K. A. Ericsson and H. A. Simon. MIT. *Protocol Analysis: Verbal Reports as Data*, 1984.
- [ES93] K. A. Ericsson and H. A. Simon. MIT Press. *Protocol Analysis – revised edition*, 1993.
- [Firesmith94] D. C. Firesmith. Report on Object Analysis and Design. *Modelling the Dynamic Behaviour of Systems, Mechanisms and Classes with Scenarios*, 1994.
- [FMRSW89] C. Floyd, W. Mehl, F. Reisin, G. Schmidt and G. Wolf. Human-Computer Interaction. *Out of Scandinavia: Alternative Approaches to Software Design and System Development*, 1989.
- [GB01] P. Grünbacher and R. O. Briggs. Proceedings of the 34th Hawaii International Conference on System Sciences. *Surfacing tacit knowledge in requirements negotiation: Experiences using Easy WinWin*, 2001.
- [GL83] J. Goguen and C. Linde. Proceedings of the 1st IEEE International Symposium on Requirements Engineering. *Techniques for Requirements Elicitation*, 1993.
- [Glinz95] M. Glinz. Proceedings of the 5th European Software Engineering Conference. *An Integrated Model of Scenarios Based on Statecharts*, 1995.
- [Glinz00] M. Glinz. Proceedings of the second World Congress for Software Quality – 2WCSQ. *Improving the quality of requirements with scenarios*, 2000.
- [GLNGT04] Daniel Gruhl, David Liben-Nowell, R. Guha and Andrew Tomkins. In Proceedings of the 13th International World Wide Web Conference (WWW'04). *Information Diffusion Through Blogspace*, May 2004.
- [GO90] V. Goodrich and L. Olfman. Proceedings of the Twenty-Third Annual Hawaii International Conference on System Sciences. *An Experimental Evaluation of Task and Methodology Variables for Requirements Definition Phase Success*, 1990.
- [Goguen96] J. A. Goguen. Proceedings of the IEEE International Conference on Requirements Engineering. *Formality and informality in requirements engineering*, 1996.
- [GoingOn09] www.goingon.com, Last access on 28 May 2009. www.goingon.com
- [GoLightly09] CrunchBase. *GoLightly Company*, Last access on 29 May 2009. <http://www.crunchbase.com/company/golightly>
- [Grady06] Jeffrey O. Grady. McGraw-Hill. *System Requirements Analysis*, 6 February 2006.
- [Graham96] I. Graham. Object-Oriented Systems. *Task Scripts, Use Cases and Scenarios in Object-Oriented Analysis*, 1996.
- [Granovetter82] Mark Granovetter. Sociological Theory. *The Strength of Weak Ties: A Network Theory Revisited*, 1982.

- [Greenberg08] Karl Greenberg. Media Post News. *Mercedes intros 'Generation-Benz' Social Network*, 17 November 2008. http://www.mediapost.com/publications/index.cfm?fa=Articles.showArticle&art_aid=94888
- [Groove09] J. V. Groove. Mashable – The Social Media Guide. *Ning's Social Networks Get Their Own App Platform*, May 2009. <http://mashable.com/2006/07/04/goingon-network-build-your-own-social-network/>
- [GS08] P. P. Grube and K. Schmid. Third International Workshop on Multimedia and Enjoyable Requirements Engineering (MERE'08). *Selecting Creative Techniques for Innovative Requirements Engineering*, 2008.
- [HA04] T. Hogg and L. Adamic. Proceedings of the 5th ACM Conference on Electronic Commerce – EC'04. *Enhancing reputation via online social networks*, 2004.
- [Haystack09] Haystack, Last access on 29 May 2009. http://haystack.cerado.com/html/haystack_directory.php
- [HB01] J. Hartwick and H. Barki. IEEE Transactions Professional Community. *Communication as a dimension of user participation*, 2001.
- [HD03] A. M. Hickey and A. M. Davis. Proceedings of the IEEE International Requirements Engineering Conference. *Elicitation technique selection: How do experts do it?*, 2003.
- [HDN99] A. M. Hickey, D. L. Dean and J. F. Nunamaker. Proceeding of the 32nd Hawaii International Conference on System Sciences. *Setting a Foundation for Collaborative Scenario Elicitation*, 1999.
- [Hendrickson07] M. Hendrickson. TechCrunch. *Nine Ways to Build Your Own Social Network*, July 2007. <http://www.techcrunch.com/2007/07/24/9-ways-to-build-your-own-social-network/>
- [Hi509] Hi5. Press Room, Last View: 9 March 2009. <http://www.hi5networks.com/press.html>
- [HJD02] M. E. C. Hull, K. Jackson and A. J. J. Dick. Springer-Verlag. *Requirements Engineering*, 2002.
- [HL01] H. F. Hofmann and F. Lehner. IEEE Software. *Requirements Engineering as a Success Factor in Software Projects*, 2001.
- [HMDZ08] Klaus Hoermann, Markus Mueller, Lars Dittman and Joerg Zimmer. Rocky Nook. *Automotive SPICE in Practice: Surviving Interpretation and Assessment*, 2008.
- [Holbrook90] H. Holbrook. ACM SIGSOFT Software Engineering. *A Scenario-Based Methodology for Conducting Requirements Elicitation*, 1990.
- [HP00] F. Houdek and K. Pohl. Proceedings of the 11th International Workshop on Database and Expert Systems Applications. *Analyzing requirements engineering processes: a case study*, 2000.
- [HPW98] P. Haumer, K. Pohl and K. Weidenhaupt. IEEE Transactions on Software Engineering. *Requirements elicitation and validation with real world scenes*, 1998.
- [HSGK94] P. Hsia, J. Samuel, J. Gao and D. Kung. IEEE Recommended Practice for Software Requirements Specifications. *Formal Approach to Scenario Analysis*, 1994.
- [ID93] G. Isaksen and K. Dorval. ICN Newsletter. *Changing views of creative problem solving: Over 40 years of continuous improvement*, 1993.
- [IEEE84] Institute of Electrical and Electronics Engineers. *IEEE Guide to Software Requirements Specifications – ANSI/IEEE Standard 830-1984*, 1984.
- [IEEE90] Institute of Electrical and Electronical Engineers. *IEEE Standard Glossary of Software Engineering Terminology – IEEE 610.12-1990*, 1 May 1990.
- [IEEE98] *Guide for Developing System Requirements Specifications – Description – IEEE Std 1233*, 1998.
- [IEEECS98] IEEE Computer Society. *IEEE recommended practice for Software Requirements Specifications – IEEE Std 830*, 20 October 1998.
- [Jacobson92] J. Jacobson. Addison-Wesley. *Object-Oriented Software Engineering: A Use Case Driven Approach*, 1992.
- [Jaoui91] H. Jaoui. Librairies Techniques. *La Créativité Mode d'Emploi*, 1991.
- [Jason09] Jason Associates. *Star Tracking*, Last View: 11 March 2009. <http://www.startracking.org/blog/?home=yes>
- [JCJO92] I. Jacobson, M. Christerson, P. Jonsson, and G. Overgaard. Addison-Wesley. *Object-Oriented Software Engineering: A Use-Case Driven Approach*, 1992.

- [Johnson86] W. L. Johnson. Proceeding of the 3rd International Software Process Workshop. *Specification via Scenarios and Views*, 1986.
- [Jones08] Bradley L. Jones. *Web 2.0 Heroes - Interviews with 20 Web 2.0 Influencers*, 2008.
- [JuniperModeling08] juniperResearch. *Mobile Content Strategies & Business Models Scenarios & Forecasts 2008-2013: Modeling a Mobile Future*, December 2008.
- [Kadushin04] Charles Kadushin. *Introduction to Social Network Theory, Chapter 2 Some Basic Network Concepts and Propositions*, 17 February 2004.
- [KC95] M. Keil and E. Carmel. Communications of the ACM. *Customer-developer links in software development*, 1995.
- [Kivenson77] G. Kivenson. Van Nostrand Reinhold. *The Art and Science of Inventing*, 1977.
- [KM69] D. W. Karger and R. G. Murdick. Industrial Press. *Managing: Engineering and Researching*, 1969.
- [KM93] F. Kensing and A. Munk-Madsen. Communications of the ACM. *PD: structure in the toolbox*, 1993.
- [Kontio95] J. Kontio. The Hughes Information Technology Corporation and the EOS Program. *OTSO: a systematic process for reusable software component selection, version 1.0*, 1995.
- [KS98] G. Kotonya and I. Sommerville. John Wiley & Sons. *Requirements Engineering: Processes and Techniques*, 1998.
- [Kwiqq09] CrunchBase. *Kwiqq*, Last access on 29 May 2009. <http://www.crunchbase.com/company/kwiqq>
- [Kyng95] M. Kyng. John Wiley & Sons. *Creating Contexts for Design*, 1995.
- [Labash09] Matt Labash. The Weekly Standard. *Down with Facebook! What nobody bothers to mention about the social-networking site is that it's really dull-mind-numbingly dull*, 16 March 2009. <http://www.weeklystandard.com/Content/Public/Articles/000/000/016/256implp.asp?pg=1>
- [LE01] D. Lowe and J. Eklund. 6th Australian Workshop on Requirements Engineering. *Development Issues in Specification of Web Systems*, 2001.
- [Leite87] J. C. Leite. Advanced Software Engineering Project Technical Report. *A Survey on Requirements Analysis*, 1987.
- [LH87] K. Lyytinen and R. Hirschheim. Oxford Surveys Inform Tech. *Information system failures: a survey and classification of the empirical literature*, 1987.
- [LK95] P. Loucopoulos and V. Karakostas. McGraw-Hill. *System Requirements Engineering*, 1995.
- [LPR93] M. Lubars, C. Potts and C. Richter. Proceeding of the International Conference on Software Engineering. *Developing initial OOA Models*, 1993.
- [LRBMKH97] J. C. S. d. P. Leite, G. Rossi, F. Balaguer, V. Maiorana, G. Kaplan, G. Hadad and Oliveros. Proceedings of the Third International Symposium on Requirements Engineering. *Enhancing a Requirements Baseline with Scenarios*, 1997.
- [LSK04] M. J. Leimester, P. Sidiras and H. Krcmar. Proceedings of the 37th Hawaii International Conference on System Sceinces. *Success Factors of virtual communities from the perspective of members and operators: an empirical study*, 2004.
- [LW00] D. Leffingwell and D. Widrig. Addison-Wesley. *Managing Software Requirements – a unified approach*, 2000.
- [LYM06] B. Lea, W. Yu and N. Maguluru. *Enhancing business networks using social network based virtual communities*, 2006.
- [MAB05] L. Mich, E. C. Anesi and D. M. Berry. Springer-Verlag. *Applying a pragmatics-based creativity-fostering technique to requirements elicitation*, 2005.
- [Macaulay96] L. A. Macaulay. Springer. *Requirements Engineering*, 1996.
- [MAJP02] S. Martin, A. Aurum, R. Jeffery and B. Paech. AWRE'02. *Requirements Engineering Process Models in Practice*, 2002.
- [Mason60] J. G. Mason. McGraw-Hill. *How to be a more creative executive*, 1960.
- [MBLC05] A. Majchrzak, C. M. Beath, R. A. Lim and W. W. Chin. MIS Quarterly. *Managing client dialogues during information systems design to facilitate client learning*, 2005.
- [McDermid89] J. A. McDermid. IEE Colloquium on Requirements Capture and Specification for Critical Systems. *Requirements Analysis: Problems and the STARTS Approach*, 1989.

- [MFKH90] L. Macaulay, C. Fowler, M. Kirby and A. Hutt. Interacting with Computers. *USTM: A New Approach to Requirements Specification*, 1990.
- [MH97] K. McGraw and K. Harbison. Lawrence Erlbaum Associates, Inc. *User-Centered Requirements: The Scenario-Based Engineering Process*, 1997.
- [Milson89] F. D. Milson. Proceedings of the Seventh International Conference on Software Engineering for Telecommunication Switching Systems: SETSS'89. *Using CORE with SDL to Specify Requirements*, 1989.
- [MJF03a] N. A. M. Maiden, S. Jones and M. Flynn. Proceedings Joint Eurocontrol/FAA ATM'2003 Conference. *Innovative Requirements Engineering Applied to ATM*, June 2003.
- [MJF03b] N. A. M. Maiden, S. Jones and M. Flynn. Proceedings 11th International Conference on Requirements Engineering. *Integrating RE Methods to support Use Case Based Requirements Specification*, 2003.
- [MKK05] S. Misra, V. Kumar and U. Kumar. IEEE. *Goal Oriented or Scenario Based Requirements Engineering Technique – What should a practitioner select?*, 2005.
- [MM03] A. Mavin and N. Maiden. Proceedings of 11th IEEE International Requirements Engineering Conference. *Determining socio-technical systems requirements: experiences with generating and walking through scenarios*, 2003.
- [MMRG04] Neil Maiden, Sharon Manning, Suzanne Robertson and John Greenwood. Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques. *Integrating Creativity Workshops into Structured Requirements Process*, 2004.
- [MR96] N. A. M. Maiden and R. Rugg. Software Engineering Journal. *ACRE: Selecting methods for requirements acquisition*, 1996.
- [MRG04] N. Maiden, S. Robertson and A. Gizikis. IEEE Software. *Provoking Creativity: Imagine What Your Requirements Could Be Like*, 2004.
- [MRRP90] T. R. Mittermeir, N. Roussopoulos, T. Raymond and A. Peter. Van Nostrand Reinhold. *An Integrated Approach to Requirements Analysis Modern Software Engineering: Foundations and Current Perspectives*, 1990.
- [MS92] N. A. M. Maiden and A. G. Sutcliffe. Communications of the ACM. *Exploiting Reusable Specifications Through Analogy*, 1992.
- [MS03] Jose Luis Mate and Andres Silva. Information Science Publishing. *Requirements Engineering for Sociotechnical Systems*, 2003.
- [Mycoted06] Mycoted Website. Last modified at: 16 April 2006, Last Viewed at: 22 April 2009. www.mycoted.com
- [NE00] B. Nuseibeh and S. Easterbrook. Proceedings IEEE International Conference on Software Engineering (ICSE'2000). *Requirements Engineering: A Roadmap*, 2000.
- [NFK96] B. Nuseibeh, A. Finkelstein and J. Kramer. Information and Software Technology Journal. *Method engineering for multi-perspective software development*, 1996.
- [Nicole07] K. Nicole. Mashable – The Social Guide. *Me.com Launches a Ning Competitor*, May 2007. <http://mashable.com/2007/05/08/me-snapp/>
- [Ning09] www.ning.com, Last access on 28 May 2009. www.ning.com
- [NS00] L. Nguyen and P. A. Swatmann. School of Management Information Systems. *Managing the Requirements Engineering Process*, 2000.
- [Olsen93] N. Olsen. IEEE Software Magazine. *The software rush hour*, 1993.
- [Osborn53] A. F. Osborn. Scribener's Sons. *Applied Imagination: Principles and Procedures of Creative Problem Solving*, 1953.
- [PB04] M. G. Pitts and G. J. Browne. Journal of Management Information Systems. *Stopping behaviour of systems analysts during information requirements elicitation*, 2007.
- [PB07] M. G. Pitts and G. J. Browne. Information Systems Journal. *Improving requirements elicitation: An empirical investigation of procedural prompts*, 2007.
- [Penenberg08] Adam L. Penenberg. Fast Company. *Ning's Infinite Ambition*, 11 April 2008. <http://www.fastcompany.com/magazine/125/nings-infinite-ambition.html>
- [PHKTT03] Päivi Parviainen, Hanna Hulkko, Jukka Kääriäinen, Juha Takalo and Maarit Tihinen. VTT Publications 508. *Requirements Engineering – Inventory of technologies*, 2003.
- [Polanyi66] M. Polanyi. *The tacit dimension*, 1966.

- [Potts99] C. Potts. 4th IEEE International Symposium on Requirements Engineering. *SceniC: A Strategy for Inquiry-Driven Requirements Determination*, 1999.
- [PTA94] C. Potts, K. Takahashi and A. I. Anton. IEEE Software. *Inquiry-based requirements analysis*, 1994.
- [RA97] C. Rolland and C. B. Achour. Data & Knowledge Engineering Journal. *Guiding the Construction of Textual Use Case Specifications*, 1997.
- [RAB96] B. Regnell, M. Andersson and J. Bergstrand. Proceedings of the Second IEEE International Symposium of Computer-Based Systems, 1996.
- [RARSMJHPDH98] C. Rolland, B. Achour, J. Ralyte, A. Sutcliffe, N. Maiden, M. Jarke, P. Haumer, K. Pohl, E. Dubois and P. Heymans. Req. Eng. *A proposal for a scenario classification framework*, 1998.
- [RB99] C. Rolland and A. Benjamin. Requirement Engineering Journal. *A Multi-Model view of Process Models*, 1999.
- [RD92] B. Ramesh and V. Dhar. IEEE Transactions on Software Engineering. *Supporting systems development by capturing deliberations during requirements engineering*, 1992.
- [Reinikainen01] L. Reinikainen. Lappeeranta. *Elicitation of Customer Requirements with Group Methods in Software Engineering*, 2001.
- [RG99] J. Ryser and M. Glinz. Third International Software Quality Week – QWE’99. *A Practical Approach to Validating and Testing Software Systems Using Scenarios*, 1999.
- [RJ01] B. Ramesh and M. Jarke. IEEE Transactions on Software Engineering. *Toward reference models for requirements traceability*, 2001.
- [RK09] Cristobal Cobo Romani and Hugo Pardo Kuklinki. *Planeta Web 2.0*, 2007.
- [RKW95] B. Regnell, K. Kimbler and A. Wesslen. Proceedings of the Second IEEE International Symposium of Requirements Engineering, 1995.
- [Robertson01] S. Robertson. Human-Computer Studies. *Requirements trawling: techniques for discovering requirements*, 2001.
- [Robertson02] J. Robertson. IEEE Software. *Eureka! Why Analysts Should Invent Requirements*, 2002.
- [Royce70] Winston Royce. Technical Papers of Western Electronic Show and Convention (WesCon). *Managing the Development of Large Software Systems*, 25-28 August 1970.
- [RSA98] C. Rolland, C. Souveyet and C. B. Achour. IEEE Transactions on Software Engineering. *Guiding Goal Modelling using Scenarios*, 1998.
- [Rubicon08] Rubicon. *Online Communities and Their Impact on Business: Ignore at Your Peril*, October 2008.
- [Rzepka89] W. E. Rzepka. Proceedings of the Twenty-Second Annual Hawaii International Conference on System Sciences. *Requirements Engineering Testbed: Concept, Status and First Results*, 1989.
- [SaïdR98] S. S. Saïd and C. Rolland and A. Benjamin. Proceedings of the 8th European-Japanese Conference on Information Modelling and Knowledge Bases. *Formalising Guidance for the CREWS Goal-Scenario Approach to Requirements Engineering*, 1998.
- [SBJA98] R. Stevens, P. Brook, K. Jackson and S. Arnold. London: Prentice Hall. *Systems engineering – Coping with complexity*, 1998.
- [Schouwen90] A. J. van Schouwen. *The A-7 Requirements Model: Re-Examination for Real-Time Systems and an Application to Monitoring Systems*, 1990.
- [SG91] J. L. Sampler and D. F. Galleta. IEEE Xplore. *Individual and Organizational Changes Necessary for the Application of Creativity – Techniques in the Development of Information Systems*, 1991.
- [Siddiqi96] J. Siddiqi. IEEE Software. *Requirement Engineering Wisdom*, 1996.
- [SK89] H. A. Simon and C. A. Kaplan. Foundations of Cognitive Science MIT Press, Cambridge. *Foundations of cognitive science*, 1989.
- [SMMM98] A. G. Sutcliffe, A. M. Maiden, S. Minocha and D. Manuel. IEEE Transactions on Software Engineering. *Supporting Scenario-Based Requirements Engineering*, 1998.
- [SN98] A. Sutcliffe and N. Maiden. IEEE Transactions on Software Engineering. *The domain theory on requirements engineering*, 1998.
- [SP90] A. P. Sage and J. D. Palmer. John Wiley & Sons. *Software System Engineering*, 1990.

- [SPICE98] SPICE. *ISO/IEC TR 15504-2: Information Technology Software Process Assessment Part 2: A Reference Model for Processes and Process Capability. Technical Report type 2. International Organisation for Standardisation*, 1998.
- [SR98] A. G. Sutcliffe and M. Ryan. Centre of HCI Design. *Experience with SCRAM, a Scenario Requirements Analysis Method*, 1998.
- [SS97] Ian Sommerville and P. Sawyer. *Annals of Software Engineering. Viewpoints: Principles, problems and a practical approach to requirements engineering*, 1997.
- [SSV98] I. Sommerville, P. Sawyer and S. Viller. *Proceedings of the IEEE International Conference on Requirements Engineering. Viewpoints for requirements elicitation: a practical approach*, 1998.
- [ST03] Komi-Sirviö and M. Tihinen. In the 15th International Conference on Software Engineering and Knowledge Engineering (SEKE'03). *Great Challenges and Opportunities of Distributed Software Development – An Industrial Survey*. 1-3 July 2003.
- [Standish95] Standish Group International. *Chaos*, 1995.
- [Stéphane05] S. S. Stéphane. *Proceedings of the 12th Asia-Pacific Software Engineering Conference – APSEC'05. Enhancement of a Use Cases based Requirements Engineering approach with Scenarios*, 2005.
- [Stroud07] Dick Stroud. *Journal of Direct, Data and Digital Marketing Practice. Social networking: An age – neutral commodity – Social Networking becomes a mature web application*, 3 October 2007.
- [Suchman83] L. Suchman. *ACM Transactions on Office Information Systems. Office procedures as practical action*, 1983.
- [Sutcliffe97] A. G. Sutcliffe. *Proceedings of the Third IEEE International Symposium of Requirements Engineering. A Technique Combination Approach to Requirements Engineering*, 1997.
- [Sutcliffe98] A. Sutcliffe. *Requirements Engineering Journal. Scenario-based requirements analysis*, 1998.
- [Sutcliffe03] A. Sutcliffe. *Proceedings of the IEEE International Conference. Scenario-Based Requirements Engineering*, 2003.
- [Sutton00] D. C. Sutton. *Req. Eng. Linguistic problems with requirements and knowledge elicitation*, 2000.
- [TAV99] M. Tawbi, C. M. Achour and F. Vélez. Centre de Recherche en Informatique. *Guiding the process of Requirements Elicitation through Scenario Analysis: Results of an Empirical Study*, 1999.
- [TechCrunch09] TechCrunch. Last access on 29 May 2009. http://www.techcrunch.com/wpcontent/white_label_social_networking_solutions_chart2.html
- [TS99] M. Tawbi and C. Souveyet. *Proceedings of the 2nd International Workshop on the Many Facets of Process Engineering. Guiding Requirements Engineering with a Process Map*, 1999.
- [TT06] T. Tsumaki and T. Tamai. *Software Process Improvement and Practice. Framework for matching requirements elicitation techniques to project characteristics*, 2006.
- [VanGundy81] A. B. VanGundy. Van Nostrand Reinhold Company. *Techniques to Structured Problem Solving*, 1981.
- [Vidal03] R. V. V. Vidal. Technical Report. *Creativity and problem solving*, 2003.
- [Vidal04] R. V. V. Vidal. Technical University of Denmark. *Creative and Participative Problem Solving – The Art and the Science*, 2004.
- [Watts03] Duncan Watts. W. W. Norton & Company. *Six Degrees: The Science of a Connected Age*, 2003.
- [Webligo09] CrunchBase. *Webligo*, Last access on 29 May 2009. <http://www.crunchbase.com/company/webligo>
- [WEC93] D. B. Walz, J. J. Elam and B. Curtis. ACM. *Inside a software design team: knowledge acquisition, sharing and integration*, 1993.
- [Wexelblat87] A. Wexelblat. Microelectronics and Computer Technology Corporation. *Report on Scenario Technology*, 1987.
- [WK04] J. Whittle and I. H. Krüger. *Third International Workshop on Scenarios and State Machines: Models, Algorithms, and Tools – SCESM'04. A Methodology for Scenario-Based Requirements Capture*, 2004.
- [WPJH98] K. Weidenhaupt, K. Pohl, M. Jarke and P. Haumer. IEEE Software. *Scenarios in System Development: Current Practice*, 1998.

- [Young03] Ralph Young. Arthec House, Incorporated. *Requirements Engineering Handbook*, 2003.
- [Yu97] E. S. K. Yu. Proceedings of the IEEE International Symposium on Requirements Engineering. *Towards modelling and reasoning support for early-phase requirements engineering*, 1997.
- [ZAS93] R. W. Zmud, W. P. Anthony and R. M. Stair. Journal of Management Information Systems. *The use of mental imagery to facilitate information identification in requirements analysis*, 1993.

Appendix A

Techniques for Requirements Elicitation

A.1. Traditional

A.1.1. Interviews

Interviewing is a technique often used in the requirements elicitation phase. This is the most common used technique when gathering requirements [CK92] [MS03]. Basically they are based in discussions between the requirements engineer and each stakeholder. These discussions' theme is the target system, so as to construct and understand a statement of stakeholders' requirements. Knowing that they are essentially human-based social activities, their effectiveness depends greatly on interaction between participants. There are some studies that address the many social aspects dealing with users in interviews [Berlin89] [Zucconi89]. According to [Berlin89], *"even a few hours of interviews can be very valuable, even when conducted by engineers who have had only brief training in interviewing and user needs analysis."* Interviews can be divided into two types: structured or closed interview which consists in a pre-defined set of questions and open interview which is a free and open-ended way of discussing about what do stakeholders expect from the system (with no pre-defined agenda) [KS98] [PHKTT03]. Interviews are simple and direct and can be used in virtually every situation to gather general system requirements [Reinikainen01]. Interviews provide the advantage of enabling direct contact with customers and the possibility of having immediate validation from them. Interviewing the right persons can result in the representation of multiple stakeholders' opinions across different communities of stakeholders being elicited [CK92]. On the other hand, the face-to-face mode of conversation can raise difficulties related to cultural differences. In fact, the organization and expression of the information collected through interview is a neglected issue and *"little tool support exists to help with the interviewing process as well."* [CK92] Other limitation of primarily or exclusively relying on interviews for eliciting is the responsibility that is placed on the requirements analyst *"shoulders"*. The requirements analyst is supposed to collect and integrate all different interpretations, goals, objectives, communication styles and terminology into a single set of requirements. According to [CK92] [RR99], interviews must be used in conjunction with other techniques. For instance, methods like the *gIBIS*, *"addresses social issues by inhibiting unconstructive rhetorical moves and supporting more constructive communication."* [CB88] [CK92] Another way to structure interviews is the use of domain models (e.g. feature oriented domain models).

A.1.2. Mind Mapping

Mind mapping is a method used to facilitate comprehension of notes taken during an interview, observation or when listening to another individual (stakeholder). Mind mapping differentiates from traditional notes in standard linear language, because it relies on *"words, pictures, symbols and colour to capture the way that your brain perceives the subject matter."* [Robertson01] This way, later when looking at this personalized view, the recall process will be easier when compared to the recall process using the traditional method for taking notes. In RE, mind mapping could also be use as a tool to summarize the understanding about something [Robertson01].

A.1.3. Neurolinguistic Programming

"Neurolinguistic programming is a set of models, skills and techniques for thinking and acting electively. The technique has many different elements including influencing skills,

understanding body language, the art of asking key questions, elective meetings and negotiations.” [Robertson01] This method provides a meta-model that provides insights on how to better understand what people say and do. This model could be used *“as a tool to identify vagueness or ambiguity in requirements.”* [Robertson01]

A.1.4. Document Review

When seeking for detailed knowledge about a given system, the review of available documentation seems like the logical step [Reinikainen01]. This method allows for team members involved in system analysis to get some knowledge before they start the stakeholders’ communication process. Basically, this method involves inspection of documents and files used by the organization. The latter is called document archaeology [RR99]. According to the same study, document review is not a standalone tool and should be used in association with other techniques. Document archaeology is defined as: finding new requirements that are suitable of being part of the new product out of the information from old work [RR99].

A.1.5. Contextual Inquiry

Contextual Inquiry (CI) is an interview method for gathering data. This method makes unarticulated knowledge about the work explicit so that the designer can understand it. This enables them to get at the low-level detail of work, which is often considered to be habitual and invisible. CI is considered to be as more as a discovery process than evaluative, more like learning than testing. CI is based on understanding the product’s utilization context making the user more like partner in the design process than an external user. It is all about interpretation [PHKTT03].

A.1.6. Introspecting

Introspection is one of the most obvious methods when trying to understand what properties a system should have to succeed. According to [GL83] this is a very useful method, but has a major problem: *“the introspection of an expert in a different field, such as requirements engineering, is unlikely to reflect the experience of actual users.”* [Reinikainen01] This happens because experts tend to work with what they remember or imagine of themselves. When designing interface, the gap between expert and customer could be particularly significant. This not means that introspection is inadmissible, rather that the process of introspection must be accompanied of a careful evaluation of its limits by the one’s using it [Reinikainen01].

A.2. Group

A.2.1. Group work & Meetings

“Meeting techniques cover separate techniques for meetings and workshops for gathering and developing requirements from different stakeholders” [MS03]

One of the most popular methodologies for requirements elicitation is Focus groups [Maguire98]. Focus groups bring together a cross-section of stakeholders in a discussion group format. This method is properly adequate to requirements elicitation and in the identification of issues that need to be tackled. The general idea is that each participant can act to stimulate ideas in other participants. In this technique, groups are brought together to discuss a certain topic. This discussion is often fostered through the use of stimulus materials, like films, storyboards or *“mockups”* (prototypes) as a focus [GL83]. The final objective is that by process of discussion,

the collective view becomes established, being greater than the individual parts [MS03]. Usually, the participants of a focus group are selected in a very criterious way and this methodology is used to confirm interview or questionnaire findings [Reinikainen01]. Focus groups are said to allow more natural interactions between participants when compared to other techniques, such as questionnaires or interviews [GL83]. In RE, focus groups are especially useful in scenario-based engineering to: refine initial understanding of requirements, refine initial design ideas and to validate revised work processes [MH97].

Another meeting technique is known as JAD (Joint Application Development) [CK92] [Ambler98]. The JAD technique is an extended facilitated workshop (JAD Session) in which both users and developers perform modelling activities. This technique focuses on improving the group process and involving the right people from the start [Zahniser90]. JAD groups are extremely popular in Requirements Engineering, especially for Information Systems development, because of its claimed speed on requirements development [GL83] [Dorine91]. These sessions are lead and moderated by a trained facilitator [Ambler98]. Basically, it involves collaboration between stakeholders and system analysts to identify needs or requirements in a concentrated and focused effort. This technique allows for simultaneous gathering and consolidating of large amounts of information in a short period of time. Usually, this technique provides a forum to facilitate the exploration of multiple view points regarding a given topic. On the other hand, JAD implies strong effort related to planning and scheduling tasks, total commitment from stakeholders (time and effort) and requires trained and experienced personnel. JAD is appropriate for gathering requirements from different stakeholders [PHKTT03]. JAD could be one of the techniques chosen when there are too many stakeholders to interview [Reinikainen01]. According to [Reinikainen01], this technique provides: reduction of time and cost in the requirements elicitation process, better communication amongst team members, appropriate channels to resolve conflicts and build consensus and improvement of workshop outcomes (e.g. flow charts, screen designs and system specifications). On the other hand, [LC93] identifies some problems associated with this technique: discrepancies participation's degree of JAD participants, limited time for group consensus in real-time and the outcome of the workshop have to be compiled and documented manually, which can become very consuming. Other problem that is often associated with JAD is related to the fact that these sessions are lead and moderated by a facilitator, who could inadvertently influence participants [CK92]. In addition, and according to [GL83] the close relation between JAD and Focus Groups allow people to think that these two methods suffer from the same problems.

Group work type activities are often supported by diverse kinds of materials (e.g. documents, diagrams and prototypes) so as to promote discussion and feedback. The objective of this type of activities is to involve stakeholders and encourage them to find solutions and resolve conflicts with minimum intervention from the requirements engineer. These group sessions can be very difficult to organize due to large number of possible stakeholders involved. Additionally, stakeholders must feel surrounded by a atmosphere of confidence where they could speak honestly and openly. For this reason, group work is less effective in highly political situations.

Group work and meetings provide the ability to get and share multiple viewpoints about the same subject resulting in collective wisdom thinking. On the other hand, these techniques could lead to dispersion from the main subject in discussion and are very demanding in terms of cost and time.

According to [HN99], elicitation techniques that depend on user interviews or group meetings as the primary mechanisms for involving users are inefficient, especially when dealing with large and highly diverse user groups. It was in this context that Group Support Systems (GSS) research emerged. This particular methodology has been *"highly successful in improving group meeting productivity and outcome in real-world settings."* [Reinikainen01]. Research on the use of GSS applied to requirements elicitation has led to development of specific tools designed for this activity and data modelling. In addition, research has been also focusing on Collaborative Software Engineering Methodology (CSEM). The latter has demonstrated the

need for additional collaborative tools to support key aspects of the requirements elicitation process [Reinikainen01]. Basically, “a group support system is a set of techniques, software and technology designed to focus and enhance the communication, deliberations and decision making of a group.” [Reinikainen01] Other terms that are often used along GSS are: Group Decision Support Systems (GDSS), Groupware, Computer Cooperative Work (CSCW), Computer Aided Team (CAT) and Electronic Meeting Systems (EMS).

GDSS are often categorized in four main types [SG85]: decision room, the local decision network, teleconferencing and remote decision making. These are organized along two dimensions: time and place. In terms of time, communication can be categorized as synchronous (e.g. messages are sent simultaneously) or asynchronous (e.g. messages are sent at a different time). In terms of place, both sender and receiver could be in the same or different physical spaces (Figure 19).

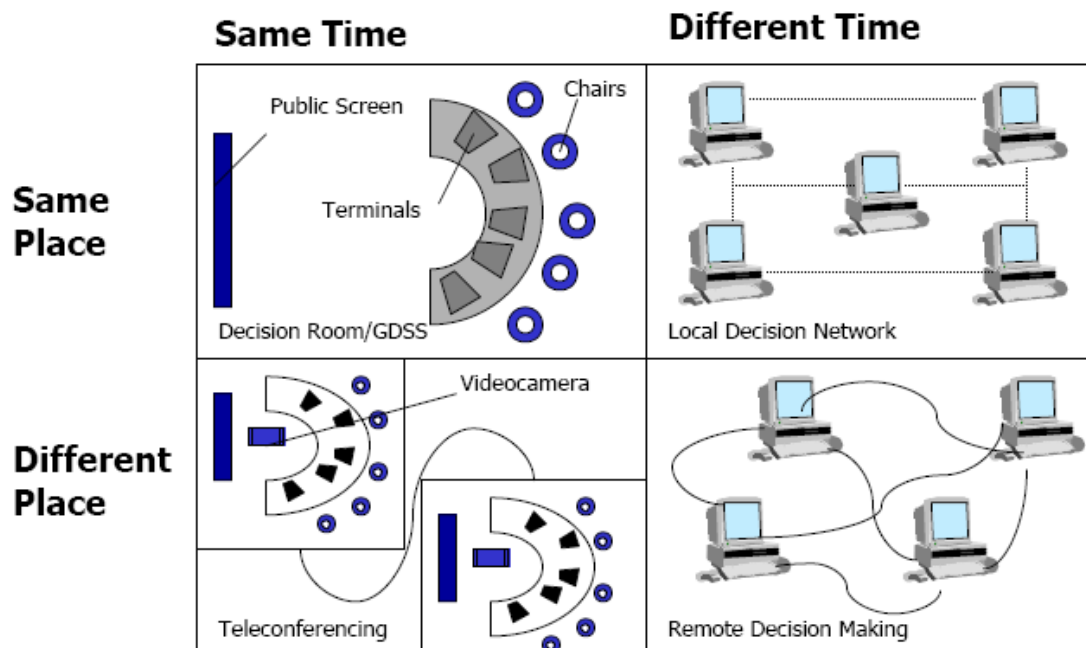


Figure 19: DeSanctis and Gallupe's typology of group DSS (modified from Finaly and Marples 1992)
[Reinikainen01]

According to [TA98] an important factor in idea-generating software is the intense input of ideas from the user. This helps the user moving from an analytical mode to a more creative one. Psychological research suggests that people have the tendency to anchor their thoughts on those of others. This has at least one disadvantage, subsequent ideas may not be significantly new [Reinikainen01]. Electronic brainstorming (software) is a thinking platform lacking of human subjectivity which objective is to encourage and foster creative thinking. In [MH97], electronic brainstorming is described as a technique that allows: rapid idea documentation, reducing impact of arrogant participants, reducing the stress of some participants when talking in public and real-time group view. Electronic brainstorming consists of gathering ideas and comments in an unstructured manner and then providing others with the possibility to respond to each other's questions/comments. This should be just about enough to enable a synchronous free flow of ideas [Reinikainen01].

As mentioned above, JAD is an efficient technique but it also has some problems. Those problems transform JAD techniques automation in a considerable challenge. Electronic JAD is an EMS which objective is to support traditional JAD session techniques using a set of Group System tools. In addition, E-JAD introduces some new concepts to traditional JAD techniques. One of them is the additional significant amount of individual work to perform by

each participant. In E-JAD, each participant is incited towards a more creative attitude [Reinikainen01].

[HN99] presents the challenges and results of the study of scenario combination with GSS technologies. According to the latter, in CSEM, scenarios are meant to support the collaborative requirements elicitation process. Scenarios should be used “*to support an evolutionary process that starts with rich descriptions of the business process, and then evolves those contextual scenarios into specific system cases, prototypes and, finally, into behavioural requirements specification.*” [Reinikainen01] The study suggests that this should be “*accomplished through an iterative process of individual user scenario definition, group refinement of scenarios, development team analysis and implementation and group review and feedback until behavioural requirements are agreed upon.*” [Reinikainen01]

Both synchronous and asynchronous collaboration techniques have been studied for the RE area. However, some studies, such as [HG98], defend that asynchronous methods are inadequate and that live collaboration and discussions are fundamental for RE group sessions. For instance, *Telepresence* is a method that provides distributed participants with the feeling that they are in the same meeting room. According to [Reinikainen01], in RE meetings, the sense of presence is absolutely necessary to guarantee coordination of real-time discussions. Other example of a method that helps in achieving synchronous collaboration is *Teledata*. This method allows participants in a meeting to share materials and discuss about ongoing work. In RE, this means sharing representations (e.g. text and graphics) and other documents. The share of artefacts between participants in requirements elicitation meetings is crucial and should not be neglected [HG98]. Finally, *Process Support* methods support the natural structured process in requirements engineering. According to [HG98], “*groupware should provide enough structure to guide a group through the particular of RE, both to help them stay on track and to remove the tedium of recreating routine structure.*” [Reinikainen01]

There are more methods and techniques that allow synchronous collaboration, regardless of the place. Two more relevant examples are: *Teleconferencing* and *Web-based Brainstorming*. The first allows for electronic communication between two or more people in different locations to have a conference or to collaborate. A variant of this allows for multiple participants view (*video teleconferencing*) through the linkage of several computers. The second one, *Web-based Brainstorming* is used when face-to-face brainstorming is not possible. This technique is based on Internet or Intranet to enable a virtual brainstorming session [Reinikainen01]. In RE, this technique is best suited for development of advance applications which require research or critical long-term view for a project that involves a significant number of users and other stakeholders [LW00]. *Web-based Brainstorming* is usually characterized by the existence of a list server or webpage that allows recording and commenting of features. This technique is particularly effective, since it is focused on persistence and idea maturation over time [LW00].

A.2.2. Abstraction

This technique is based on useful generalizations. “*The purpose of generalizations is to understand and articulate the rules that apply to a specific domain of knowledge and even to discover rules that are shared between domains.*” [Robertson01] Generalizations have the disadvantage that many people find very hard to think in terms of abstractions, and they often prefer to think in terms of specific instances.

A.2.3. Family Therapy

As presented in [Robertson01], stakeholders in a project are bounded in a similar manner to the members of a family. In fact, everyone is involved in the same social structure (the project). However, individual members have different opinions and viewpoints. For years,

family therapists have been studying how to help family groups in achieving a peaceful and productive co-existence. The family therapy model could be used in RE to help engineers communicate with their stakeholders in a project. The family therapy model is constituted by four parts: intake (choose about what to hear or observe), meaning (assign meaning to data), significance (decide how to feel about the assigned data) and response (make response). In RE, the family therapy model is best suited to facilitate communication between requirements analysts and stakeholders, *“providing a feedback loop in order to avoid misinterpretations.”* [Robertson01]

A.3. Model-Driven

A.3.1. Storyboarding

Storyboarding from the film and cartoon industries is another technique for building scenarios. According to [LW00], *“the purpose of storyboarding is to gain an early reaction from the end-user to the concepts proposed for the applications.”* Storyboards enable the observation of user’s reaction early in the lifecycle, well before coding and, even before detailed specifications’ development. Storyboards are often used for the following reasons: understand data visualization, define and understand business rules for the application, define algorithms and other mathematical constructs or to demonstrate reports or other types of outputs for early review [LW00] [Reinikainen01].

A.3.2. Business Events

“Requirements specification involves the investigation of some activity, work or business in the world.” [Robertson01] The business events’ technique is a way of discovering, investigating and managing the boundaries of the work. This technique is in someway similar to task analysis and decomposition models [Robertson01].

A.3.3. Quality Function Deployment - QFD

“Identifying customer needs, expectations, and requirements, and linking them into the company’s products.” [MS03] [PHKTT03]

QFD is basically a method to transform user demands into design quality, helping planners focusing on characteristics of a new or existing product or service. QFD transforms customer needs (VOC – the voice of the customer) into engineering characteristics for a given product or service. This is done by utilising different diagrams, tables, charts and matrices to facilitate tasks. QFD is used for different activities in RE, but is considered to be specially suited for gathering requirements, and carrying out high and low-level analysis of them [RMCM98] [PHKTT03].

