Social-Driven Location Sharing in Education

DIPLOMARBEIT

zur Erlangung des akademischen Grades

Diplom-Ingenieurin

im Rahmen des Studiums

Information and Knowledge Management

eingereicht von

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an der
Fakultät für Informatik der Technischen Universität Wien

Betreuung: Univ.Prof. Dipl.-Inf. Dr.-Ing. Jürgen Dorn
Mitwirkung:

Wien, 20.04.2015

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(Unterschrift Verfasserin)   (Unterschrift Betreuung)

Social-Driven Location Sharing in Education

MASTER'S THESIS

submitted in partial fulfillment of the requirements for the degree of

Master of Science

in

Information and Knowledge Management

by

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Registration Number 0828727

to the Faculty of Informatics
at the Vienna University of Technology

Advisor: Univ.Prof. Dipl.-Inf. Dr.-Ing. Jürgen Dorn
Assistance:

Vienna, 20.04.2015

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Acknowledgements

First and foremost I express my sincerest gratitude to my supervisor, Univ.Prof. Dipl.-Inf. Dr.-Ing. Jürgen Dorn, who has supported me throughout my thesis with his patience, knowledge and guidance. I would like to thank him for introducing me to the topic as well the useful comments and remarks during the development of this thesis. I could not wish for a friendlier supervisor. Besides my supervisor, I take this opportunity to express my sincere thanks to Principals of the Faculty of Informatics and all the faculty members at Vienna University of Technology, for their help and support.

A very special tribute to my fellow students and friends which I have been blessed to have in my daily life. Special thanks to my dear friend, Lorena Nisperuza, with whom I traveled most of the journey of master study. I express my sincere thanks to my colleague and friend, Robert Szymanski, for his help and support with the German translation.

Finishing this thesis would not be possible without my loved ones. I would like to express my deepest gratitude to my parents, Farah and Hassan Rezaei, for supporting me throughout all my studies. Special thanks to my mom, who has been an inspiration throughout my life, and my dad for his wisdom, understanding and life lessons. This thesis is dedicated to them for all they have done for me and their unconditional love. I also would like to take this opportunity to thank my husband, Soroush Zafari, by all my heart, along with his family, for his love, help and support all through my thesis and to appreciate his generosity and understanding throughout my study. Furthermore I would like to thank my grandmother for her love and for all that she has done for me in my whole life. I also want to thank my younger sister, Marieh, who has always been there for me as my family and my best friend.

I will be grateful forever for your love.

Abstract

In the last decade there has been a huge growth of using *Location-Based Social Networks* (LBSN) in everyday lives. These applications allow users to *'Check-In'* at different places such as restaurants, bars and historical places, sharing their location with their friends on social networks. Some examples of such applications are Facebook Places, Foursquare+Swarm, google, Gowalla and Loopt. It is believed that Location-Based Social Networks can be a huge benefit in education, since the majority of users are college and university students. These social networks bring students and educators together. This is done through the collaboration, the ability to share innovative ideas, discussing different topics in groups, giving tips and recommendations, blogging and online learning.

In this thesis it shall be investigated how Location-Based Social Networks can be used in higher educational environments such as university campus. The first part of this work deals with analyzing different LBSNs, extracting the nature, features and concerns of such systems. This is done through a brief literature study on this topic and approaches which already exist in this area. It is determined how these social networks have been used or implemented for the purpose of learning in different fields.

The second challenge is to demonstrate how using a LBSN application on mobile phone would benefit various users in this domain and how it can motivate the entire stakeholder to implement, invest, and use such an application. It is discussed how this method along with gaming aspect of social networks, to compare with traditional learning methods, would higher students motivation and can influence their participation in learning environments. It is considered how awarding users with digital badges in social networks will make it possible to evaluate and recognize many skills and competencies which cannot be evaluated in classical learning environments. Therefore different scenarios are presented as use cases of adopting a LBSN for a lecture or exercise class at a university. Furthermore it is discussed if applying an already existing application would be sufficient for implementation of mentioned scenarios.

The later chapters of this thesis deal with providing a prototypical design of a LBSN application for mobile phones, including declaration of requirements, features, locations, possible badges and the data model of the application. The proposed prototypical design is then implemented for a case scenario to show how the prototype works.

Kurzfassung

Im letzten Jahrzehnt ist die Benutzung der *Location-Based sozialen Netzwerke* (LBSN) im täglichen Leben stark angestiegen. Diese Applikationen (Apps) ermöglichen dem Anwender (User) an verschiedenen Plätzen *'ein zu checken'*, wie zum Beispiel Restaurants, Bars und historischen Plätzen, und den Standort mit ihren Freunden in sozialen Netzwerken zu teilen. Einige Beispiele für solche Applikationen (Apps) sind Facebook Places, Foursquare+Swarm, google, Gowalla und Loopt. Es wird angenommen, dass die Location-Based soziale Netzwerke eine große Hilfe im Bildungssystem sein können, da der Großteil der Benutzer Jugendliche oder Studenten sind. Diese sozialen Netzwerke bringen Studenten und Erzieher näher zusammen. Das geschieht durch Zusammenarbeit und die Möglichkeit innovative Ideen untereinander zu teilen, verschiedene Themen in Gruppen zu behandeln, Tipps und Empfehlungen abzugeben, zu bloggen und ebenfalls durch Online-Learning.

In dieser Arbeit wird eruiert, wie Location-Based soziale Netzwerke im Umfeld der tertiären Ausbildung, wie zum Beispiel einem Universitätscampus, genutzt werden können. Der erste Teil dieser Arbeit beschäftigt sich mit der Analyse der verschiedenen LBSNs, mit den Grundlagen, Features und Zielen solcher Systeme. Das geschieht durch eine kurze Literaturstudie zu diesem Thema und durch eine Beschreibung bestehender Ansätze auf diesem Gebiet. Es wird herausgefunden wie soziale Netzwerke bereits im Lernumfeld auf verschiedene Art genutzt werden.

Die zweite Herausforderung war es zu zeigen, wie die Nutzung eines LBSN-Apps auf dem Handy den verschiedenen Usern in einem Themengebiet zu gute kommt und, wie es alle Beteiligten motiviert sich einzubringen, zu investieren und ein solches App zu nutzen. Es wird aufgezeigt, wie mit dieser Methode und dem Aspekt des Spielens in sozialen Netzwerken, im Vergleich zu traditionellen Lernmethoden, die Motivation der Studenten gesteigert und ihre Anteilnahme am Lernumfeld beeinflusst werden kann. Es wird miteinbezogen, wie es ausgezeichneten Usern mit digitalen Abzeichen in sozialen Netzwerken ermöglicht wird, viele Fähigkeiten zu erwerben, welche mit klassischen Lernumfelder nicht erreicht werden können. Deshalb werden in verschiedenen Szenarien die Adaptionsmöglichekiten für LBSNs als Lernutensilie oder Übungstool für Universitäten präsentiert. Zusätzlich wird aufgezeigt, ob die Änderung einer bereits bestehenden Anwendung für die genannten Szenarien in Frage käme.

Die späteren Kapitel dieser Arbeit beschäftigen sich mit einem möglichen Prototypen eines LBSNs für Handys, mit Angaben zu Voraussetzungen, Features, Orten, möglichen Abzeichen

und einem Datenmodel der Applikation. Das vorgeschlagene Design wird dann in ein Beispielszenario implementiert, um zu zeigen, wie der Prototyp funktioniert.

Contents

Introduction

"The secret of getting ahead is getting started.", Mark Twain

Social Networking is social relationship among groups of people who appear on the Internet as an online and virtual community [52]. Kollock [26] in 1999 pointed out that, there are four motivations which attract people to *Social Networking Sites* (SNSs), 1) *Anticipated reciprocity* 2) *Increased recognition*, 3) *Sense of efficacy* and 4) *Sense of community*. These four motivations lead people to join SNSs along with their personal motivation, whether it is a need for social acceptance, pride, expectation, or even an emotional sharing [52].

Nowadays Social Networking Sites have been gaining popularity in the physical society, where they have been introduced to those who have never been used them before. The number of users of SNSs has been increasing rapidly in a very short time with advancement of the information technology, which ease the access to social networking sites in everyday life. Another reason is the persuasive functionalities of SNSs, which can attract people with different desires. Some examples of the most popular SNSs are *Facebook* [14], *Twitter* [54], and Linkedin [29]. As Treepuech [52] discussed, people are spending more time online using these services, and it made SNSs to have an increasing influence in the society. This significance influence results in adopting the application of SNSs in various domains such as telecommunication, business, marketing, education, entertainment and politic.

In recent years with the growth of usage of mobile devices and smart phones with advanced location sensing capabilities, there has been major growth of using *Location-based Social Networks* (LBSNs). Location has become the new buzzword for social-spatial strategies to target consumers. Applications like Foursquare, Loopt, Gowalla, and Facebook Places allow users to 'check-in' at restaurants, bars, gyms, retail outlets, and offices, thereby sharing their location within their friends on social network. These developments enable consumers to rediscover their proximities to products, along with feeding a desire for making known everyday movements to the network [57]. In Figure 1.1 Kefalas [24] pictures perfectly the basic possible entities in
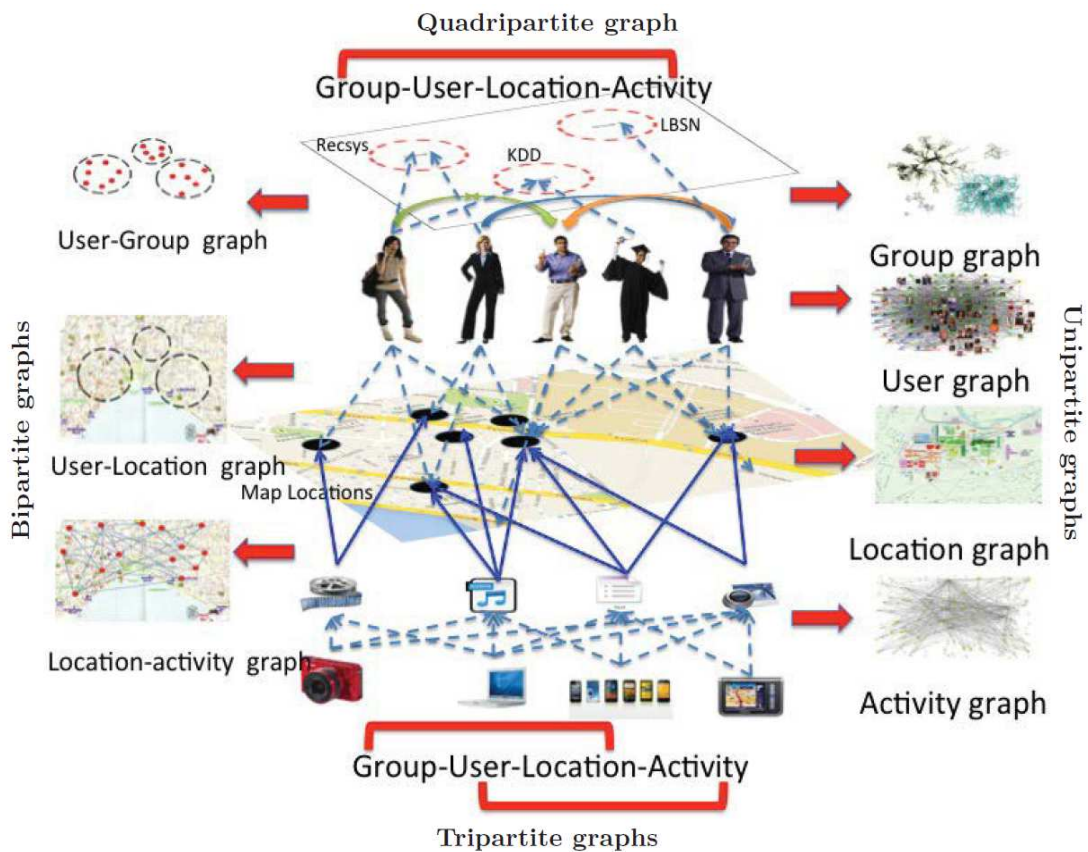
Figure 1.1: User, Group, Location, and Activity entities and their correlations in LBSNs [24]

LBSNs which are listed as user, group, location, and activity entities and the relations together with connections among them. Users are different people with different interests who join social networks for different reasons such as connecting and interacting with friends and sharing information on network. Groups are a number of people who share a mutual interest. A user can be a member of several groups. Location is a place which will be defined on the LBSN in order that users check-in to share their location on the move, or to get information about the place. Activities are different actions which are made through users at different locations.

1.1 Motivation

The development of Web 2.0 has transformed the web into a more dynamic and interactive environment, offering a set of tools that enhance interaction, connection and collaboration between users. Many web-based applications, such as online social networks, wikis and blogs, support such Web vision. Online social networks have tremendous potential to enhance e-learning experience, by creating an atmosphere of cooperation and easy interaction among users which are

educators and students. To compare with interactive learning methods, a traditional learning content management system is rigid in nature, which limits the student learning procedure. As a result, the concepts of communication, relationship and interaction among users are needed to overcome their limitations. Although most of online social networks that currently exist have not been designed for educational purposes, yet they have certain features that may prove to be very interesting and important when applied in an educational context. Several studies discussed that using an online social network enhance interaction and information sharing among its users. Such sharing might encourage people to learn together, sharing views and content relating to the matters in question [42].

The trend and direction of utilizing Social Network Sites (SNSs) such as Facebook, Twitter, or YouTube for education is to use as a tool for sharing collaboration and posting comments, which leads to the development of teaching and learning management. Treepuech [52] indicates that in general the student has more satisfaction with the teaching and learning management by SNSs than by traditional Learning Management System (LMS), since it provides users a familiar and easy-to-use technology with easier communication and collaboration. Moreover, social network technology is a learner-centered teaching medium for facilitating social interaction, connecting participants, expanding their relations, and accelerating information exchange. Several researchers have shown that social network technology can lead to self-efficacy, social presence, peer assessment, engagement, and sociability in students' learning behavior [28].

In the last few years, with the growth of usage of mobile devices, and also the increasing number of users of the social networks, they became a part of everyday life of the users. Location-based Social networks can be a huge benefit in education, since the majority of the users are teenagers, college and university students who spent many hours a day on social networks. These social networks bring students, educators and even parents together. This is done through the collaboration, the ability to share innovative ideas, discussing different topics in groups, giving tips and recommendations, blogging, and online learning. The functions and features that such a system offers to students and educators would higher their motivation to share knowledge, to compare with traditional learning methods. For this reason, we believe that using these applications in learning system would increase student's interest for learning and it would higher the participation of the students in the lectures, exercise classes and even learning groups. The gaming aspect of such applications would motivate students by offering a learning environment apart from books and pens, which will increase their desire to learn more. It might awaken the instinct of competition and willing to get the prize. Another important advantage of using such application is, to raise the culture of sharing knowledge with the others, which is one of the most important competencies for the students also in their future lives.

In this thesis it shall be investigated how far such a system can be used in higher education. The idea could be a location-based social network application where students can 'check-in' to lectures, seminar rooms, exercise classes, and to other places if they learn together with other students. Additional information about courses could be integrated into the system and perhaps a more structured model of places is required. Then a user may get *Digital Badges* if s/he has

visited a certain number of events or after completing some tasks or attaining a challenge.