A.3.4. Volere Requirements Resources

“Provides a generic process for gathering requirements, ways to elicit them from users, as well as a process for verifying them.” [MS03] [PHKTT03]

According to [RR99] *“requirements are the most misunderstood part of systems development, and yet the most crucial.”* The Volere approach to requirements engineering provides a Requirements Specification Template with all the steps needed to complete this process with success. This method focus on the understanding of customer needs through all phases of the process [RR99] and can also be used when writing the software requirements specification [PHKTT03].

When gathering requirements using this method is usual to recur to the *Volere* Snow Card. This artefact is a card containing the shell components. It aims at capturing all aspects of a given requirement, being filled in as information becomes available [Reinikainen01]. [RR99] used snow cards when interviewing customers and users to record requirements as they hear them. With the development of the gathering process, the cards' degree of completion increases.

A.3.5. Viewpoint-Oriented Methods

“The purpose of view-point-oriented methods is to produce or analyze requirements for multiple view points. They can be used while resolving conflicts or documenting system and software requirements.” [MS03]

A.3.5.1. Controlled Requirements Expression - CORE

The *CORE* method is normally designated as a view-point-oriented method. The *CORE* method has been defined to fit into a set of standards and procedures and it is applicable to many types of systems (e.g. not only computer systems). This method has a strong impact on negotiation and prioritisation of different view points. *CORE* is supported by a very simple diagrammatic notation. *“CORE defines the steps in production of a requirement specification, with particular emphasis on start-up and the link between steps. For each step, CORE also defines the activities involved and the checks to be applied.”* [Mullery79] In the matter of RE, *CORE* has a strong orientation for requirements gathering [Bose95] [PHKTT03].

A.3.5.2. Viewpoint-Oriented Requirements Definition – VORD

VORD “helps to identify and prioritize requirements and also can be utilized when documenting system and software documents.” [MS03]

VORD steps include viewpoint identification and structuring, documentation, analysis and specification. This method has the ability to capture all possible requirements by analysing a system from multiple perspectives. *VORD* steps are: identification of relevant viewpoints and then break them into sub-viewpoints. For each viewpoint, requirements are collected, rated by importance, documented, analysed and specified. *VORD* can also be used for system documentation and software requirements [KS96] [PHKTT03].

A.3.5.3. Viewpoint-Oriented System Engineering – VOSE

VOSE organizes viewpoints into configurations (collections of related viewpoints). This solution resolves conflicts among system requirements. In order to accomplish this, *VOSE* provides different styles of templates for description of viewpoints. *“The final system is constructed after combining all of the configurations with problem solved.”* [KS98] In RE, *VOSE* is usually utilized for performing top-level analysis to raw requirements [PHKTT03].

A.3.6. User-Led Requirements Construction – ULRC

ULRC is considered to be a social process that addresses one of the major problems in requirements elicitation: the gap between the user and the developer [DD96]. This is accomplished by training users to build the requirements model themselves [CM02]. This approach is constituted by three rounds. In round one the developer teaches the user how to build the requirements model. In round two, the user builds the model of the future domain using the model of current domain. Round three functions *“as part of an iterative process to improve the quality of requirements.”* [CM02].

A.3.7. Requirements reuse

Requirements reuse is a methodology that is often used in projects in which some requirements are not unprecedented. This means that the requirements engineer will reuse requirements that were already identified for other system's development in the same application area. It is generally considered to be a good practice to reuse as most knowledge as possible when building a new system. Reusing requirements means effort and time saving in the process of requirements elicitation, as well as risk decrease in the production of requirements [SS97] [KS98] [PHKTT03].

Requirements reuse and reverse engineering techniques provide the possibility of using already proven and tested information (e.g. code). However, these techniques are only used in some specific situations.

A.3.8. REVEAL

REVEAL is method for elicitation, specification and management of system requirements. It provides systematic guidelines for most RE activities (e.g. establishment of the problem context, identification of the stakeholders, elicitation and recording of requirements, validation, verification and maintenance). *REVEAL* fits perfectly in the gathering and elicitation requirements' phase. It is also suited for top-level requirements analysis [PHKTT03].

A.4. Cognitive

A4.1. Card Sorting

Card sorting is a technique that could be utilized for requirements elicitation and involves all relevant stakeholders. The involved stakeholders must *"sort a series of cards containing the names of domain entities into groups according to their own understanding. Furthermore the stakeholder is required to explain the rationale for the way in which the cards are sorted."* [MS03] This technique is often used to categorize and clarify requirements [MS03]. An example of a card derivative to determine program classes in software code is the *Card Responsibility Collaboration (CRC)* [BC89]

A4.2. Laddering

Laddering is a technique in which stakeholders *"are asked a series of short prompting questions, known as probes, and are required to arrange the resultant information into an organized hierarchical structure."* [MS03] Likely with what happens in card sorting, laddering is used as a way to clarify requirements and categorize domain entities.

A4.3. Repertory Grids

"Repertory grids involve asking stakeholders to develop attributes and assign values to a set of domain entities." [MS03] The result of this process is the modelling of the system in the form of a grid matrix with the categorization of the system's elements, categories' instances and variables assigned values. The aim of this method is to discover differences and similarities between domain entities. These characteristics turn repertory grids perfectly suited for requirements elicitation from domain experts. The repertory grids' technique is more detailed than card sorting and laddering, but is limited in presenting characteristics for complex requirements [MS03].

A.5. Contextual

A.5.1. Soft System Methodology - SSM

SSM's main goal is to establish a common understanding of a given problem within an organisation. SSM offers a set of guidelines to different situations (e.g. changing or ill-defined situations). This methodology does the latter through the structuring of the problem from the perspectives of all relevant systems (e.g. people, procedures, policies, hardware and software). This methodology has seven phases which objective is to: analyse complex systems, to plan and determining appropriate changes [CM02]. The first phase involves *“the formulation of the problem, represented in pictorial form. This “rich picture” allows for elicitation and development of multiple perspectives of the system, one new perspective of which is taken to develop a conceptual model to contrast against the existing problem situation. The comparison of desired and actual states is debated by participants, in order to refine the requirements and take action to improve the problem situation.”* [CM02] This approach is suitable for requirements elicitation and is often combined with other requirements' analysis methods [KS98] [PHKTT03].

Appendix B

SNS Comprehensive Analysis

B.1. General Purpose Social Networks Sites

Facebook

Facebook is a Social Network Site launched in February 2004. According to *Cnet* this Social Network Site has at least 235.000.000 registered users [Facebook09]. *Facebook* is one of the world reference social network sites and it grows in the thousands of new users each day. Basically, it started out with a business model somehow similar to the one of Professional Networks. In the beginning, *Facebook* was specially envisioned to American University students. The website's name refers to the paper facebook depicting member of a campus community that some US colleges and preparatory schools give to incoming students to get to know other people on campus. In this manner, nowadays, 50% of its users have already graduated in the university [Celaya08]. It is a register only Social Network Site for people with the minimum age of 13 years old. According to *Global Alexa Page Ranking* [AlexaFacebook09], *Facebook* occupies the 5th position in the most “popular” social network sites. One of the successful key issues that lead to *Facebook*'s success was definitely the ability to provide companies with a new way to create applications in order to share information and provide services. Additionally, this online platform allows for users to share recommendations and opinions about books, music and other potential purchase intentions. *Facebook* is a typical case of “*Wisdom of Crowds*”, because it enables conversation about products and services through the use of these above mentioned applications [Celaya08].

Facebook was founded in Cambridge, Massachusetts and has headquarters all over the world. Its founder is Mark Zuckerberg and CEO Dustin Moskovitz.

Following it is presented a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 8: General Purpose Social Network Site - *Facebook*

Name	Description
Name/Designation	<i>Facebook</i>
URL	www.facebook.com
Purpose	<i>Facebook</i> is a General Purpose Social Network Site that was firstly envisioned for American students only and then evolved to a much broader audience. That way, <i>Facebook</i> reached worldwide. Basically, one cannot say that this social network site was much more successful in one part of the world than other. In <i>Facebook</i> users can join networks organized by city, workplace, school and region to connect and interact with other people. Users can also add friends, send them private messages and update their personal profiles.
Target	
Geographically	According to <i>Global Alexa Page Ranking</i> [AlexaFacebook09], <i>Facebook</i> users come mostly from the following countries: United States (29,8%), United Kingdom (7,5%), Italy (6,2%), France (5,5%) and Canada (3,9%). <i>Facebook</i> presented notorious success in English speaking countries, but it rapidly enlarged its list of translation languages to reach broader audiences.

Age Group	<i>Facebook</i> was firstly designed to an younger population of students. Nowadays, its user's profile is generalizing, because users want to use <i>Facebook</i> to other purposes, such as products/services reviewing. The most recent and fastest growing segment on <i>Facebook</i> is the 35 to 54 age-group [Labash09].
Gender	<i>Facebook</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Education	<i>Facebook</i> has a strong academical purpose that derived from early <i>Facebook</i> days. Although, nowadays, <i>Facebook</i> is not only restricted to students, it bases almost all initial registration in High School/College/University attendance.
Primary Features / Functionalities	
Registry	The <i>Facebook</i> 's registry module is called <i>Sign Up</i> . Initially, it shows a tag line that mentions the fact that <i>Facebook</i> is a free platform that everyone can join. This module asks for some basic information: full name, email account, <i>Facebook</i> 's password, gender and birth date for privacy issues. After inserting and validating the required information, the system initiates security check through a mechanism of user's letter confirmation (CAPTCHA). If successful, the platform sends a confirmation email for the purpose of activating the account. Then the actual process of registration begins. It is divided in three main steps. The first is to find friends. The system searches for eventual users in the user's email contact list and then invite them at user's request. The second step involves introducing information about High School, College, University, Company and City. The third and last step is simply to join <i>Facebook</i> .
Sign In	The login module is very simple and it is identical to most Social Network Sites' login modules. Basically it just asks the registered user for email account and <i>Facebook</i> 's password. To ease the user's experience, the login module also has functionalities that allow its users to stay logged within a session (e.g. " <i>Keep me logged in.</i> "), as well as to retrieve its password (e.g. " <i>Forgot your password?</i> "). The latter functionality allows its users to receive an email in its associated email account with the actual password.
Friends Finder	The first method that <i>Facebook</i> users utilize to find friends involves using their mails emails. The user only needs to enter its email account and password. Additionally, the user can import a contact file. The second method is to search for user names within <i>Facebook</i> 's user database, in order to find old school or university classmates. At last, <i>Facebook</i> allows its users to find friends from AOL Instant Messenger or Windows Live Messenger buddies on <i>Facebook</i> by importing their buddies list or live contacts.
Profile	<i>Facebook</i> 's profile is very detailed and allows its users to display much information about them. Editable Profile information may be: birthday date, gender, hometown, relationship status, interests (e.g. music, TV shows, movies, books, and quotations), political and religious views, activities, IM screen name, mobile phone, land phone, address, city, zip code and website. Additionally, <i>Facebook</i> 's editable information also involves Education and Work related information. This information is related to study places and attendance years. <i>Facebook</i> allows its users to know what other users are doing through a status mechanism (micro-

	blogging look alike and similar to the one described in the <i>Hi5</i> case), in which users can post short messages. Similarly, <i>Facebook</i> also provides a place to enter links. Both of them can be commented by other users. <i>Facebook</i> users can rapidly create albums and post photos with descriptions, setting different privacy levels in the same place in a very intuitive manner. Videos are handled similarly to photos. Both video and photos can be recorded or took online through an <i>Adobe Flash Player</i> Application. The level of user profile customization is relatively limited since its users can only use plain text (e.g. no HTML or CSS).
Settings	<i>Facebook</i> has three different types of configurable settings: Account, Privacy and Application. The Account settings allow <i>Facebook</i> users to change different types of information: basic profile information, contact email account, password, the security question, etcetera. Privacy Settings are used by users to configure who can see personal information and profile, who can contact or who can search for a given user, what stories will appear in a given user's profile and a list of potential blocked persons. Finally, Application settings allow users to configure options of every one of <i>Facebook</i> 's applications: Events, Gifts, Groups, Notes, Photos, Links and Video. Additionally, <i>Facebook</i> 's settings include: Credit card management, join new networks, manage notifications from different <i>Facebook</i> 's applications, and phone activation to use <i>Facebook</i> 's mobile services and to change the actual translation language in use.
Message System	<i>Facebook</i> 's message system allows its users to communicate within network environment. It includes composing, sending and receiving messages to/for other registered users; receive RSS notifications and friends' updates.
Secondary Features / Functionalities	
Search Engine	<i>Facebook</i> has a built-in search engine that allows its users to search for content within platform.
Event Handler	<i>Facebook</i> also provides an event manager that includes upcoming, past and friend's events and birthdays. This event handler is similar to an online schedule with notifications, which could also be received through mobile.
Wall	<i>The Facebook's Wall</i> is shown in every user's profile page and allows other users (friends) to post messages. Besides plain text, posts also allow attachments. The <i>Wall</i> is a central location for recent information on a given user and everyone can contribute. If posted on the <i>Wall</i> , then soon enough these posts will figure in the Fans' News Feeds.
Pokes	This feature allows users to send a virtual " <i>pokes</i> " (a notification that tells a user that they have been poked). " <i>In principle, this is intended to be a "nudge" to attract the attention of the other user</i> " [Facebook09].
Notes	<i>Facebook Notes</i> is a blogging feature that allows tags and embeddable images. Additionally, users can import blogs from different blog hosts (e.g. <i>Xanga</i> , <i>LiveJournal</i> and <i>Blogger</i>).
Added-Value Content	
Online Advertising	<i>Facebook</i> has made a strong bet on online advertising through <i>Facebook Ads</i> , <i>Progress Tracking of Ads</i> , specific <i>Brand Profiles</i> , <i>Ad Messages</i> , etcetera. <i>Facebook</i> is one of the preferred social network sites to most brands and companies, because they provide a customer

	awareness digital place, where they could publicize, inform, and review their products/services. With the <i>Facebook's</i> event handler settings users can enable the association of advertising to their own events (e.g. Event: Football game, Advertiser: Sports Store).
Market Place	The <i>Facebook Marketplace</i> allows users to post classified ads within the following categories: For Sale, Housing, Jobs, and other. This is free of charge and ads can be posted in either available or wanted format.
Facebook Gifts	Similar to the <i>Hi5 Gifts</i> System. One of the only differences is related to the designation given to <i>Facebook's</i> virtual money (gift credits).
Insights Tool	<i>Facebook's</i> Pages Insights Tool provide users with the ability to see how many comments Fans are making on their posts, track <i>Facebook</i> users that started and continued to view their profiles.
Widgets and Applications	Similar to <i>Hi5</i> , but less highlighted in this website. <i>Facebook</i> launched the <i>Facebook Platform</i> , which provides a framework for third party developers to create applications that interact with core <i>Facebook</i> features. Third parties use the FQL functions to fetch data from the <i>Facebook's</i> API.
Chat	A truly added-value application is the chat one. It enables <i>Facebook</i> users and their network friends to communicate synchronously in a chat-oriented application, similar to instant messaging. It also provides feeds stories to be posted and discussed between friends in the chat.
Languages	<i>Facebook</i> offers its users at least 42 languages plus dialects. <i>Facebook</i> explores the collaborative idea of the Web 2.0, asking their members if they want to contribute to the <i>Facebook's</i> worldwide translation process. In order to do that, <i>Facebook</i> provides a Translation Application that provide discussion forums and the possibility of submit translation of new <i>Facebook features</i> . This application displays statistics on the number of translators, number of translations submitted and “untranslated” phrases, as well as translations made by a given user.
Mobile	Through www.m.facebook.com users can access to the mobile platform by mobile services. When a given user activates its mobile phone respecting a given account, he earns the possibility of receiving <i>Facebook's</i> alerts, uploading videos or photos and accessing to the mobile <i>Facebook's</i> platform directly from its mobile phone.
Facebook Connect	This is a single-on service that allows <i>Facebook</i> users to login to affiliated sites using their <i>Facebook</i> account and sharing information from such sites with their <i>Facebook</i> friends [Facebook09].
Some Associated Brands	
Burger King – Whooper Sacrifice Application	<i>Burger King's Facebook</i> application <i>Whooper Sacrifice</i> is the perfect example of Viral Marketing on Social Networks. Basically, <i>Burger King</i> was offering one free burger (the <i>Whooper</i>) to any user that removed 10 friends from their network [MashableWhooper09]. This campaign was a success.
Redbull	<i>Redbull</i> , the energetic drink brand, has a profile on <i>Facebook</i> . This profile is very interactive and has features ranging from: downloads, videos, products information, comments on <i>Redbull</i> websites through <i>Facebook</i> and applications such as games and other ways to connect with their customers.

Southwest Airlines	<i>Southwest Airlines</i> provide its clients with a utility profile on <i>Facebook</i> . That profile's purpose is to help the company understanding its customer base. This profile allows communication between company and customers, as well as between customers with the common desire of friendly, affordable and comfortable airfare.
Technology	
Architecture	<i>Facebook</i> has 235.000.000 registered users and its architecture is capable of supporting that much traffic rate in a very robust manner.
Server Information	Similarly to <i>Hi5</i> , <i>Facebook</i> also uses the <i>Apache</i> Web Server. In addition, it also uses <i>Content Delivery Network</i> , as well as <i>P3P</i> Policy known as the Platform for Privacy Preferences Project that “enables websites to express their privacy practices in a standard format that can be retrieved automatically and interpreted easily by user agents” [BWFacebook09].
Content Delivery Network	<i>Facebook</i> uses <i>Akamai</i> in order to provide a distributed computing platform for global Internet content and application delivery.
Database	<i>Facebook</i> uses <i>MySQL InnoDB</i> relational DB.
Framework and Language	<i>Facebook</i> ’s framework is <i>Ruby on Rails</i> and its main coding language is <i>Ruby</i> .
Document Information	<i>Facebook</i> relies on the following technologies to ensure efficient document information: <i>OpenSearch</i> to describe the search engine so it can be used by search client applications, <i>XHTML</i> , conditional comments, <i>CSS</i> and <i>Javascript</i> .
Encoding	<i>Facebook</i> encodes its webpages using <i>UTF-8</i> (8-bit UCS/Unicode Transformation Format).
Other technologies	From the long list of technologies used by <i>Facebook</i> the following are worth mentioning: <i>Capistrano</i> (automating tasks on remote servers), <i>Memcached</i> (distributed memory object caching system) and <i>Pingdom</i> (website monitoring).

Similarly to the first case (*Hi5*), *Facebook* is evolving by providing multiple platforms embed applications. *Facebook* does not benefit from a broad project like the *OpenSocial*, but it has its own application library. Also similarly to the *Hi5*’ case, *Facebook* is evolving towards mobile and has also developed a totally oriented mobile website.

Facebook grew in way that was more homogeneous than the *Hi5*. Basically, because of the fact that *Facebook* was initially a students’ oriented platform, and most Internet and social network sites’ users were already people attending the academia. This lead to a solid level of adoption between users, avoiding strange adoption busts in different regions.

An important factor that lead to *Facebook*’s success was definitely its “*Wisdom of Crowds*” product/service reviewing system that attracted both brands and companies, improving revenue models’ efficiency. The *Facebook* social network site benefits from several of its added-value content features.

Similarly to *MySpace*, *Facebook* is also a strong bet for brands and companies to easily reach their audiences. Examples like the *Burger King*’s application help business companies understand that there are new rules of marketing emerging. Additionally, enterprises must learn and talk with their customers, in order to better respond to their needs.

MySpace

MySpace is a web-based social network site, normally categorized as a General Purpose Social Network. Basically, the majority of its users come from the United States. *MySpace* was ready to launch within 10 days in August 2003. Owned by *Fox Interactive Media*, *MySpace*'s headquarters are in Beverly Hills, California. Its president is Tom Anderson, and Chris DeWolfe is the CEO.

In the *Global Alexa Page Ranking* [AlexaMySpace09], *MySpace* occupies the 8th position. Nowadays, *MySpace* is said to have at least 200.000.000 registered users over 14 years old (minimum age).

In June 2006, *MySpace* became the most popular social network site in the United States. Later, *MySpace* was overtaken by *Facebook*, based on monthly visitors (April 2008) [MySpace09].

Following it is presented a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 9: General Purpose Social Network Site - *MySpace*

Name	Description
Name/Designation	<i>MySpace</i>
URL	www.myspace.com
Purpose	<i>MySpace</i> is a General Purpose Social Network Site specially envisioned to reach large audiences. Usually is described as one of the most popular social network sites. <i>MySpace</i> has a particularly interactive interface and provides access to applications like: friends' network, personal profiles, blogs, groups, photos, music and videos [MySpace09]. <i>MySpace</i> is also known by its logo: “ <i>A place for friends.</i> ”. An important characteristic that comes to mind when talking about <i>MySpace</i> is it's bound with music and artists. It bases its revenue model almost solely on advertising.
Target	
Geographically	According to <i>Alexa</i> [AlexaMySpace09], most of its users come from the United States (69,1%), Germany (3,7%), United Kingdom (3,1%), Mexico (2,3%) and Australia (1,7%). The target market was obviously the United States, but <i>MySpace</i> has been betting on Asian Markets for a while now (e.g. China, South Korea and India). In less than 8 months has “ <i>captured</i> ” 10 million users, minimum [Celaya08]. The <i>MySpace</i> 's geographical expansion strategy is based in launching headquarters all over new target geographic markets. Although, <i>MySpace</i> is still not available in so many languages (at least 15).
Age Group	<i>MySpace</i> is designed to reach a broader age group than, for instance, <i>Hi5</i> and <i>Facebook</i> . <i>MySpace</i> 's objective is to reach youngsters (over 14 years old) and adults internationally. Both show clear satisfaction for having the ability to use some of the social network site features to personally customize their own profiles, in opposition to what happens with one of their major competitors: <i>Facebook</i> . This user's state of mind about <i>MySpace</i> can be noticed on their loyalty levels, measured by the daily time spent by user updating and staying in touch with their friends [Celaya08]. One of the <i>MySpace</i> 's most popular features allows its users to search for new music from bands and artists. Although many think that <i>MySpace</i> is a web place where young people “ <i>talk</i> ” and share opinions about music and other themes, surprisingly, 40% of

		its users are aged over 35 years old [Celaya08].
Gender		<i>MySpace</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Life Style		As mentioned above, <i>MySpace</i> nourishes a strong connection with music artists and bands and is much known for launching some successful careers (e.g. Sean Kingston). Many <i>MySpace</i> users use the website, not only to have a profile and interact with friends, but also to search for and listen to music. Basically, <i>MySpace</i> is often referred almost as a music review network, where people share music interests, although this is not its main purpose. Additionally, in an attempt to differentiate, <i>MySpace</i> has accomplished some partnership with major record labels (e.g. <i>Sony</i> , <i>Universal Music</i> and <i>Warner</i>), in order to get them to provide their catalog in the <i>MySpace</i> music channel.
Interests		<i>MySpace</i> allows its users to create groups so they can share common interests. (e.g. Art. Literature, Sports, Cinema, etcetera.). These groups are a much appreciated way that companies use to reach their consumers and expose their products/services.
Primary Features / Functionalities		
Registry		The <i>MySpace</i> 's registry module is very complete and asks the user for almost all the information needed to complete its profile: email account, <i>MySpace</i> 's password, local name (e.g. to be viewed by other <i>MySpace</i> users), name, surname, country, zip code, address, birth date, gender and language preference. After that, <i>MySpace</i> 's module presents the letter confirmation system (CAPTCHA). Having in consideration <i>MySpace</i> 's strong bound with music, the registry module also contemplates musicians' registration in the site, as well as copyright issues. After entering all requested information, the registration process takes only two steps that can be ignored/skipped: Photo Upload and Finding Friends through email account (e.g. <i>gmail</i> , <i>AOL</i> , <i>Windows Live Hotmail</i> or <i>Windows Live Messenger</i>) or name. When the registration becomes complete, the user has to wait at least 7 days to create its own group for security reasons (e.g. avoid spam). Then a confirmation email is sent to the user's email account, as well as email notifications of new friends (e.g. After registry, Tom Anderson is automatically added to your network, as well as the <i>MySpace</i> 's version used – <i>MySpace Portugal</i>). An important <i>MySpace</i> 's characteristic is that it allows non-registered users to view and use most of the features available (e.g. except some features like: sending messages to users, download and upload music, etcetera). Although being a little too crowded with information, this module presents some insights about the whole purpose of the website to encourage users to register.
Sign In		The <i>MySpace</i> 's login is similar to the same module in <i>Hi5</i> or <i>Facebook</i> .
Friends Engine	Search	<i>MySpace</i> 's Friends Search Engine has similar characteristics with the ones in <i>Hi5</i> and <i>Facebook</i> , but, additionally it allows <i>MySpace</i> users to search for friends based on school, similar interests or careers.
Profile		<i>MySpace</i> profiles have an important feature that satisfies its users: customization. <i>MySpace</i> users only need basic knowledge on HTML and they are immediately able to design their own profile pages, by choosing colors, images and music. Users appreciate <i>MySpace</i> 's interface that enables different theme pages that are easy to use and experiment. Additionally, <i>MySpace</i> platform also includes intuitive

	features to tag photos, videos and podcasts, so as to ease the process of sharing them with the rest of the community. Profiles allow users to create private online groups (e.g. communities), but they have to be registered for a minimum time period (7 days). Through these online communities, users can share all kinds of multimedia content. Similar to <i>Hi5</i> and <i>Facebook</i>, <i>MySpace</i> has a status display, that is used by users to announce what they are doing or its state of spirit. <i>MySpace</i> profile allows its users to manage photos, videos, schedule and personal blogs that can be created in the platform. In the eventuality of receiving new messages from users, a notification message is displayed in a side bar in the profile page. The <i>MySpace's</i> profile page has a characteristic that is sometimes seen as a drawback by its users: excess of advertising (e.g. pure advertising from companies and music/artists advertising). Profile comments exist and are treated similarly to the <i>Facebook</i> ones.
Settings	<i>MySpace</i> settings allows its users for fast profile information editing, account configuration (e.g. cancel an account), establish privacy and security settings (e.g. block users). The settings' configuration mechanism is similar to the one presented in the <i>Hi5</i> case, for instance. Additionally, <i>MySpace</i> has taken particular care into the spam issue. The <i>MySpace</i> settings include configuration of levels of security related to spam issues, such as using <i>CAPTCHA</i> (special images that computers have some difficulty in reading, in order to avoid that people use computer programs to send spam messages and comments) to protect different kinds of actions (e.g. messages, friend requests, comments, events invitations and instant messaging invitations) from spam activities. <i>MySpace</i> settings also include management of email notifications and applications (e.g. block a given application type or create user's restrictions to those applications on a given user's profile). <i>MySpace</i> allows its user to use a <i>MySpace's</i> ID that could be associated with accounts from third party applications. Finally, <i>MySpace</i> has a configuration system feature specially envisioned to manage HTML comments to profile, photos or blogs (that sometimes are very noisy and undesired by users). Additionally, <i>MySpace</i> settings enable users to display a music player in their own profiles, as well as to display absent messages to a given user's network friends.
Message System	The <i>MySpace's</i> message system is very similar to the one explained for the <i>Facebook</i> case. Additionally, provides spam handling, friend requests and solicitations management, management of an email oriented contact list, sending messages to group of friends and receiving/sending invitations to events.
Secondary Features / Functionalities	
Search Engine	The <i>MySpace's</i> search engine is powered by <i>Google</i> and allows user searches based on the following categories: People, <i>MySpace</i>, Web, Music, Videos and Images.
Event Handler	With the <i>MySpace's</i> event handler, users can view and search for upcoming events, create their own events and invite other users (registered and logged users only).
Take a Tour	<i>Take a tour</i> is a feature that did exist neither in <i>Hi5</i> nor in <i>Facebook</i>, and it is basically a simple guided tour available to people who want to start using the website. Sometimes, features like this can be the difference between adoption or not. Although, some users with more experience could find it as an annoying and noisy complement to the

	site's design.
Today on MySpace	This is another complementary feature that allows <i>MySpace</i> users to be aware of the news on different subjects. The user is able to show which kind of subject interest him (e.g. music, people or videos).
Moods	<i>Moods</i> are small emoticons that are used to depict the mood of a given user.
Forums	<i>MySpace</i> users use forums as the simplest and easiest way to share and discuss interests (comparing to groups or even to the <i>MySpace</i> ' s message system). Among various themes and subjects, <i>MySpace</i> users can discuss about: science, religion or <i>MySpace</i> issues. Forums also allow for registered and logged users to save their favorite topics and configure their forum' options.
Online Advertising	<i>MySpace</i> has various forms of online advertising. In the first place, it uses typical advertising banners from companies in the most diverse areas. This is one of the <i>MySpace</i> 's most profitable revenue model, and companies interested in placing their ads in the website must fill an online request form. <i>MySpace</i> is very efficient in collecting user data and to use behavioural data to select ads that each visitor sees. Secondly, <i>MySpace</i> uses advertising related to music, bands and artists.
Added-Value Content	
Advanced/Basic Search	Basic search is one feature that was been already identified in this document (e.g. <i>Hi5</i> and <i>Facebook</i>). The basic search may include: network (e.g. whole network or just friends), gender, age, relationship status, country, region and ordained by new in <i>MySpace</i> , recently updated or last login. Advanced search is truly an added-value content feature. Besides the search options that basic search has, advanced search also includes: ethnics, height, weight, lifestyle (e.g. smoking, non smoking, sexual orientation, education, etcetera.) and religion. The search results are displayed through each user's profile photo, based on the search options introduced.
MySpace Music	<i>MySpace Music</i> is a website area specifically directed to music fans that have interest in knowing highlighted artists, search for artists and look for different types of music to listen. Additionally, and besides other information provided by <i>MySpace Music</i> , it is possible for registered and logged users to download music.
MySpace Video	<i>MySpace Video</i> is similar to <i>MySpace Music</i> , but instead is focused on videos and it enables video upload from users (registered and logged in the system).
MySpace IM	<i>MySpace IM</i> uses <i>Skype</i> to enable instant messaging to its users. This is a very interesting feature that allows users to download the software from the site and add all their <i>MySpace</i> friends instantly.
Artist on Artist	<i>Artist on Artist</i> is a <i>MySpace</i> feature that allows users to be friends with stars and watch their interviews specially made to <i>MySpace</i> . This area also has artist forums and allows for user's comments.
Personal Blogs	The <i>MySpace</i> 's social network site was designed also to be a blog manager, where users can create their blogs and manage all associated matters (e.g. subscriptions, readers, security and statistics).
Groups	The number of <i>MySpace</i> groups is huge and every registered and logged user can create one after at least 7 days from register date in the

	website. These groups are similar to the ones described in <i>Hi5</i> and <i>Facebook</i> .
Help	This is a feature that few social network sites present and seems to be of much value to users. Basically this is a separated multimedia interactive site focused on tutorials to help <i>MySpace</i> users to take maximum potential of the platform (e.g. profile creation, video upload, HTML tips, etcetera.).
Applications Gallery	<i>MySpace</i> applications gallery allows users to search through a huge online repository of applications to use on their profiles. Games are available online in some languages (e.g. the Portuguese version of <i>MySpace</i> does not have access to games translated into Portuguese, but has access to the English version).
Languages	<i>MySpace</i> is available in at least 32 languages through <i>MySpace International</i> .
Mobile	Accessing through mobile devices or PC to http://m.myspace.com/ all users can use their mobile phones to connect from everywhere. The concept is similar to the presented in the <i>Facebook</i> case.
Some Associated Brands	
Nike	<i>Nike</i> brand has its own customized profile in <i>MySpace</i> . This profile allows for <i>Nike</i> fans to watch videos and photo galleries, to add <i>Nike</i> to their personal list of friends, favorites, groups or forward to friends, as well as to comment and participate in the <i>Nike's</i> Forum. In addition to the profile, <i>Nike</i> also provides a <i>widget</i> that allows <i>MySpace</i> users to watch <i>Nike</i> news, products and commercials.
Nokia	<i>Nokia Express Music</i> is the <i>Nokia's</i> profile on <i>MySpace</i> . This profile allows <i>Nokia</i> fans to do download, view <i>Nokia's</i> new and products. In addition, everyone can network and interact (e.g. add as a friend, send message, comment, etcetera.) with <i>Nokia's</i> profile on <i>MySpace</i> .
My Jobs	<i>My Jobs</i> on <i>MySpace</i> is a feature that is used by many brands and companies (e.g. <i>Apple</i> , <i>Microsoft</i> , etcetera.) to offer job opportunities to <i>MySpace</i> users.
Technology	
Architecture	With 200.000.000 registered users, and 260.000 new users registering each day, <i>MySpace</i> is another good example of a robust system [Hoff09].
Server Information	<i>MySpace</i> uses an Internet-based service for servers using Microsoft Windows called <i>IIS6</i> . Besides this, <i>MySpace</i> also uses <i>Google Webmaster</i> , <i>Yahoo Site Explorer</i> and <i>Content Delivery Network</i> [BWMySpace09].
Database	<i>MySpace</i> uses <i>Microsoft SQL Server</i> relational DB.
Framework and Language	<i>MySpace</i> uses the <i>ASP.NET 2.0</i> as a web application framework from <i>Microsoft</i> in order to build dynamic WebPages in <i>.Net</i> coding language.
Document Information	<i>MySpace</i> claims to use <i>XHTML</i> , conditional comments, <i>CSS</i> and <i>Javascript</i> .
Analytics and Tracking	<i>MySpace</i> relies on <i>Google Analytics</i> for tracking and analysis purposes.
Advertising	In order to deliver <i>Google AdWords</i> ads that are relevant to site content

	pages, A contextual advertising solution for delivering <i>Google AdWords</i> ads that is relevant to site content pages, <i>MySpace</i> uses <i>Google Adsense</i> .
--	--

MySpace is a slightly different case from the other two Social Network sites studied. *MySpace* has a strong musical influence that is directly related with almost all features that the website provides. Typically this is a website which is not solely designed for young people, rather it is designed for all music fans from all ages. *MySpace* is also a place for discussion, where users share and review everything, since music/videos to products/services. Some of its features are similar to the *Facebook* social network site, but *MySpace* seems to be more aware of its users' needs and more in touch with whole Web 2.0 concept.

Due to its popularity, *MySpace* has been “*harassed*” by major brands, in order to provide services that enable them to connect with their fans. This is currently one of the added-value features provided by *MySpace* and one of the major business unexplored fields.

Other General Purpose Social Network Sites

Following are presented brief descriptions of other General Purpose Social Network Sites.

Table 10: General Purpose Social Network Site - *Bebo*

Name	Description
Name/Designation	<i>Bebo</i>
URL	www.bebo.com
Description	<i>Bebo</i> is a General Purpose Social Network Site that started to focus on blogs, “ <i>Blog early, Blog often.</i> ” [GBebo09] and evolved over the years to a 40.000.000 registered users' general social network open to people over 13 years old. It was launched in January 2005, and it is developing to be available in more versions (e.g. United States, United Kingdom, Australia, etcetera). Besides the most common social network site features, <i>Bebo</i> also has some value-added ones, such as: blog settings, white board application (users can draw online) and book shelf.
Technology	<i>Bebo</i> uses <i>Resin</i> as its scalable <i>Java/PHP</i> application server in collaboration with <i>Google Webmaster</i> . <i>Bebo</i> claims to use <i>XHTML</i> , <i>CSS</i> and <i>Javascript</i> . Web page encoding is guaranteed through <i>UTF-8</i> [BWBebo09].

Table 11: General Purpose Social Network Site - *Friendster*

Name	Description
Name/Designation	<i>Friendster</i>
URL	www.friendster.com
Description	<i>Friendster</i> is a General Purpose Social Network Site in which registration is optional [Friendster09]. This social network site is particularly popular in countries like Indonesia, Malaysia, Philippines, Singapore and Thailand. In May 2008, a <i>Friendster Report</i> stated that the website had 100 million members worldwide [Friendster09]. <i>Friendster</i> is known by providing fans with profiles from celebrities, which users can see, send friend requests and comment.

Technology	Server functions are assured through <i>*nix</i> and <i>Apache</i> . The main framework for web development is <i>PHP</i> and can be easily embedded in <i>HTML</i> . <i>Friendster</i> claims to use <i>HTML 4.01 Transitional DTD</i> , <i>CSS</i> and <i>Javascript</i> . Encoding is assured by <i>UTF-8</i> [BWFriendster09].
-------------------	--

Table 12: General Purpose Social Network Site - *Mocospace*

Name	Description
Name/Designation	<i>Mocospace</i>
URL	www.mocospace.com
Description	<i>Mocospace</i> is a social network specifically designed for use on mobile devices. This is a typical example of a mobile social network [MocoSpace09]. <i>Mocospace</i> is a General Purpose Mobile Social Network with at least 3.000.000 users worldwide. Its main features are: mobile chat, instant messaging, photo and video sharing and forums.
Technology	<i>Mocospace</i> bases its web server on <i>Resin</i> and <i>Content Delivery Network (Akamai)</i> . <i>Mocospace</i> utilizes <i>CSS</i> for document information [BWMocospace09].
Similar Social Network Sites	<i>itsmy</i> , <i>mobikade</i> , <i>FriendsTribe</i> , <i>dodgeball</i> and <i>JuiceCaster</i>

Table 13: General Purpose Social Network Site - *Orkut*

Name	Description
Name/Designation	<i>Orkut</i>
URL	www.orkut.com
Description	<i>Orkut</i> is a General Purpose Social Network Site owned by <i>Google</i> , very popular in Brazil, Paraguay, India, Pakistan and Estonia [Orkut09]. <i>Orkut's</i> initial target was the United States market, but the website was mainly adopted by Brazilian people. The most known <i>Orkut's</i> features include: scrapbooks as a form of online and offline communication and online communities. Other interesting feature is that every other day <i>Orkut</i> displays a different quote in their users' profiles.
Technology	<i>Orkut's</i> framework is <i>Google Front End</i> , it claims to use <i>HTML 4.01 Transitional DTD</i> , <i>CSS</i> and <i>Javascript</i> . Additionally, <i>Orkut</i> encodes webpages trough <i>UTF-8</i> [BWOrkut09].

Table 14: General Purpose Social Network Site - *Tuenti*

Name	Description
Name/Designation	<i>Tuenti</i>
URL	www.tuenti.com
Description	<i>Tuenti</i> is an invitation-only Spanish General Purpose Social Network Site aimed to the Spanish market. <i>Tuenti</i> allows its users to set up a profile, upload photos, link videos and connect friends. This Social Network Site does not use online advertising, due to its noisy design nature.

Technology	<i>Tuenti</i> claims to use <i>XHTML Transitional</i> , <i>CSS</i> and <i>Javascript</i> . Encoding of webpages is assured by <i>UTF-8</i> [BWTuenti09].
-------------------	--

Table 15: General Purpose Social Network Site - *MyLife*

Name	Description
Name/Designation	<i>MyLife</i> former <i>Reunion</i>
URL	www.mylife.com
Description	<i>MyLife</i> former <i>Reunion</i> is a General Purpose Social Network Site based on premium account purchase (90% of the revenues). When registering, users have limited access to some features. This website's objectives are: “ <i>help members find and keep in touch with friends’ relatives and lost loves</i> ” [Reunion09]. “ <i>MyLife is known acquire the real names, birth data, high school and colleges attended by individuals and create profiles on their behalf.</i> ” [Reunion09]
Technology	<i>MyLife</i> uses <i>*nix</i> , <i>Apache</i> and <i>P3P</i> for web server purposes. Its main framework is <i>J2EE</i> and it claims to use <i>HTML 4.01 Transitional DTD</i> . Additionally it uses <i>CSS</i> , <i>Javascript</i> and conditional comments. To encode webpages, <i>MyLife</i> uses <i>ISO/IEC 8859</i> [BWMylife09].

Table 16: General Purpose Social Network Site - *SapoSpot*

Name	Description
Name/Designation	<i>SapoSpot</i>
URL	www.spot.sapo.pt
Description	<i>SapoSpot</i> is a Portuguese General Purpose Social Network Site directly associated with <i>Sapo</i> account. This Social Network Site is as popular as some of those studied in this document, but has many interesting features, such as: a geo-referenced system that allows its users to create an online “ <i>spot</i> ” and a pool system that users can use to share opinions about any subject.
Technology	<i>SapoSpot</i> uses <i>*nix</i> and <i>Apache</i> for web server services. Web development is made through the use of <i>PHP</i> . The website claims to use <i>XHTML Transitional</i> , <i>CSS</i> , <i>Javascript</i> , <i>PNG Fix (Javascript libraries)</i> and conditional comments. Webpages’ encoding is through <i>UTF-8</i> . In order to publish frequently updated content, <i>SapoSpot</i> uses <i>RSS</i> [BWSapoSpot09].

The universe of General Purpose Social Network Sites is very vast and diversified, but at some extent, their ultimate purpose and main features are all very similar. In the end, most General Purpose Social Network Sites reach for common audiences.

B.2. Professional Social Network Sites

LinkedIn

LinkedIn is a Professional Social Network Site that was founded in December 2002 and launched in May 2003 [aLinkedIn09] [LinkedIn09]. This business oriented network site has at least 35.000.000 registered users in over 200 countries, spanning approximately 170 industries [LinkedIn09]. *LinkedIn*'s CEO is Reid Hoffman, which is also *PayPal*'s Chairman of the Board.

This Professional Social Network Site is particularly popular in the United States and India, and each day are created, in average, 43.000 new profiles [Celaya08]. According to a 2008 *Nielsen's Report*, *LinkedIn* has grown 361% compared to the last year [Celaya08]. The *Global Alexa Page Ranking* [AlexaLinkedIn09] states that this website occupies 146th position in the traffic rank.

Following it is presented a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 17: Professional Social Network Site - *LinkedIn*

Name	Description
Name/Designation	<i>LinkedIn</i>
URL	www.linkedin.com
Purpose	<i>LinkedIn</i> is a Professional Social Network Site designed for professional purposes in diverse industries that pretend to foster the exchange information, ideas and opportunities. Basically, we could define <i>LinkedIn</i> as a networking tool to find connections, to recommend job candidates, industry experts and business partners. This tool allows users to maintain a list of contact details of people they know and trust in business. One of its user's most appreciated features is the capability of controlling and maintaining their professional identity online, with dynamic and always updated <i>curriculum vitae</i> . <i>LinkedIn's</i> “ <i>contact network is built up consisting of their direct connections, the connections of each of their connections (termed second degree connections) and also the connections of second degree connections (termed third degree connections)</i> . This can be used to gain an introduction to someone you wish to know through a mutual, trusted contact.” [aLinkedIn09]
Target	
Geographically	<i>LinkedIn</i> was launched in Mountain View, California in the United States. At an average rate of 1 person per second joining this network, and despite the fact that it was originally built to the American market, nowadays about half of <i>LinkedIn</i> members are from outside the United States. <i>LinkedIn</i> users come mostly from these countries: United States (49,4%), India (12,5%), United Kingdom (5,1%), Germany (3,7%) and Netherlands (3,0%) [AlexaLinkedIn09]. The social network's platform only exists in 4 different languages: English, German, French and Spanish. Although, <i>LinkedIn</i> is currently in an international expansion phase. Early in 2008, <i>LinkedIn</i> opened an Office in London, England, in order to improve its presence in Europe, considered as a key market for Professional Networks [Celaya08]. Only 6 millions of their total numbers of users are from Europe. This is not so strange, due to the fact that until July 2008 the only <i>LinkedIn's</i> language available was English. The future <i>LinkedIn's</i> goal should pass by reaching users from Latin America and Asia [Celaya08].
Age Group	<i>LinkedIn</i> is a professional social network site that is mainly designed for working people over 18. There are two types of different users, according to its age. First there are those people that are still in the University, just graduating or joining the working environment. Those are mainly young fellows between the ages of 18 and 24. The second type of users is mainly constituted by adults with some experience in the working market that are willing to be connected and be aware of what is around them professionally. <i>LinkedIn</i> features please both

	types.
Gender	<i>LinkedIn</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Education / Life Style	According to <i>LinkedIn</i> [LinkedIn09], 75% of their users are people with some kind of university degree [Celaya08]. Also, more than half of them have decision power in their own workplaces. One of the main differences between <i>LinkedIn</i> and other professional networks (e.g. Xing, Viadeo, etcetera) is that in <i>LinkedIn</i> is more common to find CEO's and other jobs of great responsibility [Celaya08].
Primary Features / Functionalities	
Registry	The registry module has information input fields that are specific of professional network sites. First, this module's objective is to assure that people that want to become members are serious and are willing to collaborate with the website. This <i>LinkedIn</i> module is used to fill institutional data, leaving the rest of the professional information to be filled when the user has logged in the social network. The information fields to fill in the registry module are: first name, last name, email account, <i>LinkedIn</i> password, country, zip code, current company, title and industry. Additionally, this module also asks the user for information about its current employment state (e.g. unemployed). When registered, the user will receive a confirmation email in its email account. Only registered and logged users can access to the website's features.
Sign In	<i>LinkedIn</i> 's login module is no different from other General Purpose Social Networks' login modules also described in this document. Essentially, <i>LinkedIn</i> 's login module does not allow users to automatically remember their passwords. Additionally, every time a <i>LinkedIn</i> user is going to log into the site, it has access to information about <i>LinkedIn</i> current new features.
People Engine Search	A notorious difference between General Purpose and Professional Network Sites is that professional social networks do not treat connections as friends, but as co-workers, classmates, colleagues or just people that a given user wants to know professionally. That way, after user's registration, there are at least 4 different ways that a given user can use to build its network: by email account (e.g. <i>Windows Live Hotmail</i> , <i>Yahoo!</i> , <i>gmail</i> , <i>AOL</i> or other), by address book (e.g. <i>Outlook</i> , <i>Apple Mail</i> or other), by current and/or past company's colleagues or, finally, by former classmates from school.
Profile	<i>LinkedIn</i> profiles allow their users to contact with previous co-workers, establish new professional relationships, search adequate profiles for a recruitment process, receive new job proposals from other companies and much more [Celaya08]. <i>LinkedIn</i> profile allows each member to have one photo, plus detailed professional information: country, industry, current and past education, recommendations from other users, work experience, technical and social skills, potential websites, blogs, personal presentations and personal contact. Additionally, the <i>LinkedIn</i> profile has an area with information about what kind of opportunities or information is a given user willing to receive. <i>LinkedIn</i> profiles are similar to job resumes, and that is one of the reasons why they only allow one photo per user. Other reasons to explain this fact are related to the social network's objectives (e.g. Professional networks

	do not have the objective to trigger social interaction in the vernacular sense of the term). Profiles also have partnerships with <i>Google Presentation Applications</i> that could be used to present <i>LinkedIn</i> users. Finally, <i>LinkedIn</i> profiles allow access to a given user's network, professional connections, to contact import and networks statistics.
Account & Settings	<i>LinkedIn</i> 's account settings are related to different accounts that are available through purchase. Basically, <i>LinkedIn</i> provides different accounts that allow access to added-value features. Through purchase of new account types, <i>LinkedIn</i> users can upgrade their accounts. <i>LinkedIn</i> 's settings are very diverse and range from: Profile Settings (e.g. Photo, Privacy Profile Settings, recommendations' Management, Status Visibility and Member Feed Visibility), Personal Information (e.g. name, location, email account, password and account management), email notifications (e.g. contacts, messages and invitations), homepage settings, RSS settings, privacy settings (e.g. possibility of receiving invitations to participate on market research surveys, profile views, partner advertising, connections browse, profile and status update, service provider listing, authorized applications, etcetera.) and configuration settings related to network purpose (e.g. use the network to: find a job, consulting or contracting positions, hire people, sell products/services to companies, investigate deals with companies, find professional information and find interested professional in a given product or venture).
Message System	The <i>LinkedIn</i> 's message system has a particularly important role in the site's dynamics. Social connections in Professional Networks like <i>LinkedIn</i> are mostly proposal, invitations and consults. This message system allows its users to communicate with other <i>LinkedIn</i> users (if allowed by the other's privacy settings), similarly to what happens with most other social network sites. Additionally, <i>LinkedIn</i> 's message system allows its users to send introductions (e.g. introductions made with the <i>Google Presentation Applications</i>) to other users, send invitations to events or other proposals, send profiles in order to apply to a certain job position, send business related questions or answers, send job proposals or even send recommendations to colleagues. Furthermore, this message system allows group messages and invitations. To avoid spam, <i>LinkedIn</i> allows its <i>premium account</i> users to contact only 3 people whom a given user wants to establish professional relationships with (per day).
Professional Search Engine	The <i>LinkedIn</i> 's professional search engine allows for basic and advanced search. The basic allows search for job, company, answers, in box, groups or people. The advanced search is based on search features like industry, school or company, and provides two types of search: for people and by reference. Search for people focus on people characteristics (e.g. name, age, interests, industry, company, school, etcetera). Search by reference is based on the companies in which a given user worked and for how long (e.g. initial and final date by company).
Secondary Features / Functionalities	
Explore People Search	This feature allows its users to save at most 3 particular searches, in order to provide fast profile access to them.
Status: “What are you working on?”	<i>LinkedIn</i> status is similar to other social network sites' status. The main objective is to inform other users what are the things you are working

	on at that moment (e.g. projects, tasks, etcetera).
Profile Completion	Every <i>LinkedIn</i> user has access to a profile status completion bar. This gadget allows a given user to know which is its profile's degree of completion in terms of information and used functionalities. Additionally, it also includes some tips to improve profile and <i>LinkedIn</i> 's usage in general.
Revenue Models	Professional network sites such as <i>LinkedIn</i> have different revenue models. The most common is the purchase of subscriptions by its users, which enables them to have access to upgraded features and versions of the platform [Celaya08]. For instance, <i>LinkedIn</i> 's premium account provides added-value features, such as access to a higher number of <i>InMail</i> messages that can be sent or an higher number of search results. Professional network sites also have significant revenues from online advertising (e.g. 20% to 30% of total) [Celaya08]. <i>LinkedIn</i> is no different and it displays job announcements from companies interested in recruiting and finding talents through social web.
Added-Value Content	
Amazon Book Search and Reading List	<i>LinkedIn</i> provides its users with the possibility of searching for books through <i>Amazon.com</i> and creating personal reading lists. <i>LinkedIn</i> users also can see other user's reading list.
The New York Times Partnership	<i>LinkedIn</i> has a service that gives its users the ability to view daily news about their or other professional sectors of activity. In order to improve this service, <i>LinkedIn</i> has partnered with <i>The New York Times</i> so each user can receive personalized information from that specific publication on its profile. Nevertheless, <i>The New York Times</i> has access to personal information from <i>LinkedIn</i> users [Celaya08].
Answers	One of the most unknown <i>LinkedIn</i> 's features is to freely consult and ask questions to experts in different areas, in order to clarify possible doubts.
Jobs	<i>LinkedIn</i> 's <i>Jobs</i> allows its users to find job opportunities using the <i>Job Advanced Search</i> . This feature also provides statistics on how many people have seen a given user's profile and on how many searches has a given user appeared in.
Events	The events' feature is the adequate instrument to manage and be aware of ongoing events. It allows users to add new events and manage all events and associated dates. Additionally it provides the ability to accept invitations to events.
Groups	This feature is identical to those same features studied in General Purpose Social Network Sites. The only difference is that these groups are business oriented and allow users to create groups associated with real companies. In <i>LinkedIn</i> , creating a group is a serious matter.
Applications	<i>LinkedIn</i> has taken the opportunity to embed applications as a great way to facilitate the way users interact in the professional network world. A good example of the latter is the partnership with the <i>Google Presentation Application</i> and with <i>Reading Amazon</i> . For instance, <i>LinkedIn</i> provides access to online work tools, files management services and blog connection services. Two important applications are <i>LinkedIn Pools</i> and <i>MyTravel</i> . The first one is used by users to collect market research data related to its <i>LinkedIn</i> connections. The second one allows users to share upcoming trips, current location and trips'

	stats.
Languages	As mentioned before, the <i>LinkedIn</i> platform is translated only in 4 different languages: English, German, French and Spanish.
Mobile	Mobile <i>LinkedIn</i> exists in www.m.linkedin.com and it is much simpler than the online website (features and design).
Some Associated Brands	
Job Opportunities	Brands and companies have only one way to associate with <i>LinkedIn</i> : by providing job opportunities. Companies representing brands can offer job opportunities on this Professional Network, but they are not allowed to create profiles to connect with other users, in opposition to what happens with General Purpose Social Networks.
Technology	
Architecture	<i>LinkedIn</i> has 35.000.000 registered users around the world, so it must be a good example of how to build a robust and scalable platform. The ultimate purpose of this Professional Social Network Site implies that security issues have been taken good care of.
Server Information	Its web server is the <i>Apache</i> and the <i>Apache Tomcat Coyote</i> as a connector element that supports the <i>HTTP/1.1 Protocol</i> . To express the website's privacy practices in a standard format, <i>LinkedIn</i> uses <i>P3P Policy</i> .
Framework and Language	<i>LinkedIn</i> 's election development framework is <i>J2EE</i> , and off course that its coded in <i>Java</i> .
Database	Its relational DB is <i>MySQL</i> and <i>Oracle 10g</i> .
Document Information	<i>LinkedIn</i> claims to be <i>HTML 4.01 Transational DTD</i> . To represent information, <i>LinkedIn</i> also makes use of <i>CSS</i> and <i>Javascript</i> .
Encoding	Webpages encoding is <i>UTF-8</i> .
Analytics and Tracking	For analytics and tracking, <i>LinkedIn</i> applies <i>Google Analytics</i> and <i>Quantcast Tracking</i> .
Other technologies	The list of other technologies used includes: <i>Spring</i> (platform for building and running <i>Java</i> applications), <i>Jetty</i> (Web server in <i>Java</i>) and <i>Lucene</i> (text search engine library in <i>Java</i>). The operating system is the open source <i>Solari OS</i> [BWLinkedIn09].

Professional networks like *LinkedIn*, generally, have similar features to General Purpose networks, but those features are rearranged to serve Professional networks' purposes and objectives. These networks are all about business oriented connections and are not used for entertainment.

LinkedIn is certainly in an expansion phase, mostly to European markets. This is an important step to this professional social network due to the fact that Europe is considered as the Social Networks' key market.

Viadeo

Viadeo is a Professional Social Network Site launched in June 2004 by Dan Serfaty (co-Founder and Chairman). This is an open social network that has at least 6.000.000 users. Since its beginning, it grew from a small social network localized in France to have different localized

versions for some European countries: United Kingdom, Germany, Spain, Italy and Portugal [Viadeo09].

At the beginning of 2009, “*out of Viadeo's 1.800.000 members in France 80% to 90% have at least five years of postgraduate education (Master's level or higher)*” [Viadeo09].

Following it is presented a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features. It is important to be aware that some features are very similar between different Professional Social Network websites. In this manner, some of them will be described very shortly with proper associations to similar features in other networks.

Table 18: Professional Social Network Site - Viadeo

Name	Description
Name/Designation	<i>Viadeo</i>
URL	www.viadeo.com
Purpose	<i>Viadeo</i> is a Professional Social Network Site mostly designed for European Social Networking and Campus Networking in Seven Languages (e.g. English, Deutsch, Spanish, Portuguese, French, Italian and Dutch). <i>Viadeo</i> former <i>Viaduc</i> , focus on the business needs of professionals, directors and CEO's of business companies. This Social Network follows a strong image of community and each country version has its own features and tries harder to encourage equal communication between its members, despite their different experiences. To <i>Viadeo</i> what really matter is the sharing of knowledge [Celaya08].
Target	
Geographically	As mentioned above, <i>Viadeo</i> has different versions to each language/location. Each time it wants to enter a new geographical market, <i>Viadeo</i> builds new permanent offices locally, buys local companies and hires professionals from the zone in which it wishes to operate. <i>Viadeo's</i> strategy is based in creating trust relations with local institutions and associations. <i>Viadeo</i> users are mostly from Europe, since there are no built platform versions to other countries' continents.
Age Group	<i>Viadeo's</i> users are characterized as middle-age professionals (35-50 years) searching for clients and business opportunities in social networks [Celaya08].
Gender	<i>Viadeo</i> does not make particular target distinction between genders. The website is built with features that generally please both. Despite that, 60% of its users are middle-age men.
Life Style	<i>Viadeo's</i> users are normally described as people that are not very social network active, possibly without blog or an account in <i>YouTube</i> , but with particular interest in being part of a community where they are able to share knowledge, contacts and experiences [Celaya08].
Primary Features / Functionalities	
Registry	The <i>Viadeo's</i> registry module is very simple and is constituted of two different phases: basic information completion and detailed information completion. The basic information includes: gender, name, surname, email account, country and <i>Viadeo's</i> password. This module also offers some users' statistics and opinions about the website, as well as site's related tags (e.g. networking, blogs, companies, jobs, etcetera.) to encourage people to register. Additionally, this module displays

	information about advantages in registering. The detailed information is related to the user's company, function, sector, job, location and what are the opportunities which the user is looking for (e.g. find clients, establish commercial partnership, establish financial partnership, etcetera.). The registration ends up with the user choosing the language version of the platform he wishes to use.
Sign In	This module is identical to already described login systems (e.g. <i>LinkedIn</i>).
Search Engine	<i>Viadeo</i> 's search engine is similar to the one presented in <i>LinkedIn</i> . Additionally, it grants access to a list of other users' visited profiles and allows for users to mark them.
Profile	<i>Viadeo</i> 's profile is very similar to the <i>LinkedIn</i> profile. This profile displays the user's photo, experience and education information, possible existent references and recommendations, as well as users' blogs (with a <i>Viadeo</i> 's <i>widget</i> to link the blog to the social network site) and links.
Settings Preferences	/ Most features are also very similar to the accounts and settings module on <i>LinkedIn</i> , but <i>Viadeo</i> 's Settings/Preferences allow users to configure their accounts so they can connect directly with other users (e.g. without having common friends). Through this module, users can purchase the premium account. <i>Viadeo</i> is much more restricted in terms of functionalities, when compared to <i>LinkedIn</i> . For instance, <i>Viadeo</i> 's users can only perform some actions that are free on <i>LinkedIn</i> (e.g. know which people have seen a given user's profile) through the purchase of the premium account.
Message System	<i>Viadeo</i> 's message system, as most of its features, is identical to the one presented in the <i>LinkedIn</i> case. A characteristic of this feature is the fact that it provides news about a given user's network contacts.
Secondary Features / Functionalities	
Profile Completion	This feature is exactly like the one in <i>LinkedIn</i> .
Contact Suggestions	Through <i>Contact Suggestion</i> , the <i>Viadeo</i> 's system advises users about other users with similar interests and characteristics.
Events	This feature allows for events' management.
Classifieds	Classifieds are often job opportunities or requests that are sent and spread through each user's relationship network. These opportunities are listed in the website.
Added-Value Content	
Answers	<i>Answers</i> is a <i>Viadeo</i> 's feature that grants users with the possibility of getting answers from experts in different sectors. It also provides each user with the possibility of answering themselves to others' questions.
Job & Education	This feature has an additional characteristic, compared to the similar in <i>LinkedIn</i> . Basically, <i>Viadeo</i> 's <i>Job & Education</i> provides access to MBA and Masters' opportunities, plus information about them and possibility to connect with people that have already attended.
Groups / Hubs	<i>Hubs</i> or <i>Viadeo</i> 's groups are very similar to other group features in other social network sites (e.g. <i>LinkedIn</i>). Although, <i>Viadeo</i> provides different groups to different versions of the platform (e.g. the Portuguese platform does not share the exact same groups of the

	English platform).
Languages	As mentioned above, this social network site is available in 7 different languages (Europe only): English, Deutsch, Spanish, Portuguese, French, Italian and Dutch.
Technology	
Architecture	<i>Viadeo</i> is another example of a Professional Social Network Site with a considerable amount of registered users (6.000.000 users), so it is worth to mention its technological analysis.
Server Information	<i>Viadeo</i> uses <i>Apache</i> as its web server, <i>*nix</i> as its operating system and <i>P3P Policy</i> .
Document Information	<i>Viadeo</i> claims to use <i>HTML 4.01 Transitional DTD</i> , as well as <i>CSS</i> and <i>Javascript</i> .
Encoding	Similarly to <i>MyLife</i> , <i>Viadeo</i> uses <i>ISO/IEC 8859</i> for webpage encoding.
Analytics and Tracking	<i>Viadeo</i> uses <i>Google Analytics</i> for tracking and analysis purposes.
Javascript Libraries	<i>Viadeo</i> uses some <i>Javascript Libraries</i> such as: <i>script.aco.lus</i> (cross-browser user-interface for building applications), <i>Prototype</i> (<i>Javascript</i> framework) and <i>JSON</i> (data-interchange language) [BWViadeo09].

Professional network sites have revealed to be very similar between them. The differences are few, and they are commonly related to the revenue model used. For instance, although both *Viadeo* and *LinkedIn* bet on premium accounts and subscriptions as they major revenue model, *Viadeo's* basic account is very limited in terms of functionality in opposition to what happens in *LinkedIn*. As another example, *Viadeo* as almost none online advertising in opposition to *LinkedIn*.

Other Professional Social Network Sites

Following are presented brief descriptions of other Professional Social Network Sites.

Table 19: Professional Social Network Site - *MeetTheBoss*

Name	Description
Name/Designation	<i>MeetTheBoss</i>
URL	www.meettheboss.com
Description	<i>MeetTheBoss</i> is a Professional Social Network Site for business and financial communities worldwide [MeetTheBoss09]. Founded in the United Kingdom in September 2008, by Spencer Green (Chairman), this is a business oriented social networking tool available only in English and open for registration. This social network site provides features that facilitate communication (e.g. secure video conferencing, instant messaging, email and SMS between members). Each <i>MeetTheBoss's</i> member has a personal profile with its business interests. Similarly to the Professional Social Network Site <i>The Star Tracker</i> , this site features interviews with industry leaders. As most Professional Networks, there is a section specially envisioned to expert Answers and Questions. Is one of the most recent professional networks in activity and already has 20.000 executives, which were approved after submitting their network's access requests (register)

	[MeetTheBoss09].
Technology	<i>MeetTheBoss</i> uses <i>J2EE</i> as its development framework, <i>XHTML Transitional</i> , <i>CSS</i> , <i>Javascript</i> , <i>Javascript Libraries (SWFObject)</i> and <i>Google Analytics</i> for tracking and analysis of the website [BWMeetTheBoss09].

Table 20: Professional Social Network Site - Ryze

Name	Description
Name/Designation	<i>Ryze</i>
URL	www.ryze.com
Description	<i>Ryze</i> is Professional Social Network Site designed to link business professionals, particularly entrepreneurs [Ryze09]. According to the site's information the social network has 500.000 members in 200 countries. The main revenue model is based on subscriptions of premium accounts. The basic account is very limited and only allows access to a few functionalities. <i>Ryze</i> is one of the first Social Networks to appear in 2002, founded by Adrian Scott [Ryze09]. Its main features are related to: profiling, inviting friends, networks, events and classifieds.
Technology	<i>Ryze</i> server applications are: <i>Apache</i> , <i>mod ssl</i> and <i>OpenSSL</i> . It uses <i>PHP</i> for development and it presents information on <i>CSS</i> and <i>Javascript</i> [BWRyze09].

Table 21: Professional Social Network Site - Xing

Name	Description
Name/Designation	<i>Xing</i>
URL	www.xing.com
Description	<i>Xing</i> is another Professional Social Network Site. It was named <i>openBC</i> until November 2006. It is used by 7 million users from at least 190 countries. It is translated mostly in European countries' languages, but it is also translated in Japanese [Xing09]. According to <i>Xing's</i> collaborators, a huge part of its users are international executives (e.g. men with 34 years old, with high education degree) [Celaya08]. This social network uses three different revenue models: online advertising, premium purchases and e-commerce [Celaya08]. <i>Xing</i> offers personal profiles, groups, discussion forums, event handler, coordination with mobile services and different <i>plug-ins</i> (e.g. <i>Firefox</i> , <i>Microsoft Outlook</i> , <i>Windows Address Book</i> , etcetera.)
Technology	<i>Xing</i> uses the <i>Apache</i> web server. Its applications used to document information are: <i>OpenSearch</i> , <i>XHTML Transitional</i> , <i>CSS</i> , <i>Javascript</i> , conditional comments, plus some <i>Javascript Libraries</i> [BWXing09].

Table 22: Professional Social Network Site - Refernet

Name	Description
Name/Designation	<i>Refernet</i>
URL	www.refernet.net
Description	<i>Refernet</i> is not quite a Social Network, but is considered more as a

	Professional Online Community that service providers use to network and exchange referrals. Through the community is possible to meet Realtors, insurance agents, mortgage brokers, loan officers, financial advisors and various service providers. This professional community is designed to entrepreneurs who either sell or provide services. Its target audiences include: business owners, service providers, and every working professional that owns or wants to start a business [Refernet09]. This professional community is based in the following phrase: “ <i>Business networking is proven to be one of the best methods to establish credibility, build your contact list and obtain quality business referrals.</i> ” [Refernet09]
Technology	Refernet uses <i>Apache</i> , <i>PHP</i> , <i>CSS</i> and <i>ISO/IEC 8859</i> for webpage’s encoding [BWRefernet09].

Table 23: Professional Social Network Site - *Yelp*

Name	Description
Name/Designation	<i>Yelp</i>
URL	www.yelp.com
Description	<i>Yelp</i> is a Professional Social Network focused on user review and local search. According to [Yelp09], this site is accessed by over 10.6 million people each month. This site is only available in three versions: United States, Canada and United Kingdom. <i>Yelp</i> was founded in 2004 and helps people finding cool places for a variety of purposes based on network members information [Yelp09]. Normally, this website is available by city and is available through mobile devices in www.m.yelp.com .
Technology	<i>Yelp</i> uses <i>Ubuntu</i> , <i>Apache</i> , <i>mod ssl</i> and <i>OpenSSL</i> . The language used by <i>Yelp</i> for software development is <i>Python</i> . Additionally, <i>Yelp</i> claims to use <i>HTML 4 / 4.01 Strict</i> . For document information, <i>Yelp</i> makes use of: <i>Open Search</i> , <i>Image Tool Bar</i> , <i>Image Map</i> (contains image maps, clickable regions of an image), <i>CSS</i> and <i>Javascript</i> . Other technologies include: <i>Google Adsense</i> , <i>Google Ad Partner Services</i> and <i>RSS</i> [BWYelp09].

Table 24: Professional Social Network Site - *Spoke*

Name	Description
Name/Designation	<i>Spoke</i>
URL	www.spoke.com
Description	<i>Spoke</i> is a Professional network with 40 million business people at 2.3 millions companies. <i>Spoke</i> is characterized by the fact that it allows users to connect with anyone in the network whether they are member or not, in opposition to most Professional Networks. In this manner anyone could reach anyone without even having to be registered in the network. <i>Spoke</i> is used by business people whose job requires them to make contact and develop new relationships with other business people (e.g. sales, business development, marketing, recruiting, etcetera) [Spoke09].
Technology	<i>Spoke</i> uses the following technologies: <i>nginx</i> (<i>HTTP</i> server and mail proxy server), <i>PHP</i> , <i>XHTML Transitional</i> , <i>CSS</i> , <i>Javascript</i> and

ISO/IEC 8859 [BWSpoke09].

Most Professional Social Network Sites focus on the same details, but some are more successful and thought of in a more serious manner, due to its special focus on privacy rules (e.g. 3 friend request denials and the user is expelled from the website).

B.3. Specialized Social Networks Sites

Classmates

Classmates is a Specialized Social Network Site which was created in 1995 by Randy Conrads [Classmates09]. *Classmates* is often described as an open social network site used to locate and interact with acquaintances from high school, college, work and the military [AlexaClassmates09].

Classmates has more than 40 million registered accounts, including 3.5 million pay accounts as of 31 March 2008 [AlexaClassmates09]. According to *Global Alexa Page Ranking* [AlexaClassmates09], *Classmates* occupies a traffic rank position of 492nd, which is considered to be very significant having into account that this is a specialized social network.

Created and “*raised*” in the United States, *Classmates* had a more prominent growth in this country. Lately, *Classmates* has been expanding to other countries as well, but the number of users from the United States continues to be overwhelmingly superior to other countries.

Following it is presented a more detailed description of the Social Network Site, as well as its more relevant characteristics, functionalities and features.

Table 25: Specialized Social Network Site - *Classmates*

Name	Description
Name/Designation	<i>Classmates</i>
URL	www.classmates.com
Purpose	<i>Classmates</i> is a Specialized Social Network Site envisioned to reach people who want to meet friends from school, college, work or the military. Basically, the social media website helps its members in finding, connecting and keeping in touch with friends and acquaintances that they met throughout their lives (e.g. kindergarten, primary school, high school, college, work, and the United States Military). <i>Classmates'</i> members contribute to this social network site with relevant user generated content that is crucial in attracting new social networking members and maintaining old ones. As an important note, the <i>Classmates'</i> company operates three international social networking services to reinforce its business model (e.g. <i>StayFriends</i> in Germany and Sweden and <i>Trombi</i> in France) [Classmates09]. <i>Classmates'</i> users use their real names (in opposition to screen names), but their private data only can be shown if allowed by a given user in a one on one communication process.
Target	
Geographically	As mentioned above, the website was created and first launched in the United States, so initially, it was very popular there. Later, the company tried to focus on different markets, including European countries and from Asia and Pacific. Despite this expansion effort, nowadays, an huge amount of their users come from the United States (79,5%). Others come from: Canada (4,1%), India (1,6%), United Kingdom

		(1,0%) and Iran (0,8%) [AlexaClassmates09]. The website has some European versions, but they were not so widely adopted.
Age Group		<i>Classmates</i> is directed to all of those people who wish to connect with people that they met throughout life. Those are mainly adults, but young people also want to reconnect with others that they met.
Gender		<i>Classmates</i> does not make particular target distinction between genders. The website is built with features that generally please both.
Education / Family / Life Style		Although <i>Classmates</i> is considered to be a Specialized Social Network Site, its target audience, at least in the United States, is relatively big, because the website has specialized in different areas: high school, college, work and the military. This way, the target audience is considered to be very diverse.
Primary Features / Functionalities		
Registry		<i>Classmates</i> 's registry module is very complete and intuitive, because it has to deal with a considerable amount of different people, trying to access to different communities (e.g. the military, school). First, there are different versions of the website, depending on the country of the user (e.g. United States, France, Germany, etcetera). No matter the user's country, the features remain the same. The only feature that changes is the website version's language. This module starts by asking its users which kind of community they want to join (e.g. school, college, and the military). Then, having into account to the user's choice, the website asks for information related to the place where they attended that community/institution (e.g. state, city and institution attended). For each one of these places, the website provides information about the number of members listed in the social network site. After this, the user only has to enter its personal information (e.g. graduation year/class, birth date, gender, first name, last name, last name at the date of graduation, email account and zip code).
Sign In		The <i>Classmates</i> ' sign in module can be compared, for instance, to the one presented and described in <i>LinkedIn</i> .
People Engine	Search	Similarly to most people search engines provided by Social Network Sites, this one has two main types: basic and advanced. The basic type allows website users to search for people, k-12 schools (Kindergarten through grade 12 in the United States), colleges, workplaces, military or neighbors. The advanced search is considered to be very simple compared to other already presented in this document (e.g. <i>LinkedIn</i>). The advanced search only allows the same basic search features plus searching by name, institution and location.
Profile		<i>Classmates</i> profile is the feature that most differ from this social network site from those presented until now. Similarly to other social network sites, despite its type, this profile provides personal information on its users, as well as profile statistics (e.g. number of visits, number of guest book names, number of notes and number of photo comments). Additionally, it allows its users to upload photos and associate them with a given temporal date. Then these photos are shown in a time line that can be customized. Other profile's interesting feature allows its users to tell their stories based in a check box filling system. Then users are able to match their own story with others. The <i>Classmates</i> profile also provides a map with all of a given user's friends' location, a bulletin board and the possibility to join other

	communities/institutions. Finally, the profile feature enables its users to have knowledge of what is going on in their communities through activity news.
Account Settings	This is a very simple feature that allows edition of profile and communities. Furthermore, users can also configure their account settings (e.g. password configuration).
Message Center	<i>Classmates's Message Center</i> is also very simple and allows users to communicate between them. Its functionalities are: <i>inbox</i> , <i>outbox</i> and <i>review terms</i> . The last one is a remainder of the <i>Classmates'</i> terms and regulation. This happens, in order to aware its users of website's communication rules.
Secondary Features / Functionalities	
Profile Progress	This feature is identical to those described in the <i>LinkedIn</i> and <i>Viadeo's</i> cases.
Site Tips	This feature helps <i>Classmates'</i> users in taking the best out of the social network sites. Plus it also informs its users about potential ways of getting money just by networking.
Help Center	The <i>Help Center</i> provides information about <i>Classmates's</i> features and FAQ.
Gold Members Account & Online Advertising	These are two revenue models adopted by <i>Classmates</i> . The <i>Gold Members Account</i> provides users with the ability to locate its friends and to arrange events or reunions. Moreover, the website also displays online advertising. Likewise other networks (usually professional ones), this network launches periodical online surveys for users to take part in (e.g. <i>Foresee Online Surveys</i>). <i>Classmates</i> has been criticized for some of its business practices that included user difficulties in canceling account, because of the company's membership billing renew policies.
Added-Value Content	
Events & Reunions	<i>Events & Reunions</i> is one of the key features of this Specialized Social Network Site. Basically, is based on users' communities and allows them to set up reunions, be aware of upcoming events or have access to information about past events. Another key characteristic within this feature is related to <i>Reunion Extras</i> : create an online reunion, document a day in the life of a group, pick a cause and a monetary goal, create discussion groups within communities and mobilize the community in finding a given community missing colleague.
Languages	<i>Classmates</i> is available in different languages according to the version of the website (e.g. English, German, French, etcetera.).
Technology	
Server Information	<i>Classmates</i> uses <i>P3P Policy</i> for server purposes, in order to express their practices in standard format.
Document Information	The <i>Classmates's</i> website claims to be <i>HTML 4.01 Transitional DTD</i> . Additionally uses <i>CSS</i> and <i>Javascript</i> .
Other technologies	<i>Classmates</i> uses other technologies such as: <i>JQuery</i> as a <i>Javascript Library</i> and <i>DoubleClick.Net</i> for online advertising [BWClassmates09].

Classmates is a good example of a Social Network Site that specialized on reconnecting old acquaintances from many institutions one attended throughout life. Features like *Classmates's Events & Reunions* are perfect examples of specialized services that differentiate these networks' type from others.

Similar Social Network Sites

Table 26: Specialized Social Network Site - *CollegeTonight*

Name	Description
Name/Designation	<i>College Tonight</i>
URL	www.collegetonightinc.com
Purpose	<i>College Tonight</i> is a Specialized Social Networking Service for United States college students, graduate students and Alumni. It has special focus on campus nightlife events. <i>College Tonight</i> helps US students to socialize and explore their communities. To start an account it is required to have an email with “.edu” ending [CollegeTonight09].
Technology	This websites uses: *nix, Apache, mod ssl, OpenSSL, AutoPassthrough (Frontpage security module for Apache), PHP, Frontpage Extension (website administration tool), XHTML Transitional, CSS and Javascript [BWCollegeTonight09].

Table 27: Specialized Social Network Site – *Friends Reunited*

Name	Description
Name/Designation	<i>Friends Reunited</i>
URL	www.friendsreunited.co.uk
Purpose	<i>Friends Reunited</i> is a Specialized Social Network Site that is free to register and that facilitates contact with friends from primary and secondary schools, university, address, workplace, sports club or armed service. Basically, any user can create its profile to share photos and interests and map their real life in a time line. <i>Friends Reunited</i> was the first online social network to reach popularity in Britain. This website has different versions (e.g. England, Ireland, Scotland, Wales, Australia, New Zealand, South Africa, Singapore, Hong Kong or Malaysia). Similarly to <i>Classmates</i> it is possible to set up reunions between friends [FriendsterReunited09].
Technology	The <i>Friends Reunited</i> list of main technologies used is constituted by: IIS6, P3P Policy, Javascript Libraries (jQuery and jQuery UI Tabs), ASP.NET, ASP. NET Ajax, XHTML Transitional, CSS and Javascript [BWFriendsReunited09].

Table 28: Specialized Social Network Site – *Trombi*

Name	Description
Name/Designation	<i>Trombi</i>
URL	www.trombi.com
Purpose	<i>Trombi</i> is a Specialized Social Network Site created in the year 2000 that helps its users finding, connecting and keeping in touch with friends from kindergarten, primary school, high school and college in France. In July 2006, <i>Trombi</i> was acquired by the Social Network

	<i>Classmates</i> [Trombi09].
Technology	<i>Trombi</i> main technologies for development are: <i>Apache</i> , <i>Apache Tomcat Coyote</i> , <i>HTML Transitional DTD</i> , <i>CSS</i> and <i>Javascript</i> [BWTrombi09].

Social Network Sites that are similar to *Classmates* often have the same features and functionalities, but are designed to target different communities by country (e.g. *StudyVZ* – Germany and *Nasza-klasa* - Poland).

Other brand Specialized Social Networks

Following are presented brief descriptions of other brand Specialized Purpose Social Network Sites.

Table 29: Specialized Social Network Site – *MOSH*

Name	Description
Name/Designation	<i>MOSH</i>
URL	www.mosh.nokia.com
Purpose	<i>MOSH</i> is the <i>Nokia</i> mobile online community where <i>Nokia</i> users can fill their phones with unique, user-generated mobile content. Through <i>MOSH</i> everything from applications (e.g. mobile games, videos, songs or graphics) are accessible from mobile device. This mobile online community is free and open to registration and users that have created mobile content could upload it into the platform and get it available to other users. Additionally, users can comment, rate content and chat. This online community organizes its members by rank (e.g. usage degree: uploads) or by quantity of connections.
Technology	<i>MOSH's</i> list of main technologies is constituted by: <i>Apache</i> , <i>Red Hat Enterprise Linux</i> , <i>RSS</i> , <i>XHTML Strict</i> , <i>CSS</i> and <i>Javascript</i> [BWMOSH09].

Table 30: Specialized Social Network Site – *Toyota Hybrid*

Name	Description
Name/Designation	<i>Toyota Hybrid</i>
URL	www.toyota.com/hybrid
Purpose	<i>Toyota Hybrid</i> is a Specialized Social Network Site designed to proud owners of <i>Toyota</i> hybrid vehicles network among them. Hybrid owners can post videos, share photos and meet other owners. Additionally, they can discuss reasons for buying a hybrid vehicle and maybe convince non-believers. Nowadays, the site has, at least, 10.000 registered users. The social network has features that are able to group owners by vehicle attributes (e.g. color, age, etcetera), as well as applications like interactive maps and gas saving calculators.
Technology	The list of development technologies is constituted by: <i>Apache</i> , <i>XHTML Strict</i> , <i>CSS</i> and <i>Javascript</i> [BWToyotaHybrid09].

Table 31: Specialized Social Network Site – *My Starbucks Idea*

Name	Description
-------------	--------------------

Name/Designation	<i>My Starbucks Idea</i>
URL	www.mystarbucksidea.force.com
Purpose	<i>My Starbucks Idea</i> was launched in a phase where <i>Starbucks'</i> products (e.g. coffee) started to lose clients. This Specialized Social Network is also part of a bigger business strategy that wants to get feedback from customers. Unlike other brands that used Social Media applications and services just to provide information and as a form of advertising, <i>Starbucks</i> really wants to take in consideration ideas from its customers. In order to accomplish that goal, the Social Network allows users to vote on items, discuss them and have access to results on some work-in-progress ideas [Nicole08].
Technology	<i>My Starbucks Idea</i> is developed in the following main technologies: <i>P3P Policy</i> , <i>HTML 4.01 Transitional DTD</i> , <i>CSS</i> and <i>Javascript</i> [BWMyStarbucks09].

A great number of brands and companies are creating personalized Social Networks for their clients. Particularly, brands create Social Network Sites to trigger viral marketing (e.g. *word-of-mouth*) on specific products (e.g. *Mercedes-Benz* and *Hybrid Toyota*).

myTag

myTag is a Portuguese Specialized Social Network Site created by *Optimus*. This Social Network is particularly popular in Portugal, especially among *Optimus* mobile service users.

Table 32: Specialized Social Network Site – *myTag*

Name	Description
Name/Designation	<i>myTag</i>
URL	www.optimustag.pt/Comunidade
Purpose	<i>myTag</i> is a Specialized Social Network from <i>Optimus</i> , the Portuguese mobile phone service provider. Its main objective is to connect <i>Optimus</i> clients, providing a new and complementary online communication service. Non <i>Optimus</i> clients can become members too, but they are encouraged to do it. Basically, <i>Optimus</i> current and potential future clients could have an online profile that enables them to share photos, communicate and meet new friends online. This is an additional service to the mobile phone service, instant messaging and web phone. <i>myTag</i> allows for its users to create a profile, meet people, share personal photos, receive network notifications through mobile devices and others. This website is very interactive and most features are available through a system similar to <i>pop-up</i> .
Target	
Geographically	<i>myTag</i> is oriented to current and potential future customers of the Portuguese mobile service provider <i>Optimus</i> . The website is only available in Portuguese.
Age Group	<i>myTag</i> is definitely designed for an younger crowd. As will be stated in this <i>myTag</i> Social Network's description, most of the website's functionalities are built thinking mainly in younger crowd of <i>Optimus</i> clients (14 to 30 years old).
Gender	<i>myTag</i> does not make particular target distinction between genders. The

		website is built with features that generally please both.
Life Style		<i>myTag</i> is envisioned to capture new <i>Optimus</i> mobile users or to maintain old ones. This Social Network is designed to users that use their mobile phones in a daily regular basis.
Primary Features / Functionalities		
Registry		This module is similar to the most registry modules described in this document. Basically, it asks the user for information, such as: nickname, birth date, gender, email account and <i>myTag</i> 's password. This module differs from others because it asks the new user for its mobile phone number to complete the activation process. Registration is available for any user associated with any Portuguese mobile service. The activation code is then sent to the mobile phone, and the activation process is finished online.
Sign In		The login system is identical to others described in this document (e.g. <i>LinkedIn</i>).
People Engine	Search	Users can search for other users' profiles through the built-in <i>myTag</i> 's search engine. The basic search allows search by name. The advanced search allows search by: name, email account, sign of the zodiac, country, region, location, relationship status, gender, age and through mail service.
Profile		<i>myTag</i> 's profile has 5 main components: personal information, photo gallery, comments, blogs and friends' network. A profile can be commented by other registered users, as well as its photos. The blog feature allows its users to connect their <i>tag</i> accounts to their blogs. <i>myTag</i> 's profile also provide its users with interesting information and news about the site, members and new features related to blogs, photos or personal network. The <i>myTag</i> 's profile also provides mobile functionalities that will be explained in detail later in this document.
Options		This module allows for account configuration of various functionalities: password, associated email, phone number, account deletion, privacy settings (e.g. private messaging, information privacy, comments allowance, etcetera.) and email notifications (e.g. <i>Tag</i> news, birthday dates, friend requests, comments, etcetera.).
Message System		The message system is similar to most of the systems described in this document (e.g. <i>Hi5</i>). Additionally, it provides a list of the friends in a given user's network. This list is used to set which users have privacy rights to send SMS to the user.
Added-Value Content		
Shout		This is truly an added-value feature. This feature is kind of innovator, at least in this manner. The <i>Shout</i> feature allows users to communicate with all the other online users, through a short message. All online users can communicate and " <i>shout</i> " in real time about any kind of subject. This feature can also be used through SMS.
Radio		The <i>myTag</i> 's Radio provides real time online radio listening. This way the user has access to various radio stations without leaving its profile.
Mobile		This feature is crucial to the website's functioning. This is due to the fact that this social network is specialized in mobile services' users (<i>Optimus Tag</i>). This feature provides users with the ability to update their blogs or even to " <i>shout</i> " through mobile, from everywhere, just

	by sending a SMS.
Language	As mentioned above the site is designed for Portuguese mobile users. The website is only available in the Portuguese version.
Technology	
Server Information	<i>myTag's</i> web server is <i>Apache</i> and it <i>Apache Tomcat Coyote</i> as a connector component that the <i>HTTP/ 1.1 Protocol</i> .
Framework and Language	The main development framework is <i>J2EE</i> and the coding language is <i>Java</i> .
Document Information	<i>myTag</i> claims to use <i>HTML 4.01 Transitional DTD</i> , as well as <i>CSS</i> and <i>Javascript</i> .
Analytics and Tracking	For campaigns analysis and tracking, <i>myTag</i> makes use of <i>Google Analytics</i> and <i>EyeBlaster</i> .