1.2   Problem Statement

In traditional learning methods, the communication between educators and students is not always possible easily. The reasons can be listed as lack of time, having various courses one after each other and difficulties in having face to face discussions. Another problem that the educators are dealing with, is the absence of motivation for some students to attend lectures and specially exercise hours. In addition, increasing the will of knowledge sharing between students and working in groups has became a challenge for teachers in recent years.

To ease the learning process and to improve the communication and collaboration between educators and learners, universities started to provide online courses and e-learning portals. Although in online e-learning portals the communication is easier through different media, but the participation of the students in the lectures can not simply be tracked. Lack of face to face relationship between the users is another problem that users of e-learning portals are dealing with. In order to assist solving such problems, online Social Networks could be used as a supporting tool in learning environments.

Purdue University [56] in their news page indicates that, it is believed using location-based social networks and *digital badges* will relief the full educational potential of the Web. Digital badges, icons that represent academic achievements or skills which are smaller than a college grade, are an increasingly popular way for universities to acknowledge the breadth of students' learning. According to their statistics, badges are currently in use or in development at institutions such as MIT [38], Carnegie Mellon [55], the University of California Davis [36] and University of Seton Hall [37]. Organizations outside of higher education are issuing badges, too, including NASA, the National Oceanic and Atmospheric Administration, The U.S. departments of Veterans Affairs and Education, the Corporation for Public Broadcasting, and the movie studio Disney-Pixar.

In this thesis we are going to discuss that a social network which is connected to a location-based service might be helpful for tracking the participation of the students and increase the motivation of attending lectures and exercise classes by using digital badges as award system. Users will earn the badge only after achieving a certain point, a challenge or completing a task/assignment. It shall be investigated how far this system can be used and help in education.

The idea is that students make profiles on the social network, 'check-in' to lectures and seminar rooms, labs and to other places if they learn together with other students. This way, the time that students spent in other places for learning purposes will be recognized and validated in addition to formal lectures and homework. Furthermore a structured model of places will be provided. Then a student may get badges if s/he has visited a certain number of events. It should be examined further, whether these badges may be integrated in another badge system like *Open Badge*. *Mozilla* [34] proposes an open architecture where a user can collect badges

from one organization and combine it with badges from other organizations. These badges are called Open Badges, where first implementation was developed as an open source software.

1.3   Aim of the Work

As we mentioned before, the development of Web 2.0, location-based technologies, social networks and mobile technologies over the last few years has enabled their usage in different domains in our everyday life. The main goal of this work is to discuss how these technologies can be used in the domain of education.

The result of this work shall be a prototype for a location-based social network which will be designed especially for educational purposes. Students and educators can 'log in' to this system in order to have an easier and better communication and collaboration with other users. Apart from getting tips and recommendations from each other, they can also earn digital badges after completing some tasks or 'checking-in' to different places related to their groups or lectures attending. The first part of this thesis would be research and analysis of what can be achieved using online social networks, specifically a location-based social network, in learning environments. The analysis should go further than the features which are already exist in this kind of applications, but which practical features could be added to get the most benefit out of it. For example, features like customizing learning groups, adding different courses in the profile, organizing digital badges and the ability to share them with other social networks and more.

In this thesis the features of location-based social networks will be analyzed. This will be done by providing a brief literature study on the topic and the papers and works which exist in this area. Then it will be discussed how these features can benefit in higher educational system. Next a prototype of such an application will be designed and implemented. Later the evaluation of this prototype can be done in any chosen course at Vienna University of Technology in different semesters for long term comparison of the results.

The outcome of this work can be seen from different points of view:

- From the student's point of view: An integrated, interesting and trustful system with the information about group works and projects that a student is attending regarding to different courses, which are using location-based services for teaching and grading purposes. A profile with easy access to all the badges that are pending or already earned by the student or the other colleagues. Receiving tips and recommendations from the students and educators on different posts and locations.

- From the educator's point of view: An easy, reliable system for collaborating, motivating and communicating with the students of a specific course. Not only students influence their grades by collecting points and badges as reward is this system, but there are also some badges available which can be earned by teachers and tutors in order to motivate them as well. Moreover the knowledge extracted might be used in many reporting tools for further improvements in the learning organization.

The history of all the users will be saved and it might be used or exported to other open badge systems in order to validate soft skills and competencies and to cooperate with other organizations all around the world.

1.3.1 Hypotheses

Several researches discussed that using LBSNs in education could have many potential advantages. Following hypotheses shall be proved by using a LBSN with digital badges in higher education:

1. Using location-based social networks creates an atmosphere of cooperation, collaboration and easy interaction among users by benefiting from visions of Web 2.0 such as sharing, commenting, rating and tagging.

2. Usage of LBSNs and digital badges enhances information and knowledge sharing between users by motivating them to get rewards.

3. It encourages users active participation in learning environment by improving their motivation.

4. Usage of LBSNs assists controlling effort required for projects and exercises by using extracted information for time management.

5. Digital badges and LBSNs help to recognize, evaluate and acknowledge skills, achievements and small efforts. Furthermore they support educators to follow student's progress by connecting badges with course objectives.

6. Information provided in LBSNs together with digital badges present a flexible learning path to students.

7. With the location-based aspect the gap between real and virtual world is becoming smaller.

These hypotheses will be considered in analyzing and designing the LBSN and later will be proved as the evaluation of this work.

1.4 Methodological Approach

In this thesis we apply methods and approaches as follows:

1. Research and Analysis: A study of theoretical framework and the contextual concept. Gathering information needed for analyzing the situation, which will be done by doing a research on the studies related to this topic, which already exist, considering the traditional learning methods and studying student's interest in this topic by providing a questionnaire. Figuring out the features which exist in location-based social networks and trying to extend them to fit our needs.

2. Modeling and Design of Implementation:

    - Presenting different Scenarios and for these scenarios, analyzing the activities which can be done using such application for a university course. This includes using features which already exist in social networks and also features which are missing but would be helpful to add them in the application.

    - Proposing a prototypical design (including data model) for such an application. Defining of the places and design of the user interface for profile, setting, privacy, contacts, groups, badges, events, etc. and the links between them. The Badge part of the application will use the digital badge images designed and created by Lorena Nisperuza [35] in her master thesis 'Digital Badges in Education'. Her thesis, also submitted to Vienna University of Technology, would be a prototype which includes the main characteristics of a digital badge managing system, like the creation of new badges in charge of the lecturer, the earned badges by student, the groups of available tasks to earn badges and the details of these tasks.

    - The prototype will be implemented for a proposed scenario with a brief declaration of possible badges, together with discussion about all the activities that can be done using the LBSN application.

3. Evaluation, Methods, tools: Comparing the grades, motivation and shared knowledge of the students and educators using this application, to the students of previous semesters of the same course using traditional methods of learning would be the evaluation of this work. This can be done through a questionnaire as a future work after implementing of an application based on this prototype. It can be done as a mandatory part of the exercise section of the Knowledge Management course to make the evaluation possible. The number of the students participating would be the number of the students registered in a semester to the lecture.

1.5 Structure of the Work

A prototype of a location-based social network application will be designed and presented in this thesis, focusing on how to use location-based services and information technology to improve learning and knowledge sharing for higher education. The structure of this work will be organised as follows:

- Chapter 2 provides an overview of the state of the art and the background of already existing researches and approaches in this area. It will take a look to the application of social networks and specifically location-based services in the field of learning. Then an introduction to Location-Based Social Networks will be given, where its nature, behavior and features will be discussed in detail.

- Chapter 3 discusses the result of a questionnaire which is released and has been answered by the students, in order to notice the student's aspect of using interactive tools and social networks in learning.

- Chapter 4 deals with describing use case scenarios to derive requirements of the system in order to show the advantages of using a LBSN in educational environment.

- Chapter 5 describes and provides the design process of the user interface (UI). The implementation design of the application will be explained explicitly.

- Chapter 6 presents the implementation of the designed prototypical UI for a higher education scenario.

- Chapter 7 deals with proving hypotheses and evaluation methods for the presented solution and the possible future works.

- Chapter 8 concluding remarks and providing summary of the work together with limitations and possible future attempts.

State of the Art

"I'm a great believer that any tool that enhances communication has profound effects in terms of how people can learn from each other, and how they can achieve the kind of freedoms that they're interested in.", Bill Gates

This chapter concentrates on previous publications into reference concerned with online and specifically location-based mobile learning. It gives a brief overview of the most important existing approaches in the field of using *Online Social Networks* and *Location-Based Services* in learning environments.

2.1 Literature Studies

The development of Web 2.0, location-based technologies, social networks and mobile technologies over the last few years has enabled their usage in different domains in our everyday life. Many scientists have based their researches and approaches on this area to get the most benefit out of these technologies which are growing very fast every day.

In 2002, Stacey [47] found that a higher quality of electronic communication helps to engage students and aids in their learning of the course material. Further studies in online collaboration have shown that virtual communication patterns correspond in some fashion to real-life communication [41], [44]. Furthermore, it is discussed that online learning environments provide a valid form of learning and offer many different methods of interaction [49].

In 2013 Slater [46] wrote his Ph.D thesis about exploring academic knowledge transfer within social networks in several ways. Moreover Rodriguez-Tejedo and his colleagues [43] have published a study considering the effect of the usage of a social network site called *grouply* for a class related group project on the development of individual abilities and performance in group work.

In the following sections some works and studies are presented, which have used social networks and/or Location-Based technologies in education.

2.1.1 Social Network to Support Collaborative Learning

In 2012 Yampinij, Sangsuwan and Chuathong [58] presented a conceptual framework for social network to support collaborative learning for enhancing knowledge construction of Grade 3 students, designed for stimulating the cognitive structure via the problem situation and learning tasks (cf. Figure 2.1). *Social Network to Support Collaborative Learning (SSCL)* is the computer network used in learning environment for encouraging the students in learning process and collaborating in groups by the group process, communication between the learners, coach, experts and workplace owners. Then, the knowledge and experience sharing is viewed as the tools for knowledge construction which is precise and matches the real context in real life. The concept of sharing knowledge and cooperative learning via the social network, chatting, blogging, tagging, E-mail or any kinds of learning resources that encourage the students in knowledge and experience sharing between the students and other stakeholder will help the students in connecting the lesson learned to the context in real life of working.
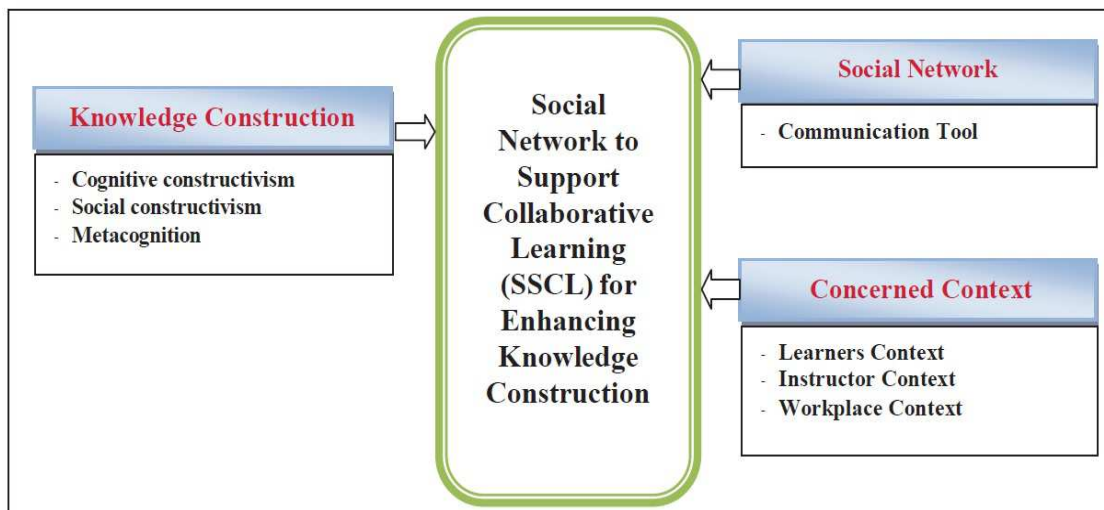

Figure 2.1: Conceptual framework for Social Network to Support Collaborative Learning [58]

2.1.2 E-Learning Portals

Nowadays social learning tools are highly used in learning environments. The goal of these tools is not only to enhance contact and collaboration between users, but also to gather information from the individuals, categorize it and make the knowledge available and visible for all other collaborators who can get benefit. The most popular of these tools are social *e-learning* portals. Figure 2.2 shows an overview of the collaborative e-learning environment with online social
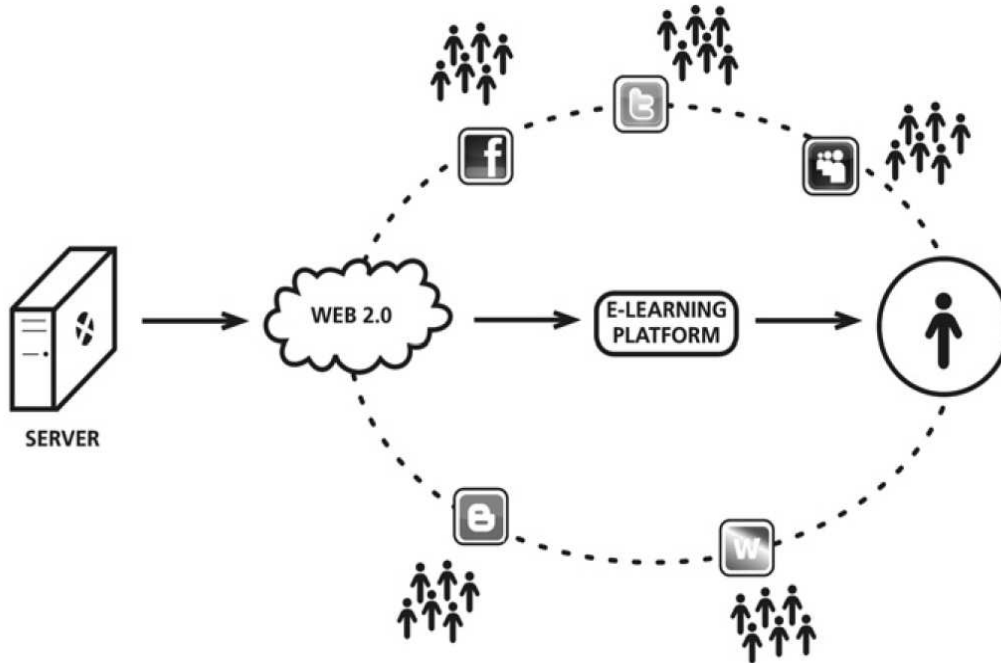
networks according to [42].

Figure 2.2: Collaborative e-learning environment with online social networks [42]

There exist many approaches and studies which uses e-learning to improve the teaching and learning process between the students and teachers. These approaches use internet technologies to provide a set of solutions to improve the participation, knowledge sharing and motivation of the students. Although e-learning facilitates the learning process, but from the other hand it lowers the F2F (Face to Face) interaction between the students and educators. Lack of social interaction is a serious problem in e-learning courses, which might with other factors result in dropping students out of a course. However enhancing e-learning with social networks would help to solve this problem. A number of social studies have pointed out that interaction with classmates and the professor is a significant contributor to perceived learning in on-line courses [22]. Tinto [51] in 2003 stressed that academic satisfaction is not enough for some students who suffer from isolation. Thus it is important to encourage e-learners to construct a social network among them. This might, as a result, higher the student's satisfaction with course.