This is one more case of a Specialized Social Network Site. *myTag* is a perfect example of a simple social network site that specialized in a niche.

Other Specialized Social Network Sites

Here are presented diverse types of Specialized Social Network Sites. Basically, the main objective is to picture the huge immensity of different focused-subject Social Networks.

Table 33: Specialized Social Network Site – *Eons*

Name	Description
Name/Designation	<i>Eons</i>
URL	www.eons.com
Purpose	<i>Eons</i> is a Social Network Site specialized and designed for people over 50 years old. However it is open for registration to people over 13 years old. This website was created in July 2006 and provides games, photo and video sharing, links and information on health, relationships, fitness, debt, retirement and insurance [Eons09]. Most <i>Eons'</i> features are designed to that specific age-group (e.g. longevity calculator).
Technology	<i>Eons's</i> list of technologies contains: <i>CentOS</i> , <i>Apache</i> , <i>P3P Policy</i> , <i>Google Analytics</i> , <i>Quantcast Tracking</i> , <i>XHTML Strict</i> , <i>CSS</i> , <i>Javascript</i> and <i>UTF-8</i> [BWEons09].

Table 34: Specialized Social Network Site – *MyChurch*

Name	Description
Name/Designation	<i>MyChurch</i>
URL	www.mychurch.org
Purpose	<i>MyChurch</i> is an open Social Network Site specialized and designed for Christians Churches. In addition to common Social Network Sites features, <i>MyChurch</i> allows its users to post sermon podcasts, manage religious events and collect tithes from members (e.g. voluntary contribution) [MyChurch09]. This website has specific features, such as: daily bible verse, church groups and church notifications.
Technology	The list of main technologies used in this website development are: <i>*nix</i> , <i>Apache</i> , <i>Google Webmaster</i> , <i>PHP</i> , <i>Frontpage Extensions</i> , <i>HTML</i>

	4.01 Transitional DTD, CSS and Javascript [BWMyChurch09].
--	---

Table 35: Specialized Social Network Site – Dogster/Catster

Name	Description
Name/Designation	Dogster/Catster
URL	www.dogster.com / www.catster.com
Purpose	Dogster and Catster are two very particular Social Network Sites. These social networks can be summarized as canine/feline sharing applications to dogs/cats (directed to their “owners”). These sites objective is to stimulate people’s love and enjoyment of their dogs and cats. The most interesting features are: breed info, adoption system, manuals and nurturing tips.
Technology	The list of main technologies used to build these two websites is constituted by: Apache, Red Hat Enterprise Linux, Content Delivery Network, PHP, XHTML Transitional, CSS and Javascript [BWDogster09].

Table 36: Specialized Social Network Site – Sítios dos Miúdos

Name	Description
Name/Designation	Sítio dos Miúdos
URL	www.sitiodosmiudos.kids.sapo.pt
Purpose	Sítio dos Miúdos is a Portuguese Social Network Site designed with features for kids with different ages (e.g. until 8 years old, 8 to 10 years old and older than 10 years old). This website is completely designed in Portuguese with features like: games, music, photos, images, videos and study applications.
Technology	This particular website was developed and maintained using the following principal technologies: IIS5, Google Webmaster, ASP.NET, HTML 4.01 Transitional DTD and Javascript [BWSítioDosMiúdos09].

Table 37: Specialized Social Network Site – Amiguinhos

Name	Description
Name/Designation	Amiguinhos
URL	www.amiguinhos.com
Purpose	Amiguinhos is a Portuguese Beta version of a dating/friendship Social Network Site. Besides common Social Network Site’s features, Amiguinhos allows its users to: configure personal online status (e.g. invisible, online or occupied), post an infinite number of photos, use an automatic system that gives access only to similar interest people and viewing a ranking system based on site’s usage.
Technology	Amiguinhos is a website that was developed under the Fedora OS, Apache web server and PHP language. The website claims to use XHTML Transitional, CSS and Javascript [BWAminguinhos09].

Table 38: Specialized Social Network Site – ChillTime

Name	Description
Name/Designation	ChillTime

URL	www.chilltime.com
Purpose	<i>ChillTime</i> is a very interactive Social Network Site. This website is very popular among Portuguese Internet users, but it provides different versions (e.g. Angola, Brazil, Italy, etcetera). Its main objective is to provide networking tools valued by its users. In addition to profile creation, the Social Network Site also allows Web 2.0 groups (e.g. groups with real time chat, news, videos, discussions, and etcetera), share schedules, news, weather, collaborative online journals, games, and etcetera.
Technology	A part from <i>Apache</i> , <i>ChillTime</i> also uses: <i>PHP</i> , <i>CSS</i> and <i>Javascript</i> [BWChillTime09].

There is a huge diversity of Specialized Social Network Sites. This Appendix only briefly describes a few with a variety of different purposes. The objective is to portray a picture of these types of websites' universe.

Appendix C

Interview - Requirements Elicitation in the Requirements Engineering Process

This interview is designed in the context of the elaboration of a dissertation for the Master in Engineering Informatics and Computers at FEUP (Faculdade de Engenharia da Universidade do Porto). The title of the dissertation is: *Differentiator factors in the implementation of Social Network Sites*.

“The elicitation of requirements can be broadly defined as the acquisition of goals, constraints, and features for a proposed system by means of investigation and analysis. Furthermore it is generally understood that requirements are elicited rather than captured or collected.”

This activity is often done in the initial stage of the system and software engineering life cycle, and its main objective is to describe a future or target system.

We aim at understanding whether Social Network Sites have a structured process, how it is used, and which kind of techniques are employed in the elicitation/gathering/identification of requirements for new functionalities/features.

Please refer to your experience, and feel free to share all details you consider more relevant. The answers to this interview will be used for academic purposes only.

Please follow the instructions.

1. Does *TheStarTracker* use a structured way for eliciting/gathering/identifying requirements for new functionalities/features for its social network website? If so, go to question **1.1**. If not, go to question **2**, on page 3.

1.1. Stakeholders involved: How does *TheStarTracker* choose the stakeholders that must be involved in the requirements elicitation process?

1.2. Steps and their main characteristics, such as: procedures, duration, stakeholders per step and other relevant information: Which are the techniques or methods that *TheStarTracker* uses for Requirements elicitation/gathering/identification?

Examples of such techniques are:

- Traditional
 - Questionnaires, Interviews, Document Review, Contextual Inquiry, Introspecting, etcetera.
- Group
 - Brainstorming, Group work & Meetings, Focus Groups, JAD, etcetera.
- Prototyping
- Model-driven
 - Scenarios, Storyboarding, SCRAM, Requirements Reuse, etcetera.
- Cognitive
 - Observation
- Contextual
 - Apprenticing

1.3. Problems: Which problems does *TheStarTracker* identify as more frequent or critical in the Requirements Elicitation/Gathering/Identifying Process?

Examples of such problems are:

- Problems of scope
 - the boundary of the system is ill-defined;
 - unnecessary design information may be given;
- Problems of understanding
 - users have incomplete understanding of their needs;
 - users have poor understanding of computer capabilities and limitations;
 - analysts have poor knowledge of problem domain;
 - user and analyst speak different languages;
 - ease of omitting “obvious” information;
 - conflicting views of different users;
 - requirements are often vague and un-testable;
- Problems of volatility
 - Requirements evolve over time;

1.4. Advantages: What does *TheStarTracker* think that are the advantages of using this process for Requirements Elicitation/Gathering/Identifying?

1.5. Disadvantages: What does *TheStarTracker* think that are the disadvantages of using this process for Requirements Elicitation/Gathering/Identifying?

1.6. Creativity and Innovation: Does *TheStarTracker* use creativity requirements elicitation/gathering/identification techniques to come up with ideas? Which are they? If not, why?

Examples of such techniques are:

- Brainstorming, Cultural Probes, Six Thinking Hats Method, Picture Stimulation, Role Storming, etcetera;

This interview ends here. Thank You for your collaboration.

2. What are the reasons that explain why *TheStarTracker* does not use a structured way for eliciting/gathering/identifying requirements for new functionalities/features for the social network website?

2.1. Please describe which methods or techniques are used for eliciting/gathering/identifying requirements for new functionalities/features for the social network website? (e.g. *The Star Power*)

Examples of such techniques are:

- Traditional
 - Questionnaires, Interviews, Document Review, Contextual Inquiry, Introspecting, etcetera.
- Group
 - Brainstorming, Group work & Meetings, Focus Groups, JAD, etcetera.
- Prototyping
- Model-driven

- Scenarios, Storyboarding, SCRAM, Requirements Reuse, etcetera.
- Cognitive
 - Observation
- Contextual
 - Apprenticing

2.2. Stakeholders involved: How does *TheStarTracker* choose the stakeholders that must be involved in the requirements elicitation process?

2.3. Problems: Which problems does *TheStarTracker* identify as more frequent or critical in the Requirements Elicitation/Gathering/Identifying Process?

Examples of such problems are:

- Problems of scope
 - the boundary of the system is ill-defined;
 - unnecessary design information may be given;
- Problems of understanding
 - users have incomplete understanding of their needs;
 - users have poor understanding of computer capabilities and limitations;
 - analysts have poor knowledge of problem domain;
 - user and analyst speak different languages;
 - ease of omitting “obvious” information;
 - conflicting views of different users;
 - requirements are often vague and un-testable;
- Problems of volatility
 - Requirements evolve over time;

2.4. Creativity and Innovation: Does *TheStarTracker* uses creativity requirements elicitation/gathering/identification techniques to come up with ideas? Which are they? If not, why?

Examples of such techniques are:

- Brainstorming, Cultural Probes, Six Thinking Hats Method, Picture Stimulation, Role Storming, etcetera.

This interview ends here. Thank You for your collaboration.

Appendix D

The Requirements Elicitation Session Guide

1st Phase

Objectives: Requirements elicitation, generation of new ideas, foster creative thinking through the process and refinement and improvement of requirements (scenarios and storyboards).

Domain: The domain of this session is fairly known by its participants.

Methodology: Scenario-Based Requirements Engineering – Adapted from *SCRAM*

This methodology is constituted by three phases. This is the **first phase** and its objective is to introduce and **brief users through the upcoming session**. In addition, this phase could be seen as warm-up for what comes next, by **putting users at ease and predisposing them to participate actively**. **Second phase's** objective is **requirements elicitation, analysis and validation of the different concept demonstrators** build by the requirements engineer before the session. Third phase's objective is to **summarize the information gathered in the form of a conceptual map and evaluate the session**. Other objective of this last phase is to **benefit from the knowledge gained through the session to briefly review all scenarios and improve them (e.g. generate new ideas from the experience gained)**.

There are three participants in this session: two users and one requirements engineer. **Users should participate** in the process and the **requirements engineer participates as demonstrator and explainer**.

Keywords: active participation, creativity, no criticism, ideas, wishful thinking (e.g. “*to develop fantasy statements about the future using formulation as: In the future, it would be nice if...*” [Vidal04])

Expected Duration: 5 minutes

2nd Phase

Presentation of the concept demonstrators: Use cases developed into scenarios which developed into storyboards.

Scenarios: Scenario representations could have a sequence of interaction steps (instance scenario) or a **set of possible interaction steps (type scenario)**. Scenarios include **narrative descriptions of (elementary scenarios): normal flow of events, exceptions and possibly ongoing actions**. A scenario could be used to describe the **behaviour expected in a given situation, or the situation in which a given behaviour is expected to occur**. High-level of abstraction.

Storyboards: **Illustrated** examples of utilization or user's behaviour. **Describe one of the possible paths of user's behaviour and is originated from scenarios**. Low-level of abstraction.

Course of Action: Brief presentation of scenario 1 followed by run through of associated storyboards (12 scenarios). **The participants should not focus excessively on HCI or interface details. At least no more than on the value of each functionality. The storyboard examples should be printed before the session in order to facilitate capture and annotation of participants' suggested modifications or thoughts.**

Participants could ask for new and more adequate storyboards.

Expected Duration: 50 minutes

Scenario 1: Send card to network connection

Storyboard Note: Alternative flows such as “no friends in network or “no cards in network” are not presented.

Probe Questions:

- 1) Change cards image in the storyboard? (3rd storyboard scene)

- 2) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 3) *"It would be nice if..."*?

Notes:

Scenario 2: Add product/service

Storyboard Note: Termination conditions are left out of the example storyboard.

Probe Questions:

- 1) What do you think about the product association idea? (2nd storyboard scene)
- 2) Do you think that there are any product characteristics that could be added to foster more UGC and participation from users? (3rd storyboard scene)
- 3) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 4) *"It would be nice if..."*?

Notes:

Scenario 3: Create review

Storyboard Note: Export review to *Twitter* and termination conditions are left out of the example storyboard.

Probe Questions:

- 1) What do you think about the review number of characters limitation? (1st storyboard scene)
- 2) Associate review to one product "vision" or all? (2nd storyboard scene)
- 3) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 4) *"It would be nice if..."*?

Notes:

Scenario 4: Create online survey

Storyboard Note: Only supports the simple scenario of online survey creation. No alternatives or exceptions.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 5: Rate review/product/service/survey

Storyboard Note: Only supports the simple scenario of rating a product. No alternatives or exceptions.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 6: View tag clouds

Storyboard Note: Very simple scenario. Pretty straightforward and characterised by little creativity.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 7: Create and add wish

Storyboard Note: Only supports the simple scenario of wish creation. No alternatives or exceptions are presented. Explain that wishes could be facilitated when acquiring products/services through virtual money.

Probe Questions:

- 1) What do you think about the actions that are associated to a given wish? (2nd and last storyboard scene)
- 2) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 3) *"It would be nice if..."*?

Notes:

Scenario 8: Manage Virtual Money Storyboard 1: Contribute to wish

Storyboard Note: This is the only storyboard that includes one possible way of earning virtual money. Alternatives like "no wishes available" or "amount of virtual money not enough", are not considered in the storyboard. Explain why wishes benefit from having virtual money (e.g. virtual money could be used to acquire something that could facilitate the realization of a given wish). To avoid people trying to monetize from this, *Cardmobili* must analyse cases and establish reasonable limits of virtual money amounts.

Probe Questions:

- 1) How to restrain people for abusing from wishes? (necessary for scenario validation)
- 2) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 3) *"It would be nice if..."*?

Notes:

Scenario 8: Manage Virtual Money Storyboard 2: Send an online gift

Storyboard Note: Only supports the scenario of sending an online gift. No alternatives or exceptions are presented.

Probe Questions:

- 1) What do you think about the privacy options? (4th storyboard scene)
- 2) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 3) *"It would be nice if..."*?

Notes:

Scenario 8: Manage Virtual Money Storyboard 3: Trade virtual money

Storyboard Note: Only supports the sending virtual money to other user. No alternatives or exceptions are presented.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 9: View and shout bargains

Storyboard Note: Does not support bargain notification reception on mobile or via email. Also, it does not support bargain shout export to *Twitter*.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 10: Manage Card Points Storyboard 1: Transfer points between cards

Storyboard Note: -

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 10: Manage Card Points Storyboard 2: Trade points for prizes/discounts

Storyboard Note: -

Probe Questions:

- 1) How to claim for a prize/discount? (necessary for validation) (e.g. print voucher, associate with card, etcetera)
- 2) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 3) *"It would be nice if..."*?

Notes:

Scenario 11: Send prizes/discounts

Storyboard Note: Very simple scenario.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

Scenario 12: Create and share idea

Storyboard Note: Very simple scenario.

Probe Questions:

- 1) Is this scenario useful? How to improve it? (at the end of the storyboard)
- 2) *"It would be nice if..."*?

Notes:

3rd Phase

Idea: Summarize and organize ideas on a concept map. Use the **concept map** printed before the session.

Creative method proposal: Keep the problem alive and foster creative idea generation.

Each participant receives one little notebook with several web 2.0 keywords written along its pages: photo, music, video, e-learning, game, collaboration, design, blogging, travel, mobile, widget, community, fun, business, money, storage, management, search and communication.

Each participant should force connections between the words and the problem at hand and vice-versa listing them on the notebook.

Notebook utilization: Each notebook's page has a keyword written in it. The requirements engineer should give one post-it with all the scenarios to each participant. Each participant will take this post-it and place it in each one of the written notebook's pages. Then, the participant should force connection between scenario and keyword, for each notebook's page. The objective is to place ideas in front of each scenario, or even to place new ideas for new scenarios. **Participants should be encouraged to write anything which comes to mind. Participants should also be warned that there is no problem if novel ideas do not come to mind. This task should not be performed right after this session and preferentially not at work (e.g. in a calm place like home).**

This task should have the maximum duration of 15 minutes.

The limit date for notebook collection is 31 May 2009.

Expected Duration: 5 minutes

Appendix E

The Conceptual Map



Figure 20: The Conceptual Map

Appendix F

Scenarios and Storyboards

Scenario 2: Add product/service

Table 39: Scenario 2: Add product/service

Type scenario: Add product/service Primary actor: User Goal: A user wants to add a product or service which is provided by a card merchant (with or without association to <i>Cardmobili</i>). Pre-conditions: User is registered in the website; Normal Flow 1) Insert designation and description of product/service 2) System checks for existence of the designation inserted 3) Select add product/service option 4) View created product/service profile 5.a) Upload one or more photos/videos to the product/service profile 5.b) Associate link(s) to the product/service profile 5.c) Rate product/service 5.d) Associate product/service with review 6) View product/service created Alternative Flow 2.1) There is already a product/service registered with that name in the system: associate it with the already existing one or change designation 3.1) User does not want to do anything else with the product/service: terminate

Storyboard 1: User adds product and uploads its image

This storyboard presents the case in which the user wants to add a new product with its respective image to the *Cardmobili*'s website.

Pedro wants to add to the website the new Nokia 2210 he just bought. Pedro inserts the designation (1) and description (2) of the product (Figure 21).

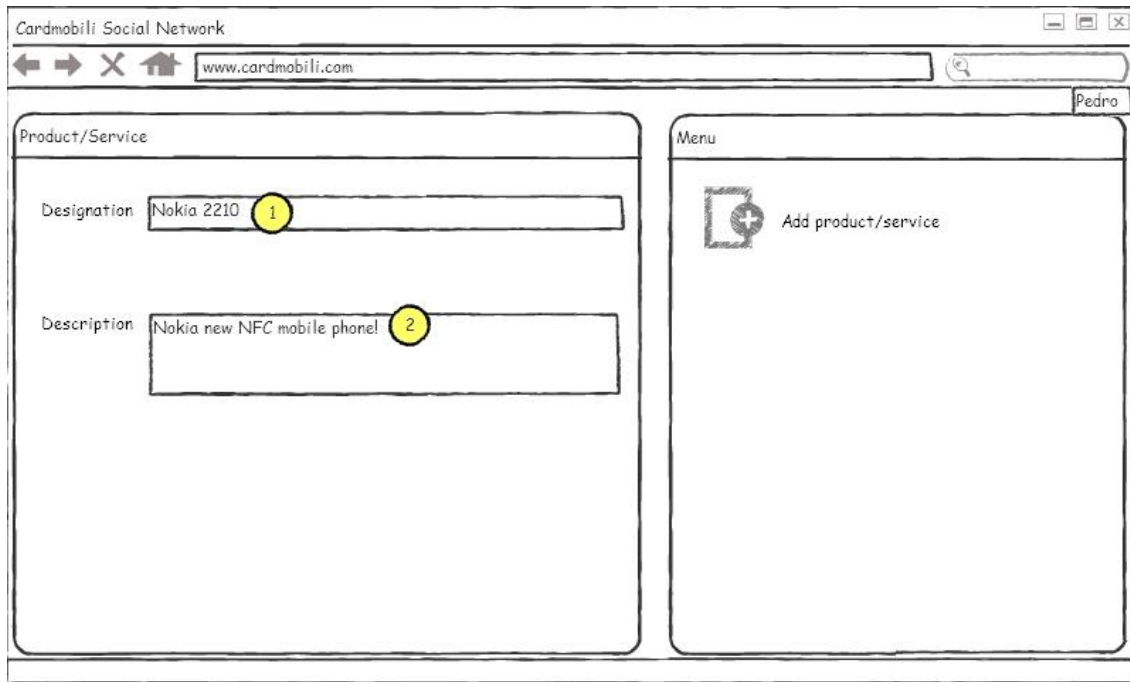


Figure 21: Storyboard 1: User adds product and uploads its image – Scene 1

The system recognizes that there is already a product with that designation. Pedro decides to associate its “*vision*” of the Nokia 2210 to the existing ones (1). This results in a list of different Nokia 2210 “*visions*” associated with the general profile of the Nokia 2210. Pedro selects the option to add product/service (2) (Figure 22).

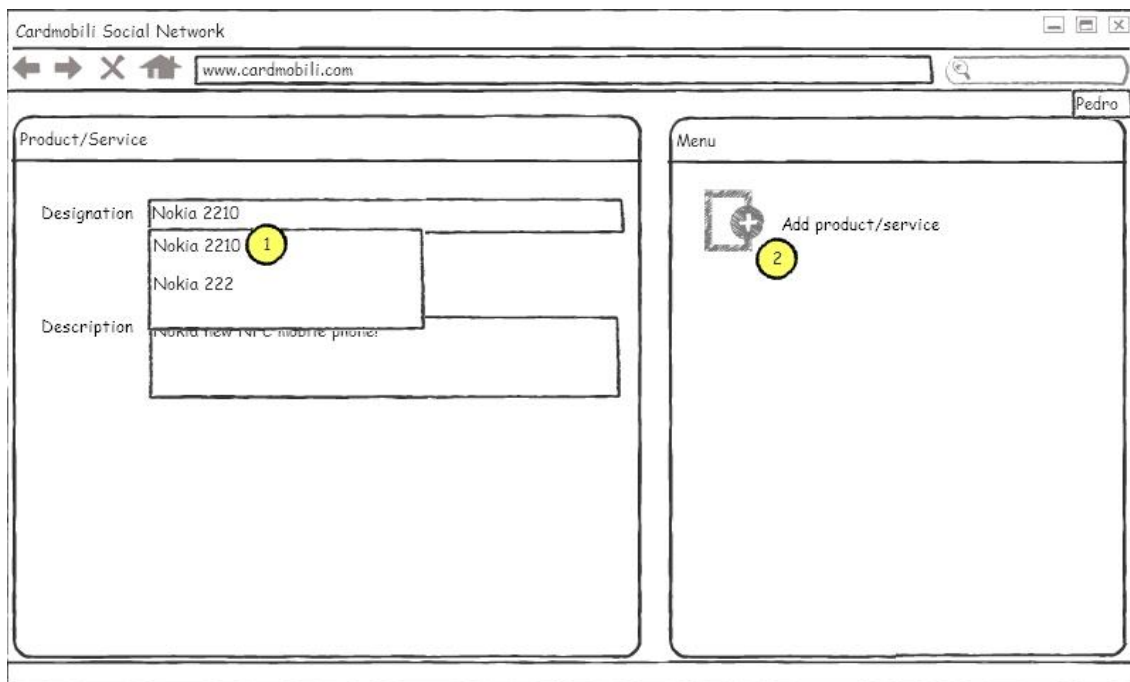


Figure 22: Storyboard 1: User adds product and uploads its image – Scene 2

Pedro has access to its Nokia 2210 “*vision*” profile and now he wants to upload a Nokia 2210 photo. To do that he selects the Upload photo option (1) (Figure 23).

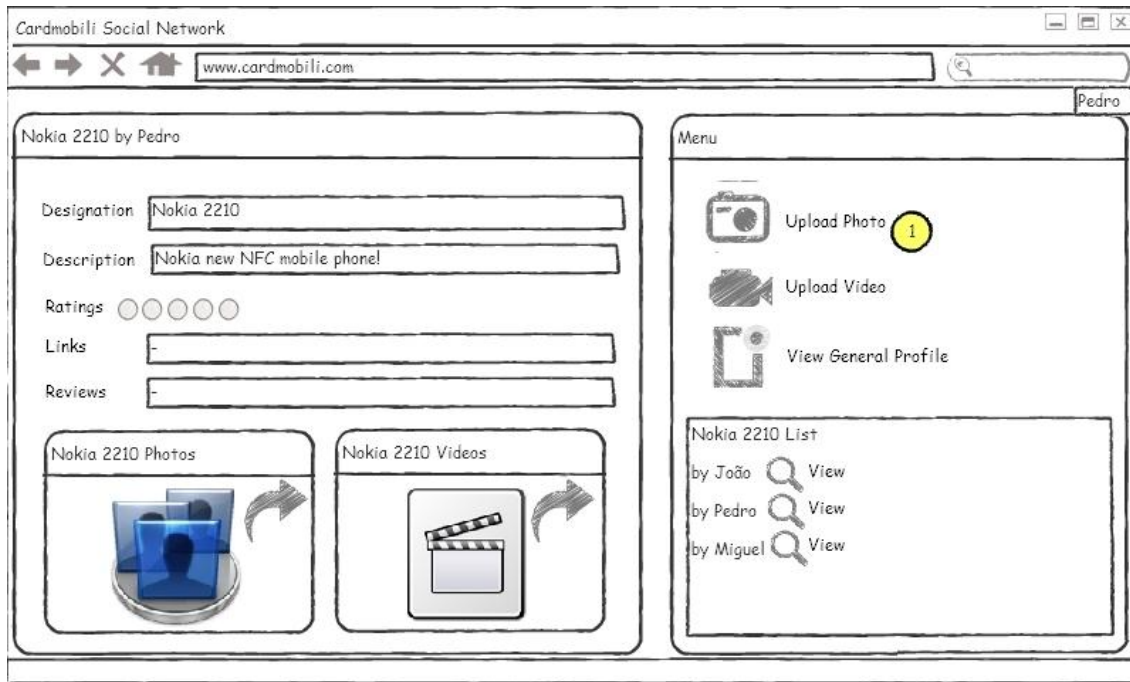


Figure 23: Storyboard 1: User adds product and uploads its image – Scene 3

Pedro chooses the file containing the photo to upload (1). He concludes this action by choosing to upload it (2) (Figure 24).

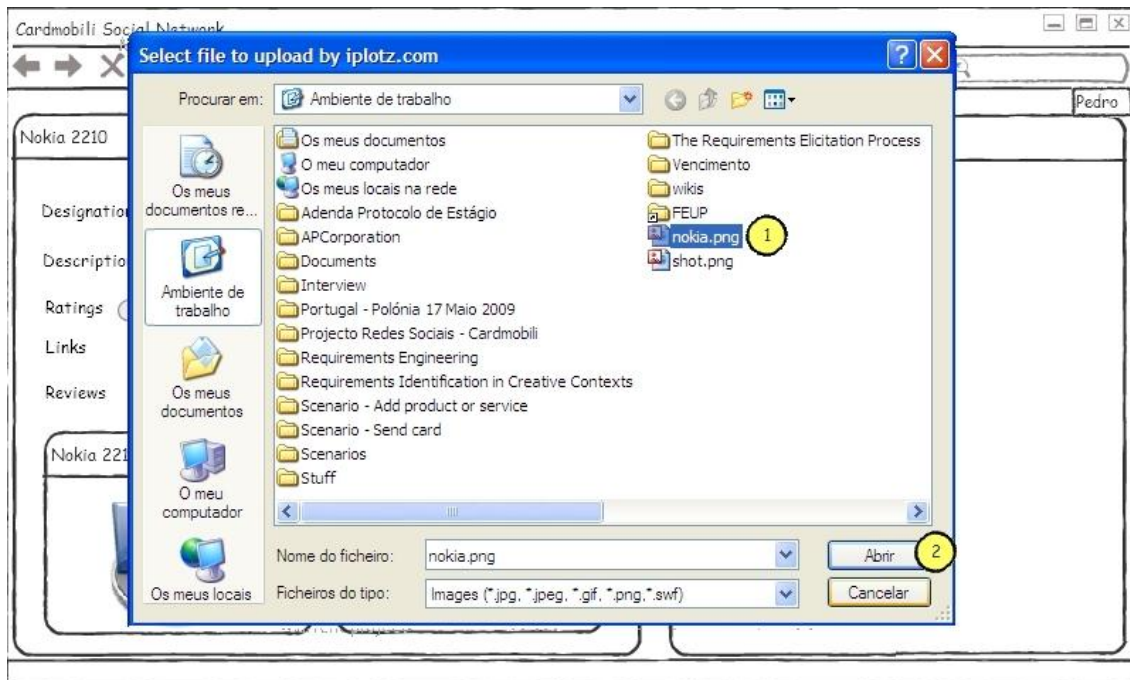


Figure 24: Storyboard 1: User adds product and uploads its image – Scene 4

By now, Pedro can see the photo he decided to upload to the Nokia 2210 product profile he just added. He also can visualize other “visions” of this product provided by other users, as well as the Nokia 2210 general profile (1) (Figure 25).

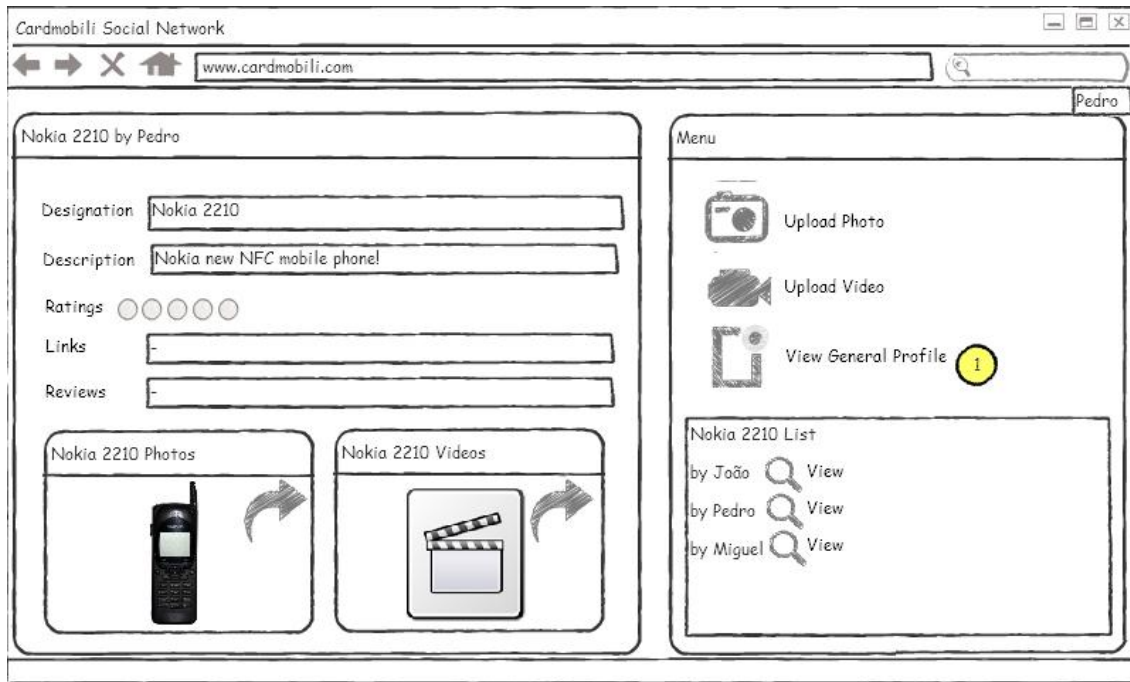


Figure 25: Storyboard 1: User adds product and uploads its image – Scene 5

The Nokia 2210 general profile presents all contributions to the same product from different users (Figure 26).

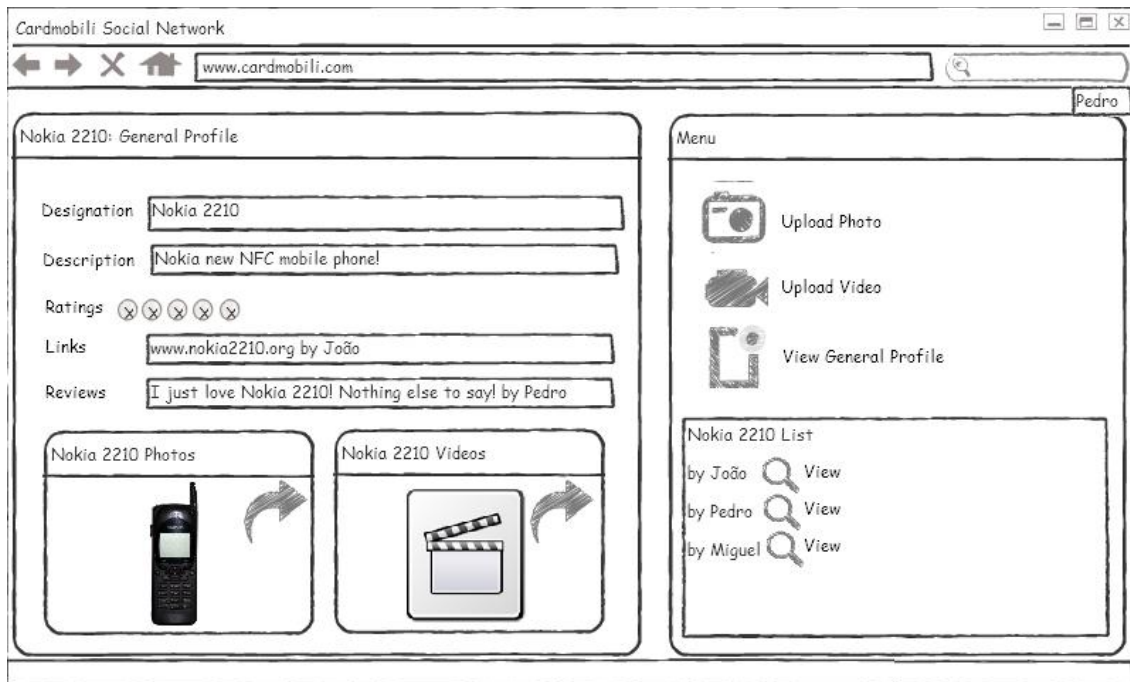


Figure 26: Storyboard 1: User adds product and uploads its image – Scene 6

Scenario 3: Create review

Table 40: Scenario 3: Create Review

Type scenario: Create review

Primary actor: User

Goal: A user wants to create a review about a product or service which is provided by a card merchant (with or without association with *Cardmobili*).

Pre-conditions: User is registered in the website;

Normal Flow

- 1) Write plain text review on the reviews area
- 2) System checks for total length of the plain text review
- 3) Select create review option
- 4.a) Associate review to product/service
- 5.a.1) Choose product/service to associate with
- 5.a.2) Select the associate review option
- 4.b) Export review to *Twitter*
- 5) View created review

Alternative Flow

- 2.1) Review text has more than 140 characters: deny creation of the review until review's total length minor than 140, repeat 1)
- 3.1) User does not want to do anything else related to the review: terminate
- 4.a.1) There are no products/services to be associated with: terminate
- 4.b.1) User does not have a *Twitter* account: terminate
- 5.a.1.1) There are no products/services to associate with: terminate or continue to 5)

Storyboard 1: User creates review about a product

This storyboard presents the case in which the user wants to write a review about a product.

Pedro wants to create a review about the Nokia 2210 mobile phone and tell others how much he likes it. First, he writes how he feels about its new Nokia 2210 (1). Then, the system recognizes that he exceeded the character number limit for review and warns him (2) (Figure 27).

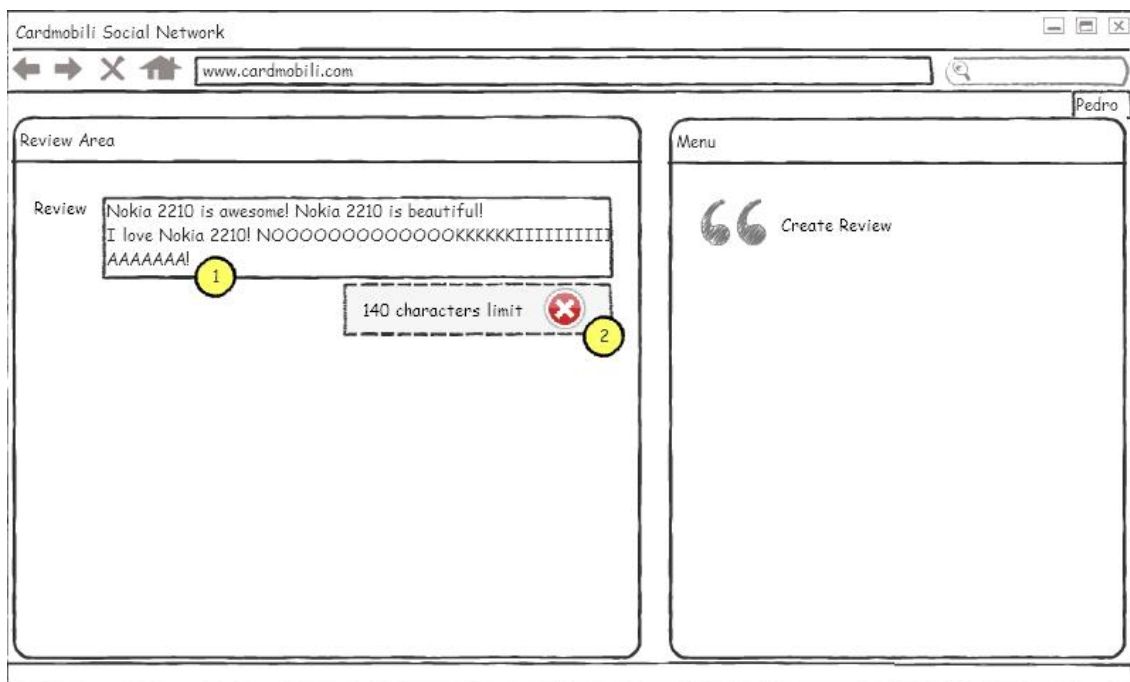


Figure 27: Storyboard 1: User creates review about a product – Scene 1

Now, Pedro has to change its previous review to respect the character number limit. He writes a shorter review saying how he feels about Nokia 2210 (1). Now, the system allows Pedro to create the Nokia 2210 review (2) (3) (Figure 28).

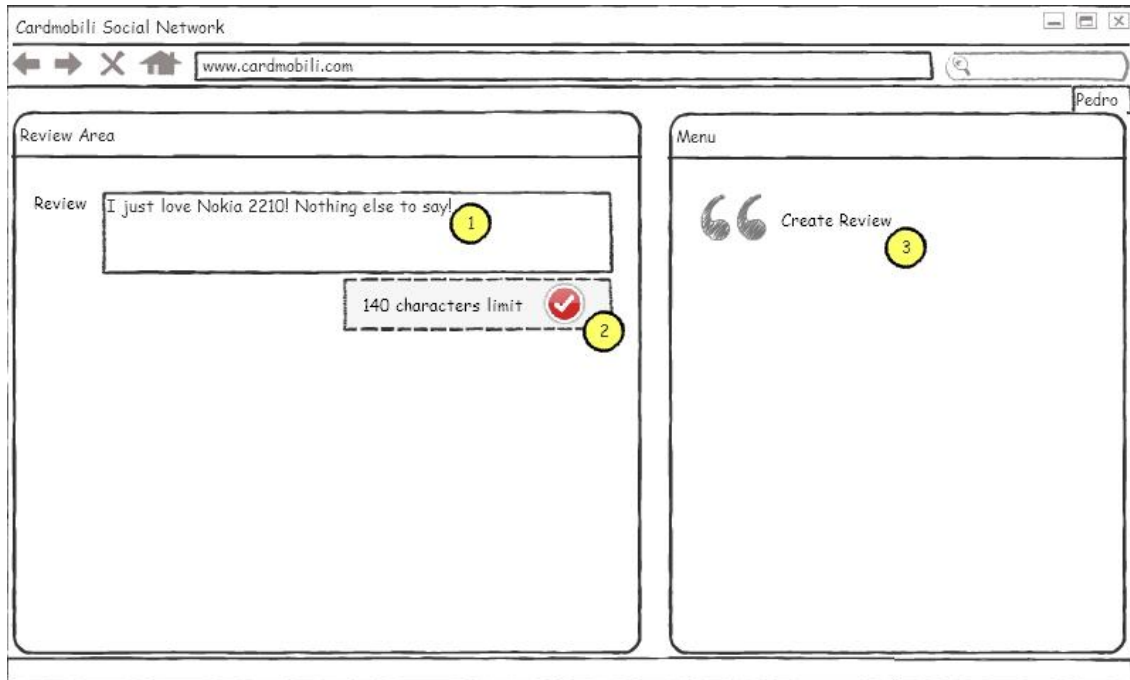


Figure 28: Storyboard 1: User creates review about a product – Scene 2

Once created, the review may be associated with any product or service in the system. Pedro wants to associate this review to the Nokia 2210 product he created earlier. First he chooses the review he wants to associate (1) (the one he has just created). Then he selects the option to associate review to product/service (2) (Figure 29).