Rodrigues and his colleagues in 2010 have done a work on *Enhancing e-learning experience with online social networks* [42]. Their study elaborates on the tremendous potential of online social networks to enhance e-learning experience, creating an atmosphere of cooperation and easy interaction among users (teachers and students). A traditional learning content management system is rigid in nature, limiting the student learning process however the main

advantage of e-learning is that it can be used regardless of time and location. They discussed that, although most of online social networks that currently exist have not been designed for educational purposes, they have certain features that may prove to be very interesting and important when applied in an educational context.

Websites such as Facebook, MySpace and Twitter belong to the Web 2.0 vision. This new structure gives users spaces to contact each other's and share information between them. They can have numerous websites with several available services that will allow, for instance, contact with groups of people with common interests or websites where one can make or edit existing content, such as wikis. [42] presented proposed modules that incorporate these features and demonstrate their integration in an e-learning platform called *PLEBOX*. It was shown through user's survey that these services enhance information and knowledge sharing and interaction between users, furnishing tools that improve the contact among students, where they can manage their own learning process. Thus, online social networks enhance e-learning experience [42].

Social e-learning portals provide various tools in order to enable learners to produce and share various types of content like presentations, notes, discussions, questions, solutions, bookmarks, comments, ratings, tag and other things. These portals also allow users to easily broadcast and integrate external social content such as *YouTube* videos, *Delicious* bookmarks and *Flickr* images, according to [2]. However, as [2] stressed, users may deal with issues regarding privacy and restriction of user rights in such social e-learning portals. For example, some users may not be willing to share their resources and/or accept feedback from their peers.

2.1.3   Personalization for Location-Based E-Learning

As defined in [62], *Location-based E-Learning* systems provide the learners with the learning contents based on their real-time locations while they are on the move. They facilitate the learning activities by integrating the learning contents with the physical world and selecting only the most relevant information. Examples of location-based E-Learning systems are in museums, botanical gardens, national parks and so forth [62]. The most important functionality of a location-based E-Learning system is to provide the learning contents according to the learner's current location. The relevant learning contents in his/her vicinity will be presented to him/her by the system automatically, while the learner walks in the learning area.

According to Zhou and Rechert [62] in 2008, *Personalization is the process of tailoring services by providers to consumers based on the knowledge about the consumers* (such as interests and preferences). It treats every user as an individual and thus is able to keep their interests and encourage their active participation. Location-based E-Learning raises new opportunities and challenges in this field, as learning activities become mobile and location-aware. Integration of personalization and location-awareness even context-awareness will greatly improve the effectiveness of E-Learning [62]. In their paper they introduced the process of personalization for location-based E-Learning, discussed the personalization techniques for location-based E-Learning and presented a prototypical application.

They presented a prototype which is a location-based E-Learning system in a botanical garden, that would be used by both students majoring in biology and visitors. The goal is, when the learner walks in the garden with a WLAN-enabled laptop or handheld, the multimedia scientific information about the plants nearby will be presented to him/her automatically according to his/her knowledge, interests and so forth; Figure 2.3.

Figure 2.3: Botany guide [62]

2.1.4   Learning By Challenging

In 2012 Allognon [2] discussed that the majority of the strategies which are used in *Intelligent Tutoring Systems (ITS)* simulating classroom teaching situations are based on multi-agent architectures, including learning companions, troublemakers, reversed tutoring, and self-explanation. In their work, they demonstrated how such classroom simulation can be achieved in a virtual learning environment using human peers, rather than software, as learning companions. They based their approach on collaborative learning, which included also social aspects such as circle of friends and cultural community while respecting the learners' privacy. To accomplish this goal, they used a *Learning By Challenging* strategy [2]. This strategy allows the learner to acquire knowledge in response to being challenged to obtain a better score than that predefined by the system or those posted by the learner's friends (cf. Figure 2.4).
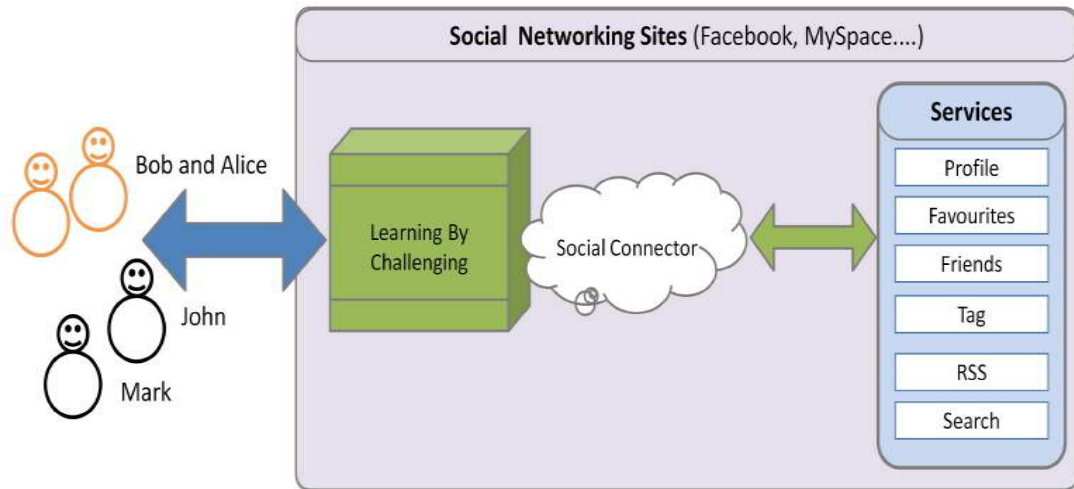
Figure 2.4: Overview of the Learning By Challenge System [2]

2.1.5 Computer-Game Based Learning

Donmus [10] in 2010 presented his research on *Computer-Game Based Learning* used in foreign language learning. He discussed the spread of computer use in education and increasing interest in computer games and using computer games in learning environments. He stressed that Academic games can be useful in education to provide students with an environment which they do exercises while learners are motivated and teach these subjects. Considering learning through social network, it is known that social network syntax adds dynamism to learning; in other words, it will add interaction feature. Therefore, learning by using social network is one of the concepts that best meets the concept of *anytime* and *anywhere* education. He listed some studies conducted on the subject of games which have shown that making a lesson with a game environment attracts students' attention and increases their motivation to the lesson. Donmus [10] mentioned that Computer-based learning environments are the result of students' existing interest in computers and computer games.

Moreover, Kebritchi in 2008 [23] listed positive effects of games as follows:

- Games motivate students because it has an alternative role in education. It offers students a learning environment apart from pen and paper.

- The desire of passing levels in games increases attention and learning.

- Games remove the lesson phobia in students' minds.

- It is proved that concepts used in the games can be remembered longer.

In addition, in 2009 Montola and his colleagues [33] has done a work on applying game achievement systems to enhance user experience in a photo sharing service. In this work an

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achievement system was added to a location based photo sharing service. The eight week field trial involved 20 participants using mobile phones to take pictures and record audio clips that were automatically uploaded by an application on the phone to the *Nokia Image Space service*. Individual achievements were awarded for uploading various numbers of photos, sound clips and scenes (groups of images), as well as the first upload of each type of content. Participant interviews indicated that the achievements triggered some friendly competition, however a drawback of the application was that achievements were not visible within the mobile client.

Furthermore in 2013, Sepehr and Head [45] examined the effect of gamification techniques in engaging students in a teaching context, in particular the influence of competition. They conducted a study over an MBA classroom that uses *ERPsim*, which is a gamified simulation system for teaching the SAP ERP (Enterprise Resource Planning) software solution. Their results showed that losing a competition can have a detrimental effect on students' satisfaction and enjoyment; however, competition is still a key element that highly motivates students to engage in the gamification tasks.

2.1.6 Badge-based Achievement Systems

What is a *badge*? Or better to say what is a *digital badge*? A badge is a validated display of accomplishment, skill, quality or interest that can be earned in any learning environment [50]. According to this definition, badges can represent traditional academic achievement or the acquisition of skills such as collaboration, teamwork, leadership, and other skills. Badges can be earned by people of all ages, from kindergartners on up, and they can make any notable accomplishments visible to anyone and everyone, including potential employers, teachers, networks and peer communities. They can be earned in structured environments like classrooms, courses or seminars, or they can be awarded for learning and contributions that take place in more informal contexts, such as online communities, association gatherings, or extracurricular activities.

According to Educause [12] *Badges* are digital tokens that appear as icons or logos on a web page or other online venue. Awarded by institutions, organizations, groups, or individuals, badges signify accomplishments such as completion of a project, mastery of a skill, or marks of experience. Digital badges provide changes in the way society recognizes learning and achievement-shifting from a traditional books-and-lecture pedagogy to a model with multiple knowledge streams, including new media, collaboration, interest-based learning, and project-based learning. Badges could represent an opportunity for higher education to rethink what is of value and recognize achievements that could be codified but currently are not.

In general a badge-based system is designed and created from the educators to be used by the users (students, learners, etc) to award the users for completing a skill or attaining an achievement. This system improves the motivation of the learners for taking part in various challenges. The *Mozilla Open Badges* (Open Badge Infrastructure or OBI) project is a program by Mozilla [34] that issues digital badges to recognize skills and achievements. The badge structure allows one to display real-world achievements and skills which may help with future career and educa-
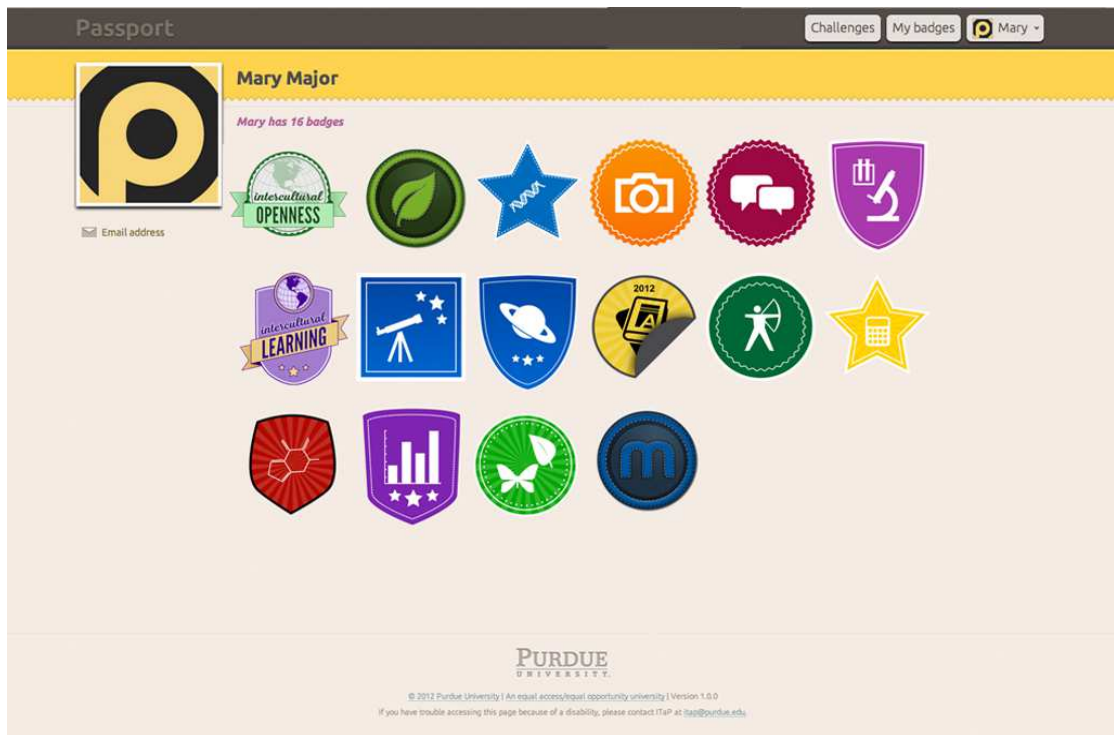
tion opportunities.

Figure 2.5: Passport: a classroom app created by Purdue University

Figure 2.5 shows a mask of *Passport*, a classroom application created by Purdue University [56], allows instructors and advisers to give students digital badges to indicate mastery of skills. The application uses Mozilla's Open Badge infrastructure and is available for use by instructors at any institution. Passport is a learning and *e-portfolio* system that uses digital badges to demonstrate user's competencies and achievements [56]. People can log-in to the application using either Purdue Career Account or external accounts such as Indiana University, Facebook, Google or by creating a new Passport Account. User's public badges display on the profile along with the biography and contact information. It is possible to create or edit a Badge, making groups, taking challenges and showing off the badges.

Passport is a learning management platform. Students earn badges by completing learning activities presented as a series of challenges. They can take quizzes, submit documents and share links. Another users of the application are educators who can easily follow each student's progress and connect badges with course objectives. As badges are collected, they can be shared online as Mozilla's Open Badge. Figure 2.6 presents an example of a profile in Passport.

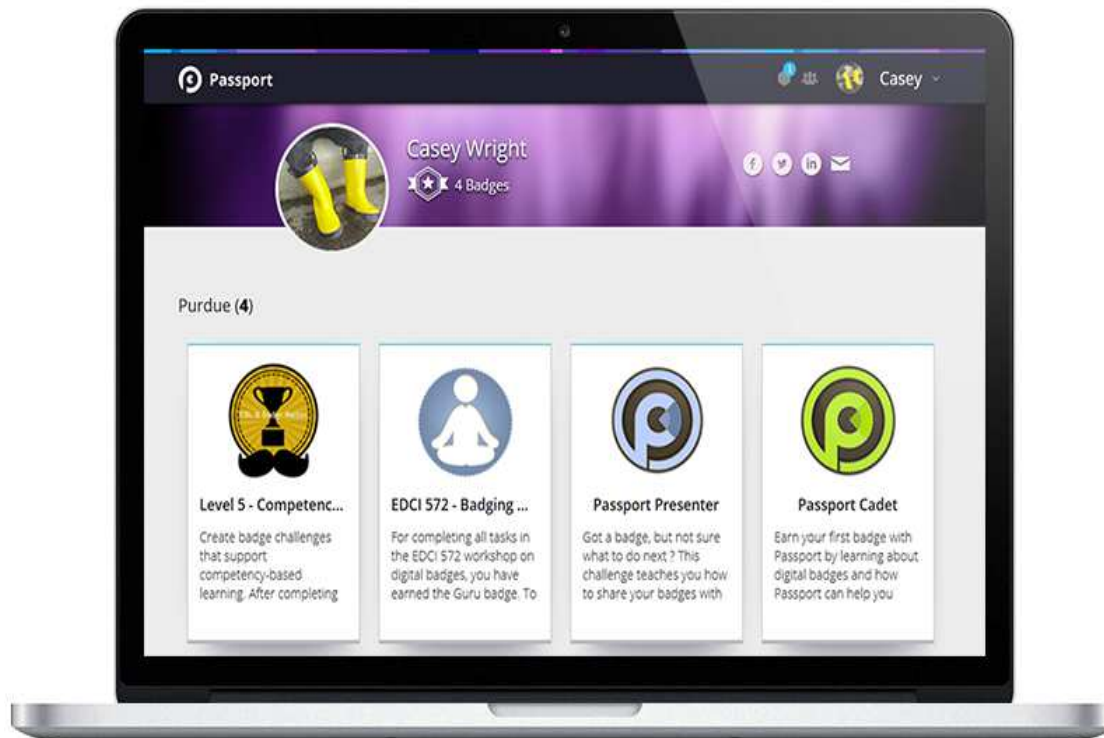In 2013 Denny [9] made an experiment measuring the impact of incorporating a badge-

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Figure 2.6: An example of a profile in Passport

based achievement system within an online learning tool. He discovered a highly significant positive effect on the quantity of students' contributions, without a corresponding reduction in their quality, as well as on the period of time over which students engaged with the tool. Their paper presented the first large-scale study providing empirical evidence of the impact of a badge-based achievement system within an online learning tool. The badges had a significant positive effect on the number of questions answered and the number of distinct days that students were active with the tool, and did not lead to a reduction in the accuracy of student answers. In addition, students enjoyed being rewarded with badges for their contributions and indicated a strong preference for having them in the interface. Although increases did not exist across all measures of activity, such as the number of questions authored by students, no negative effects were observed. Badges therefore can act as powerful motivators in educational contexts and may be integrated with considering the risk into similar environments [9].