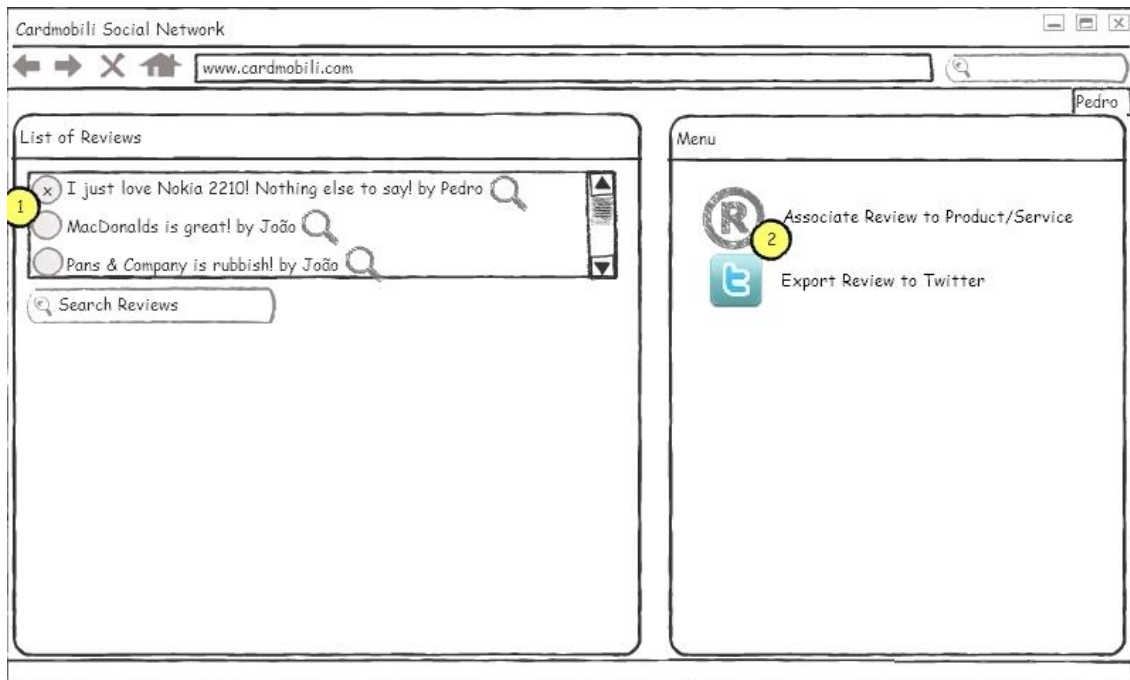


Figure 29: Storyboard 1: User creates review about a product – Scene 3

Now, Pedro chooses the product that he created earlier (1) and selects the option to associate review (2) (Figure 30).

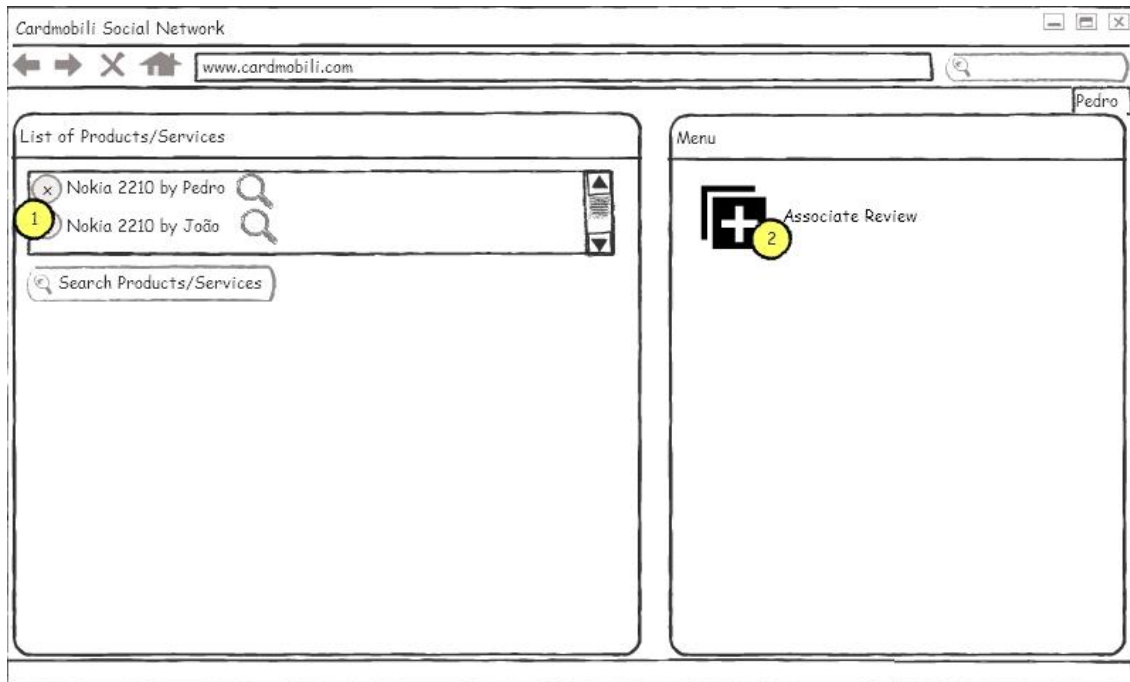


Figure 30: Storyboard 1: User creates review about a product – Scene 4

At last, Pedro sees the product “*vision*” of Nokia 2210 he created with its review associated (Figure 31).

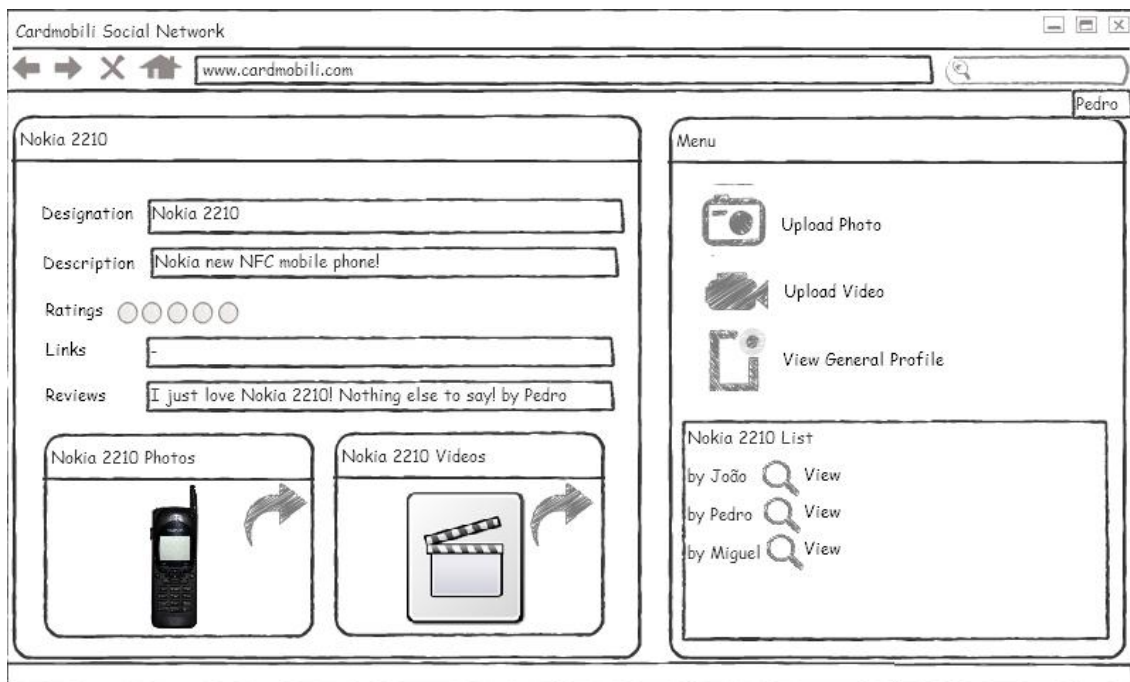


Figure 31: Storyboard 1: User creates review about a product – Scene 5

Scenario 4: Create online survey

Table 41: Scenario 4: Create online survey

Type scenario: Create online survey

Primary actor: User

Goal: A user wants to create an online survey about a given product/service and share it with

its network connections.

Pre-conditions: User is registered in the website;

Normal Flow

- 1) Insert survey title and choice options
- 2) System checks for existence of the title inserted
- 3) Select create online survey option
- 4.a) Associate survey to product/service
- 4.b.1) View survey and choose option
- 4.b.2) Select vote option
- 5) View created online survey and its current results

Alternative Flow

- 2.1) There is already a survey registered with that name in the system: associate it with the already existing one or change title
- 3.1) User does not want to do anything else with the survey: go to 7)
- 4.a.1) There are no products/services to be associated with: terminate or continue to 7)
- 4.b.2.1) The user can only choose one option: deny vote and repeat 4.b.1)

Storyboard 1: User creates online survey about a product

This storyboard presents the case in which the user wants to create an online survey and associate it with a product.

Pedro wants to create an online survey to see what other users in its network think about the Nokia 2210 mobile phone. To create the survey, Pedro inserts the survey title (1) and its options of choice (good, medium or bad) (3). The system automatically checks that the title of the survey does not yet exists (2) and can be directly created. At last, Pedro chooses to select the option to create the online survey (4) (Figure 32).

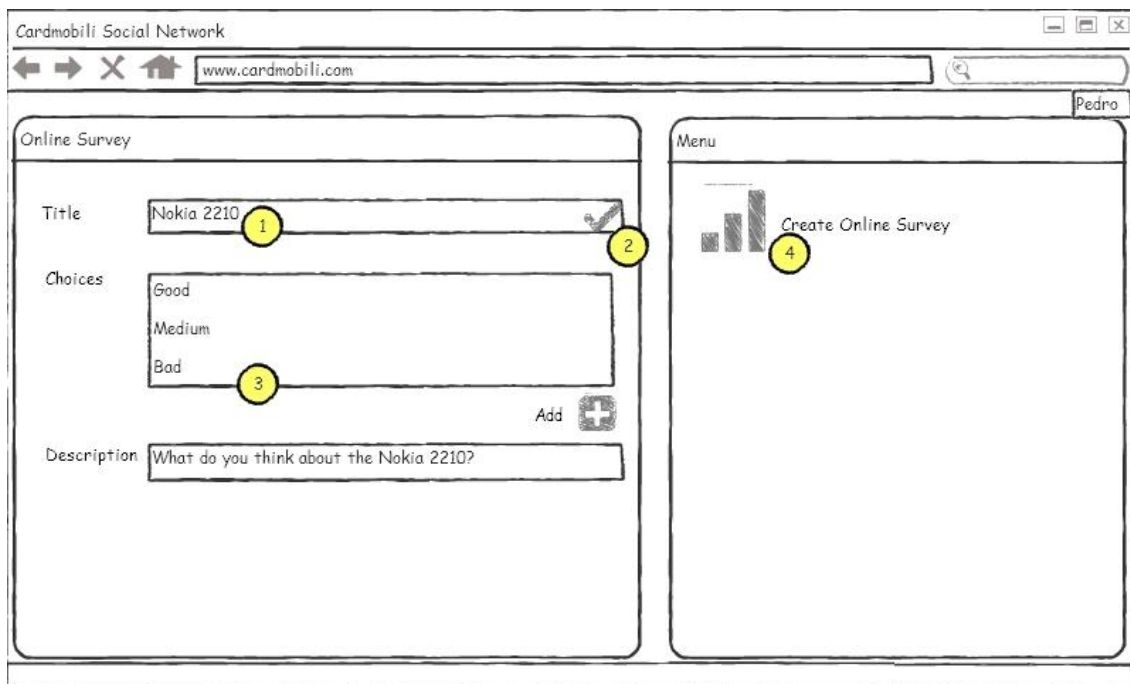


Figure 32: Storyboard 1: User creates online survey about a product – Scene 1

Pedro has now access to the results of the online survey he just created (Figure 33).

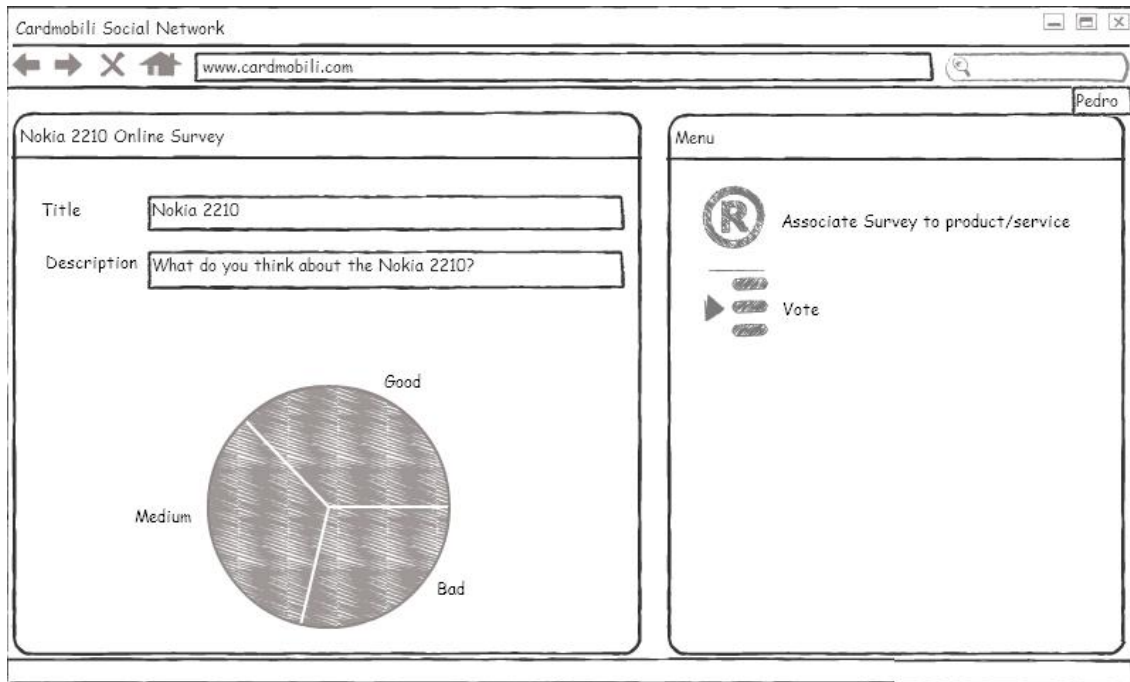


Figure 33: Storyboard 1: User creates online survey about a product – Scene 2

Scenario 5: Rate review/product/service/survey

Table 42: Scenario 5: Rate review/product/service/survey

Type scenario: Rate review/product/service/survey

Primary actor: User

Goal: A user wants to rate a review, product, service or survey in the website. This rating mechanism results in lists of best reviewers/reviews/products/services/surveys. Users associated with the best items of each of the lists could be rewarded both by *Cardmobili* and merchants (e.g. with virtual money). A review/product/service/survey can be rated only once by each user.

Pre-conditions: User is registered in the website;

Normal Flow

- 1) Choose review/product/service/survey from the respective list
- 2) Select view review/product/service/survey option
- 3) System checks the author of the review/product/service/survey chosen
- 4) Rate review/product/service/survey
- 5) View rated review/product/service/survey
- 6) View list of best rated reviewers/reviews/products/services/surveys

Alternative Flow

- 2.1) Only one item (one review or one product or one service or one survey) must be selected to be viewed: deny visualization and repeat 1)
- 4.1) Review/survey must have been authored by another user: deny rating of that specific review/survey
- 5.1) User does not want to do anything else with the survey: terminate

Storyboard 1: User rates a product

This storyboard presents the case in which the user wants to rate a product.

Scenarios and Storyboards

Pedro wants to rate the Nokia 2210 product he created. First, he chooses from the list of products/services the one product he wants to rate. So, he ticks the Nokia 2210 (1) and selects the option to view it (2) (Figure 34).

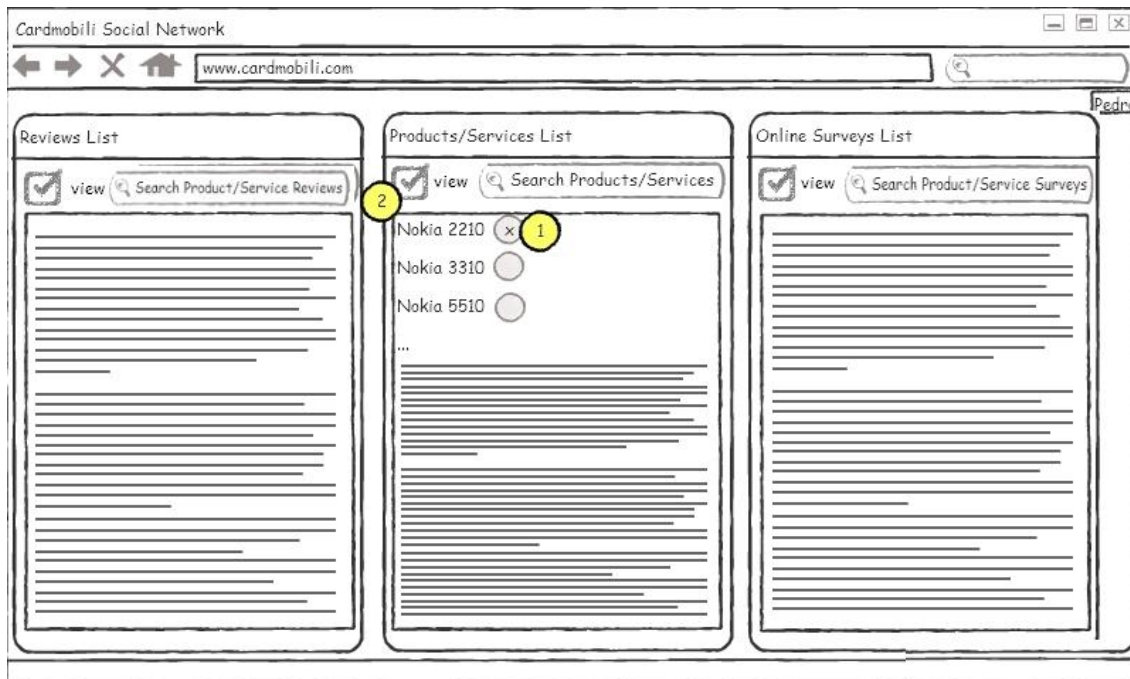


Figure 34: Storyboard 1: User rates a product – Scene 1

Pedro views the Nokia 2210 profile. The system checks if Pedro can rate this (1). Pedro is able to rate it because this is neither a survey nor a review created by him. He chooses to rate this product with a 5 in a scale of 5 points (2) (Figure 35).

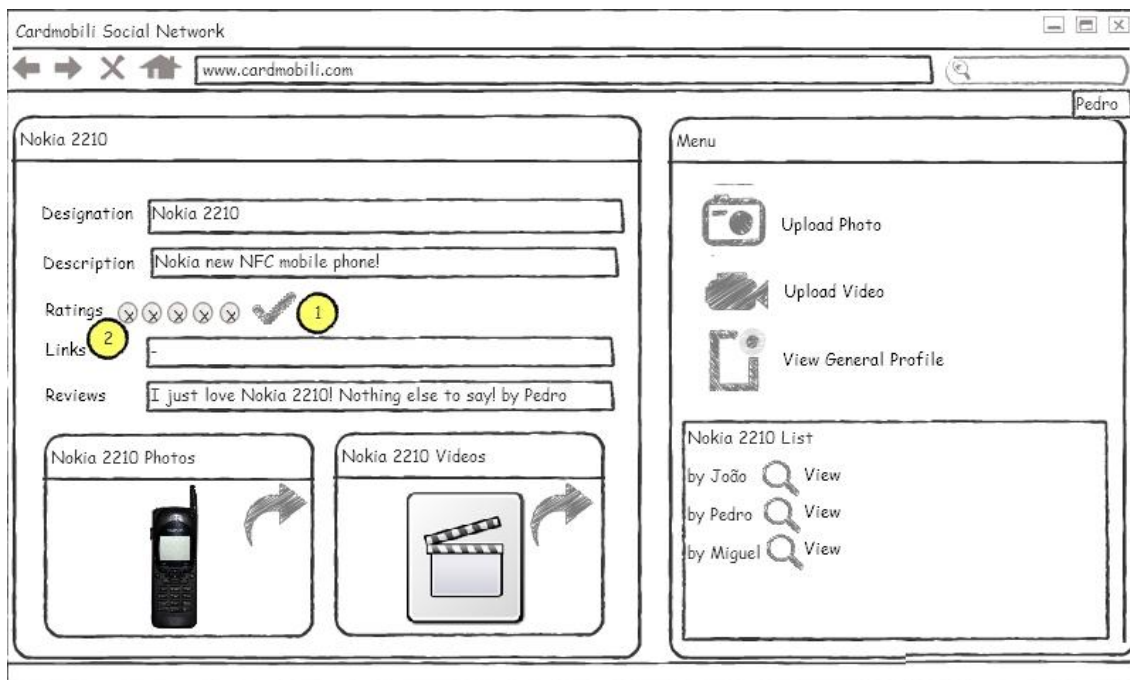


Figure 35: Storyboard 1: User rates a product – Scene 2

Scenario 6: View tag cloud

Table 43: Scenario 6: View tag cloud

Type scenario: View tag cloud

Primary actor: User

Goal: A user wants to view the tag cloud of the website. This contains the website's most frequent/used keywords in different categories.

Pre-conditions: User is registered in the website;

Normal Flow

- 1) View general tag cloud and daily tag cloud
- 2.a) View tag clouds by keywords
- 2.b) View tag clouds by people
- 2.c) View tag clouds by cards
- 2.d) View tag clouds by products/services

Alternative Flow

- 1.1) User does not want to do anything else: terminate

Storyboard 1: User views general and daily tag cloud

This storyboard presents the case in which the user views the tag clouds of the website.

Pedro views both the general and daily tag clouds. First he chooses to view a general tag cloud by people by selecting that option (1) (Figure 36).

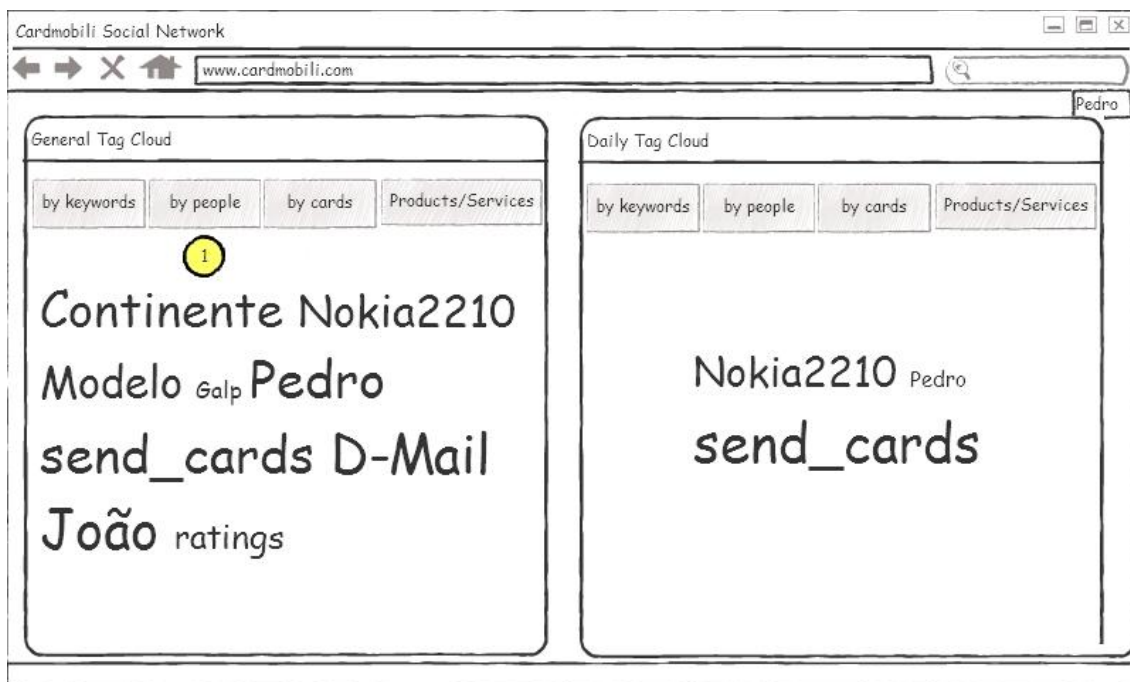


Figure 36: Storyboard 1: User views general and daily tag cloud – Scene 1

Pedro views the result of the general tag cloud by people, but he decides to click on the product Nokia 2210 in the daily tag cloud and to see its profile (1) (Figure 37).

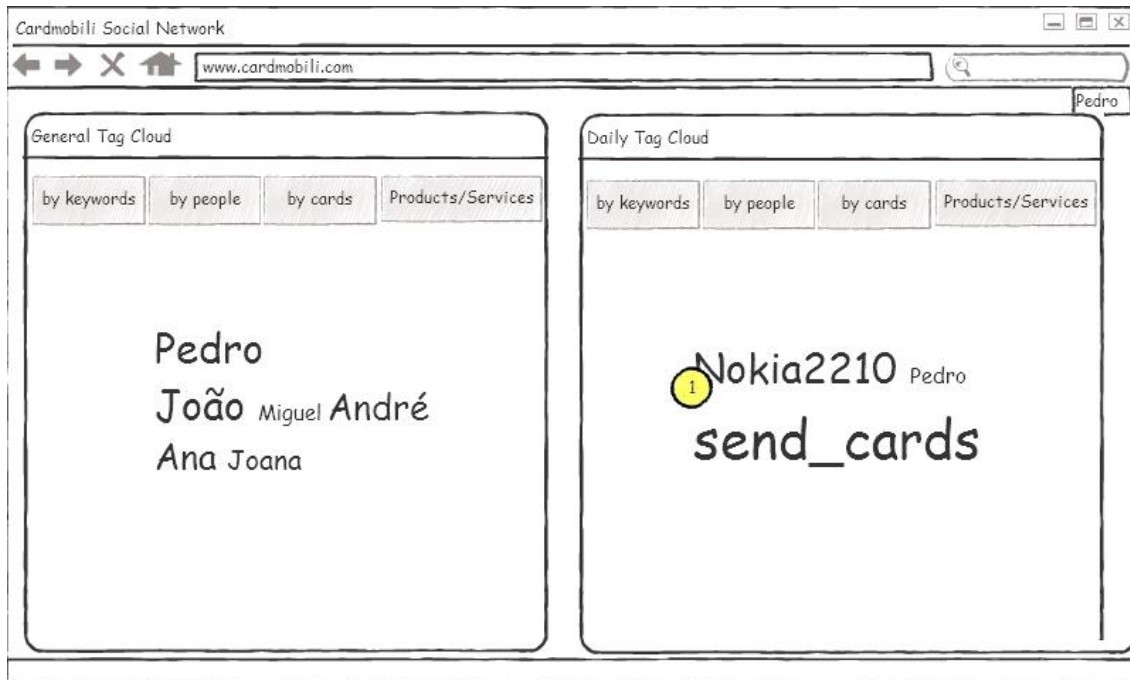


Figure 37: Storyboard 1: User views general and daily tag cloud – Scene 2

As a final result, Pedro views the Nokia 2210 product profile has he intended (Figure 38).

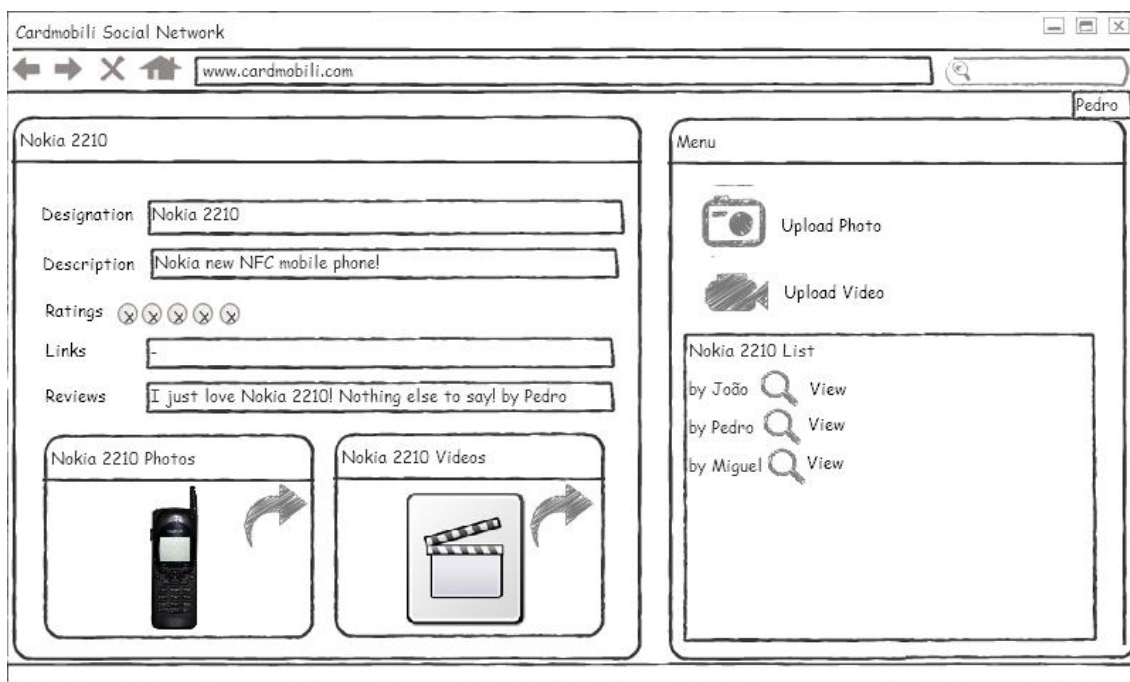


Figure 38: Storyboard 1: User views general and daily tag cloud – Scene 3

Scenario 7: Create wish

Table 44: Scenario 7: Create Wish

Type scenario: Create wish

Primary actor: Merchant

Goal: A given merchant with association to *Cardmobili* wants to create a wish. A wish can be any social cause and *Cardmobili* users can contribute to it with their virtual money and/or

ideas. This functionality's objective is to encourage social participation and the use of virtual money earned in the website for social purposes.

Pre-conditions: The merchant is registered in the website; The merchant is associated with *Cardmobili*;

Normal Flow

- 1) Insert wish title and description
- 2) System checks for existence of the title inserted
- 3) Select create and add wish option
- 4) View created wish and its current virtual money
 - 4.a) Publish idea
 - 4.b) Contribute with virtual money (type scenario: manage virtual money)
 - 4.c) Create and associate online survey (type scenario: create online survey)
 - 4.d) Associate wish to product/service (type scenario: add product/service)
- 5) View created wish and its current virtual money

Alternative Flow

- 2.1) There is already a wish registered with that title in the system: repeat 1)
- 4.1) User does not want to do anything else with the wish: terminate

Storyboard 1: *Cardmobili* associated merchant wants to create a wish

This storyboard presents the case in which a *Cardmobili* associated merchant wants to create a wish for social purposes.

Continente decides to create a social purpose wish. *Continente* managers want to build an institution constituted by people motivated to help others in a creative way. The user representing the merchant inserts the title (1) and description (3) of the wish. The system recognizes that other wishes with the same title do not exist (2). This way, the wish can be created just by selecting the option to create and add wish (4) (Figure 39).

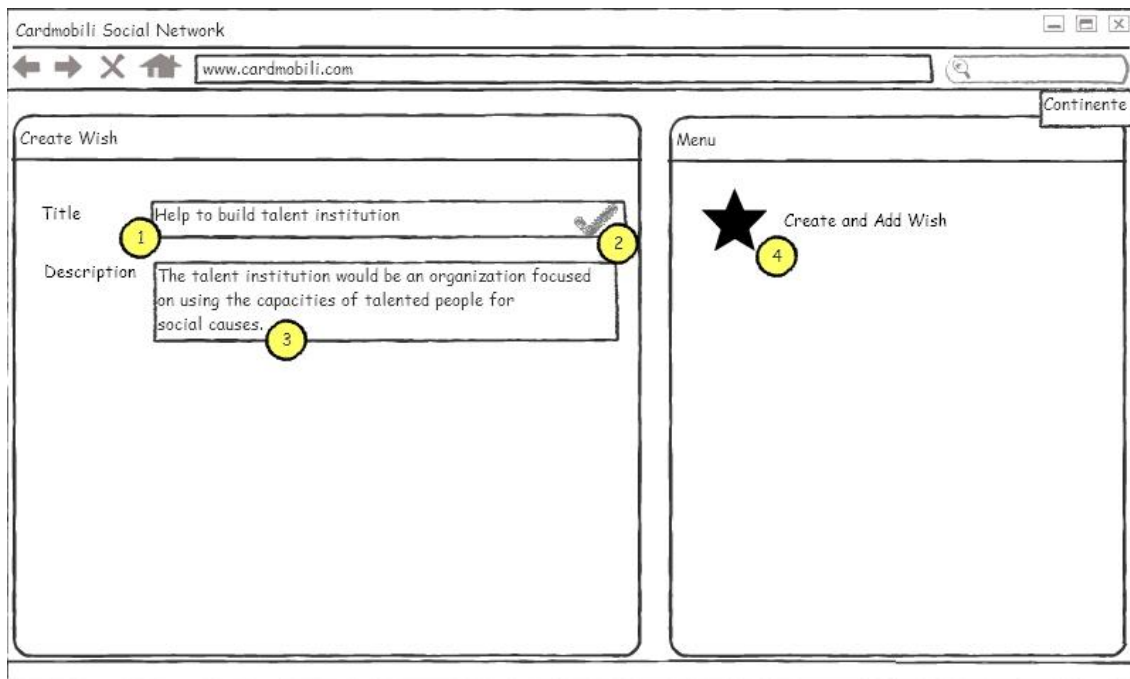


Figure 39: Storyboard 1: Associated merchant wants to create a wish – Scene 1

The user representing the merchant is now able to view the wish created and its current amount of virtual money. More important, others can see *Continente*'s wish and contribute with ideas and/or virtual money to it (Figure 40).

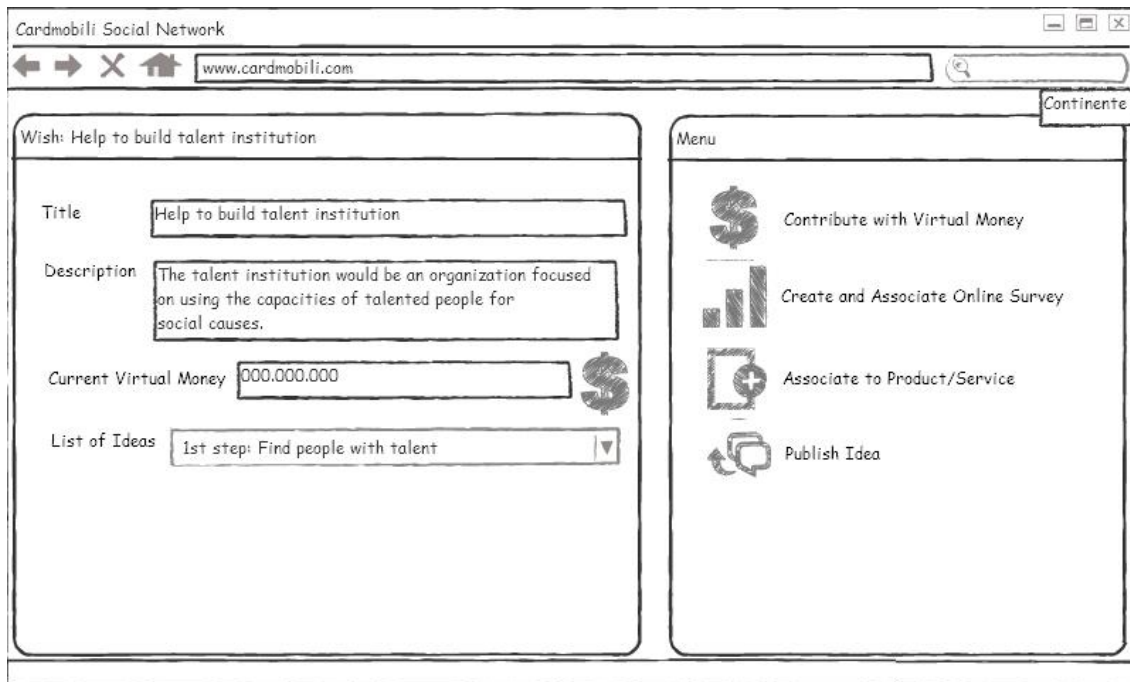


Figure 40: Storyboard 1: Associated merchant wants to create a wish – Scene 2

Scenario 8: Manage virtual money

Table 45: Scenario 8: Manage virtual money

Type scenario: Manage virtual money Primary actor: User Goal: A user wants to collect and use virtual money in different website services. A user can collect virtual money by responding to <i>Cardmobili</i> surveys or through reward when they are considered to be an active community element (e.g. list of best reviewers/reviews). Pre-conditions: User is registered in the website;

Scenario 8.1: Trade virtual money

Table 46: Scenario 8.1: Trade virtual money

Type scenario: Manage virtual money Normal Flow 1) View list of <i>Cardmobili</i> surveys 2) Choose survey from the list 3) Select respond to <i>Cardmobili</i> survey option 4) View survey and choose option 5) Select vote option 6) View survey results and virtual money earned 7.a) Select trade virtual money option 8.a) Choose partner to trade virtual money with, from network 9.a) System checks the partner' availability to trade virtual money and displays its virtual money 10.a) Insert the amount of virtual money to send/receive 11.a) Select send/receive virtual money option
--

- 12.a) The chosen partner receives invitation to trade virtual money
- 13.a) The chosen partner confirms sending/reception of virtual money
- 14.a) View current amount of virtual money

Alternative Flow

- 2.1) There are no *Cardmobili* surveys in the website: terminate
- 3.1) Only one survey must be selected to be responded: deny action and repeat 2)
- 5.1) The user can only choose one option: deny vote and repeat 4)
- 7.a.1) The user has no money to trade: terminate
- 8.a.1.a) User does not have any friends in its network: terminate
- 8.a.1.b) User does not have any friends with virtual money to trade in its network: terminate
- 9.a.1) Partner is not accepting to trade virtual money: deny trading with that partner, repeat 8)
- 11.a.1) User can only choose one friend to perform the transaction: repeat 8.a)
- 11.a.1.a) The amount of virtual money to send is bigger than the user's current total amount: deny trade and repeat 10.a)
- 11.a.1.b) The amount of virtual money to receive is bigger than the partner's current total amount: deny trade and repeat 10.a)

Scenario 8.2: Contribute with virtual money to wish

Table 47: Scenario 8.2: Contribute with virtual money to wish

Type scenario: Manage virtual money

Normal Flow

- 1) View list of *Cardmobili* surveys
- 2) Choose survey from the list
- 3) Select respond to *Cardmobili* survey option
- 4) View survey and choose option
- 5) Select vote option
- 6) View survey results and virtual money earned
- 7.b) Select contribute with money to wish option
- 8.b) View wish list
- 9.b) Choose wish from the list
- 10.b) View wish
- 11.b) Insert the amount of virtual money to contribute
- 12.b) Select contribute with virtual money option
- 13.b) View wish
- 14.b) View current amount of virtual money

Alternative Flow

- 2.1) There are no *Cardmobili* surveys in the website: terminate
- 3.1) Only one survey must be selected to be responded: deny action and repeat 2)
- 5.1) The user can only choose one option: deny vote and repeat 4)
- 7.b.1) The user has no money to contribute with: terminate
- 9.b.1) There are no wishes in the wish list: terminate
- 12.b.1) The amount of virtual money to send is bigger than the user's current total amount: deny contribution and repeat 11.b)

Scenario 8.3: Send online gifts to other user

Table 48: Scenario 8.3: Send online gifts to other user

Type scenario: Send online gifts to other user

Normal Flow

- 1) View list of *Cardmobili* surveys
- 2) Choose survey from the list
- 3) Select respond to *Cardmobili* survey option
- 4) View survey and choose option
- 5) Select vote option
- 6) View survey results and virtual money earned
- 7.c) Select send online gifts to other users option
- 8.c) Choose user from network to send online gift to
- 9.c) System checks for user's availability to receive gifts
- 10.c) Select send online gift option
- 11.c) Choose online gift from list
- 12.c) Write message to attach
- 13.c) Choose privacy options (e.g. *Send Gift anonymously* or *Keep send Gift experience private*)
- 14.c) Select the send gift option
- 15.c) The chosen user receives the online gift
- 16.c) View current amount of virtual money

Alternative Flow

- 2.1) There are no *Cardmobili* surveys in the website: terminate
- 3.1) Only one survey must be selected to be responded: deny action and repeat 2)
- 5.1) The user can only choose one option: deny vote and repeat 4)
- 7.c.1) The user has no money to send online gifts: terminate
- 8.c.1) User does not have any friends in its network: terminate
- 9.c.1) Receiver is not accepting online gifts: deny trading with that partner, repeat 8.c)
- 11.c.1) The user only can send one online gift at a time: repeat 11.c)
- 12.c.1) The user does not want to attach a message: continue to 13.c)
- 13.c.1) The user does not want to choose neither of the privacy options: continue to 14.c)
- 14.c.1) The virtual cost of the online gift is bigger than the user's current total amount: deny trade and repeat 11.c)

Storyboard 1: User contributes to card merchant wish

This storyboard presents the case in which a user wants to contribute with its virtual money to a wish proposed by a card merchant.

Pedro wants to earn virtual money to contribute to a wish that was created by *Continente*. To do that, Pedro chooses to respond to one of the available *Cardmobili*'s survey. He chooses the first *Cardmobili* survey he finds (1) and selects the option to respond to it (2) (Figure 41).