2.1.7 Social Education Network Based on Location Sensing Information

As we mentioned before, the lack of interaction and Face to Face intercommunication between student's attending an e-learning course, lowers the student's satisfaction with the course and increases the probability that she/he will drop the course. Social networks has been the subject

of many studies in this area in order to solve this problem. In the resent years with the growth of the demand of devices which have *Global Positioning System* (GPS) capability and use location based services, Location-based Social Networks has been used to support the social education as well.

In 2011 Kang and Choi [22] suggested a system that supports the construction of a social education network service using the location information of the smart-phone in e-learning. Their purpose was to use the support of a location based social network service to increase interactions among e-learners and to improve satisfaction regarding their mobile learning environment. In order to reach this goal, they designed a mechanism to form a social network service among students who take the same on-line course or have similar interests. Through their system the students can create communities for learning and exchange help among them. In addition, they can have F2F meetings for collaborative learning by using location based sensing information. For this purpose, they collected location-based information through the GPS sensor of smart-phones and then combined it with educational content [22]. See Figure 2.7.
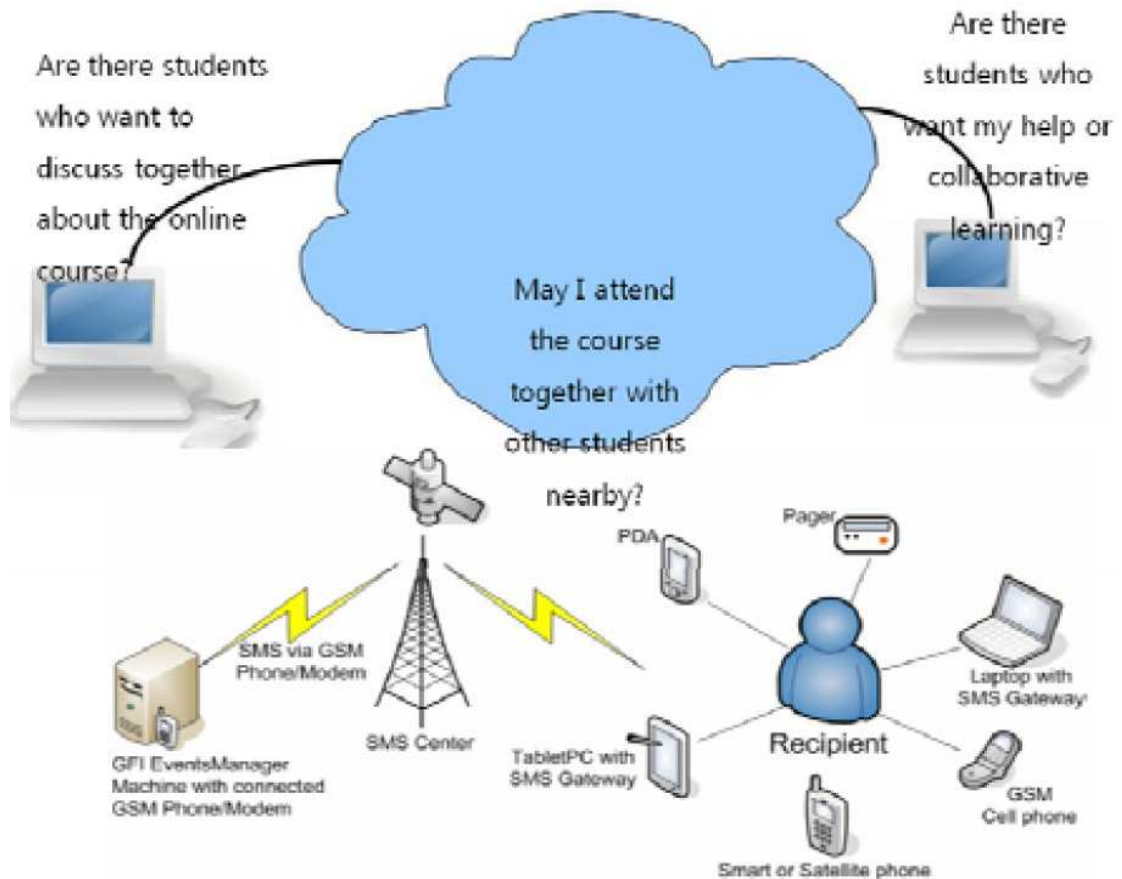

Figure 2.7: Construction of location-based social education network [22]

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2.1.8 Location-Based Games in Education

During the last decade with the growth of usage of mobile devises and smart phones with advanced location sensing capabilities, for example GPS satellite positioning, the popularity of *Location-Based games (LBGs)* has been growing very fast. Mobile devices with localization technology enable users to play mobile computer games which are using location of the player and process the geographic data as the essential input.

According to [4], a typical example of such games is the group of games referred to as *urban games* or *street games*. These are typically multi-player games played out on city streets and in built up urban environments. Some of these mobile games transcend *place* and *time* and can be played in many diverse places and extend to long periods of time; they are called *passive games*. While others are designed to be event based, which means to be played in specific places at specific times, like during visits in museums and other non-traditional game venues [4].

When players are required to physically move from one place to another in order to progress, the game is considered to be location-based [30]. *Location-based games make players respond to the events they observe on the screen as well as perform actions, that can only be done in specific locations* [6].

The Location-based games (LBGs), when properly designed, could be used to mediate the outdoor learning activities. They can be used as a tool for teaching and learning, assisting the educators to motivate the students to use their devices not only for entertaining activities, but also for collaboration with the other learners. The young generation are getting familiar with mobile technology very soon. However, usually they have hardly any opportunity to use it at school as a tool to support learning. There exist some studies that analyze the educational potential of LBGs in detail and they present case studies using such tool in different learning areas.

In 2012 Avouris and Yiannoutsou [4] reviewed a set of LBGs that have been identified as being the most cited so far for learning. They discussed an analytical framework of their main characteristics and focused on the interaction modes as well as the way the physical and virtual components are interconnected in the game, in order to shape insights into designing the next generation of applications of this kind. They derived the general classification of LBGs and presented three categories: *the Ludic*, *the Pedagogic* and *the Hybrid*. Ludic and Hybrid games are mainly built for entertainment purposes, but learning may also occur as a side effect and they may be used for educational purposes. In contract, Pedagogic games are educational games with well defined learning objectives.

Lovászová and Palmárová [30] in 2013 presented an approach of learning computer science through games that use physical objects and need physical activity without computers. They suggested a learning activity by playing Location-Based Games to Introduce Informatics Concepts for the students of primary schools. The main purpose of their research study was to develop (design, implement and evaluate) an outdoor learning activity that would be:

- mediated by mobile technology,

- focused on some fundamental informatics concepts,

- suitable for using in lower secondary education,

- game-based,

- and collaborative.

2.1.9 Location-Based Geo-tagged Image Retrieval

Development of Web 2.0 and location-based technologies made location-based image retrieval and indexing possible. It is providing a huge support in the field of culture and tourism education. In 2011 Zhang [60] listed location-based image retrieval methods as *geotag-* and *visual feature*-based image retrieval. *Geo-tagging* is the process of adding geographical identification metadata to various contents, such as photographs, videos, websites, SMS messages, QR Codes, and RSS feeds. Such metadata usually consists of latitude and longitude, though they can also include altitude, bearing, distance, accuracy data, and place names.

Geo-tagging can help users browse and watch the images including their location-specific information in an intuitive way. This can provide high-quality support for field visits and teaching, which is an integral part for culture and tourism education. For instance, learners can find images taken near a given location by entering latitude and longitude, or with values from mapping services or GPS, into a suitable image search engine. In addition, [60] pointed out that geo-tagging enabled information services can also potentially be used to find location-based news, websites, or other learning resources. These can also provide learners and instructors with further reference information [21]. Geo-tagging contains location information about the content of the image or other media which is added to a location.

In 2013 Zhuang [21] and colleagues presented an efficient location-based image retrieval method for mobile culture and tourism education by conducting the search over combined geo-tag and visual-feature spaces. Their work is followed by comprehensive experiments to testify the effectiveness and efficiency of proposed retrieval and indexing methods respectively. For this purpose they have implemented an online location-based mobile tourism system.

2.1.10 Location-Based Services into Information Technology

In 2004 Michael [31] has done an experience on introducing Location-Based Services (LBS) into the Information Technology curriculum at the University of Wollongong, Australia. They presented a LBS course at the campus designed to follow a pre-sales technical orientation. Students were getting familiar with LBSs, what technologies were relevant, and the limitations and accuracy of location identification. They were then working on some case studies followed by a business case for LBS and implication. This was students was considering that new applications were more than just making the technology work, they were about making money too.

The results showed that not only students found the course experience intellectually challenging and rewarding but also academics found the topic interesting and can bring new ideas for further researches. Also industry representatives found the experience advantageous, a vehicle for collaboration, and subsequently a way to give something back to their local community.

2.1.11 Location-based Services for Building Learning Communities

According to [13] users of services like Foursquare and Gowalla play a type of social casual game that informally builds leadership roles through online and physical interaction. In 2011 Ellertson and Seeling [13], described *my Learning Community (myLC)* application, believing that this type of game play can be used in higher education, specifically in the context of peer mentoring and learning communities.

The application is a learning community support tool, which they implemented in a peer mentoring project in *the Department of Computing and New Media Technologies at the University of Wisconsin-Stevens Point*. They combined different learning frameworks, and implemented location-based services utilizing publicly available interfaces to Foursquare/Gowalla, which allow the identification and tracking of student participation in study sessions and identification of experts (Mayors), which in turn mentor fellow students. The student and study group location and additional communication among participants of study sessions has been facilitated by *my Learning Community* application, which was made available to the students for installation on mobile and desktop devices.

Using such application, individuals learn to work together in interactive environments which promotes participatory learning and informal leadership structure among students. myLC Application worked by connecting to Gowalla location based services through a customized application interface that is meant to brand the CNMT learning community. Students could download the application on their smartphones, tablets, or even their desktop systems to interact with the learning community. They could create profiles listing identified strengths and interests in relation to the curriculum. It also allowed informal text chatting where peers could communicate, share knowledge and ask questions from each other.

2.1.12 Development of Mobile Location Based System to Support Informal Learning

Alkhafaj and Fallahkhair [1] in 2014 did a research to investigate how mobile technology could be developed to support informal learning with respect to cultural heritage sites, and how learners use mobile technology for learning purposes. They used the concept of mobile learning which supports people to learn within different contexts rather than restricting them to a certain place, such as a classroom or museum [7]. They discussed how a mobile location-based application can make the interaction between user and system more efficient and pointed out how mobile devices can support people to learn informally, particularly with respect to cultural heritage.

2.2 Analysis

As [1] pointed out, despite the large and growing body of literature that has investigated the potential of mobile location-based applications for cultural heritage sites, there are few studies that have developed general frameworks or guidelines for mobile location-based learning to assist designers and researchers who are working in this domain [1].

However there exists no evaluated implementation or integration of a social-driven location sharing application using digital badges for rewarding and evaluating in the higher education. The purpose of such an application can be listed as: to improve communication, to ease interactions, to increase motivation, to higher participation and to promote collaboration. Another main idea of this thesis is to use the gaming and competition aspects of social networks and digital badges in order to motivate students more and more for learning, knowledge sharing and taking challenges. A system which can be implemented and designed for different courses in addition to being linked to the other social networks and world learning organizations using the open badges.

2.3 Location-Based Social Networks

Nowadays, smart phones and tablets let users to be connected to Internet from anywhere, sharing their location, geo-tagged notes, photos, videos, text etc. As explained by Kefalas and colleagues in 2013 [24], this subset of Online Social Networks is known as *Location-Based Social Networks* (LBSNs), where location is a new dimension that integrates our physical with our digital lives. Online social networks such as Facebook [14] , Twitter [54] , Linkedin [29], and Foursquare [18] have attracted the attention of millions of users. These Online social networks provide recommendations to users to find new friends, point of interests, activities and etc. using their recommender systems.

Wireless technologies via smart phones and tablets gave new perspectives in recommendations in LBSNs. Important factor in LBSNs are listed as follows according to [24]:

1. *Time factor:* Time is an important factor of LBSNs that may help to provide more accurate recommendations. For example, users periodically perform daily activities in specific venues (e.g. home, work, school etc.) and they share their activities with their network. Therefore, the hidden relation between time and location could leverage the recommendations in LBSNs.

2. *Privacy*: Another important and critical factor is privacy. LBSNs reveal intuitive information about the locations that a user has visited or perhaps checked-in. This information can bring users to unpleasant and undesirable situations. Therefore user's location privacy has a very high importance and can prevent phenomena as assaulting, stalking, burglary etc.

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3. *Explainability*: Explainability is the third important factor in LBSNs. Explainability of the recommendations can provide a more transparent system and thus can increase the user's system acceptance.

In recent years, LBSNs have received high attention. However, such systems were limited in scope and purpose of use until recent years. Providers of these services allow users to share their information, location and even pictures, videos and articles with other people online. Users of LBSNs can track and share location-related information with each other on the move. By adding this new dimension of features, LBSNs bring their users from the virtual world back into real lives and allow the real-life experiences be shared in the virtual world in a very convenient fashion [59].

Location Based Social Networks use the *Global Positioning System* (GPS) of the device to get the geographic information of the user's device in order to provide some services. [3] claims that *Social Networks* give a shared environment, where users, communities or groups with common interests and even places are connected through a set of *social relationships* . The technologies involve *geographical information systems* (GIS), global positioning systems (GPS), radio frequency identification, and various other location sensing technologies with varying degrees of accuracy, coverage and cost of installation and maintenance. Some most recent location sensing technology based on ultra wide band radio can even achieve accuracies on the order of centimeters in an indoor environment.

Jiang and Yao in 2006 [20] pointed out that the various information services can be delivered to the Location-Based Service devices in two different modes. The first one is *push mode* where services are pushed to the user end automatically without the need of user request. The second is called the *pull mode* in which the user has to voluntarily request the information to be delivered from service centers.

The main purpose of analyzing LBSNs is to answer questions like: What motivates people to share their locations? Which kind of location sharing they prefer? How rewards and offers would affect the location sharing behavior of the users? Are they worried about the privacy issues of social networks? And whether or not they ever experience the feeling of regret after sharing their location on network. There are some researches analyzing the behavior of users and the location based social networks. According to [40] the main motivations for location sharing is to connect and coordinate with ones social and professional circles, to project an interesting image of oneself, and to receive rewards offered for check-in. They suggest that privacy considerations in Location Sharing Services are affected due to integration within Social Network platforms and by transformation of location sharing into an interactive practice that is no longer limited only to finding people based on their places.

Patil and his colleagues [40] offer design suggestions, such as delayed disclosure and conflict detection, to enhance privacy-management capabilities of Location Sharing Services (LSS). They used an online questionnaire to investigate the motivations, preferences, and practices of LSS users. They described that, only about 13 percent of the respondents (N = 45) indicated

that they used a dedicated, standalone LSS, such as Foursquare. In contrast, nearly 76 percent of respondents (N = 275) reported using an LSS embedded within a larger Social Network service, such as Facebook, or a blogging service, such as Twitter. A further 11 percent (N = 41) used both embedded as well as standalone services almost equally.

According to [40] Location Sharing Services now operate in various modes: (i) an *always-on* mode in which location is monitored and broadcast continually with no explicit user action, (ii) a *check-in* mode in which the user shares his or her location with an explicit action (e.g., by pushing a check-in button), or (iii) some combination of the mentioned two modes. Figure 2.8 shows the *Levels of Comfort* with the two modes of location sharing. While the mean level of comfort with the *check-in* mode was high, the opposite was the case for the *always-on* mode.
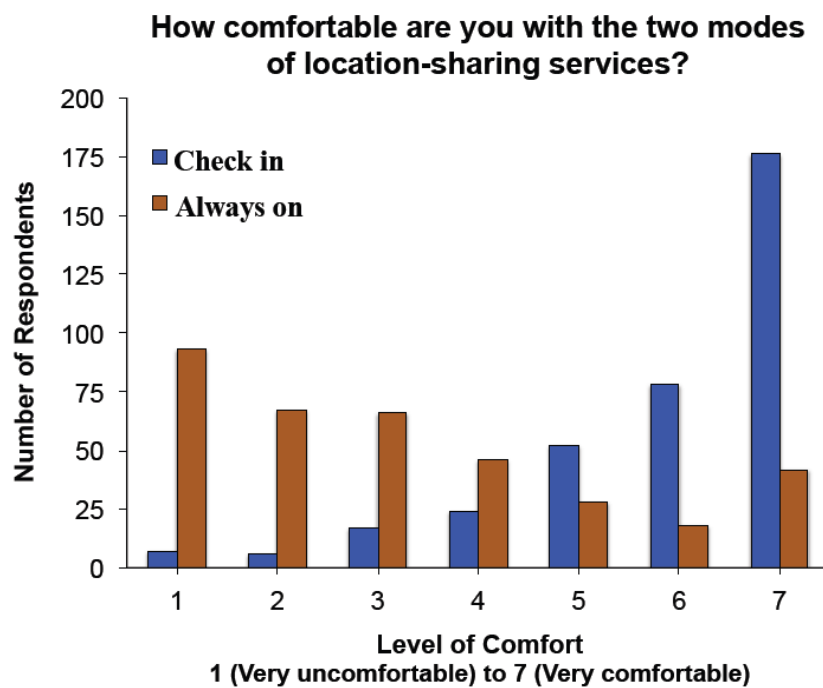

Figure 2.8: Levels of Comfort with the Two Modes of Location Sharing [40]

Huiji and Liu [19] in 2012 presented a data analysis on LBSNs. They pointed out that all location-based social networking sites share a '3+1' framework, which means 3 layers and 1 timeline, as shown in Figure 2.9. The *geographical layer* contains the history of users' check-ins, while the *social layer* contains social friendship information, together with the *content layer* which consists of user feedbacks or tips about different places. All these three layers share one *timeline*, indicating the temporal information of the user behavior on LBSN.

Location-Based Social Networks use Location-Based Services for providing various features
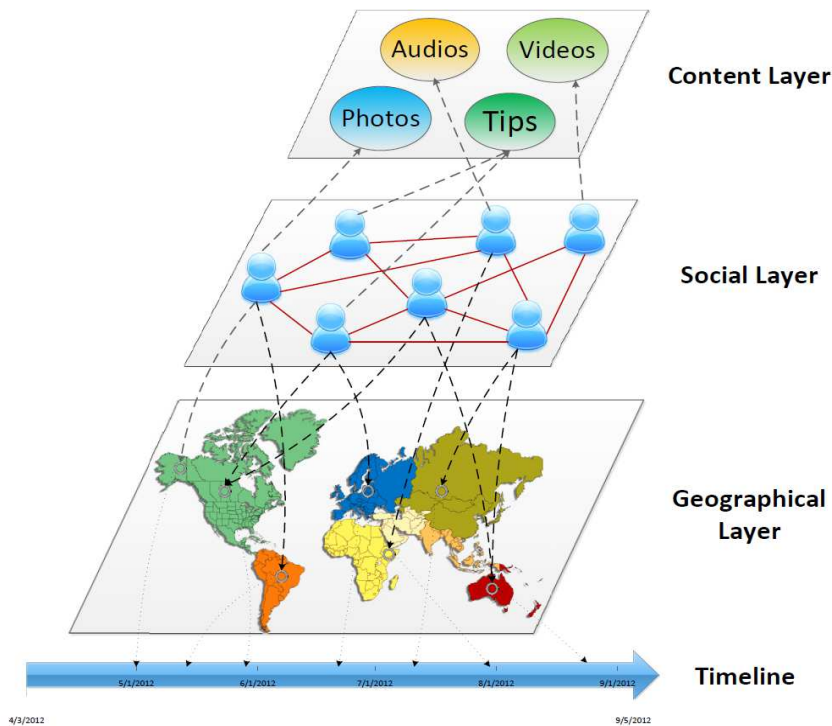
Figure 2.9: The information layout of location-based social networks [19]

and services to the users. In the next sections the definition and characteristic of Location-Based Services will be discussed, following by analyzing of the available features plus missing features of already existing Location Based Online Networks.

2.3.1 Location Based Services

Wilson [57] defines Location-Based services (LBS) as a subset of web services which meant to provide functions that are location aware, where the use of such services is predicated on knowledge of where the services are engaged. Although LBS are often referenced with regard to mobile devices, however they are not necessarily only used on mobiles. Different researches provided various definitions of LBSs from different perspectives and points of view. For example Koeppel [25] in 2000 defines LBS as *any service or application that extends spatial information processing, or GIS capabilities, to end users via the Internet and/or wireless network.*

LBS not only can identify locations of human beings who carry location-aware devices, they also can track objects that are equipped with a tiny (and usually inexpensive) sensor identifier for delivering relevant services. For instance, products moving through the supply chain can be dynamically identified with embedded smart sensors, and massive products of such form a large-scale intelligent network [20].

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Nowadays, Location based services are being used in business analyzing. Like Wilson [57] pointed out in 2012, business is where people live, where they go, and where, when, and how they spend their money. These are now key factors in business success. From product development to distribution, marketing, and sales, location technologies help companies identify, understand, and serve their markets far more effectively than ever before [57]. The amount of businesses, who are offering discounts and goods if a consumer uses Location Sharing Servic to check-in at their business location, is increasing rapidly. This motivates the users to check-in more often at these places to get some discounts. An example of such service is 'check-in' on Foursquare.

2.3.2 Available Features of LBSNs

In this part some already existing features of LBSNs are listed as follow:

- Location determination: The location can be a geographic coordinate or a symbolic location (for example in building 101 room 206) [62].

- Personal profile: Personal profile contains the personal characteristics of the user (in our case student or teacher), such as name, faculty, gender, title, nationality and other things.

- Possibility to add and save own interests and professional experiences to your profile.

- Recommendation: It is possible to leave tips and recommendations for other users and also get tips from the other users and from the system. Recommendations are provided to the learners when they come to a new location or after they finish learning a topic.

- Personalized multimedia presentation.

- The possibility to be implemented on different Devices. Implementation on different devices with different operating systems.

- Check-in to different places and sharing pictures, videos or files related to this check-in, together with adding one or more person to your check-in.

- Adding recommendations and images to different places.

- Being able to share a check-in on other social networks at the same time.

- Comparing own status or digital badges with the others.

- Collecting digital badges. And being able to share them on other networks.

- Having individual setting for each earned badge.

- Privacy setting for personal information.

- Security check and setup.

- Possibility to find out nearby places. Users may also leave comments on a place.

- Rating places such as restaurants, institutes or historical places.

- Finding out which friend is in the close area and who is far away.

2.3.3 Features to be improved

There are some features of LBSNs which exist but they may be improved. These issues might be covered with a more efficient design or using more advanced technologies. These features are presented as follow:

- Privacy issues: Various studies have shown that privacy concerns play an important role on the value that people put on sharing their location and information on Location Sharing Services (LSS). Tsai [53] presented his paper on benefits and risks of location sharing through a large survey of 587 respondents. They pointed out that LSS were beneficial for ensuring the safety of friends, coworkers, and children, coordinating activities and meetings, finding people with similar interests, etc. However, they also noticed several potential harms such as: being bothered by advertisements, exposing ones private address, being stalked, being tracked by the government or bosses, etc.

- Accurate description of locations: Although location-based social networks provide more accurate description of locations to compare with traditional geo-tagged data [19], however it can still be improved.

- Reliability: Not all the check-in made by people are reliable since it is possible to check-in to a place just by being close to that location. This might cause some fake check-ins for different reasons such as getting prise, discount and showing off.

- Motivation: Usually there are not enough reasons to motivate user to check-in and share the location to the network. Motivating user is one of the most important factors that the designer of the LBSN must keep in mind.

- Correctness of the recommended nearby places: Sometimes nearby places recommended by a LBSN are not in reality very close to the actual location of the user, since they recommend the places which are in a big radius around the user.

- The location service provided by a location-based social system should be able to estimate the real distance of the user who is checking-in to the location. This should be done precisely in order to stop users to check-in to a place where they are not actually in there. This is an issue which has not been completely covered by the existing location-based applications. For example in *Swarm* it is possible to check-in to a building by just being in the area where the building is located. It should be somehow developed that the system would not allow the users to check-in to a place when they are farer than a certain given distance, depending on the size of the area.

CHAPTER 3

Questionnaire

"The only source of knowledge is experience.", *Albert Einstein*

As mentioned before, the aim of this work is to analyse how using a location based social network with all its features would improve the learning system as well as motivation of the users. The main users of this system are students and educators. Since the system would be introduced by educators to the students, it is very important to get some pre information about the impression of the users. For this reason, we handed out our questions for the purpose of gathering information from the *respondents* who are the students.

3.1 Method

A questionnaire is released in order to see the student's aspect of using social networks in learning. First the concept of location based social networks and their potential use in business and education has been introduced to the students. The questionnaire has been answered by the students of the Knowledge Management course at Vienna University of Technology in the Winter Semester of the year 2014. After collecting the answers and feedbacks, an analysis of the result of this survey has been made. We used the questionnaire to find out the motivations and opinions of the people who would be the users of the location based social network. Gathering the requirements and information from the end user will give designers a better insight into different aspects of modeling and design of the application.

In particular, we asked them about their opinion about improving lectures and making them more interactive by using tools, quizzes, group works or social networks for collaboration in the lecture. The questionnaire is included in Table 3.1. Moreover, the questionnaire did not focused on a specific social network but rather on how online social networks and location sharing and using these technologies at lectures is experienced by users.

Table 3.1: Questions and responds

	Question	Yes	No	Others
1	Do you think that more interactivity would improve your learning in lectures?	12	0	14 (Depends)
2	Would you like to have quizzes in a lecture?	16	10	
3	Would you like to have more discussions in lectures?	19	7	
4	Would you like to have group work in a lecture?	12	14	
5	Would you use a laptop to participate in interactive elements of a lectures?	21	4	1 (I do not have a laptop)
6	Would you use a smart phone to participate in interactive elements of a lectures?	21	5	0 (I do not have a smart phone)
7	Would you check-in into a lecture with a social service such as Foursquare?	6	20	
8	Would you like to have digital badges as a kind of feedback for achieved solutions?	14	12	
9	Would you like to have digital badges as a kind of feedback for a participation in discussion?	8	18	
10	Would you like to have digital badges as a kind of feedback for a presentation?	14	12	
11	Would you like to have digital badges as a kind of feedback for presence in the lecture?	11	15	
12	Would you like to have digital badges as a kind of feedback for a question in the lecture?	11	15	

3.2 Findings

In this section the notable insights gained from the responses of the students will be discussed. The output of the questionnaire is shown as a graph in Figure 3.1.

The result shows that *NO* student think that more interactivity would *NOT* improve learning in lectures. In their opinion it considerably depends on the interaction. As it can be seen only
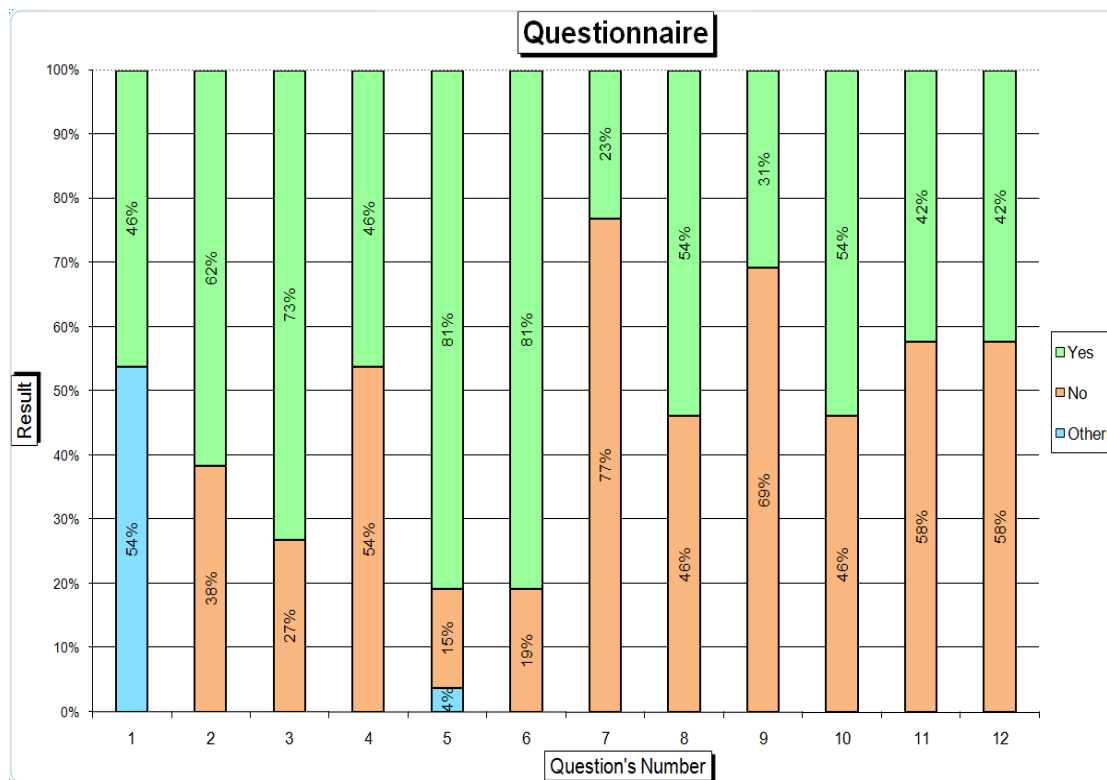
Figure 3.1: The graphic of questionnaire's result

about 23 percent of the respondents (N = 26) indicated that they used a location based application such as Foursquare to check-in to a lecture. This demonstrates that this concept is inexperienced and should be introduced briefly to the students. Furthermore, because of privacy issues, it is not desired to share information about ones location on network. However most of the respondents (81 percent) indicated that they find it useful to use a laptop or a smart phone to participate in interactive elements of a lectures. More than a half (about 54 percent) of the students determined that they would like to have digital badges as a kind of feedback for achieved solutions and for a presentation. On the other hand about 42 percent demonstrated that they would not like to have digital badges as a kind of feedback for presence in the lecture or for a question in the lecture. Furthermore, only 31 percent of the respondents, think digital badges are interesting as a feedback for a participation in discussion.