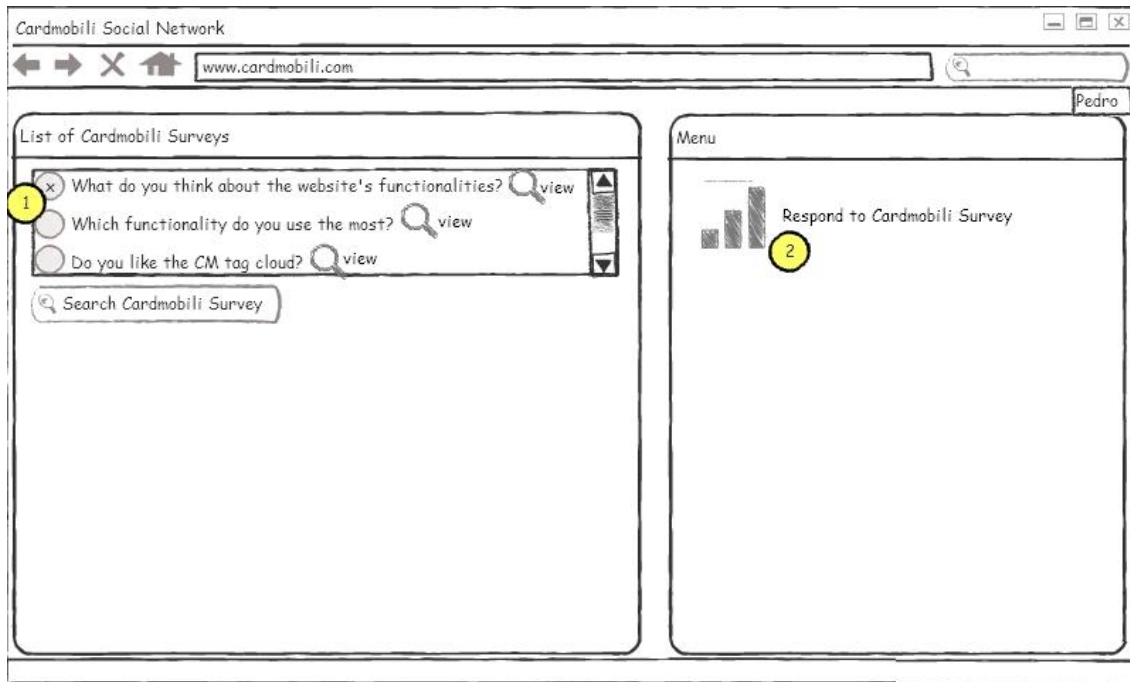


Figure 41: Storyboard 1: User contributes to card merchant wish – Scene 1

Pedro views the details and objective of the survey and chooses the “Don’t Care” voting option (1). To confirm its vote he selects the option to vote (2) (Figure 42).

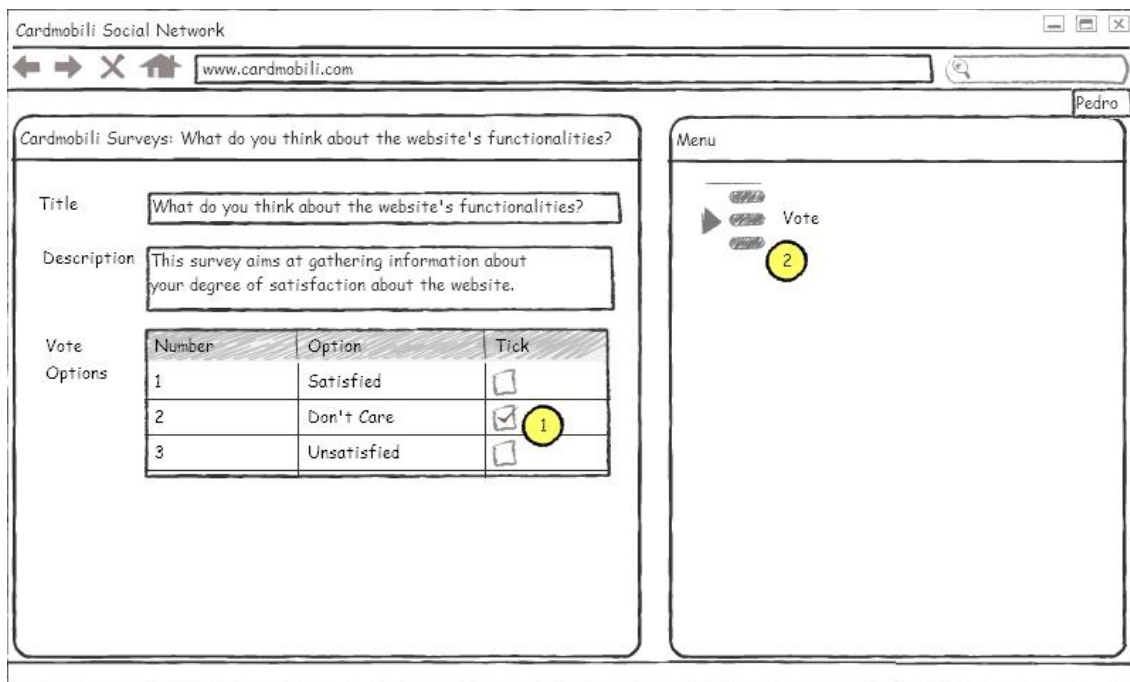


Figure 42: Storyboard 1: User contributes to card merchant wish – Scene 2

Pedro has access to the results of the voting. He also can view the virtual money earned in this action, and its current amount of virtual money. Pedro decides to contribute with its virtual money to a wish by selecting the option to contribute with virtual money to wish (1) (Figure 43).

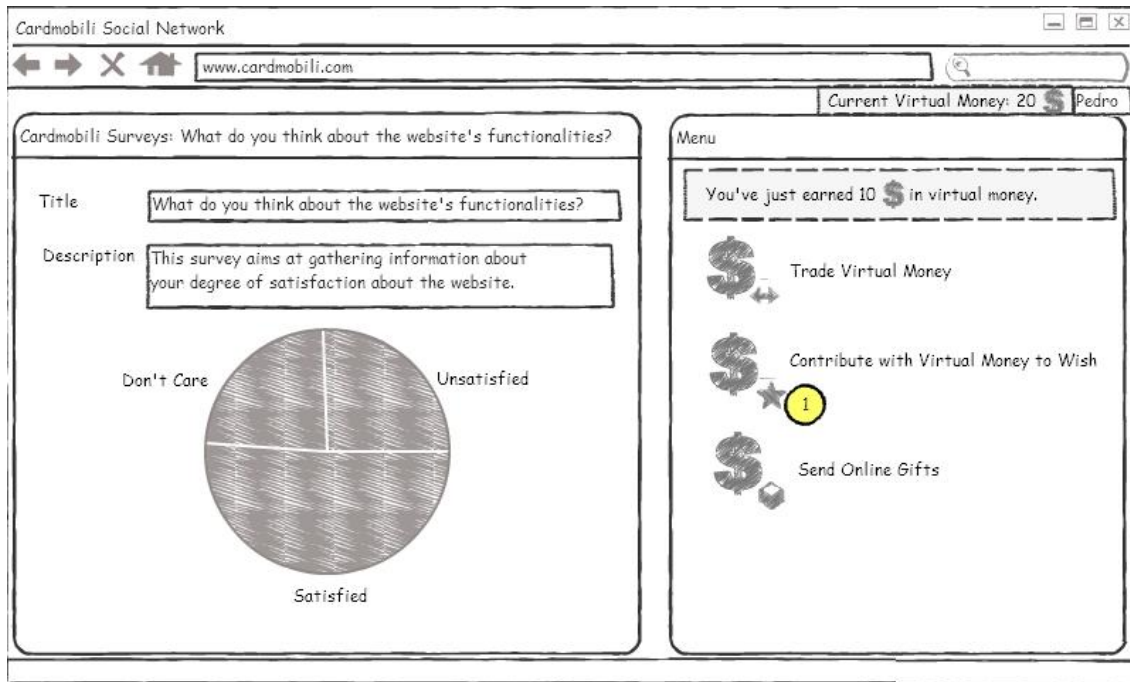


Figure 43: Storyboard 1: User contributes to card merchant wish – Scene 3

Pedro chooses its wish from the list of wishes (1) and selects the option to view wish (2) (Figure 44).

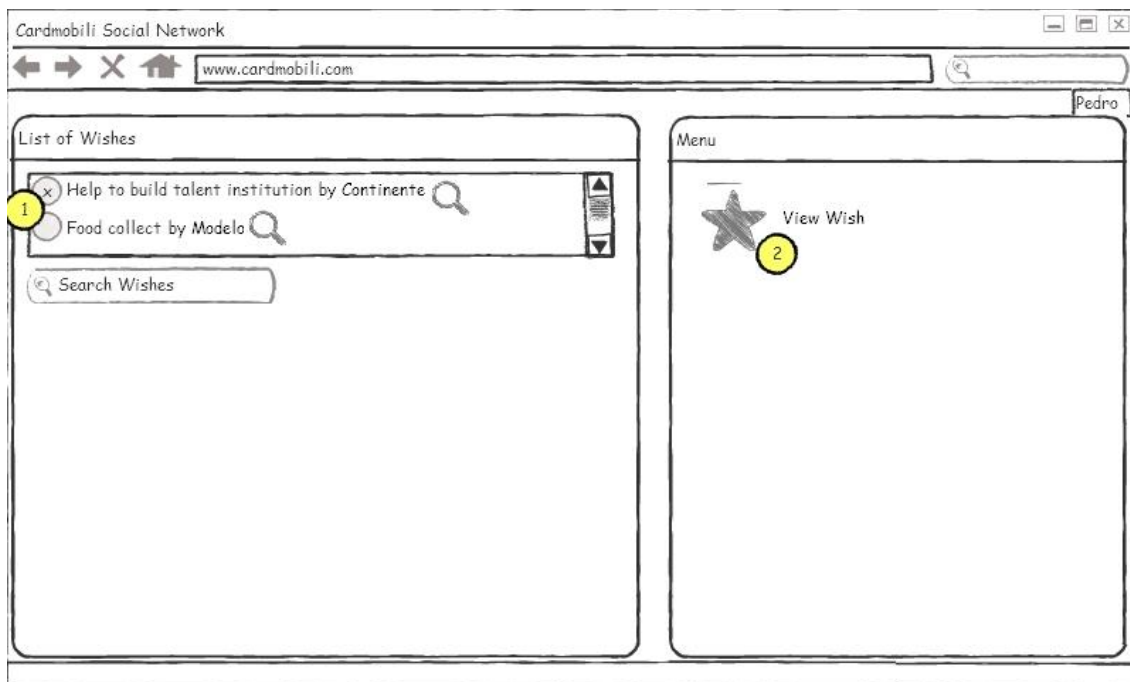


Figure 44: Storyboard 1: User contributes to card merchant wish – Scene 4

Now, Pedro is viewing the wish and he decides to contribute with all virtual money to it (1). He confirms the action by selecting the option to contribute with virtual money (2) (Figure 45).

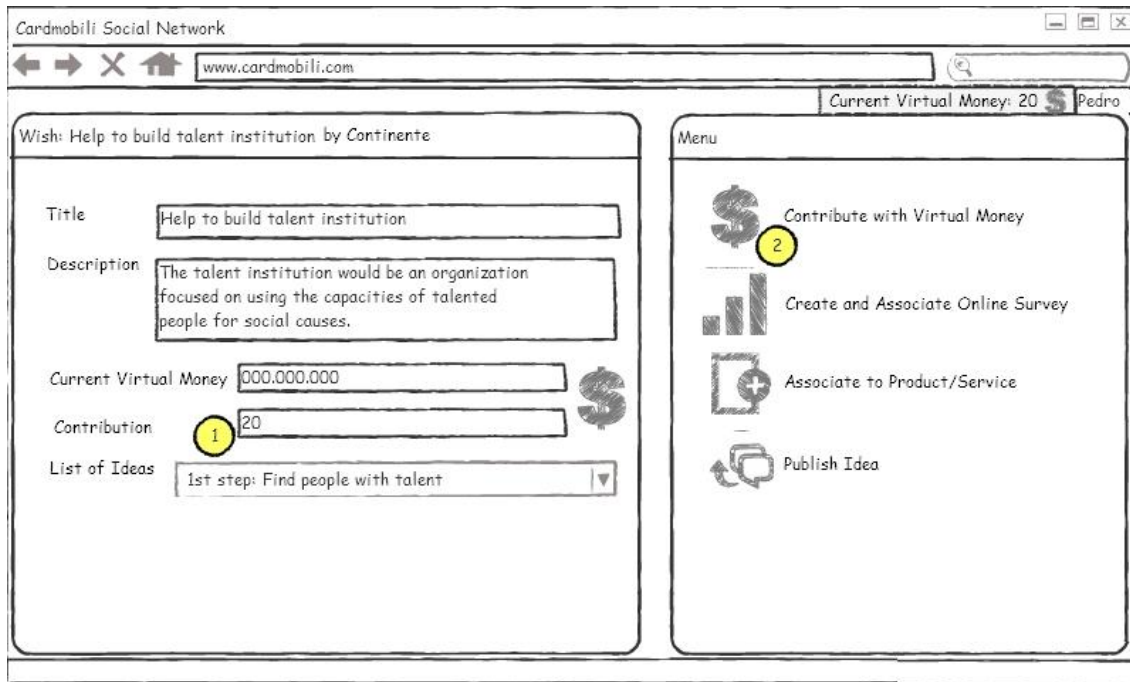


Figure 45: Storyboard 1: User contributes to card merchant wish – Scene 5

At last, Pedro views the wish to which he contributed and its personal current amount of virtual money at 0's (Figure 46).

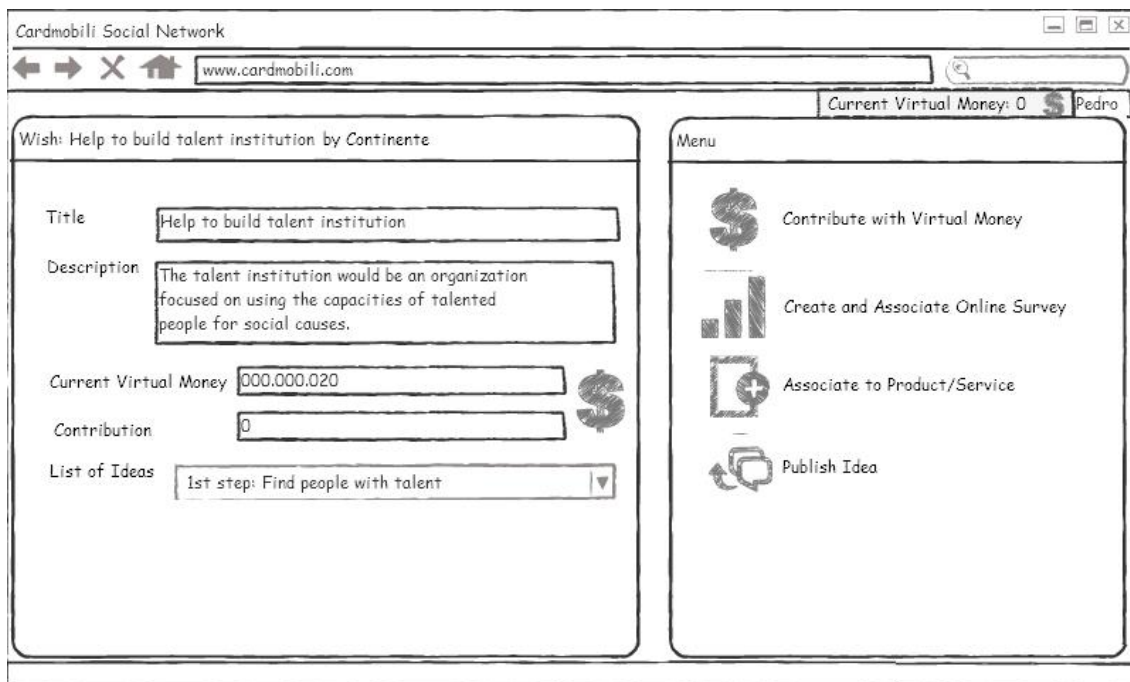


Figure 46: Storyboard 1: User contributes to card merchant wish – Scene 6

Storyboard 2: User sends online gift

This storyboard presents the case in which a user wants to send an online gift to another user from its network (users can send online gifts to anybody in the *Cardmobili's* social network). This storyboard starts from the point where the user earns virtual money from responding to a *Cardmobili* survey.

Pedro has access to the results of its voting action. He also can view the virtual money earned, and its current amount of virtual money. Pedro decides to send an online gift to a friend using the virtual money he earned. To do that he selects the option to send online gifts (1) (Figure 47).

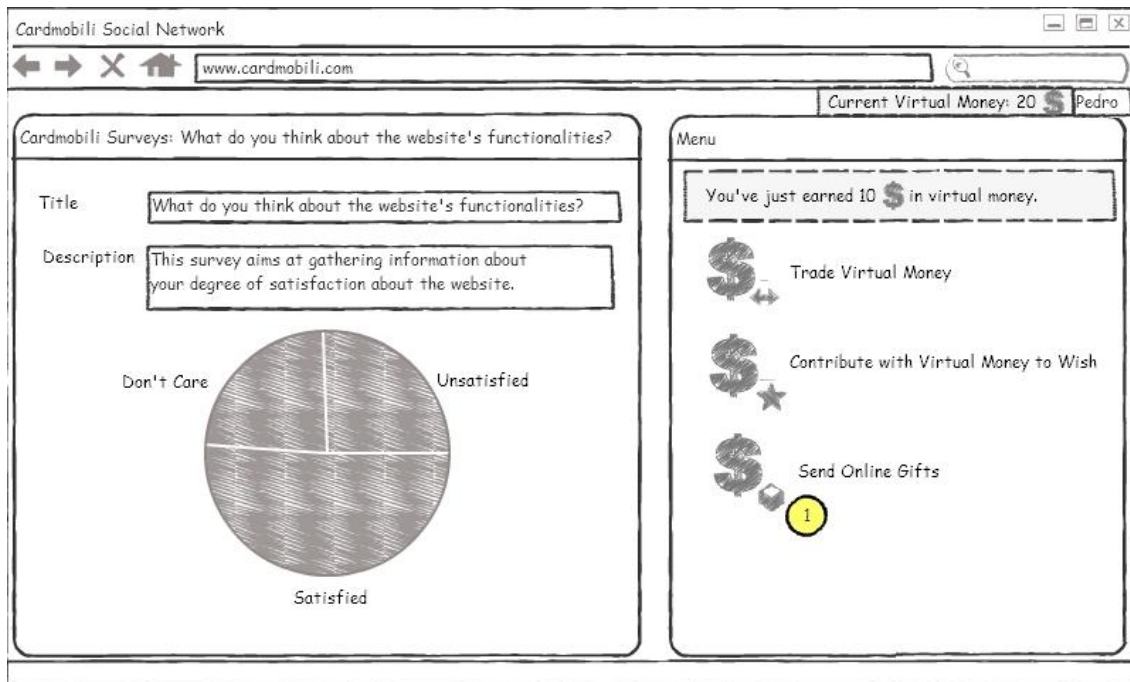


Figure 47: Storyboard 2: User sends online gift – Scene 1

First, Pedro chooses the friend he wishes to send the online gift to. He chooses Ana (1) (Figure 48).

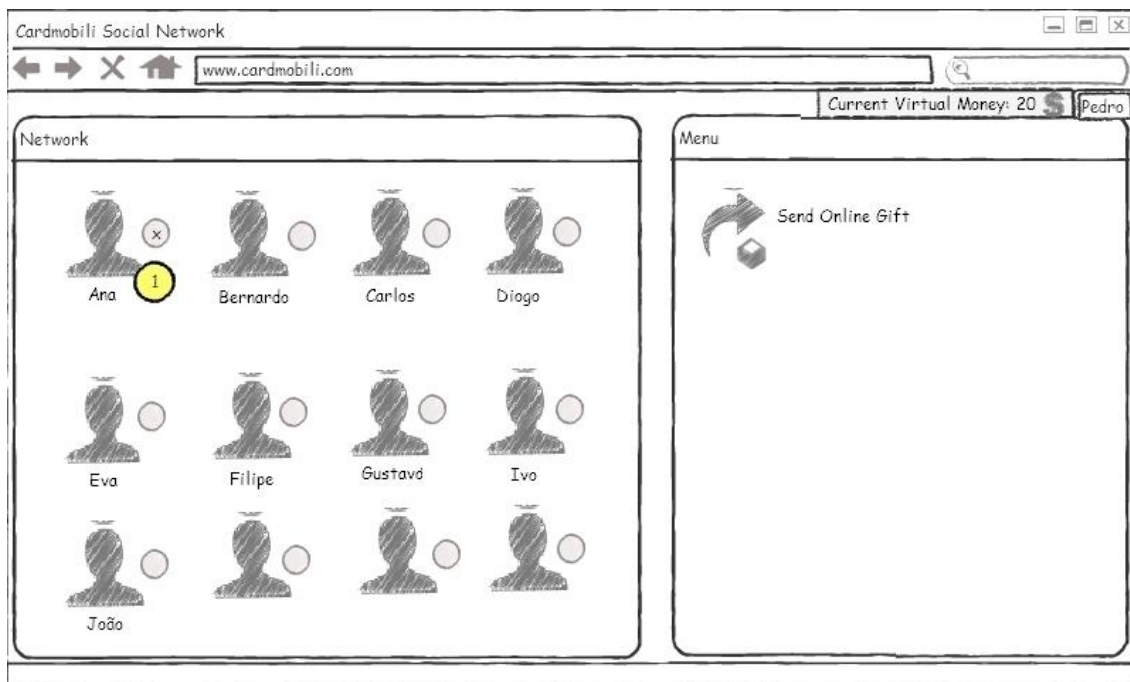


Figure 48: Storyboard 2: User sends online gift – Scene 2

The system recognizes that Ana is accepting online gifts and validates the possibility of performing the transaction. To confirm that he wants to send an online gift to her, Pedro chooses the option to send online gift (1) (Figure 49).

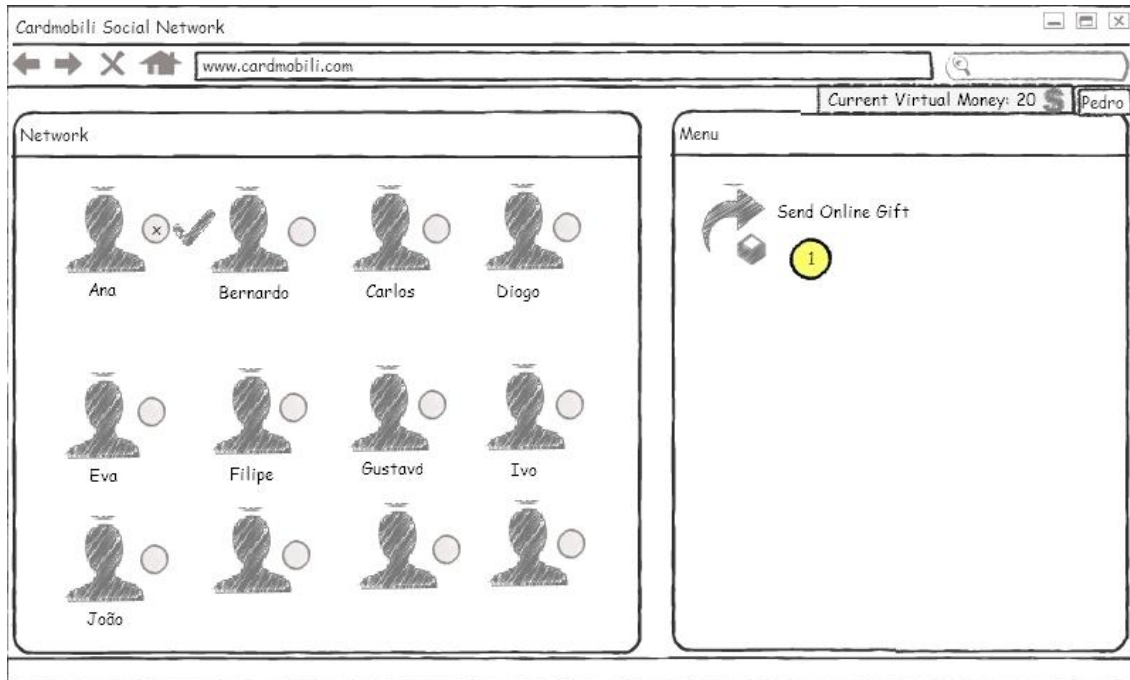


Figure 49: Storyboard 2: User sends online gift – Scene 3

In the online gifts area, Pedro chooses the mobile phone gift which costs 15 units of virtual money (1). Next he chooses to attach a message (2) and he selects the option of sending the gift anonymously (3). This way, the system will not attach Pedro's identification to the gift. Finally, he confirms the action by selecting the option to send online gift (4) (Figure 50).

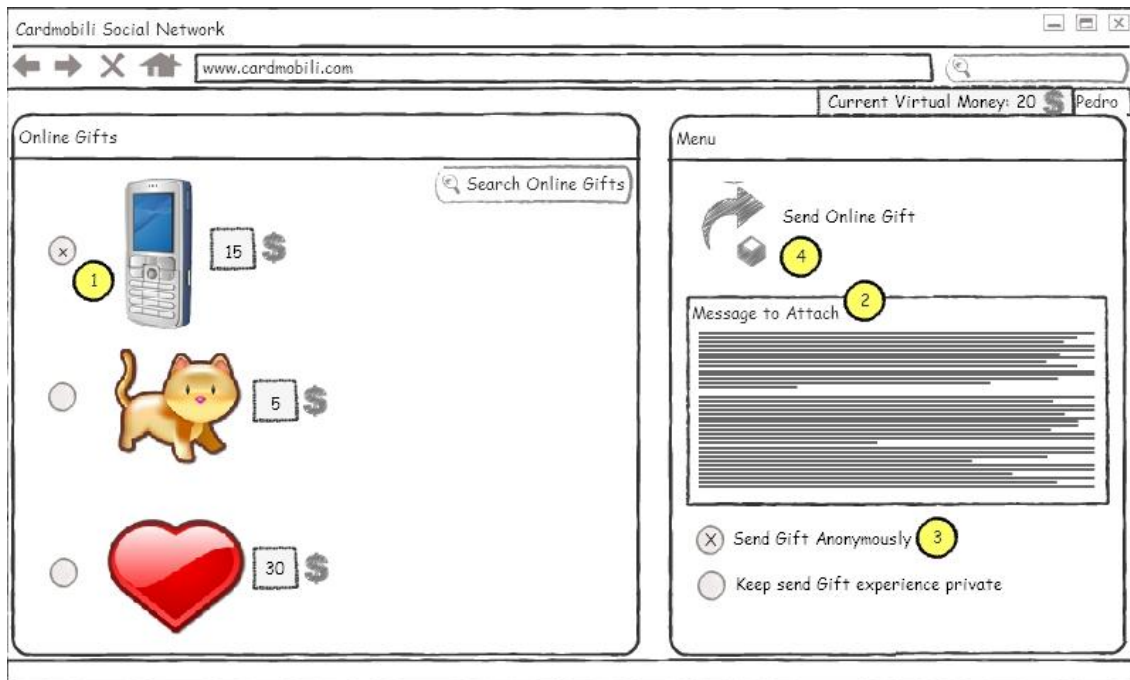


Figure 50: Storyboard 2: User sends online gift – Scene 4

The transaction takes place. Pedro spent 15 units of virtual money by sending the online gift and now is left with only 5 units of virtual money. Ana receives the online gift and attached message without knowing who sent it. She is now able to see the gift received (1) (Figure 51).

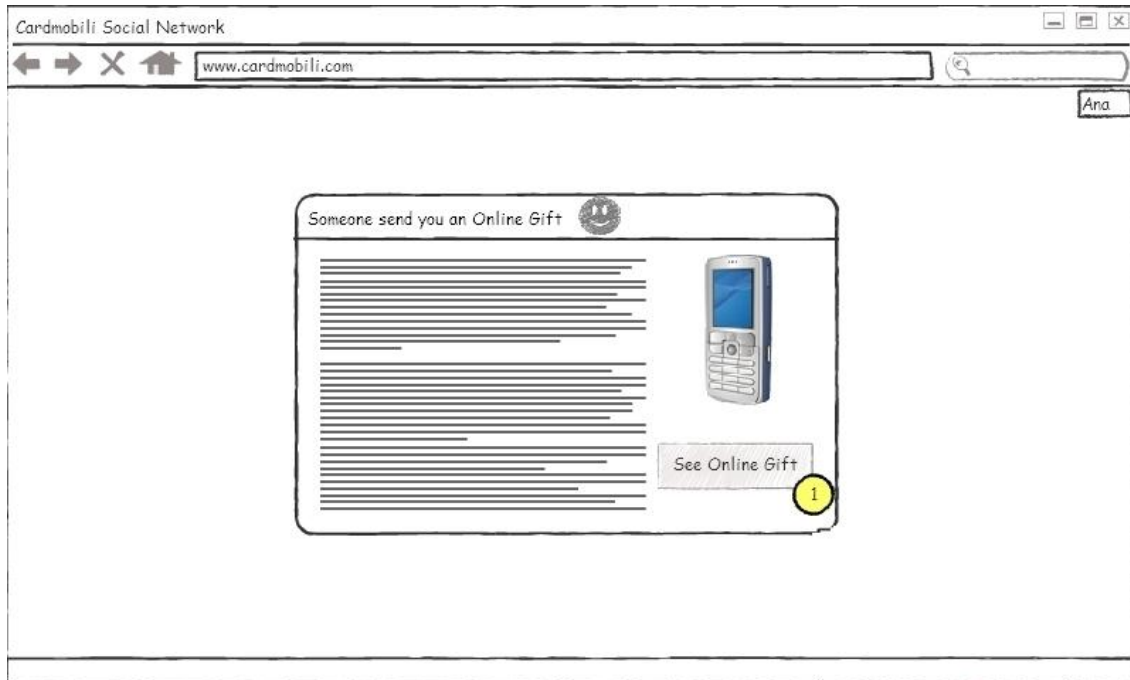


Figure 51: Storyboard 2: User sends online gift – Scene 5

Storyboard 3: User wants to trade virtual money with other user in its network

This storyboard presents the case in which a user wants to send virtual money to another user from its network. This storyboard starts from the point where the user earns virtual money from responding to a *Cardmobili* survey.

Pedro has access to the results its voting. He also can view the virtual money earned in this action, and its current amount of virtual money. Pedro decides to trade virtual money with one of its friends. To do that he selects the option to trade virtual money (1) (Figure 52).

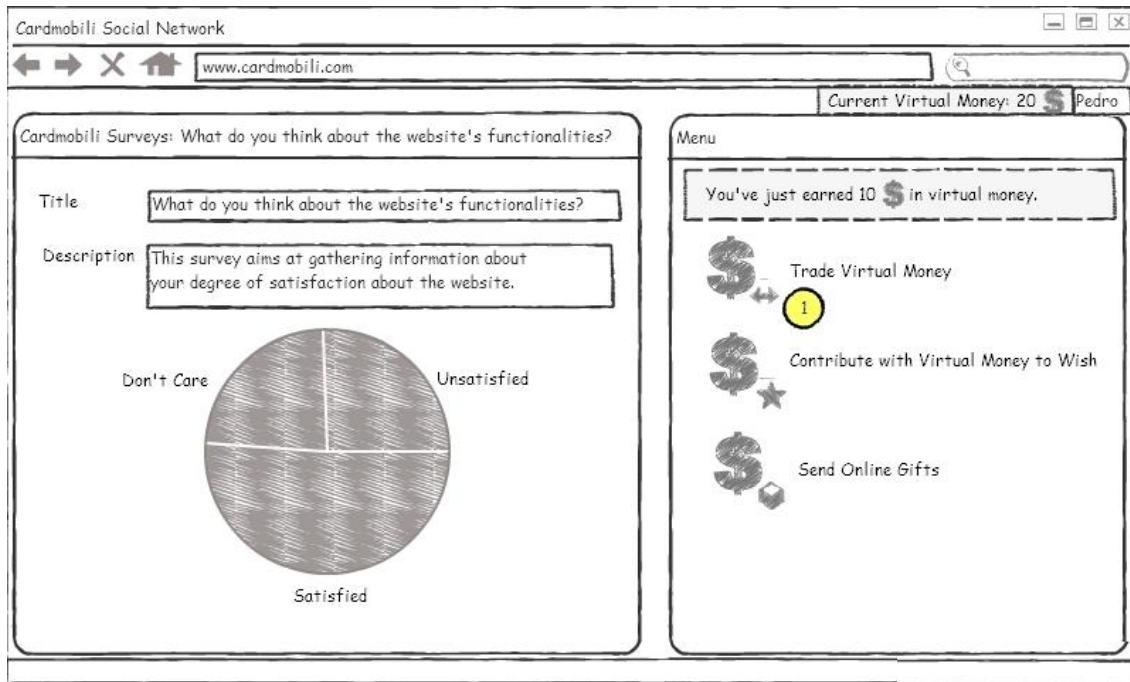


Figure 52: Storyboard 3: User wants to trade virtual money with other user in its network – Scene 1

First, Pedro chooses the friend with whom he wants to trade virtual money. He chooses Ivo (1) (Figure 53).

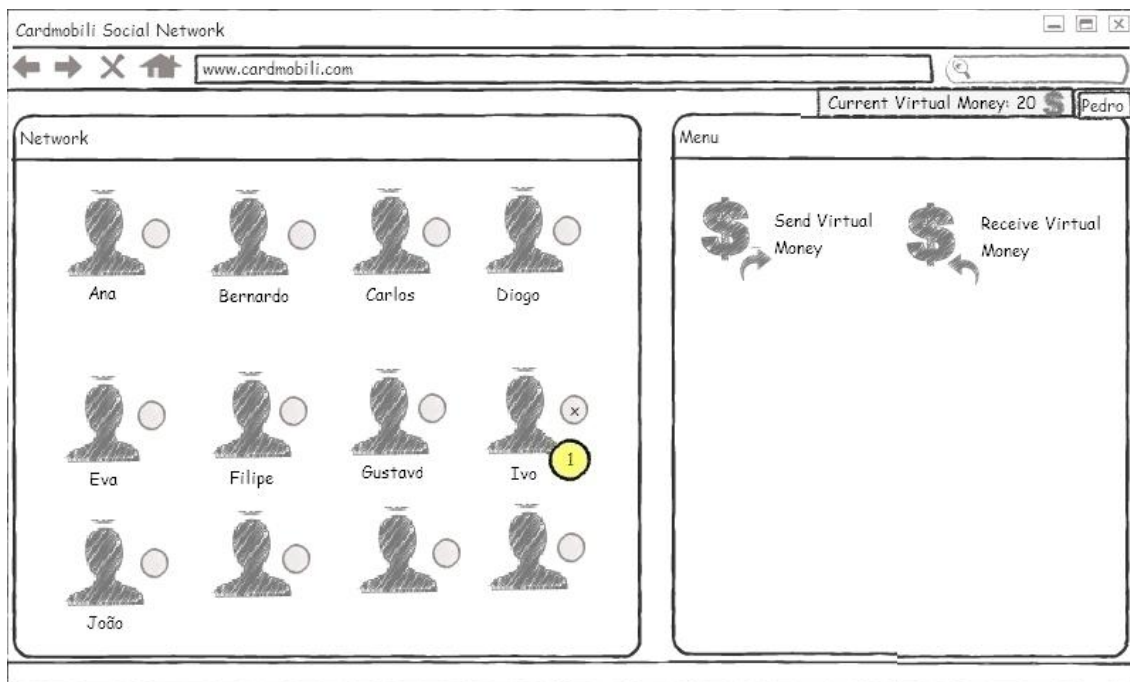


Figure 53: Storyboard 3: User wants to trade virtual money with other user in its network – Scene 2

The system immediately recognizes Ivo as a legible actor for the transfer and provides its current amount of virtual money. Now, Pedro inserts the amount he wants to send (1) and then selects the send virtual money option to confirm the transfer (2) (Figure 54).

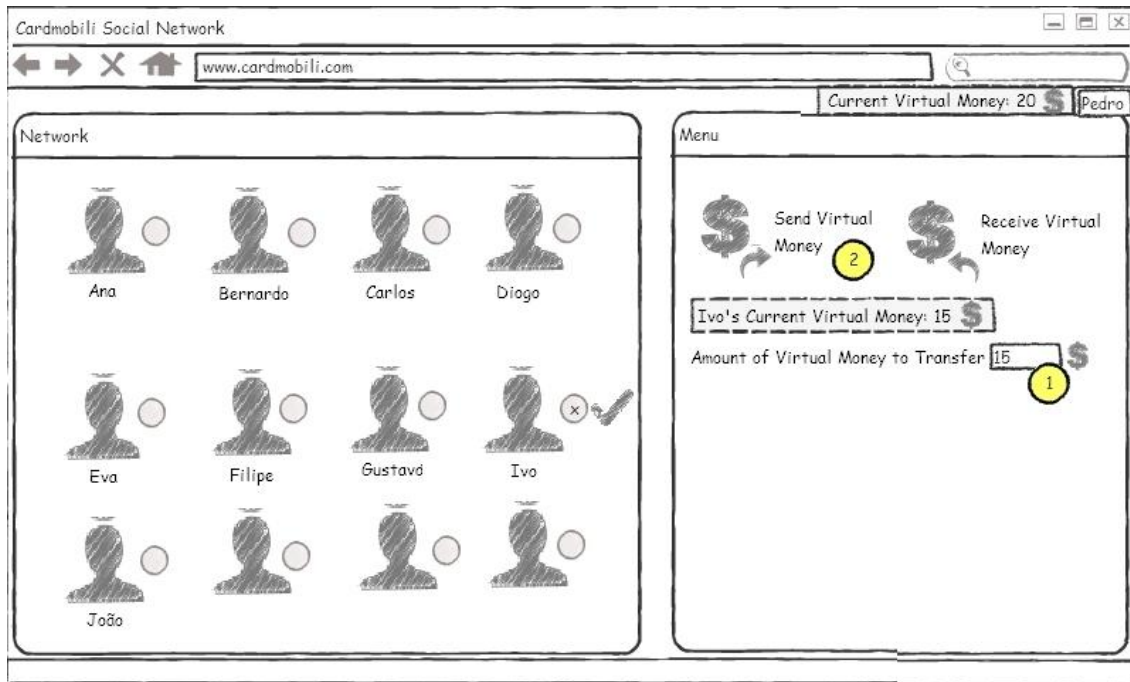


Figure 54: Storyboard 3: User wants to trade virtual money with other user in its network – Scene 3

Ivo receives the invitation to trade virtual money and decides to confirm it (1) (Figure 55).

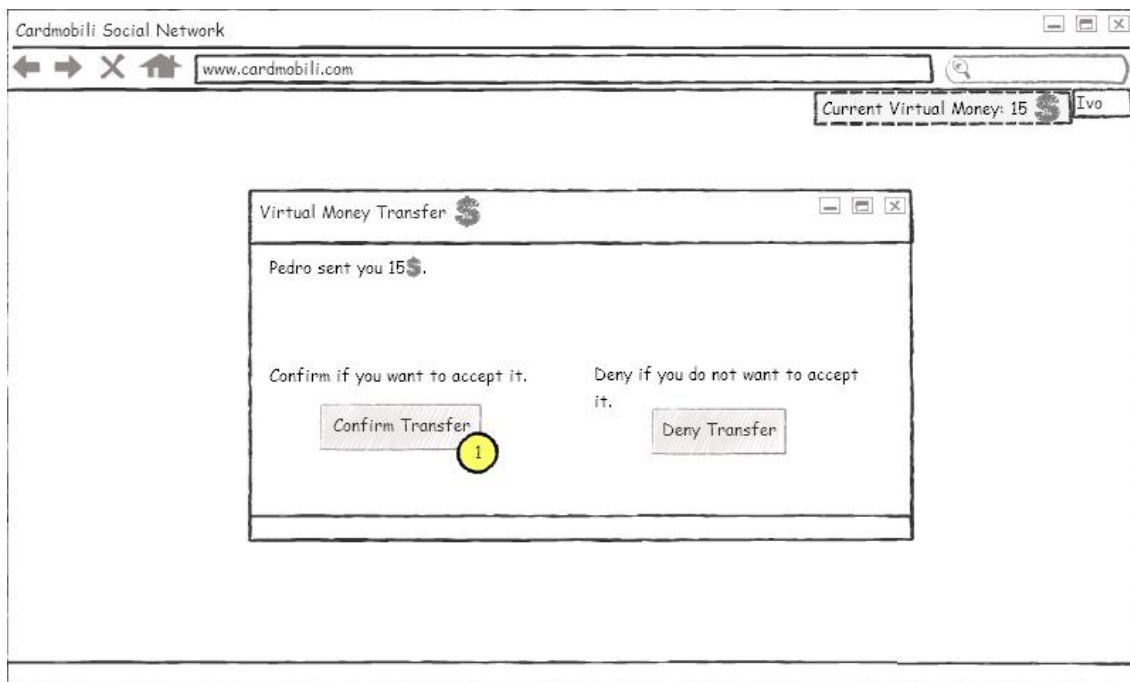


Figure 55: Storyboard 3: User wants to trade virtual money with other user in its network – Scene 4

Pedro can confirm the transfer by accessing to Ivo's profile and checking its current amount of virtual money. Now, Ivo has 30 units of virtual money while Pedro only has 5 units of virtual money (Figure 56).

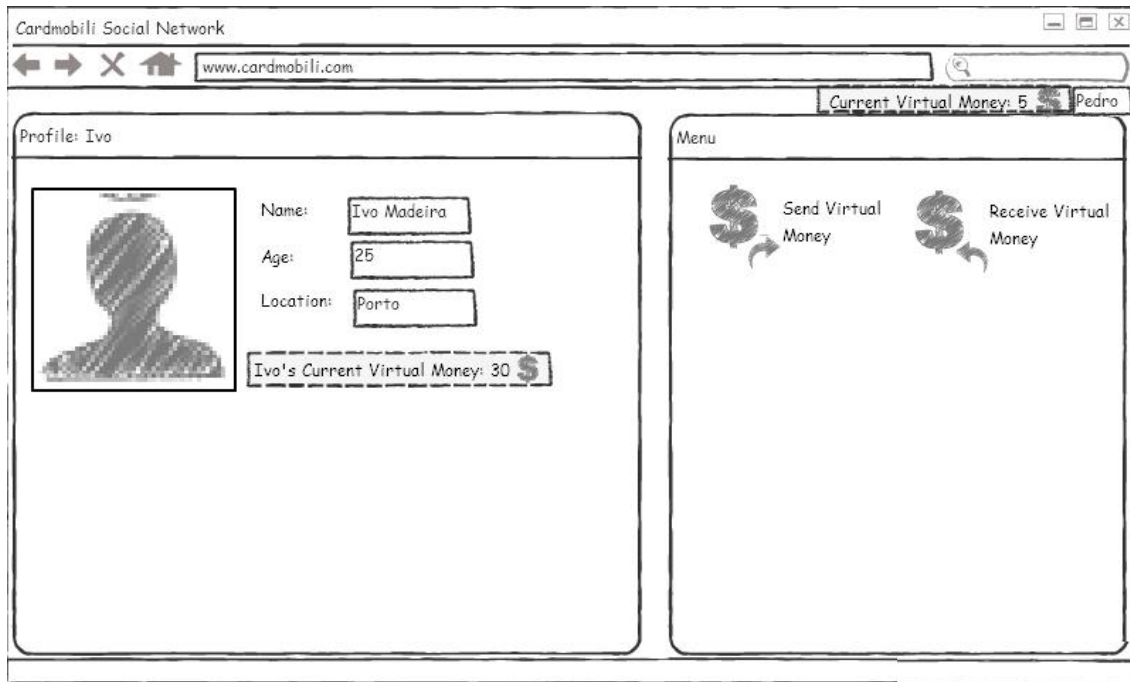


Figure 56: Storyboard 3: User wants to trade virtual money with other user in its network – Scene 5

Scenario 9: View and shout bargains

Table 49: Scenario 9: View and shout bargains

Type scenario: View and shout bargains

Primary actor: User

Goal: A user wants to visualize bargains related to different products/services. To do that the user accesses to the website shout mechanism and visualizes recent bargain shouts.

Pre-conditions: User is registered in the website;

Normal Flow

- 1.a) View current bargain shouts from other users
- 1.b) Receive bargain of the day notification on mobile/email
- 2.a.1) Write plain text in the bargain shout area
- 3.a.1) Associate bargain with product/service (type scenario: add product/service)
- 4.a.1) System checks for total length of the plain text review
- 5.a.1) Select bargain shout option
- 6.a.1) System displays bargain shout on its specific area in the website
- 7.a.1) View bargain
- 8.a.1.a) Other user respond through the bargain shout chat system mechanism
- 8.a.1.b) Export bargain to *Twitter*
- 9.a.1) Rate other users' bargain shout
- 10.a.1) System calculates and displays current bargain rating
- 2.b) Select view bargain of the day option
- 3.b) View bargain of the day
- 4.b) Select view bargain associated product/service
- 5.b) View bargain associated product service

Alternative Flow

3.a.1.1) There are no products/services to be associated with or the user do not want to associate products/services to the bargain shout: terminate or continue to 4.a.1)

5.a.1.1) Bargain text has more than 140 characters: deny creation of the bargain until bargain's total length minor than 140, repeat 2.a.1)

- 7.a.1.1) User does not want to do anything else: terminate
- 9.a.1.b.1) User does not have a *Twitter* account: terminate
- 4.b.1) The bargain has no associated product/service: terminate

Table 50: Scenario 9: Send bargain to network connection

Type scenario: Send bargain to network connection Primary actor: User Goal: A user wants to send a bargain related to a product/service to another registered user in the network. A bargain could be sent to more than one network connection. Pre-conditions: User is registered in the website; Normal Flow 1) Choose bargain receiver(s) from network 2) System checks for receivers' availability to receive bargain 3) Select send bargain option 4) View list of bargains 5.a) Choose bargain from the list 5.b) View bargain associated product/service 6) Choose to notify the receiver(s) by email 7) System checks for receivers' availability to receive notification emails 8) Select send option 9) System sends bargain to chosen receiver(s) 10) The chosen user(s) receive(s) bargain Alternative Flow 1.1) User does not have any friends in its network: terminate 2.1) Receiver is not accepting bargains: deny sending to that receiver: continue or repeat 1) 5.a.1) There are no bargains on the list: terminate 5.b.1) There are no bargains associated products/services: continue 7.1) Receiver is not accepting notification emails: deny sending notification email to that receiver, continue 10.1) User(s) receive(s) or not email notification of bargain(s) reception: terminate

Storyboard 1: User wants to shout bargain and respond and rate another

This storyboard presents the case in which a user wants to shout a bargain and turn it available to other users in the *Cardmobili* social network.

From time to time Pedro looks for new bargains by watching the shouts bar. Now, Pedro found that *Continente* is selling Nokia 2210 at low prices and he decides to share this bargain with other users (1). The system recognizes the shout as valid, because it has less than 140 characters (2). Pedro finally shares its bargain with others by selecting the option to shout a bargain (3) (Figure 57).

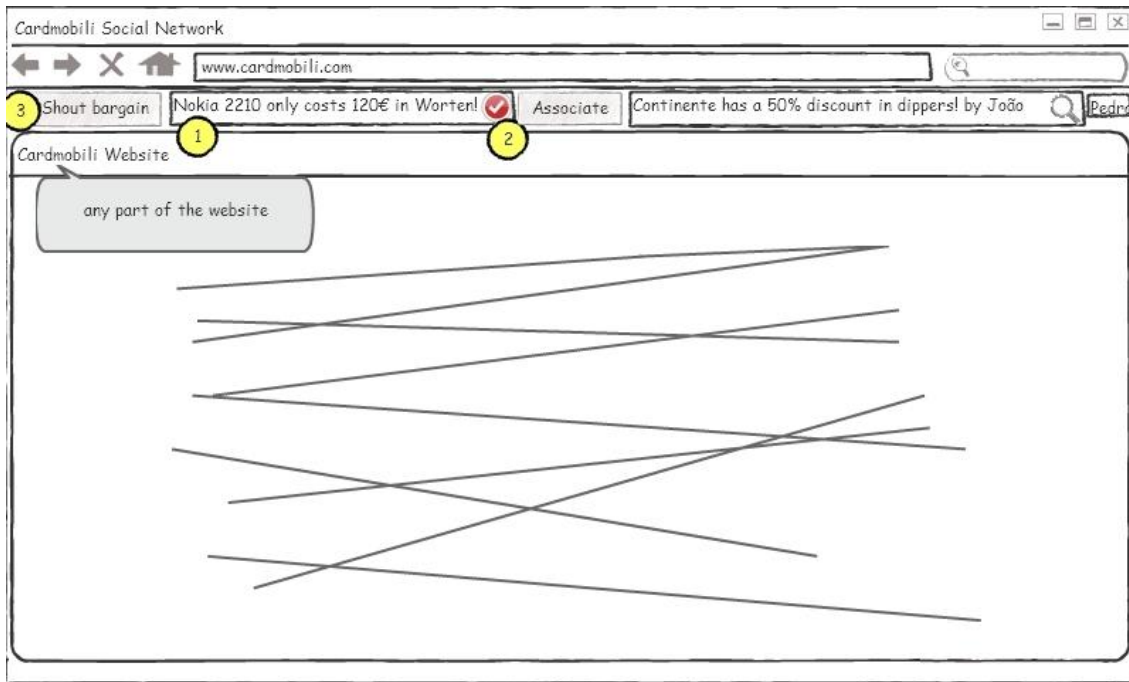


Figure 57: Storyboard 1: User wants to shout bargain and respond and rate another – Scene 1

The system displays Pedro's shout in the shout area. Now, all online users in the website are able to view Pedro's shout (Figure 58).

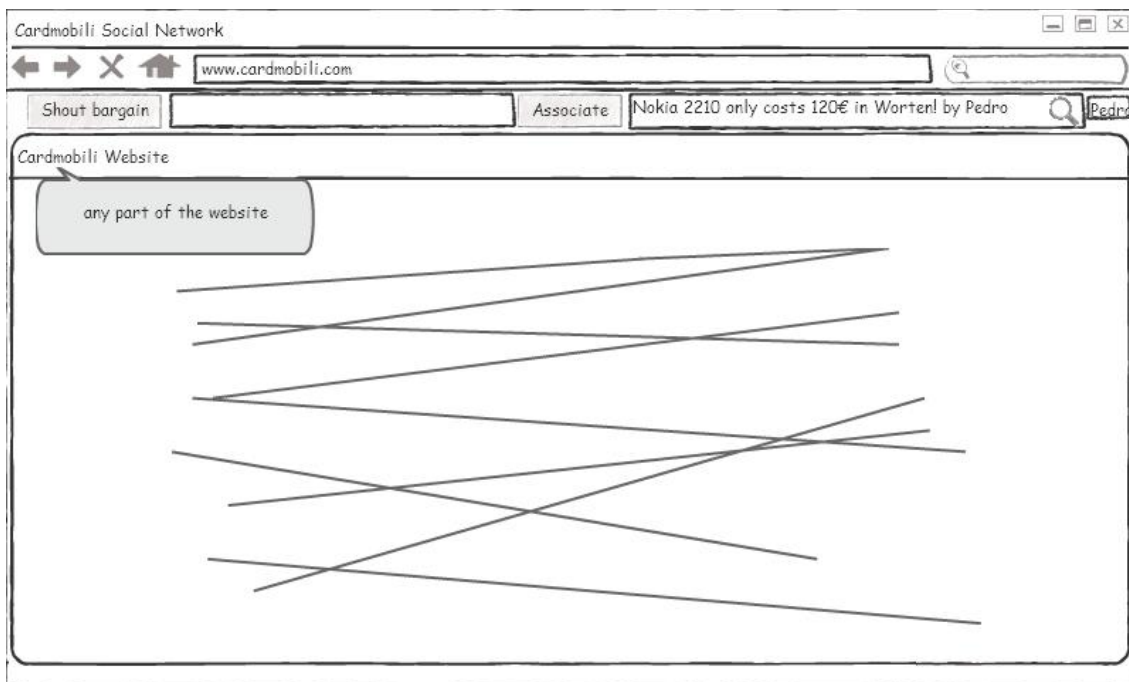


Figure 58: Storyboard 1: User wants to shout bargain and respond and rate another – Scene 2

Ana, another website's user, decides to shout back saying that Nokia 2210 is being sold at 110€ at *RadioPopular*. Pedro thinks that this shout is very good and decides to view it (1) (Figure 59).

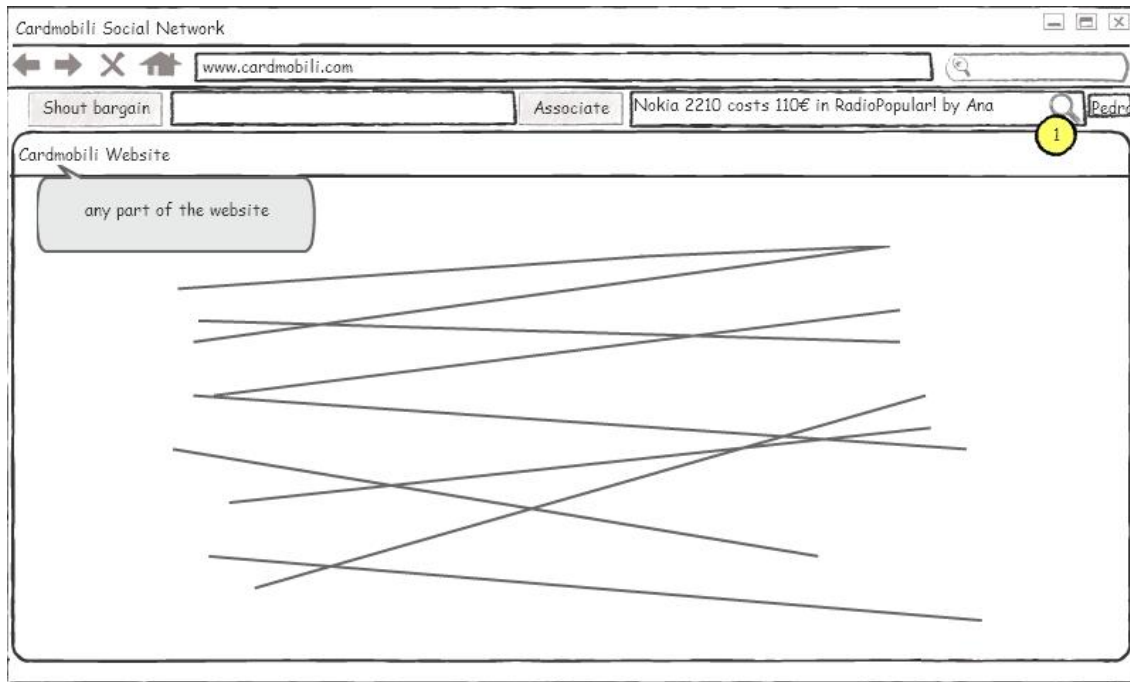


Figure 59: Storyboard 1: User wants to shout bargain and respond and rate another – Scene 3

Now, Pedro can rate Ana's shout. He decides to rate it with a 5 in a 5 points scale rating (1). He confirms its action by selecting the option to rate Ana's shout. (2) (Figure 60).

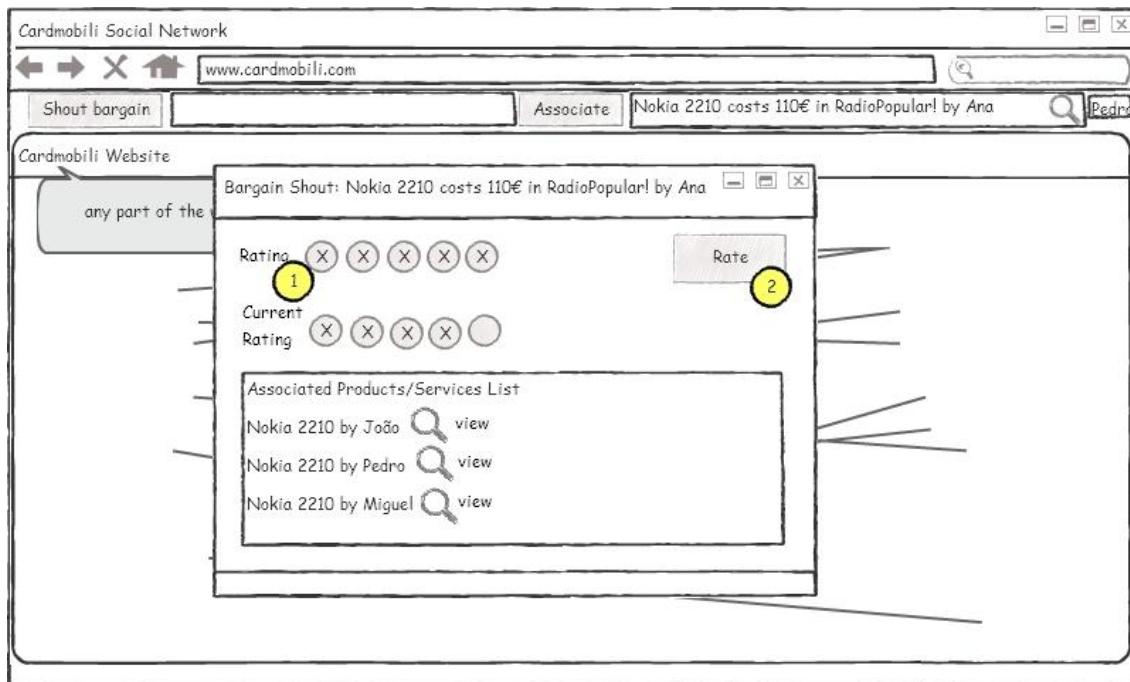


Figure 60: Storyboard 1: User wants to shout bargain and respond and rate another – Scene 4

Finally, the system blocks Pedro's ability to rate this shout again and displays Ana's current bargain rating (Figure 61).

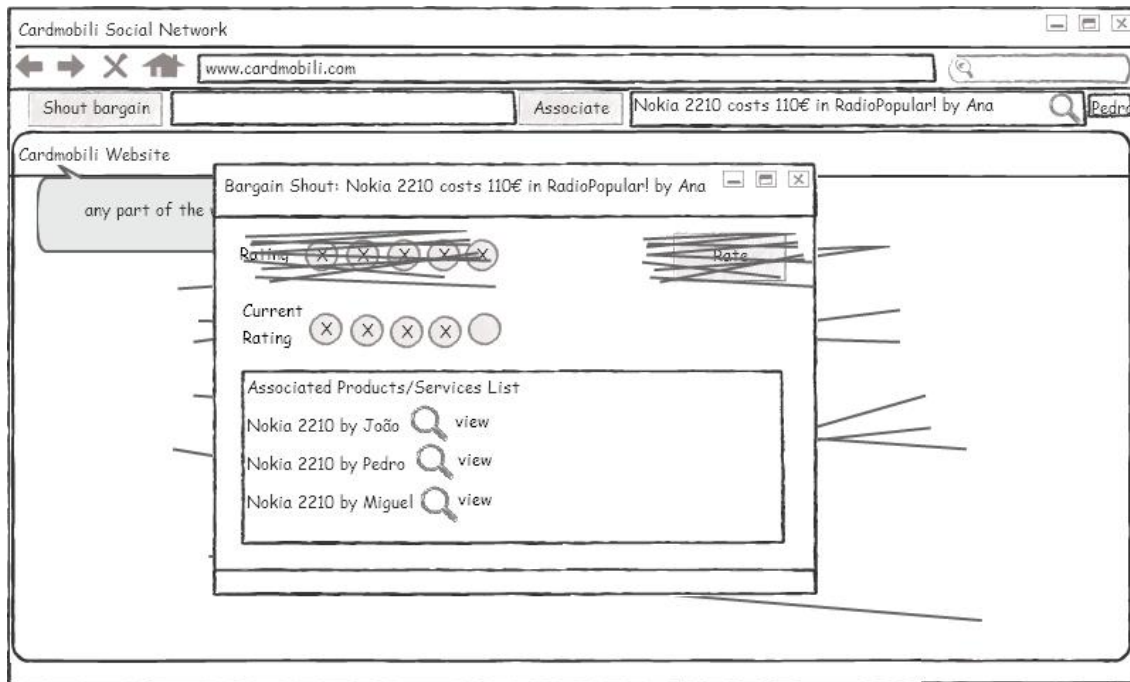


Figure 61: Storyboard 1: User wants to shout bargain and respond and rate another – Scene 5

Scenario 10: Manage card points

Table 51: Scenario 10: Manage card points

Type scenario: Manage card points
Primary actor: User
Goal: A user wants to exchange, transfer or trade points on its cards.
Pre-conditions: User is registered in the website;

Scenario 10.1: Exchange points for prizes/discounts

Table 52: Scenario 10.1: Exchange points for prizes/discounts

Type scenario: Exchange points for prizes/discounts

Normal Flow

- 1) View list of cards
- 2) Choose card from list
- 3) Select view card option
- 4) View card and respective accumulated points
- 5.a) Select exchange points for prizes/discounts option
- 6.a) View list of prizes/discounts available for that card (as well as points needed for the exchange)
- 7.a) Choose prize/discount
- 8.a) Select exchange option
- 9.a) System transfers prize/discount voucher to the user's personal area
- 10.a) View prizes/discounts personal area

Alternative Flow

- 1.1) The user has no cards: terminate
- 2.1) Only one card can be chosen: repeat 2
- 7.a.1) There are no prizes/discounts available for that card: repeat 2 or terminate
- 8.a.1) The amount of points needed to exchange that prize/discount is bigger than the current amount of points of the user: repeat 2 or terminate

Scenario 10.2: Send points to other user

Table 53: Scenario 10.2: Send points to other user

Type scenario: Send points to other user

Normal Flow

- 1) View list of cards
- 2) Choose card from list
- 3) Select view card option
- 4) View card and respective accumulated points
- 5.b) Select send points to other user option
- 6.b) Choose trade partner from network
- 7.b) System checks for receivers' availability to trade points
- 8.b) Select choose trade partner's card from network option
- 9.b) Choose trade partner's card
- 10.b) System checks for availability to perform the transaction between cards
- 11.b) Insert amount of points to send
- 12.b) Select trade points option
- 13.b) System transfers points to the receiver
- 14.b) The chosen user receives the respective points in its card

Alternative Flow

- 1.1) The user has no cards: terminate
- 2.1) Only one card can be chosen: repeat 2
- 6.b.1) There are no connections in the user's network: terminate
- 7.b.1) Trade partner chosen is not currently accepting to trade points: deny trading with that partner, repeat 6.b)
- 12.b.1) Amount of points to send is bigger than the current amount of points of the user: repeat 11.b) or terminate

Scenario 10.3: Transfer points between partner merchant cards option

Table 54: Scenario 10.3: Transfer points between partner merchant cards option

Type scenario: Transfer points between partner merchant cards option

Normal Flow

- 1) View list of cards
- 2) Choose card from list
- 3) Select view card option
- 4) View card and respective accumulated points
- 5.c) Select transfer points between partner merchant cards option
- 6.c) Choose one partner merchant card from list
- 7.c) System checks for partner merchant's availability to transfer points to the other partner merchant chosen
- 8.c) Insert amount of points to send and the direction of communication
- 9.c) Select transfer points option
- 10.c) System transfers points to the receiver card (other card)
- 11.c) The chosen card receives the respective points

Alternative Flow

- 1.1) The user has no cards: terminate
- 2.1) Only one card can be chosen: repeat 2
- 6.c.1.a) There are no partner merchants cards available in the user's network: terminate

6.c.1.b) The user only can choose one partner merchant card: repeat 6.c)
 7.c.1) Partner merchant chosen is not currently accepting to transfer points with the other partner chosen: deny trading with that partner, repeat 6.c)
 9.c.1) The amount of points to send is bigger than the current amount of points of the user in that card: repeat 8.c) or terminate

Scenario 10.4: Trade points for virtual money

Table 55: Scenario 10.4: Trade points for virtual money

Type scenario: Trade points for virtual money Normal Flow 1) View list of cards 2) Choose card from list 3) Select view card option 4) View card and respective accumulated points 5.d) Select trade points for virtual money option 6.d) Insert amount of points to trade 7.d) System displays the virtual money to earn for the inserted amount of points 8.d) Select trade points option 9.d) System transfers virtual money to the receiver 10.d) The chosen user receives the respective amount of virtual money Alternative Flow 1.1) The user has no cards: terminate 2.1) Only one card can be chosen: repeat 2 8.d.1) The amount of inserted for trade is bigger than the current amount of points of the user: repeat 6.d) or terminate
--

Storyboard 1: User wants transfer points between partner merchant cards

This storyboard presents the case in which a user wants to transfer points from one of its cards to another.

Pedro wants to transfer points from the *Continente* card to the *IkeaFamily* card. Pedro views the details of the *Continente* card, as well as the 2000 points accumulated in it. As he intended he selects the option to transfer points between partner merchant cards (1) (Figure 62).

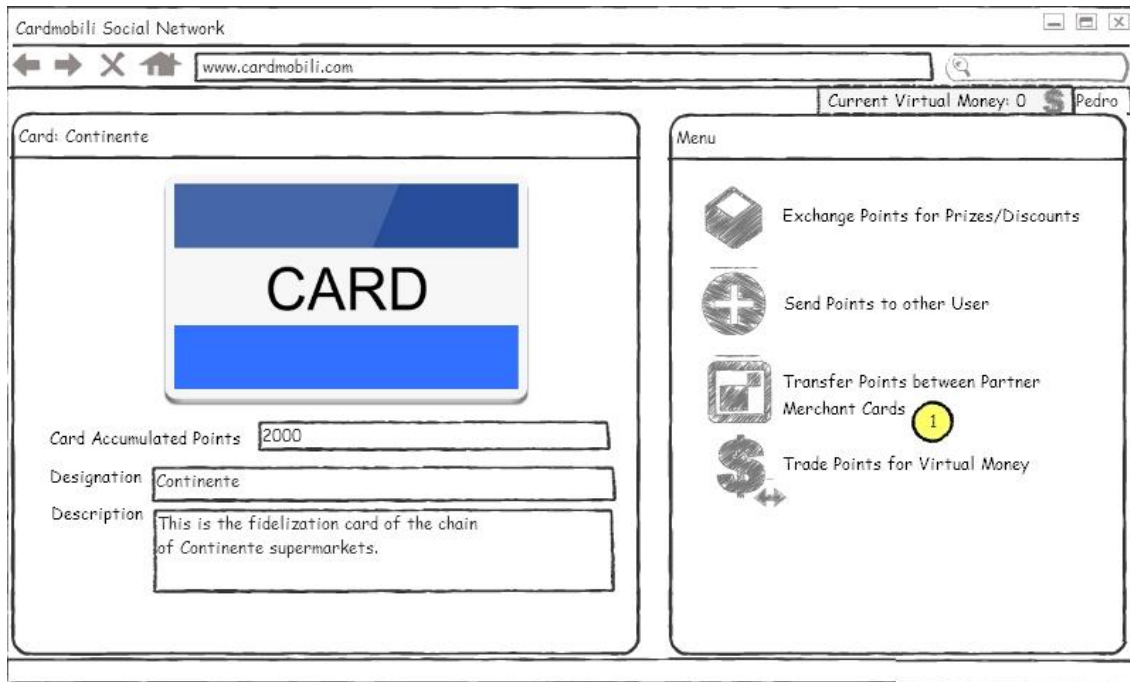


Figure 62: Storyboard 1: User wants transfer points between partner merchant cards – Scene 1

Now, Pedro has access to the list of cards he owns. He starts by choosing the second card to involve in the transaction. He chooses the *IkeaFamily* card (1). The system immediately validates the transfer between cards. Pedro wants to send the 1000 points (2) from the *Continente* card to the *IkeaFamily* card. To do that he chooses and selects the direction of the transaction (3). Finally, and to confirm this transaction, Pedro selects the option to transfer points (4) (Figure 63).

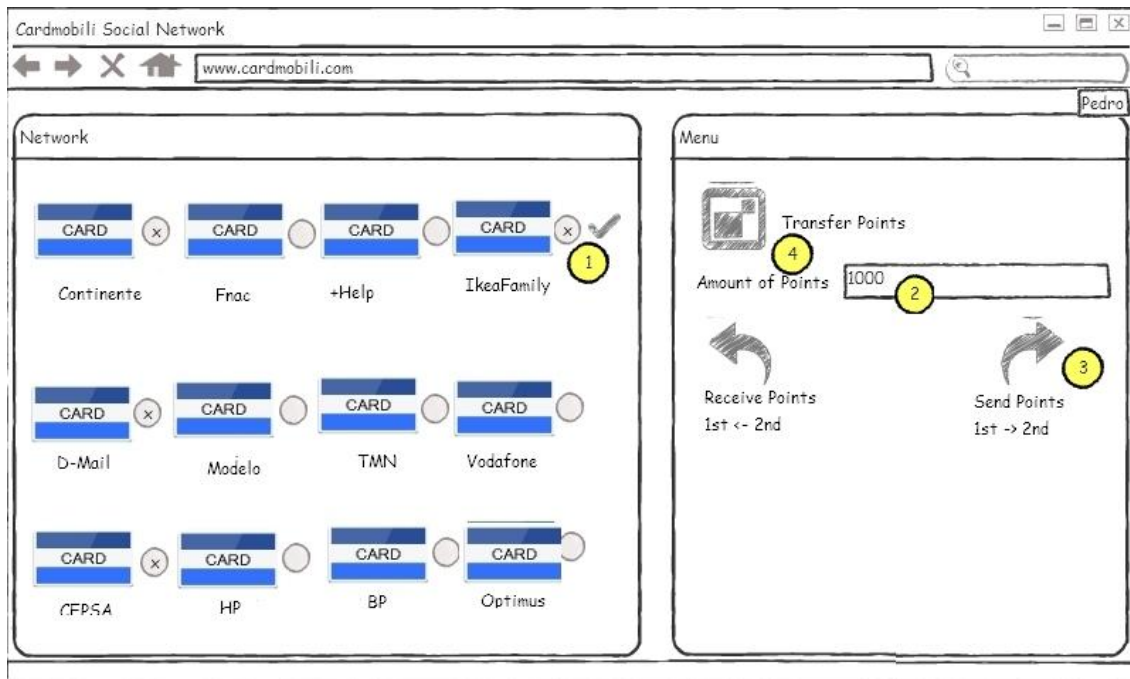


Figure 63: Storyboard 1: User wants transfer points between partner merchant cards – Scene 2

The transaction takes place and the system transfers the 1000 points as intended by Pedro (Figure 64).

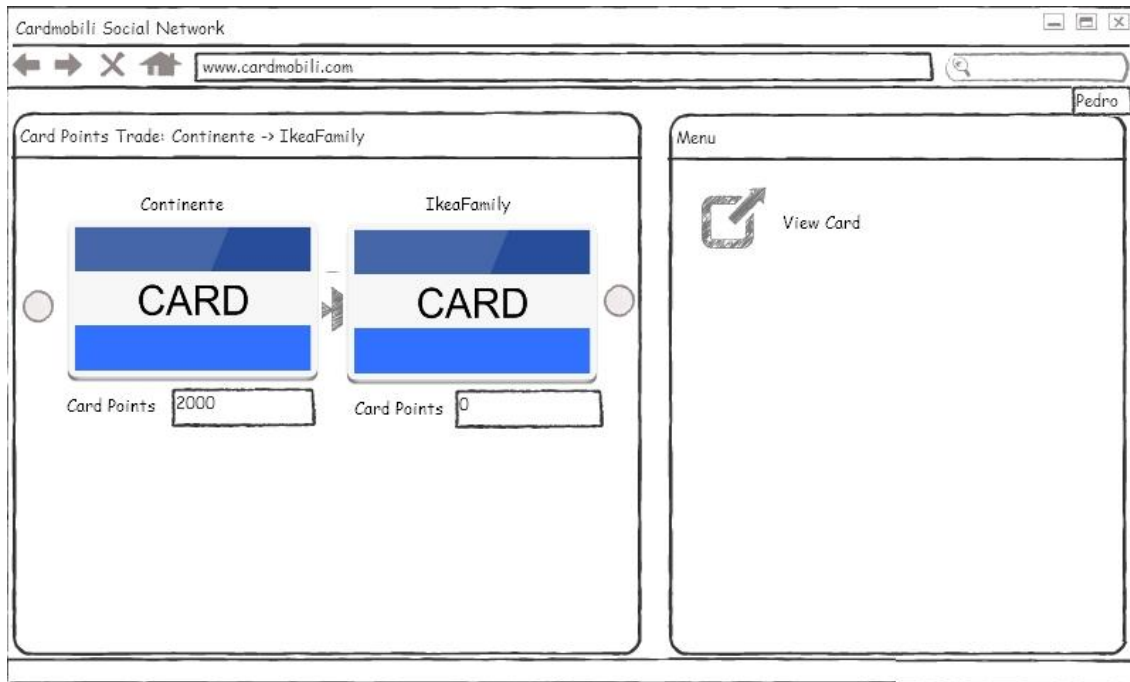


Figure 64: Storyboard 1: User wants transfer points between partner merchant cards – Scene 3

To confirm the transaction, Pedro decides to choose the *IkeaFamily* card (1) and to view its profile by selecting the option to view the card (2) (Figure 65).

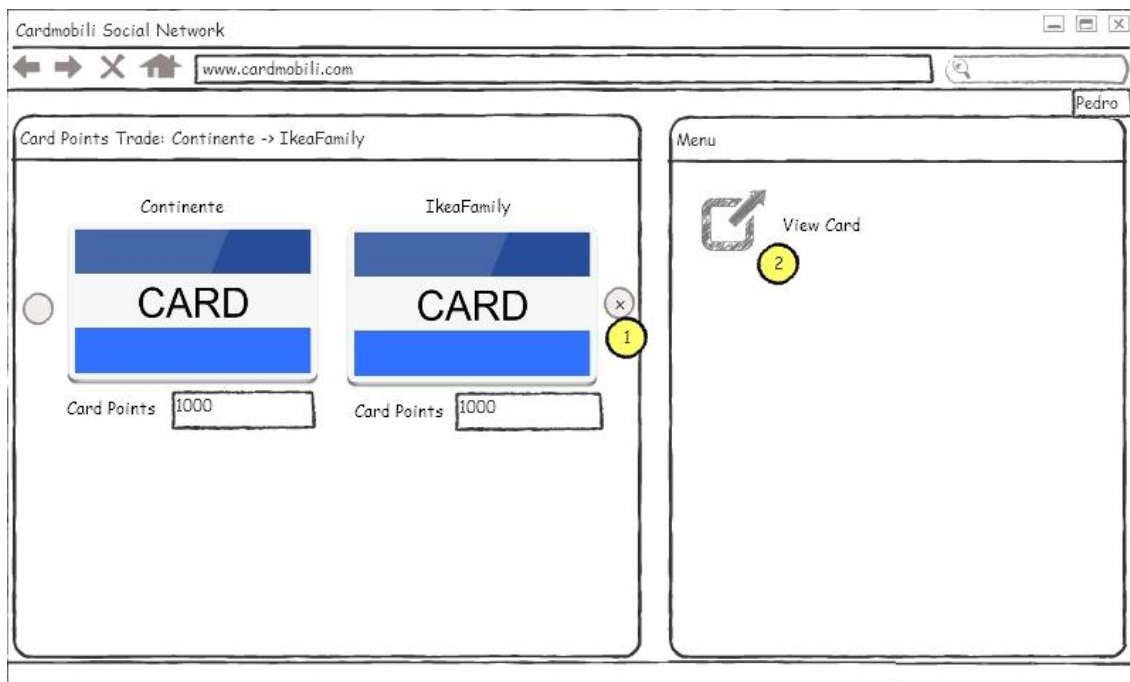


Figure 65: Storyboard 1: User wants transfer points between partner merchant cards – Scene 4

Pedro views the *IkeaFamily* card profile and checks if the points were transferred correctly (Figure 66).

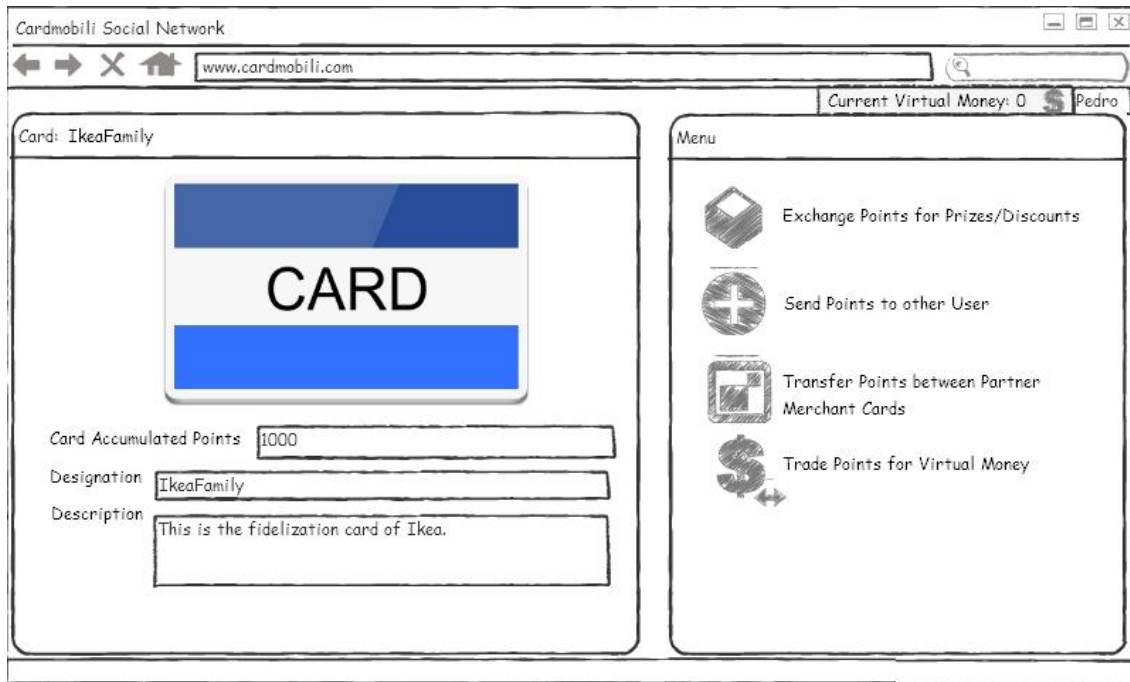


Figure 66: Storyboard 1: User wants transfer points between partner merchant cards – Scene 5

Storyboard 2: User wants to trade points for prizes/discounts

This storyboard presents the case in which a user wants to trade points of one of its cards for a prize.

Pedro wants to use its accumulated points on the *Continente* card and trade them for a prize. First, he chooses the *Continente* card (1) and selects the option to view card (2) (Figure 67).

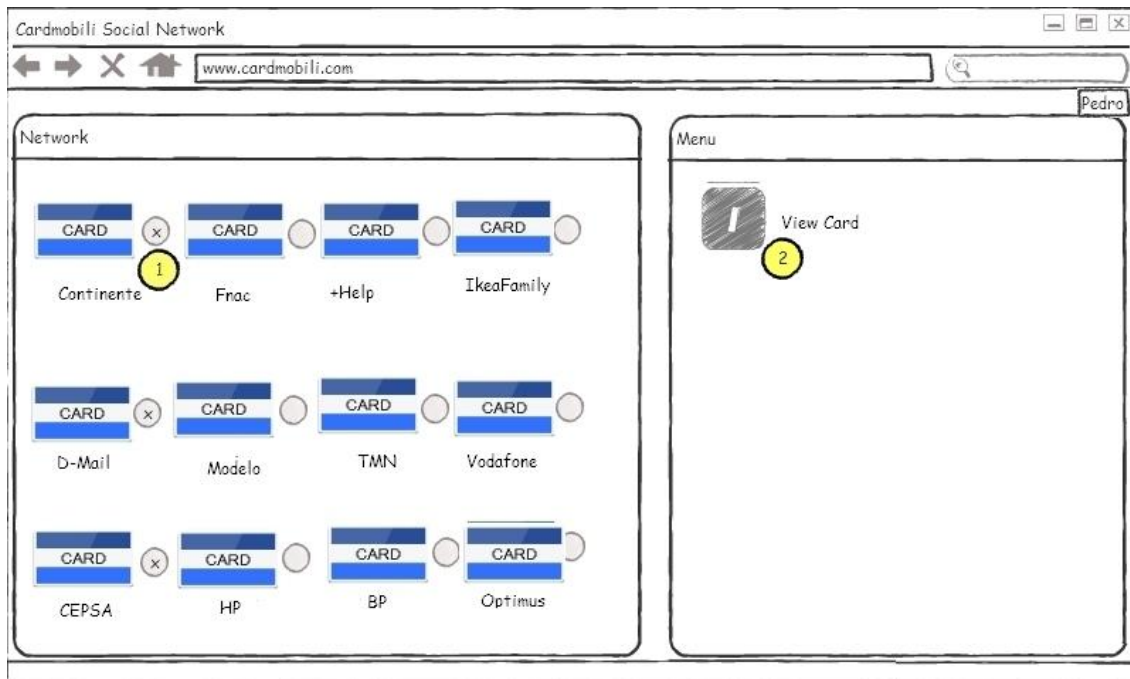


Figure 67: Storyboard 2: User wants to trade points for prizes/discounts – Scene 1

Now, Pedro views the details of the *Continente* card, as well as its 2000 accumulated points in it. As he intended he selects the option to exchange points for prizes/discounts (1) (Figure 68).

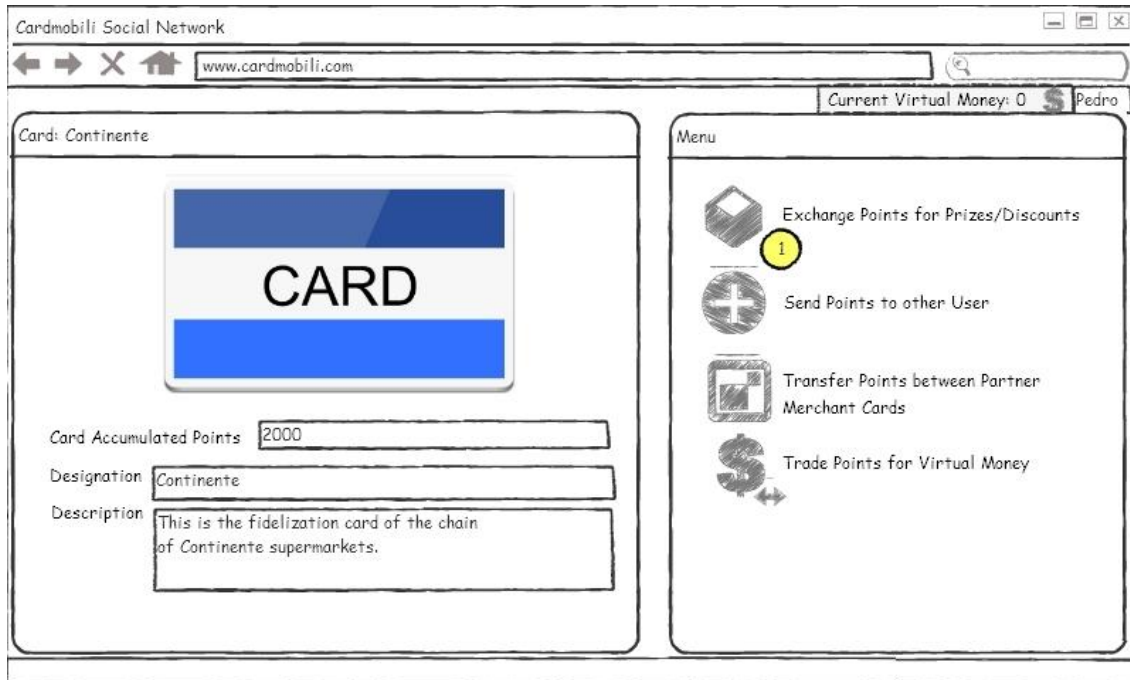


Figure 68: Storyboard 2: User wants to trade points for prizes/discounts – Scene 2

Pedro decides he wants to trade some of its points on the card for the 50% discount voucher on dippers that costs 1500 points (1). To confirm the transaction, Pedro selects the exchange option (2) (Figure 69).