Requirements

"You are never too old to set another goal or to dream a new dream.", C. S. Lewis

In this chapter the stakeholders of a LBSN, which will be used in learning environment, will be described. Then, three interesting scenarios for higher education are presented, explaining different users motivation, where all could benefit from using a location-based social network. As a consequence, requirements are derived from scenarios.

4.1 Stakeholders

Figure 4.1 pictures the stakeholders of a LBSN in learning environment. Similar to other social networks stakeholders can affect or be affected by the actions of LBSN. Society defines the group of users of the system who are sharing the same geographical or social territory along with interpersonal relationship between them. Managers and staff are people who are involved in organizing and coordinating the efforts of users to accomplish objectives together with maintenance of the system. For a learning system managers could be people responsible for curricula and for execution of courses. They may be teachers and/or may define digital badges related to course objectives.

The most important stakeholders to be analyzed here are: teachers, students, tutors and external learners, who are interacting with the application in order to benefit from the system. Teachers are users who are responsible for issuing and perhaps creating and defining digital badges in order to present different learning paths to students and recognize achievements. Teachers should connect course objectives with badges and other features of LBSN for potential use in education. Tutors are users who might be students as well (users may have different roles) who interact with the system for assisting teachers in educating processes such as managing group works, projects or exercises. Students log-in to the application, add friends, create or join groups in order to take different activities using the LBSN. External learners could be students who are not necessarily registered to the same university, but might also want to use the application in

their visit to a specific university for a semester or more. This way external learners can carry their achievements with them for future use.
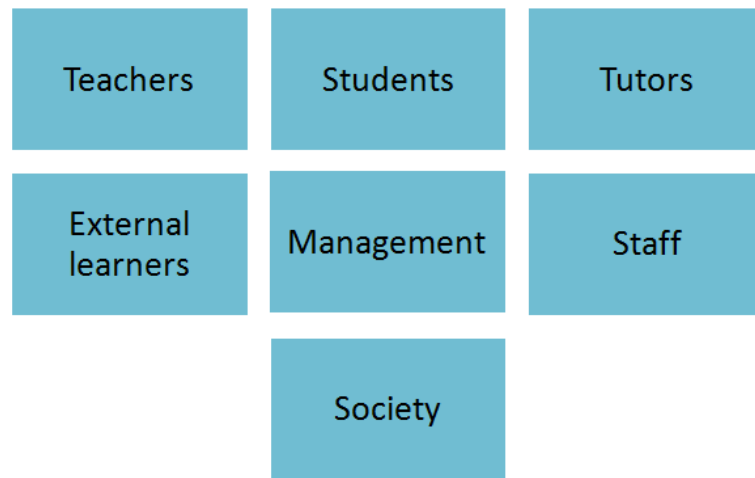

Figure 4.1: The stackholders of a LBSN in learning environment

4.2 Scenarios and Use cases

This section provides an overview of possible users and some interesting scenario cases at university campus, which would use a LBSN application in various situations and places. By explaining these scenarios, the required features of the desired system will be extracted. Each scenario leads the designer to think about some possibilities to support users demand. The scenarios are created considering the most important property of the Location-based social network which is ability to 'Check-In'. It will be discussed how a user would get badges by checking-in to different places and taking different actions. In this system digital badges will be used for awarding and learning purposes.

4.2.1 Scenario 1: Participation in lectures

Generally participation of students at lectures are not evaluated. It will be practical if students who are attending a lecture more often than the others to be rewarded. This will encourage students for taking part at lectures. How can we motivate students for participation at lectures and how their attendance can be tracked? Using a LBSN students can check-in to lecture rooms to show their attendance and teachers can reward them after defined number of check-ins with digital badges.

There are different kind of badges that can be achieved with regards to participating in lectures or exercise classes. These are based on the type of user. If a user is a student, s/he can earn a badge by for example checking-in to a lecture six times (a variable which can be defined by

teachers) in a row, or by participating in the exercise classes of the lecture. It is practical when users can see which badges are available to earn in the future as *Pending Badges*. For example user can find out that s/he has to 'check-in' to the lecture class another two times to get the *Participation Badge* for the lecture. It can be defined that, students earn a *Lecture Terminator Badge* after check-in at the last lecture of a course.

How to motivate educators to attend lectures more on-time and prevent the cancelation of a lecture class? If user is a professor, teacher or tutor, s/he may get another kind of badge for participating in lectures called *Attendance Badge*, which is designed specially for educators. In addition, they can earn a badge for showing up on-time at lectures. This can be tracked by controlling the check-in time and place. Also simulating check-out will assist to determine if an educator completed the lecture's time. It can be defined in the system that teachers earn a *Punctual Badge* after ten times (a variable which can be set up for different lectures or exercise classes) of check-ins at exact beginning time of a lecture.

Badges are designed to motivate tutors as well for participating at lectures or exercise classes. Some students have another role which is being a tutor for a lecture. Tutors assist teachers with presenting exercise classes to discuss the solutions with students and organising quizzes or exams which are needed for completing a course successfully. To encourage tutors to participate, digital badges can be used as awarding tool. It can be defined by teachers that tutors earn an *Assistance Badge* after presenting a defined number of exercise classes or after a number of participation at a lecture in order to assist the teachers.

Users can show their presence by checking-in to lecture rooms at different buildings in the campus. These rooms should be defined in the social network. If the user searches a room that can not be found on the application, there exists this feature to add a new place into the system by filling in some basic information about the place, including name and address. This way the application can be used as a tool to measure the participation of the users in lectures, and to evaluate it. People with the most number of presence may be rewarded with badges and later with better grades for the whole course. In addition, users will earn digital badges for adding new places to the application and check-in to those places. It can be defined that after adding a number of places, users earn an *Explorer Badge*, for exploring new places.

For this scenario, users shall be able to take following actions using a LBSN:

- Creating profile in the application.

- Searching for lecture room in the application.

- Finding the path to the location.

- Ability to check-in to the location.

- If location is not found, user can add the new place to the system.

- User may want to add other friends to her/his check-in.

- User (student, teacher, tutor) can share a file, photo or video about the lecture to her/his check-in.

- Users see in their news feed, if other friends/users are present at a place.

- Users earn various digital badges for their check-ins.

- Users shall be able to manage privacy setting for each earned badge individually.

- Sharing badges to other social networks or Mozilla backpack.

- User may also want to make own check-in private so that nobody sees her/his current location.

- Users can write comments on a location's mask of the application and share tips with other users.

- Users may share questions and solutions on a check-in to an exercise class.

- Teachers can track students participation by reviewing check-ins.

- Users may send messages to friends and share information about the lecture.

- Users can compare own badges with other users.

4.2.2   Scenario 2: Working Groups

Many courses in higher education have a practice or project part that students, in order to complete the course, should manage to execute a project in a working group. These working groups can be either mandatory for a lecture or optional, created by either educators or students to work and learn together. Using a location-based social network in a working group would have plenty of benefits. Let us imagine that a group of five people are working on a project. By searching in the application, group members can see who is already available in the campus. They can also communicate easily by sending messages to the group members and perhaps uploading files in their messages or comments. They can simply search for nearby learning areas. And they can also leave comments on the place's page in application. They can even look up in the application if a tutor or professor is available at her/his office.

Another feature of the application which can be used here is, to find out the easiest path to reach a place and in this case to a learning room, institute or teacher's office. The action of path finding is not only possible by connecting to a map, but also buy reading the tips that other users already left on location's mask.

A student may participate in several working groups related to different exercises and courses. In the *Group* page of the application, s/he can easily manage each group individually. It is also possible to change the setting for each 'check-in' and restrict the location visibility to a defined group of people. Not to forget that students also earn digital badges for engaging in working

groups, completing exercises, leaving comments and tips, checking-in to different places and many other situations.

Imagine a working group which is working on an advanced software engineering project. Here stakeholders are: teacher, tutor and a number of students (for example five) who will work on a project in one semester and have to present their end result at the end of the semester to the tutor and teacher. The course begins with a first presentation, 'Kick-Off Meeting', from the Professor and tutors who will explain projects to the students. Then the Tutor creates working groups of five people to implement one project together. By adding group members, students can propose to the tutor which role and responsibility they want to have for the project. For instance, for a software engineering project different roles such as designer, programmer, data base admin, organiser and documenter are needed. Students will earn later digital badges according to their roles after completing their tasks. Different meetings with the Tutor will be scheduled during working on the project. Tutor can use the application of LBSN to create groups, add members and create events for their meetings. It shall be easy to add information to each event such as date, time and place. Teacher can also easily follow project's progress on the application by reviewing the events, meetings, check-ins and shared documents.

In the Group page of the application all the activities of a group during a project will be shown. In addition, a view of the group members, uploaded files, events and earned badges is available on the group page. In general, any user of the application can create a group and add different users as members. Users will get a notification on their application that somebody has invited them to join a group, which they may accept or decline. After creating a group, the creator and the members can change the settings for the Group. Privacy and settings for shared files, earned badges and events can be customized.

During taking part in a working group, there are many possibilities for students, tutor and teacher to earn digital badges. A badge for starting the project, *Kick-off Badge*. Badges to earn after each meetings with tutor , *Mini Badge*, or after some group meetings for evaluating cooperation and collaboration between group members which is called *Collaboration Badge*. Students, tutors and also teachers may earn different badges for check-in to various places for group work or just to show that they are available at the campus. Users may earn digital badges after a number of check-ins at a specific room or place at the campus. An example would be *Library Badge*. Different *End Project Badge*s are defined for students, tutor and teacher. Furthermore plenty of role-dependant badges shall be available such as *Presenter Badge*, *Developer Badge*, *DBA Badge* and *Designer Badge*. During the project all users may earn digital badges for giving feedback to other users. Teachers may give feedback to students or tutors, and it is also possible that students give feedback to teachers, tutors or to other students. *Feed back Badge* and social badges can be used for rewarding such activities.

The group project will be finished with an end presentation of the work to the teacher. An event can be created for this reason and participants can check-in to the location of the presentation to show their participation. As it is mentioned before, users earn different badges at the

end presentation. For example the person who is presenting the work earns a *Presenter Badge*, together with *End Project Badge* which is designed for all group members. Teacher follows the project and all the badges which are gained during the work by students. Using these information teacher may decide perhaps to give different grades to group members. Moreover, teacher may also reward the tutor with a badge for leading the group.

For this scenario, users shall be able to take following actions using a LBSN:

- Creating profile in the application.

- Creating group.

- Adding members to the group.

- Setting privacy for each group.

- Creating events for group meetings and end presentation.

- Adding information such as date, time and location to the event.

- Inviting people to the events.

- Attending or declining an event.

- Finding event's place on the application.

- Finding the path to get there.

- Check-in to places of events.

- Check-in to learning rooms for group work.

- Students and tutors check-in to different places to show availability at the campus.

- Teachers check-in to their offices or other places to show that they are also available at the campus.

- Sharing check-in to other social networks such as Facebook and LinkedIn.

- Leaving comments of other users check-ins.

- Sharing files, photos and videos to the group page or to each check-in.

- Placing questions on group page and giving solution to existing questions.

- Earning digital badges for different actions explained.

- Managing each badge individually and setting up privacy.

- Sharing badges to other social networks or Mozilla backpack.

- Users can compare own badges with other users.

- Teachers can track project's progress by reviewing group pages and check-ins.

4.2.3 Scenario 3: Attending Special Events

During a semester there are various events occurring at the campus where students and teachers can organize or attend. How can we recognize who attended which events and how it could be saved or evaluated? How can a student receive a reward for attendance of different events at the campus, which may have a positive affect on grading. Usage of a LBSN and digital badges assists achieving these advantages.

Different type of users can earn digital badges as a reward for attending special events. Events such as seminars and thesis presentations. They can 'check-in' to these events and share their locations with their network. Users may earn different badges according to their profiles. For instance, the type of a badge that a professor earns by attending a seminar and perhaps presenting a talk, is different from type of the badge that a student earns by attending the same seminar. It can be defined that teachers earn a *Seminar Presenter Badge* after presenting a defined number of seminars, and students earn a *Seminar Badge* after attending a number of seminars. These numbers are all variables which can be declared by educators or issuer of badges.

In addition, international students may also join the application and earn another kind of digital badge, *Seminar Guest Badge* , for attending a talk, seminar or presentation as a guest. For each event an individual digital badge can be created and designed with a relevant name according to the name of the event. Moreover, students and teachers may attend thesis presentations and earn digital badges as reward.

Another event can be an event called *Epilog*, where students present their thesis posters. There are students who send their posters for this event to the event manager and they do not attend the event in person, however some others are personally present at the event for any further questions about their poster. These students can get an *Epilog Badge* as reward. It can also be estimated how long was the student present at the event by 'Check-In' at the beginning and at the end of the presence or perhaps by using the 'Check-Out' feature or simulating check-out by making another check-in at another place.

Another activity which is for the students, mostly in first semester, is called *Prolog*. In this challenge students are supposed to take place at a number of presentations of different lectures. By being there, they get a stamp at the end of the presentation from the lecturer. After collecting a defined number of stamps they are rewarded by for example taking part in a tombola. Using this application the stamps can be simulated by mini badges, where after earning a couple of mini badges, at the end, the student will be rewarded with a big badge like *Prolog Badge*, which will be appear on user's profile page and can be observed by other users.

Attending an event called *STEG* can also bring students digital badge. STEG denotes the introductory discussions of the faculty of computer science at the University of Vienna and consists of information on paper and a 20-minute conversation with a professor of the faculty. It is to give students a prospective before they make their choice of study and before enrollment to information technology or business informatics studies. STEG is part of the curriculum and

compulsory for all new students. Using a LBSN, educators can create an event for STEG, and different students may attend and save this event on their application. This way students will be updated with information about date, time and location of STEG event. Each student after attending the event (it is shown by students check-in to the place) will earn a digital badge, *STEG Badge*, as reward.

For this scenario, users shall be able to take following actions using a LBSN:

- Creating profile in the application.

- Creating events.

- Adding information such as date, time and location to the event.

- Any user can create an event.

- Inviting other users to the event.

- Ability to join or decline an event.

- Finding the path to the event or to a place.

- Leaving comments on an event.

- Sharing files, pictures or videos on an event's page.

- Teachers can track students participation.

- Students earn digital badges according to each event that they attend.

- Teachers also earn digital badges for attending events which are designed for educators.

- Managing each badge individually and setting up privacy.

- Sharing badges to other social networks or Mozilla backpack.

4.3   Requirements

Considering the scenarios that are mentioned above, these are the features that would be helpful to have for a LBSN using in higher education, in addition to already existing features:

- Creating different Groups and inviting another users to join the group.

- Having individual group setting for different groups.

- Determining which group is allowed to see which check-in that a person makes. Maybe a person would not like her/his colleagues to see the private check-ins.

- Managing different groups in the application such as colleagues and private friends.

- Monitoring the status and total points of other colleagues in the group.

- Adding learning materials such as photos, videos and files to a group.

- Creating events for a group.

- Adding tips and images to different places where a group checks-in. For example adding some exercise solutions to the page of the group of exercise class.

- Adding videos and other file formats life PDF to a check-in.

- Adding events and appointments.

- Getting information about different buildings and rooms at the campus.

- Path finder: Not only being connected to a map service provider, but also finding the best way to get to a place by reading the comments that other users already left on the network.

- Synchronizing the private calendar on the LBSN.

- Discussing about exercises in chat groups.

- Leaving tips on different group or place pages. Teachers may leave recommendations and feedback for students there.

- Getting pop-up tips about some similar problems from other lectures or institutes.

- Adding events as a place that students can check-in to.

- Earning digital badges after a number of check-ins to a place.

- Earning digital badges after attending a seminar or a special event. Different event badges for students and teachers.

- Earning digital badges for providing some soft skills such as presenting in a project group.

- Earning digital badges for being available at the campus after a certain number of check-ins.

- Possible badges also for teachers and tutors in order to motivate them using the application.

- Manage each earned badge individually by changing the appearance setting as well as sharing.

- Defining the concept of *'Check-Out'*. In addition to 'Check-In', it would be advantageous if Location-based Social Networks would have had a 'Check-Out' button! This ability makes it possible for the users (in our case students) for example to track the duration of the group meetings. They can calculate how many hours they spent on a project or an exercise. Also educators can perhaps provide a more precise evaluation for different groups

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according to the time that they spent on the group work. Moreover if it would be possible to 'Check-Out' another user, it would be possible to check-out a person immediately after s/he left the location. This feature is usefull in cases that the person forgets to check-out or does not check-out on purpose.

Following subsections describe some of the most important needed requirements for designing a Location-based Social Network in higher education.

4.3.1 Motivation

One of the most important purposes of using such a system in educational environment in to raise the motivation of different users by fulfilling their needs. Some of the most essential motivations are listed as follow:

- To motivate the students to participate in learning and knowledge sharing. Students will earn badges after checking-in to different lecture and exercise rooms and various events. In the application they can compare themselves to the other members and this motivates them to compete and earn more badges by taking more challenges.

- To make an improved and better communication between students and educators. Using this application students can join different learning groups, they can communicate by sending messages in the group and discussing questions and giving solutions by leaving recommendations and uploading files, photos and videos. Tutors and teachers can also join learning groups to track the learning process of the students and to communicate and to help the students in a better, easier and more interesting way. It is also possible that both students and educators leave tips and comments on different places and events to give other users information about the place. For example if a class or an event is suddenly canceled or postponed.

- To motivate teachers to give feedback to the students, to give better resources and to show empathy with the students. The social network should be designed to somehow also motivate the teachers to use the system. This could be an easy way to give frequently feedback to students for their work and also to receive feedback from them for improving the teaching methods. Using this application teachers would be able to deliver better resources such as learning material by considering students feedback and comments.

- To provide a flexible learning path to the students. By presenting different badges and explaining a step by step way of achieving them, students would get familiar with a clear view of the learning path. Considering the information gained, students can decide to choose different learning paths to reach a learning goal.

- To raise the culture of competition between the students. Competition can always motivate people for taking challenges and trying to be better in what they are doing. Also in educational environment a healthy rivalry provoke students to learn and participate more to get more badges and points and in result to get a better grade.

- For acknowledging small efforts. Various efforts, experiences or competencies that a person achieves during her/his life can not be acknowledged easily. Using a badge system which can be exported and shared to another systems and social networks is a way to make these efforts to be recognised.

- To be used in grading system. Badges and points that a student achieves by checking-in to different venues and by participating in exercise classes, learning groups and similar activities can be used by educators in grading algorithms. Also feedbacks that students can give to each other might have affect on grading.

- Furthermore, it will motivate the users because social networking and gaming is fun! A core objective of this work is to make the learning experience more attractive for the students through interactive and social network.

4.3.2 Usability

In order to get users to use a tool, it should be simple, answers their needs and so called user friendly. Usability plays an important role for an application to be successful and to compete with the other revivals. Without providing a good user interface the user will not use the system frequently. For instance taking too many steps for finding a required information in a group would be an example of a bad design with regards to usability.

4.3.3 Security

In order to make users sure that their data is safely stored and their tasks are completed with out any risk, security is an important issue which needs to be meet. A secure data base should be set up and the personal information must be treated trustfully.

Security settings keep user secure by providing ability to set *login approvals*, add *trusted contacts* and by reviewing where a user is currently logged in to the application. By setting Trusted contacts, user defines friends that can securely help if s/he ever have trouble accessing own account. User can also get an alert by setting up *login alerts* when anyone logs into her/his account from a new device or browser. This alert can be sent via email or SMS to a registered mobile phone number. Another available setting in security setting is deactivation own account anytime decided by the user.

4.3.4 Privacy

Recently, as more and more social network data has been published in one way or another, preserving privacy in publishing social network data becomes an important concern. As it is pointed out in [61], with some local knowledge about individuals in a social network, an adversary may attack the privacy of some victims easily. Various studies have shown that privacy concerns play an important role on the value that people put on sharing their location and information on location-based social networks. Although in general, such networks are beneficial in different areas, however, like mentioned by [53], some potential harm might be noticed such as: being

bothered by advertisements, exposing ones private address or other personal information, being stalked or tracked by the government or bosses, etc.

In this system levels of privacy should be defined. It means user can define for any single information that s/he is sharing, which group of people are allowed to see it. Levels of privacy can be defined not only for the shared media, but also for each badge that the user has earned and each 'check-in' that has been made. Privacy concerns play an important role also with regard to creating fake accounts and stealing identifications. There are identity thieves who steal a person's photo and create an account with the person's name and information. There should be possible to report such accounts under *Impersonation Accounts*, and to report *Hacked Accounts* or any other *Abuse* and *Spam*. Users will be able to report such problems harming themselves or another users.

4.3.5 Availability

In order that this tool can be used everywhere, there should exist a very structured definition of places, so that the user can 'check-in' at all the places in the campus. It also will be possible that the user create a place in case it does not already exit and add it to the system. However, usage of the system can not be available offline, since a basic requirement for using such a system is having access to the internet.

Implementation Design

"Life is the art of drawing without an eraser.", John W. Gardner

In the first part of this chapter it will be discussed if the mentioned scenarios in Chapter 4 and the requirements can be realizes as desired, using an already existing application for mobile phones. Later a preferable design for such an application including data model diagram will be proposed.

5.1 Suitable Application

This section describes two popular location-based applications for mobile phones: *FourSquare* [18] + *Swarm*, and *Facebook Places* [15]. These applications allow user to alert their network to their current location on the move.

Both Foursquare and Facebook Places make it possible for the users to 'check-in' to places and share their locations in order to discover new places and find nearby friends. Let us take a short look at these two LBSN and their functionalities.

5.1.1 Foursquare

In 2009, Foursquare launched the check-in and real-time location sharing with friends [17]. First version of Foursquare application was a social software platform where users with mobile phones (with GPS) could check-in at certain places, buildings or rooms. The application was providing digital badges as reward to the users after checking-in to different places. Users could 'check-in' to different venues not only to get tips and recommendations from other users, but also to collect digital badges and points to compete with other users. The idea was to motivate users to share more often their locations to the network and to try to discover new places. They were able to compare their earned badges with their friends and that would push them to try to earn more badges by doing more check-ins. Businesses were getting benefit from this feature

and some started to give some bonus or free services to the users with the most check-ins. This feature made us think that using digital badges as a reward system would be also beneficial in educational environment. Thus this work was started by analyzing how we could use Foursquare in different lectures and exercise classes at university campus.

Five years later, in summer of 2014, the company has developed another application called *Swarm*. Foursquare released the application, Swarm, along with removing the possibility to earn digital badges. However in the later release they added stickers to Swarm's check-in, but still these changes made the application not convenient enough for our purposes. Foursquare moved the check-in part of the application to Swarm, however it provides recommendations and tips to the users based on the interests and check-ins that a person has done before. Users create one profile and they can sign in to both applications. Foursquare has been implemented for Smartphones such as iPhone, BlackBerry, Palm, and the Android platform.

5.1.2 Facebook places

As reported by CNN [8], in 2010 Facebook has presented its long-awaited location feature, *Facebook Places*. An application that lets users 'check-in' on their mobile phones and let their friends get information about the places that they are visiting. The basic concept is like Foursquare where uses GPS so people can 'check-in' with mobile phones. The difference was that Facebook was introducing this concept to a wider range of users having about 500 million users. Facebook places provides a very convenient location-based service with the ability to share the location on the move to the network and at the same time to show on Facebook profile. Users updates will appear automatically on friends' home page as news feed when it is desired. Users can also tag friends who are in the same location, along with sharing a photo or a status update.

Privacy concerns are covered by providing privacy settings. By default check-ins of a user at different locations will appear on user's profile and to the news feeds of the user's friends. Also users can add friends to their check-ins without receiving any explicit permission from their side. However, users can change this default setting and control how much information should be broadcast about their location with their network. Facebook stressed out that by default, the location information will only be shared with a user's friends unless the user explicitly decides to share this information with everyone. Anyhow, a user can set up the setting and make even all the check-ins just visible to her/him self. By checking in to a place, a user can see a list of friends who are also at or near by to this location. This feature eases the communication between the users in physical world.

Although the mentioned LBSNs make it possible for users to provide a live update of where they are and what they are doing while on the move, but after studying the available features and user interface of such networks, it was clear that, despite the fact that these applications might be helpful for our purposes, but they would not cover the realization of the scenarios that we explained in Chapter 4.

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5.2 Data model

Before starting to design an application, it should be analyzed which data is required, and how these data are related. Figure 5.1 shows an overview of database model of the proposed application, with a glance of entities, their properties and the way they are linked together.

User is the most important entity which is related to several entities in order to save information about users and actions that a user make in the system. As it is shown in data model, a user may be a member of many groups and one group may have many users as members, where each group has an individual privacy setting.

The same structure is for events, that a user may attend many events and one event many have many participants. A user may earn various digital badges and each badge can be earned by many users. Each user can change the privacy setting for each earned badge individually. Moreover, a user can leave comments on other users status, a place or a shared file. A file might be a photo, video or other kind of data. Different locations can be defined in the location entity. Furthermore, a user can be related to a location by check-in to the place, and this relation will be saved in the user-location table.

Different roles are defined in the system, where a user may have more than one role. For example a user can be a student and also a tutor. Likewise, a role can be assigned to more than one user.
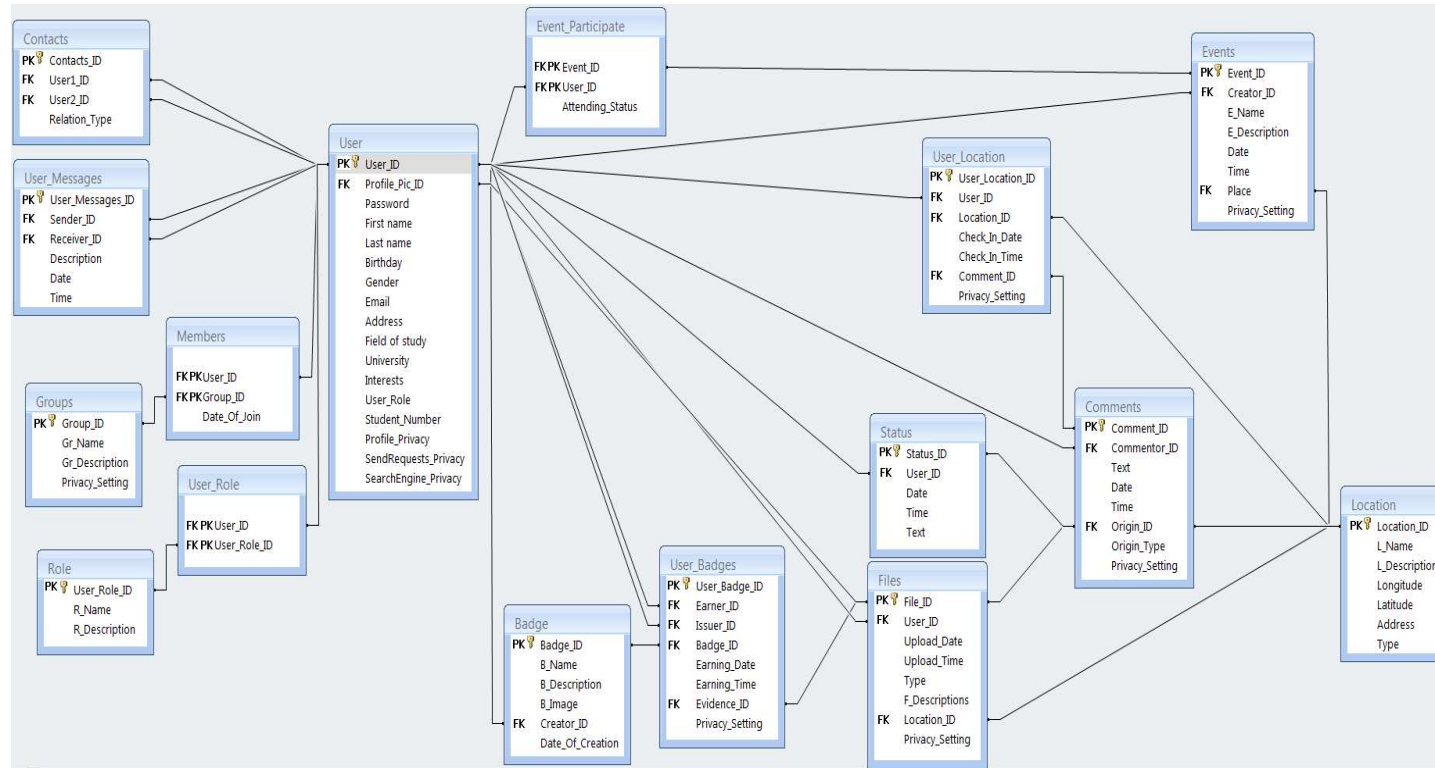
Figure 5.1: Data model for location based social network

5.3 Design of a LBSN

After analyzing the existing approaches, features and capabilities of Location-based Social Networks, the next step is to use this knowledge to describe the procedure to design the user interface. Therefore next sections of this chapter deal with explaining the proposed solution for designing such an application. the procedure is divided into five sections shown in Figure 5.2. Later in the next chapter a prototypical implementation of the application will be presented for a practical scenario in detail. Icons used in the prototype has been downloaded from [16] and badge images are imported from the work of [35].
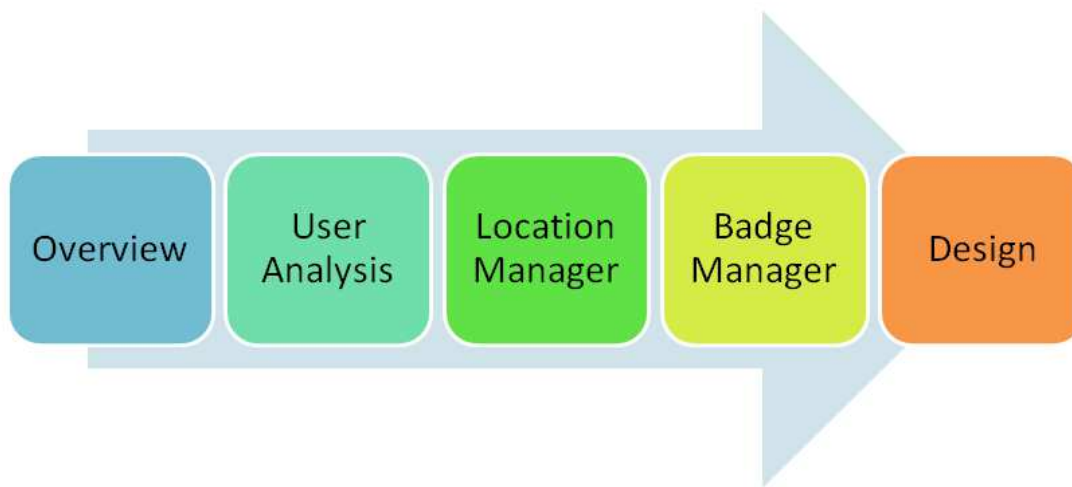
Figure 5.2: Designing of a Location-based Social Network

1. Overview: Deals with a general understanding of the whole system and how the model would work.

2. User Analysis: Describes different kind of users and stakeholder who can benefit from this system.

3. Location Manager and Environment: Deals with Location which is one of the most important ingredients in LBSNs.

4. Badge Manager: Describes how different badges can be used and managed in this application.

5. Design: Defining groups, defining places and defining badges.

5.4 Overview

As mentioned in introduction, the goal of this work is to design a LBSN which can be used, implemented and benefit in higher education. This application can be implemented on different implementation devices such as Smartphone and PC. However in this work we are going to focus on the design of the application for Smartphones, since the main feature is the ability to 'check-in' to different places using location-based services which will be done using GPS to get the geographic information of the user's device.