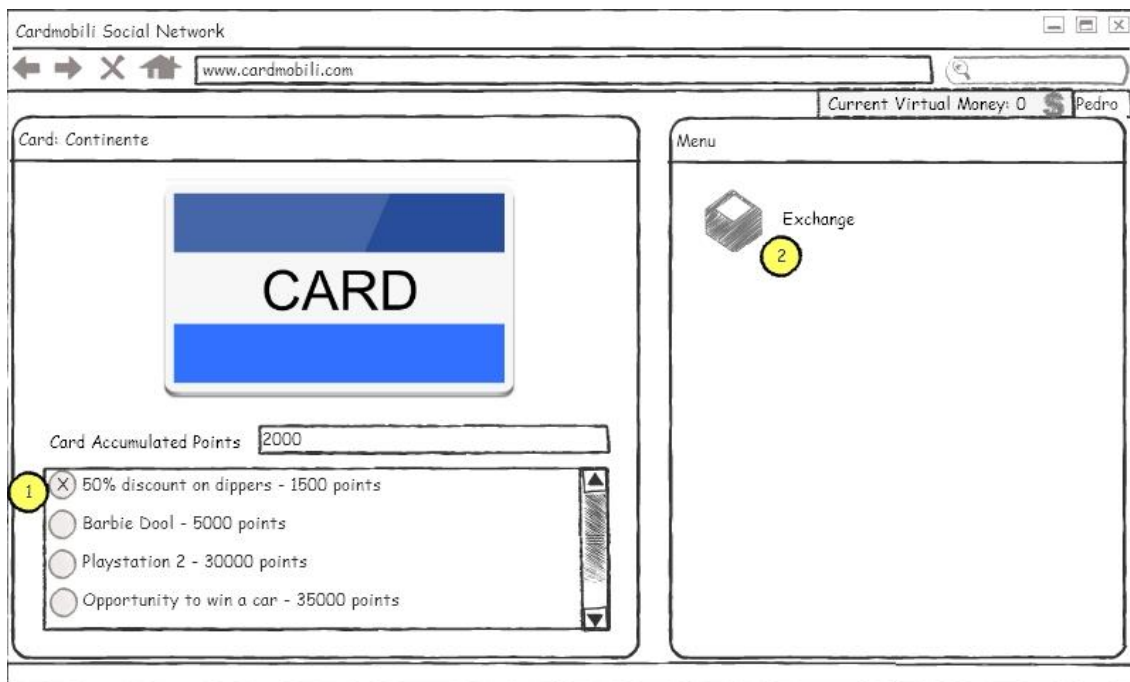


Figure 69: Storyboard 2: User wants to trade points for prizes/discounts – Scene 3

The transaction is done. Pedro is left with 500 points and the 50% discount voucher on *Continente*'s dippers (Figure 70).

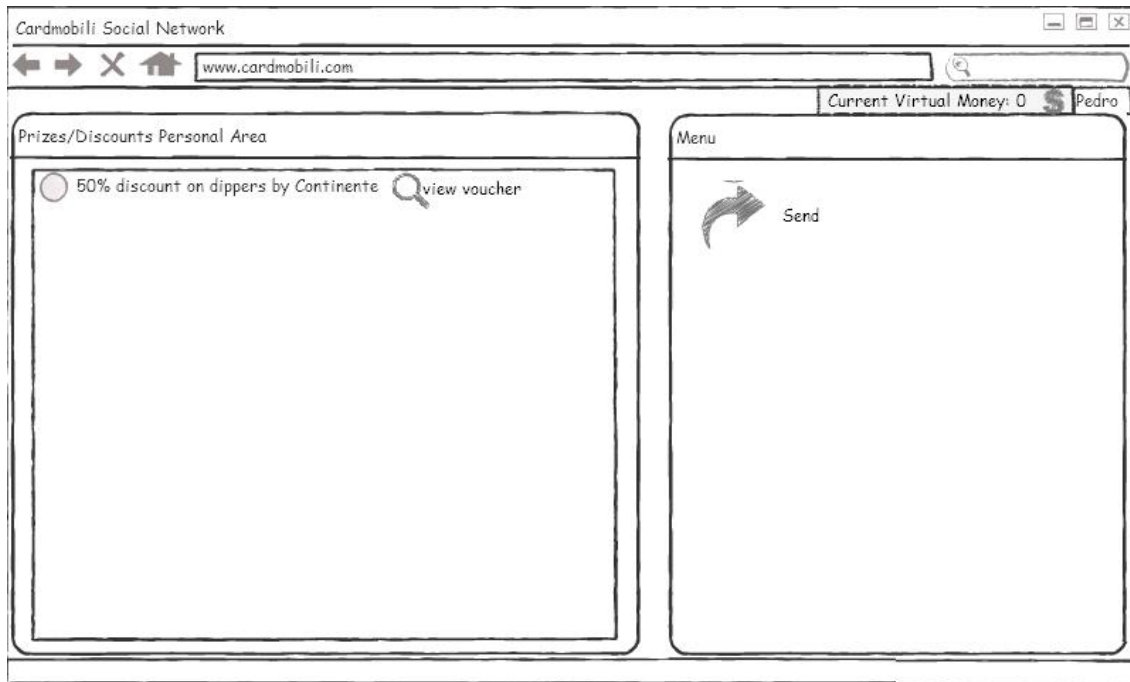


Figure 70: Storyboard 2: User wants to trade points for prizes/discounts – Scene 4

Scenario 11: Send prizes/discounts

Table 56: Scenario 11: Send prizes/discounts

Type scenario: Send prizes/discounts to other users Primary actor: User Goal: A user wants to send a given prize/discount that he owns. Each action includes only one receiver. Pre-conditions: User is registered in the website; Normal Flow 1) Choose from network the user to exchange prize/discount with 2) System checks for receiver's availability to receive prize(s)/discount(s) 3) Select send prizes/discounts option 4) View list of prizes/discounts available in the personal area 5) Choose prizes/discounts to send 6) Select send option 7) System sends prize(s)/discount(s) to chosen receiver 8) The chosen user receives the chosen prize(s)/discount(s) Alternative Flow 1.1) User does not have any friends in its network: terminate 2.1) Receiver is not accepting prizes/discounts: deny sending to that receiver: repeat 1) or terminate 4.1) There are no prizes/discounts available in the personal area: terminate

Storyboard 1: User wants to send prize he traded to another user in its network

This storyboard presents the case in which a user wants send one of its prizes to another user in its network.

Pedro does not need dippers, but he knows a friend who does. So, Pedro wants to send its friend the discount in dippers he just traded for points. To do that he chooses its friend Ana (1) and selects the option to send prizes/discounts (2) for that specific card. The system checks for Ana's availability for receiving prizes/discounts. Ana allows this kind of transaction, so Pedro can send her the discount (Figure 71).

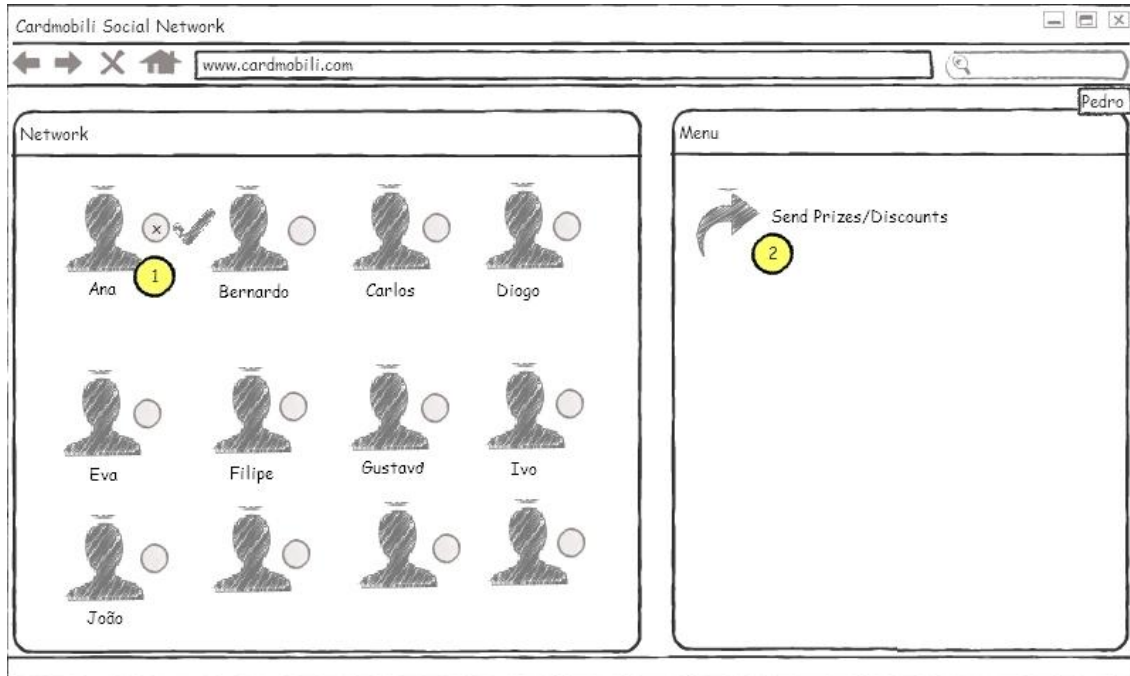


Figure 71: Storyboard 1: User wants to send prize he traded to another user in its network – Scene 1

Now, Pedro has access to its personal prizes/discounts area. He chooses the 50% discount in dippers (1) and selects the send option (2) (Figure 72).

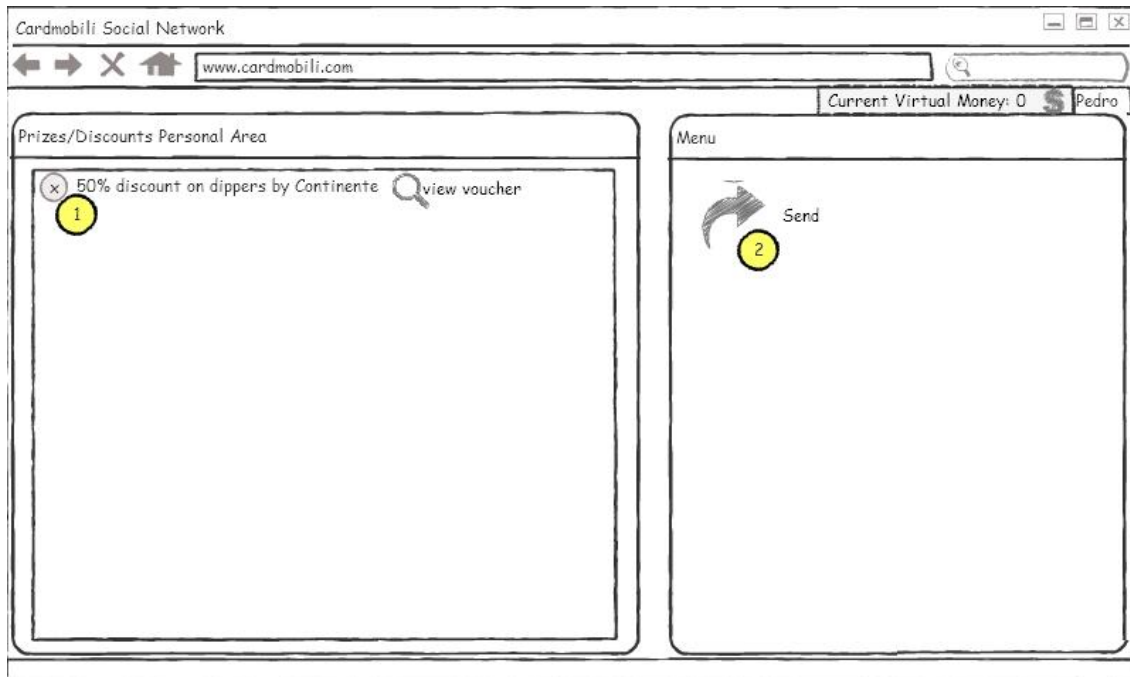


Figure 72: Storyboard 1: User wants to send prize he traded to another user in its network – Scene 2

Ana received the 50% discount on dippers from Pedro (Figure 73).

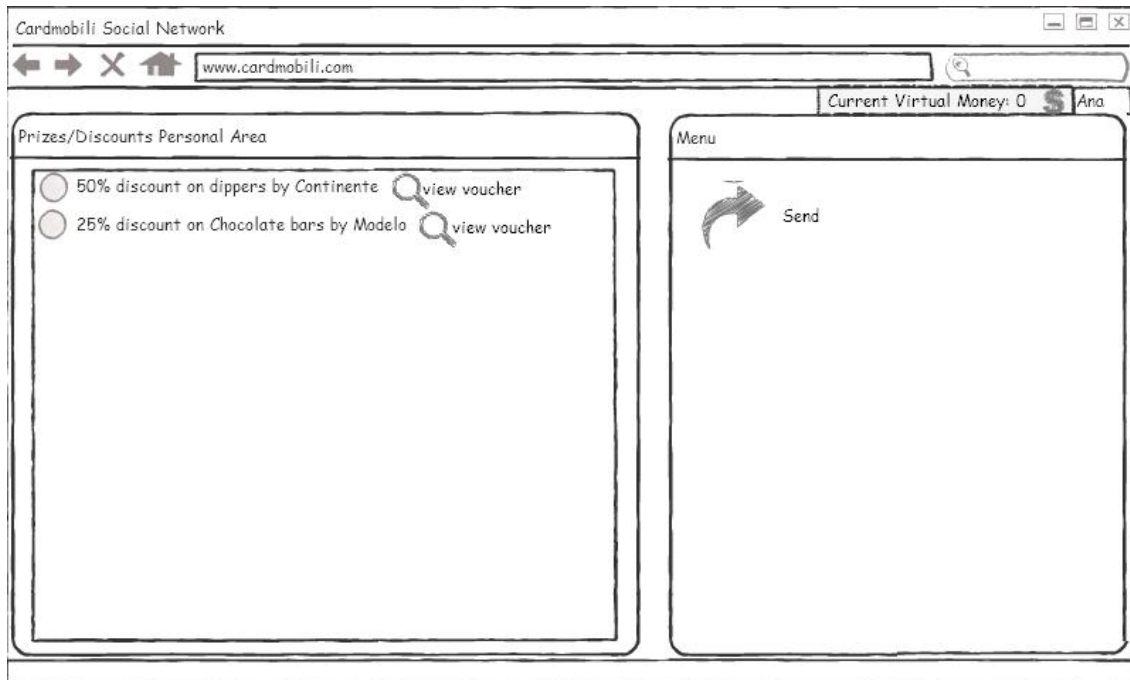


Figure 73: Storyboard 1: User wants to send prize he traded to another user in its network – Scene 3

Scenario 12: Create and share idea

Table 57: Scenario 12: Create and share idea

Type scenario: Create and share idea Primary actor: User Goal: A user wants to create and share an idea with any user in the website (e.g. typical users, <i>Cardmobili</i> and merchants). Pre-conditions: User is registered in the website Post-conditions: None Normal Flow 1) View list of ideas 2.a) View list of ongoing ideas and each respective state of completion 2.b) View list of archived ideas 3.a) Select create idea option 4.a) Insert title and description 5.a) Select create option 6.a) View created idea and state of completion 3.b) Choose archived idea from list 4.b) Select view idea option 5.b) View archived idea chosen Alternative Flow -

Storyboard 1: User wants to share one of its ideas with *Cardmobili* developers

This storyboard presents the case in which a user wants to share one of its ideas for the *Cardmobili*'s social network website with its developers.

Pedro has a specific idea for the *Cardmobili* website that he wants to share with its developers. He would like to play online games while in the website. First, he views the list of ideas, but he wants to see if some similar idea is already taken care off, so he selects the view list of archived ideas option (1) (Figure 74).

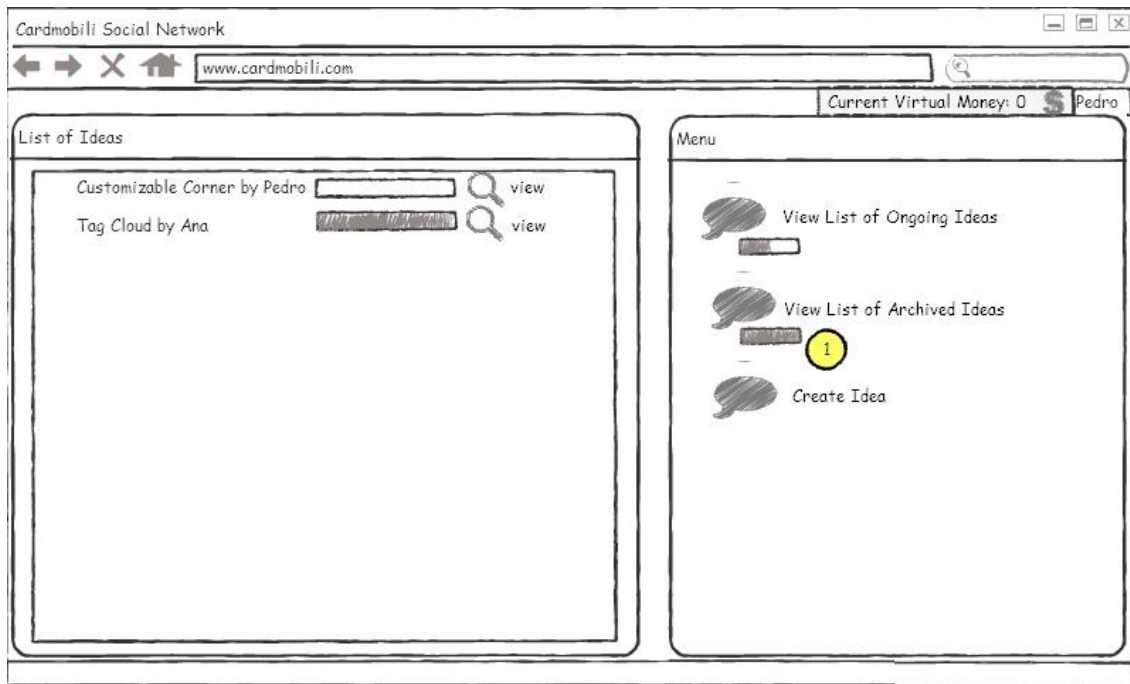


Figure 74: Storyboard 1: User wants to share one of its ideas with *Cardmobili* developers – Scene 1

Pedro has access to the list of archived ideas and sees that only Ana's tag cloud idea is finished. So, he decides to create a new idea by selecting the option to create an idea (1) (Figure 75).

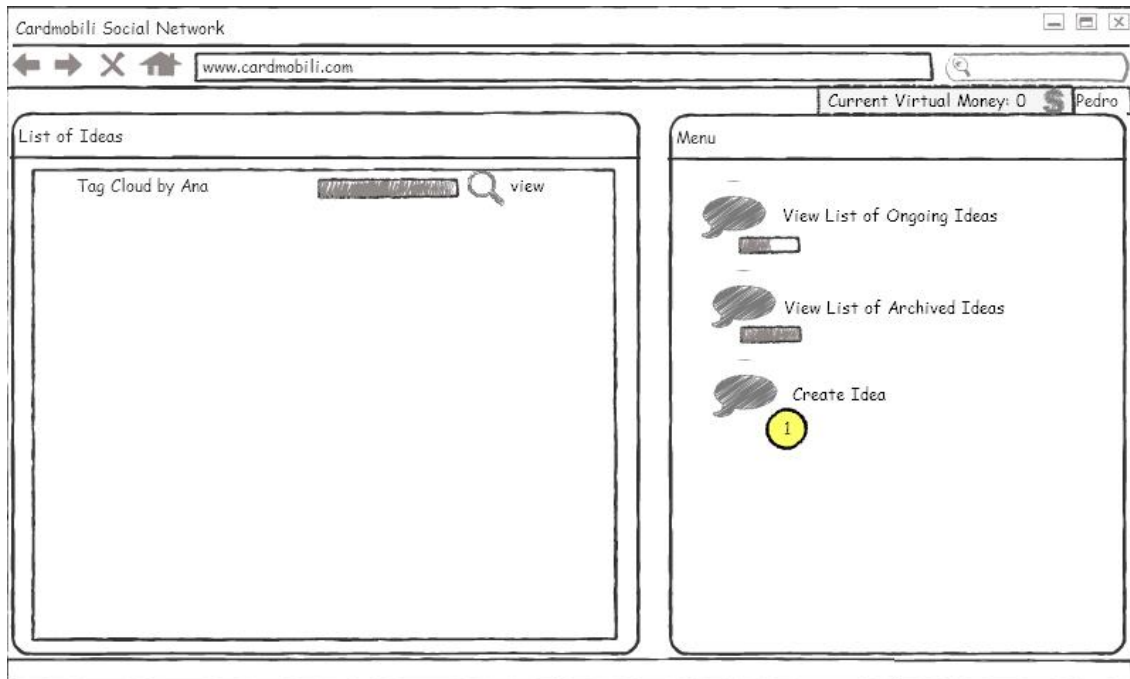


Figure 75: Storyboard 1: User wants to share one of his ideas with *Cardmobili* developers – Scene 2

Now, Pedro is in the create idea menu. He inserts the title of the idea (1) and its description (2), in order to explain it to the *Cardmobili* developers. He confirms this action by selecting the create option (3) (Figure 76).

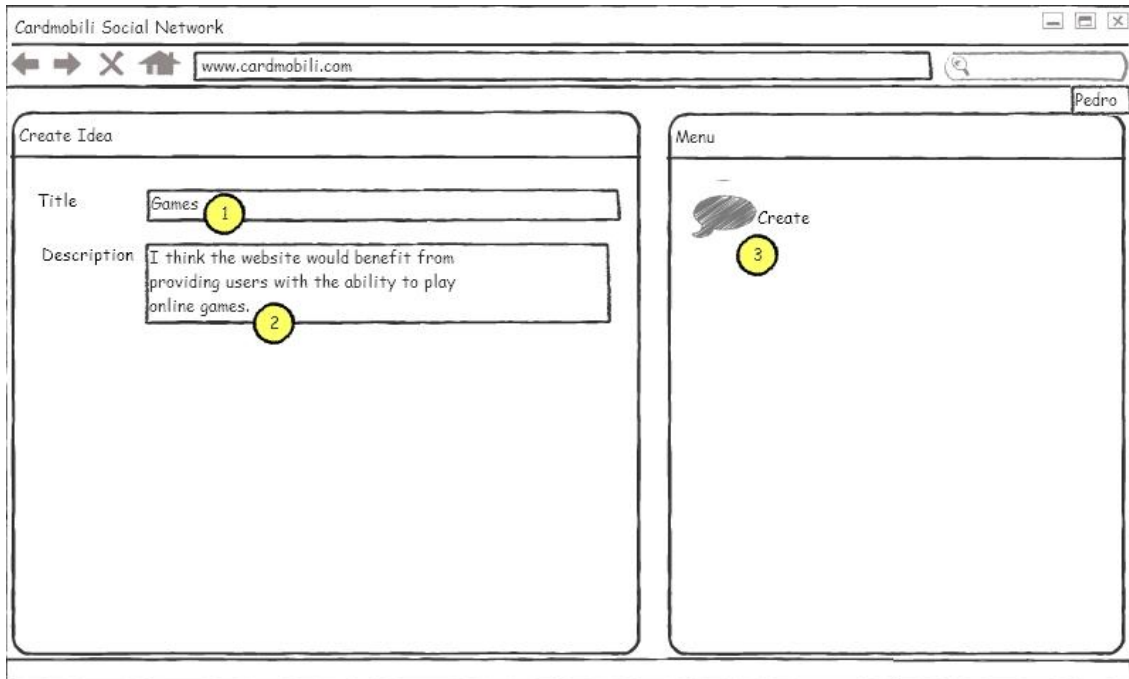


Figure 76: Storyboard 1: User wants to share one of its ideas with *Cardmobili* developers – Scene 3

Finally, Pedro views its idea created and is sharing it with others. As expected, the idea's completion state is still in 0% (Figure 77).

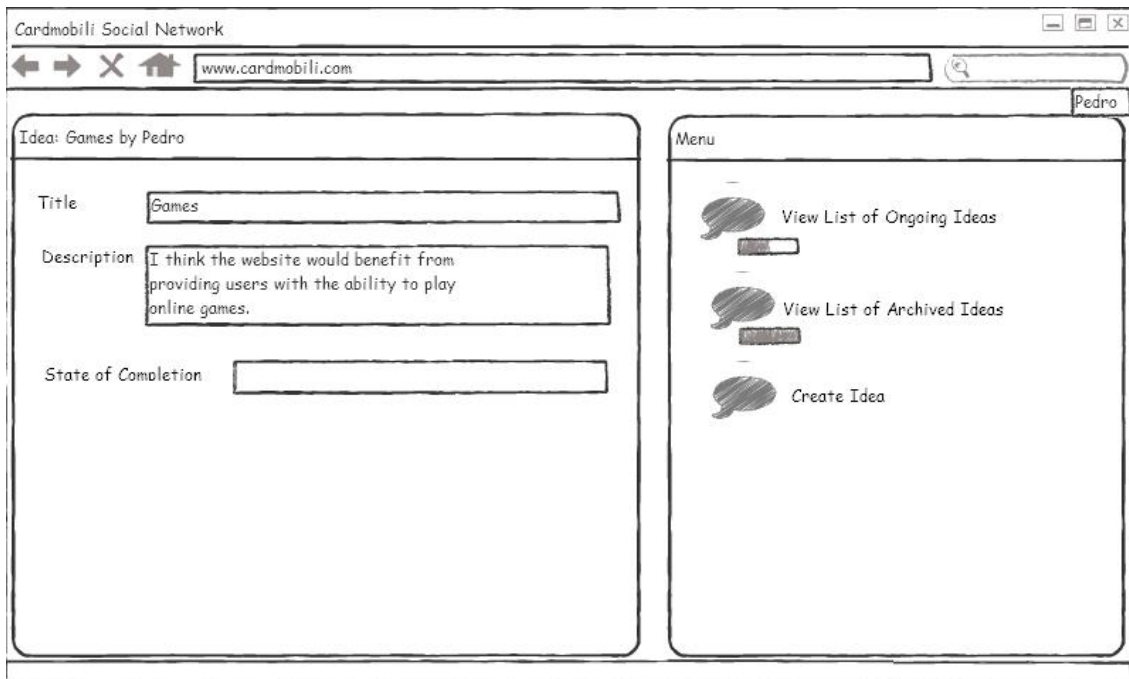


Figure 77: Storyboard 1: User wants to share one of its ideas with *Cardmobili* developers – Scene 4

Appendix G

Cardmobili's Social Network Platform Database Model

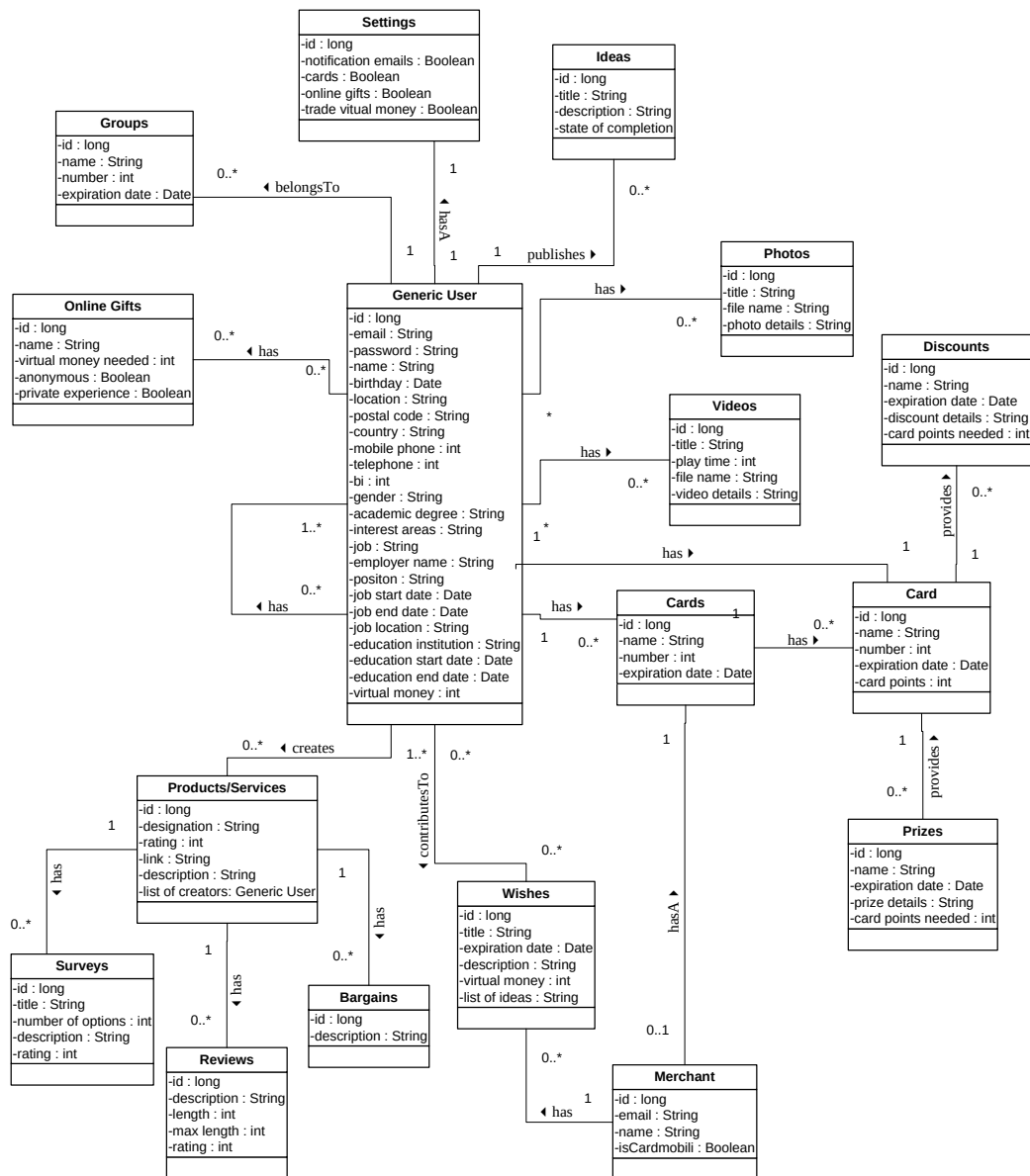


Figure 78: Cardmobili's Social Network Platform Database Model

References

- [AlexaClassmates09] Alexa. *Classmates.com*, Last View: 13 March 2009. http://www.alexacom/data/details/traffic_details/Classmates.com
- [AlexaFacebook09] Alexa. *Facebook.com*, Last View: 9 March 2009. http://www.alexacom/data/details/traffic_details/facebook.com
- [AlexaLinkedIn09] Alexa. *LinkedIn.com*, Last View: 11 March 2009. http://www.alexacom/data/details/traffic_details/linkedin.com
- [AlexaMySpace09] Alexa. *MySpace.com*, Last View: 10 March 2009. http://www.alexacom/data/details/traffic_details/myspace.com
- [aLinkedIn09] alarm:clock. *LinkedIn - Profile*, Last Modified: 6 August 2004, Last View: 11 March 2009. http://www.thealarmclock.com/mt/archives/2004/08/linkedin_hq_mou.html
- [Ambler98] S. W. Ambler. Cambridge University Press. *Process patterns. Building large-scale systems using object technology*, 1998.
- [BC89] K. Beck and W. Cunningham. Proceedings of OOPSLA'89. *A laboratory for teaching object-oriented thinking*, 1989.
- [Berlin89] M. L. Berlin. Hewlett-Packard Journal. *User-Centered Application Definition: A Methodology and Case Study*, 1989.
- [Bose95] P. Bose. Proceedings of the 10th Conference on Knowledge-Based Software Engineering. *A model for decision maintenance in the winwin collaboration framework*, 1995.
- [BWAmiguinhos09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.amiguinhos.com*, Viewed on: 24 March 2009. <http://builtwith.com/?www.amiguinhos.com>
- [BWBebo09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.bebo.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.bebo.com>
- [BWChillTime09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.chilltime.com*, Viewed on: 24 March 2009. <http://builtwith.com/?www.chilltime.com>
- [BWClassmates09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.classmates.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.classmates.com>
- [BWCollegeTonight09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.collegetonightinc.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.collegetonightinc.com>
- [BWDogster09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.dogster.com*, Viewed on: 24 March 2009. <http://builtwith.com/?www.dogster.com>
- [BWEons09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.eons.com*, Viewed on: 24 March 2009. <http://builtwith.com/?www.eons.com>
- [BWFacebook09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.facebook.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.facebook.com>
- [BWFriendsReunited09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.friendsreunited.com.uk*, Viewed on: 22 March 2009. <http://builtwith.com/?www.friendsreunited.co.uk>
- [BWFriendster09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.friendster.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.frienster.com>
- [BWLinkedIn09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.linkedin.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.linkedin.com>
- [BWMeetTheBoss09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.meettheboss.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.meettheboss.com>
- [BWMocospace09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.mocospace.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.mocospace.com>
- [BWMOSH09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.mosh.nokia.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.mosh.nokia.com>
- [BWMyChurch09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.mychurch.org*, Viewed on: 24 March 2009. <http://builtwith.com/?www.mychurch.org>

[BWMyLife09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.mylife.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.mylife.com>

[BWMySpace09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.myspace.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.myspace.com>

[BWMyStarbucksIdea09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.mystarbuckideaforce.com*, Viewed on: 24 March 2009. <http://builtwith.com/?www.mystarbuckideaforce.com>

[BWmyTag09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.optimustag.pt/Comunidade*, Viewed on: 24 March 2009. <http://builtwith.com/?www.optimustag.pt/Comunidade>

[BWOrkut09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.orkut.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.orkut.com>

[BWRefernet09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.refernet.net*, Viewed on: 22 March 2009. <http://builtwith.com/?www.refernet.net>

[BWRyze09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.ryze.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.ryze.com>

[BWSapoSpot09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.spot.sapo.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.spot.sapo.pt.com>

[BWSítioDosMiúdos09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.sitiodosmiudos.kids.sapo.pt*, Viewed on: 24 March 2009. <http://builtwith.com/?www.sitiodosmiudos.kids.sapo.pt>

[BWSpoke09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.spoke.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.spoke.com>

[BWToyotaHybrid09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.toyota.com/hybrid*, Viewed on: 23 March 2009. <http://builtwith.com/?www.toyota.com/hybrid>

[BWTrombi09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.trombi.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.trombi.com>

[BWTuenti09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.tuenti.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.tuenti.com>

[BWViadeo09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.viadeo.com*, Viewed on: 22 March 2009. <http://builtwith.com/?www.viadeo.com>

[BWXing09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.xing.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.xing.com>

[BWYelp09] BuiltWith – Technology Profiler. *Technology and SEO Profile for www.yelp.com*, Viewed on: 23 March 2009. <http://builtwith.com/?www.yelp.com>

[CB88] J. Conklin and M. L. Bengeman. ACM Transactions on Office Information Systems. *gLIBIS: A Hypertext Tool for Exploratory Policy Discussion*, 1988.

[CK92] M. G. Christel and K. C. Kang. Software Engineering Institute. *Issues in Requirements Elicitation*, 1992.

[Classmates09] Classmates. *Classmates.com*, Last View: 13 March 2009. <http://www.classmates.com/cmo/about/?jsessionid=MUANB0G1HHSRUCQKWZSST5Q?requestid=133292>

[CollegeTonight09] Mashable. *CollegeTonight*, Last Modified: 29 November 2007, Last View: 13 March 2009. <http://mashable.com/2007/11/29/college-tonight-funding-merger/>

[CrowdVine09] www.crowdvine.com, Last access on 28 May 2009. www.crowdvine.com

[Dorine91] C. A. Dorine. Journal of Systems Management. *JAD: A crucial dimension for rapid applications development*, 1991.

[Eons09] Business First. *Humana invest in social networking site for seniors*, Last Modified: 12 March 2007, Last View: 15 March 2009. <http://www.bizjournals.com/louisville/stories/2007/03/12/daily1.html/>

[Facebook09] VentureBeat. *Facebook*, Last Modified: 18 December 2008, Last View: 9 March 2009. <http://venturebeat.com/2008/12/18/2008-growth-puts-facebook-in-better-position-to-make-money/>

[Friendster09] Friendster. *About*, Last View: 10 March 2009. <http://www.friendster.com/info/index.php>

[FriendsterReunited09] BBC News. *FriendsterReunited comes of age*, Last Modified: 13 January 2003, Last View: 13 March 2009. <http://news.bbc.co.uk/2/hi/business/2652959.stm>

- [GBebo09] Guardian. *How to make 80 million friends and influence people - Bebo*, Last Modified: 18 June 2006, Last View: 10 March 2009. <http://www.guardian.co.uk/media/2006/jun/18/digitalmedia.observerreview>
- [HG98] D. Herlea and S. Greenberg. Proceedings of the 7th IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises. *Using a Groupware Space for Distributed Requirements Engineering*, 1998.
- [HN99] A. Hickey and J. Jr. Nunamaker. Proceedings of the 32nd Hawaii International Conference on System Sciences – IEEE Computer Society. *Setting a Foundation for Collaborative Scenario Elicitation*, 1999.
- [Hoff09] Tod Hoff. High Scalability. *MySpace Architecture*, 12 February 2009. <http://highscalability.com/myspace-architecture>
- [KS96] G. Kotonya and I. Sommerville. Software Engineering Journal. *Requirements Engineering with viewpoints*, 1996.
- [KS98] G. Kotonya and I. Sommerville. John Wiley & Sons. *Requirements Engineering: Processes and Techniques*, 1998.
- [LinkedIn09] LinkedIn. *About*, Last View: 9 March 2009. <http://press.linkedin.com/about>
- [LW00] D. Leffingwell and D. Widrig. Addison-Wesley. *Managing Software Requirements – a unified approach*, 2000.
- [Maguire98] M. Maguire. HUSAT Research Institute, Loughborough. *Report of trader discussion groups*, 10 April 1998.
- [MashableWhooper09] Mashable – The Social Media Guide. *I'd trade 10 Facebook Friends for a Whooper*, 9 January 2009. <http://mashable.com/2009/01/09/whopper-sacrifice/>
- [MeetTheBoss09] China-Daily. *MeetTheBoss is new Facebook for execs'*, Last Modified: 5 September 2008, Last View: 12 March 2009. http://www.chinadaily.com.cn/bizchina/2008-09/05/content_7002498.htm
- [MocoSpace09] The New York Times. *Cellphones look to gain a greater voice in an Internet world - MocoSpace*, Last Modified: 30 August 2007, Last View: 10 March 2009. http://www.nytimes.com/2007/08/30/technology/30iht-cell.1.7316591.html?_r=1
- [MS03] Jose Luis Mate and Andres Silva. Information Science Publishing. *Requirements Engineering for Sociotechnical Systems*, 2003.
- [Mullery79] G. P. Mullery. Proceedings of IEEE Fourth International Conference on Software Engineering. *CORE – A method for controlled requirement specification*, 1979.
- [MyChurch09] GIGAOM. *What's new today: Bar tunes, churches go social - MyChurch.com*, Last Modified: 1 September 2006, Last View: 15 March 2009. <http://gigaom.com/2006/09/01/whats-new-today-bar-tunes-churches-go-social/>
- [MySpace09] LABizObserved. *MySpace is not their space anymore*, Last Modified: 25 August 2006, Last View: 10 March 2009. http://www.laobserved.com/biz/2006/08/my_space_is_not_thei.php
- [Nicole08] Kristen Nicole. Mashable - The Social Media Guide. *Starbucks' Bright Idea: Launch a Social Network*, 19 March 2008.
- [Orkut09] Orkut Blog. *Orkut*, Last Modified: 8 March 2009, Last View: 10 March 2009. <http://en.blog.orkut.com/>
- [PHKTT03] Päivi Parviainen, Hanna Hulkko, Jukka Kääriäinen, Juha Takalo and Maarit Tihinen. VTT Publications 508. *Requirements Engineering – Inventory of technologies*, 2003.
- [Refernet09] Refernet. *Refernet.net*, Last View: 12 March 2009. <http://www.refernet.net/>
- [Reinikainen01] L. Reinikainen. Lappeeranta. *Elicitation of Customer Requirements with Group Methods in Software Engineering*, 2001.
- [Reunion09] Yahoo! Finance. *Reunion*, Last Modified: Last View: 10 March 2009. <http://biz.yahoo.com/ic/132/132341.html>
- [RMCM98] J. B. Reville, J. B. Moran, C. A. Cox and J. M. Moran. John Wiley & Sons. *The QFD handbook*, 1998.
- [Robertson01] S. Robertson. Human-Computer Studies. *Requirements trawling: techniques for discovering requirements*, 2001.
- [RR99] S. Robertson and J. Robertson. Addison-Wesley. *Mastering the requirements process*, 1999.

- [Ryze09] Ryze.com. *Ryze*, Last Modified: 5 February 2009, Last View: 12 March 2009. <http://www.ryze.com/faq.php>
- [SG85] G. DeSanctis and B. Gallupe. Winter. *Group Decision Support Systems: a New Frontier*, 1985.
- [Spoke09] Spoke. *Spoke.com*, Last View: 12 March 2009. <http://www.spoke.com/>
- [TA98] E. Turban and J. Aronson. Prentice-Hall. *Decision Support Systems and Intelligent Systems*, 1998.
- [Trombi09] Trombi.com. *Trombi*, Last Modified: 5 September 2008, Last View: 13 March 2009. <http://www.trombi.com/>
- [Tuenti09] ElPaís. *Tuenti el Facebook Español*, Last Modified: 10 December 2007, Last View: 10 March 2009. http://www.elpais.com/articulo/internet/Tuenti/Facebook/espanol/elpeputec/20071210elpepunet_1/Tes
- [Viadeo09] Viadeo.com. *Viadeo*, Last Modified: 28 February 2009, Last View: 12 March 2009. <http://www.viadeo.com/pt/connexion/>
- [Xing09] net.work.xing. *Xing*, Last Modified: 10 March 2009, Last View: 12 March 2009. <http://blog.openbc.com/category/english>
- [Yelp09] Yelp. *Yelp.com*, Last View: 12 March 2009. <http://www.yelp.co.uk/about>
- [Zahniser90] R. A. Zahniser. IEEE Software. *How to Speed Development with Group Sessions*, 1990.
- [Zucconi89] L. Zucconi. ACM SIGSOFT Software Engineering Notes. *Techniques and Experiences Capturing Requirements for Several Real-Time Applications*, 1989.