General model of the system looks like any social network, which allows user to log in to the system using a registered email and a password. The user then creates a profile where s/he can manage personal information, badges, learning groups and get information about other users and contacts. Information like where they have recently checked-in or weather they left a tip or recommendation on an exercise page, group or a location. Users can collect badges by checking-in to different places such as lecture rooms, exercise rooms and seminars, or by attending special events (like conferences). Furthermore the shared information on the network would help users finding their path to different places. It will help them to find working groups and communicate them easily by sending messages in the groups and sharing ideas with their network by uploading photos, videos and files. They can rate different places, lectures and exercises. On the other side, teachers and educators can use shared information on the network for grading purposes and for motivating the students to learn and participate in the lectures and to be present at the campus. The special badges designed specially for educators can also motivate more teachers to attend scientific events and take challenges. The idea is to design features in order to motivate various users of the social network to participate in different activities at the campus and to boost the culture of knowledge sharing in higher educational environment. A general look of the Home page of the application can be seen in Figure 5.3.

As we mentioned in Chapter 4, privacy is one of the most important requirements of a LBSN which should be cover in design of the UI. User is able to change own profile's privacy setting for different actions such as: Who can see profile? Who can see posts and shared documents? Who can see location of the check-ins? Who can see current location? Who can send friend request? Who can see earned badges? And is user wants the other search engines to link to the account. The *Setting* mask of the application linking to the *Privacy Setting* mask can be seen in Figure 5.4.

5.5 User Analysis

Users play the most important role in this project. Without a user analysis we could not come up to practical scenarios for designing the whole system. Their motivations, needs and goals helps us to design a system to fulfill user's demand. Different users tend to achieve a certain goal using a learning application. The users of this LBSN could be students, tutors, teachers and even another stakeholder who might also benefit from the system such as external learners who are not registered in the university but they want to attend one or more lectures at the campus. Different scenarios that are presented in the first section of this chapter discuss how different
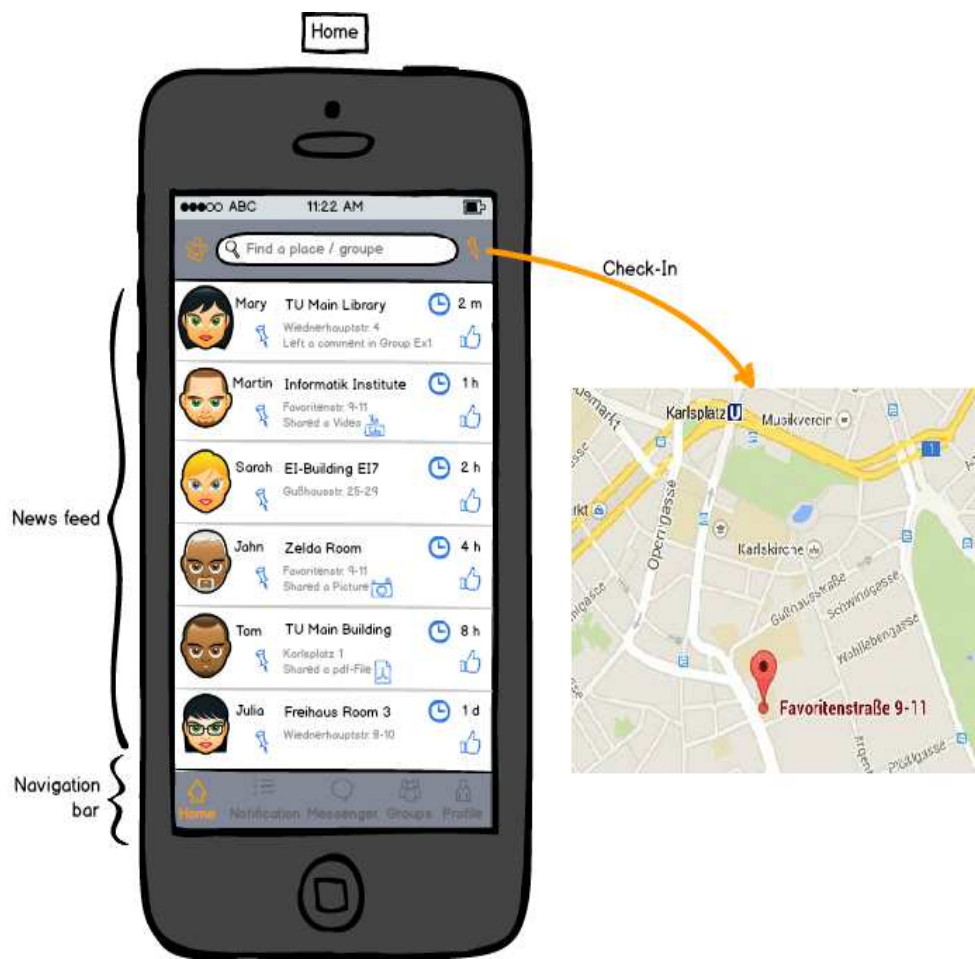
Figure 5.3: The *Home* page of the designed application

type of users can interact with the system and how this application would fulfill their needs.

As it is pointed out in [27], many social networking sites work on a basis of presumed trust, with users' profiles being displayed and available to registered users and guests (meaning non-registered users) by default, even if they do not belong to the same network or do not share the same interests. The social network should give the users the facility to set their own level of disclosure, at a community level, learning groups or to close friends only.

Users can log in to the application by creating a Personal Profile. This profile contains personal information and characteristics of the user such as, name, picture, faculty, field of study, contacts, groups, badges, events, activities and shared media. The Personal Profile can be changed and updated anytime after creating the profile. A general look of a user's *Profile* in this application is presented in Figure 5.5.
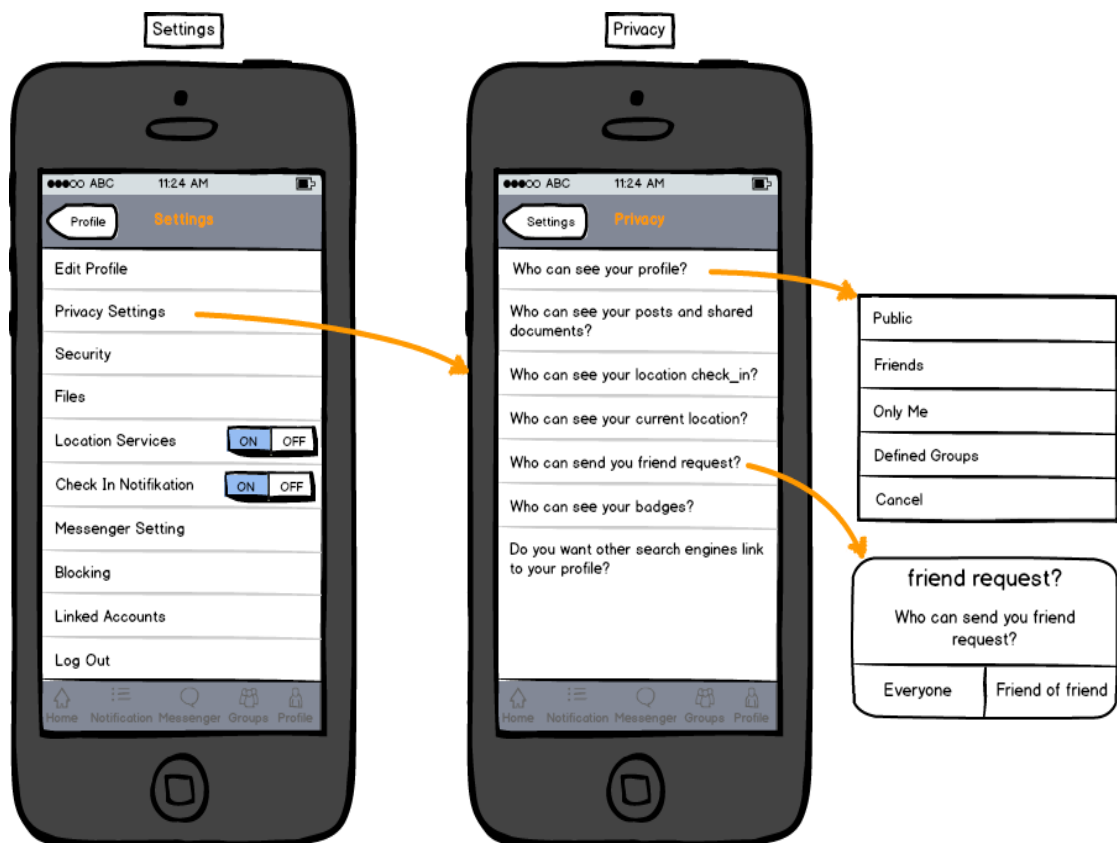
Figure 5.4: The *Setting* mask of the application linking to the *Privacy Setting* mask

5.6   Location Manager

The most important functionality of a location-based Learning system, as [62] mentioned, is to provide the learning contents according to the learner's current location based on their real-time locations while they are on the move. Such systems promote the learning activities by integrating the learning contents with the physical world and selecting only the most relevant information. The learning contents are selected based on the learner's location and 'check-in's. It means the recommendations and tips from other users/learners at the same location will be recommended to the user. The location can be a symbolic location with the postal address (for example in Freihaus building, Internet Room 3, Wiednerhauptstraße 8-10, 1040 Wien). A place page is shown in Figure 5.6.

For designing a LBSN, *Environment* should be considered as an important part. Environment for this application could vary from lecture and exercise rooms to seminars and social media. Users can attend different actives in different environments in order to collaborate and interact with the network.

Figure 5.5: An example of a *Profile* in the application

5.7   Badge Manager

Digital badges come in different shapes and types and are typically a symbol that represents the featured course or goal. Badge images created for uploading to different applications must have pre defined properties. For example badges in application *Passport* [39] would be at least 450px by 450px at 72dpi. It can be defined if uploading a larger or a smaller badge into the system is allowed. It can be that any larger badge uploaded to the application would be cropped and resaved to the pre defined size. There are several badge builder tools to create various types of badges. The badges created then can be exported to different systems.

The creator of the badge adds a *metadata* to each badge which includes the issuer's name, the recipient's e-mail address, a link to the criteria, and a short description of the badge. It may also specify other details, such as the issue date, the expiration date, or a link to the evidence that supports the granting of the badge. The earner pushes the badge into a "backpack," a portfolio-style server account, where this award is stored alongside badges from other grantors. This badge repository might be the Mozilla-hosted *Badge Backpack* [5], or it might be a backpack hosted by any provider using the OBI specifications [42]. The badge manager of our LBSN

Figure 5.6: An example of a *Place* page in the application

will help a user to take an overview of own badges and to manage every single badge simply by defining privacy and ability to add to Mozilla Badge Backpack or another similar backpack.

As we mentioned before, badges will increase the motivation of the users to participate in events and actives. Different scenarios will be discussed based on different types of badges that would be available in the system. We can list the most important types of possible badges in this Social Network as follow:

- Badges to show that the user has shown knowledge.

- Badges to show that the user has shown empathy.

- Badges acknowledged by other students.

- Shared badges.

- Badges to show user's Participation in Events such as talks, lectures, thesis presentation and Conferences.

• Badges that show availability on the campus.

Figure 5.7 displays an example of a user's *Badges* mask. The Badge mask is divided into three parts, *Earned* badges, *Pending* badges and *Possible* badges. In the Earned badges, user can see and manage the badges that are already earned by her/him. In the Pending badges user can check the status of upcoming badges that s/he might earn in the feature. Badges that the user should complete more tasks in addition to what is done already, to be able to earn them. In the Possible badges user can see which badges are generally available in the system and can be earned by her/him. This feature gives a general view and a vision of the learning path to the user. For each badge there exist a setting button which helps the user to manage each single badge separately. User can define which badge can be seen by public, friends or a defined group of people. Furthermore the user can share earned badges to another social networks such as Facebook and Linkedin.

Figure 5.7: An example of a user's *Badges* page in the application

5.8 Design

In this section we will define different groups, badges and places which will be used in this application by users for the purpose of interaction and collaboration with other students and educators. Users can take part in different groups in order to improve the learning process and to earn more points and badges. They can share knowledge, tips and recommendations and get benefit from the information spreading in network. In other words this way a student will get involved more than the traditional methods of learning. The history of the users will be saved and it can be shared on other social networks.

5.8.1 Defining Groups

Users can create or join different groups with regard to their interests or lectures and exercise classes that they are attending. Students can make different learning groups to work on a group exercise or project or just to learn together for the exam. They can meet each other several times during the semester at different places at the campus to work together. Places such as library, internet rooms or any other available place for learning. By checking-in to these places they may get badges and this will have a positive affect on their grades. They can have different settings in the application in the group mask for each group that they are a member of. They can also share their exercise solutions or question as a photo, text or pdf file on the application. And this way for example a student, a tutor or a teacher might review their question and upload an answer. Another useful feature is that the teachers might also check-in to their offices and make it visible for everyone so that when students working in a group come up to a question that they want to ask the teacher as soon as possible, they can check in system if he is present at his office. Also a badge can be achieved by a learning group. Then the badge will be shown in all the user's Badge page. In Figure 5.8 the *Groups* mask of the application is shown.

5.8.2 Defining Places

Different places can be defined in the system in order that users can check-in to. Places can vary from lecture rooms, labs, libraries, seminar and internet rooms to conference places, institutes, restaurants and buildings. When user searches for a place in the application and can not find it, it is possible to add a new place to the system. Any user is allowed to add and define a new place to the system, with entering some basic information about the place including the postal address. If a place with the same name of an existing place is adding to the system, system should alert the user that a place with similar name already exist. They the address should be checked to avoid duplications in data base.

Users can leave comments on a place's page or share files. It can be defined in the system that a user with the most number of check-ins at a place becomes the 'Mayor'. This concept can be used in learning environment. It can be defined by teachers that a student with the most check-ins to a lecture room becomes the 'Mentor' who can help other students in learning and earn a digital badge for this achievement and at the end a better grade.
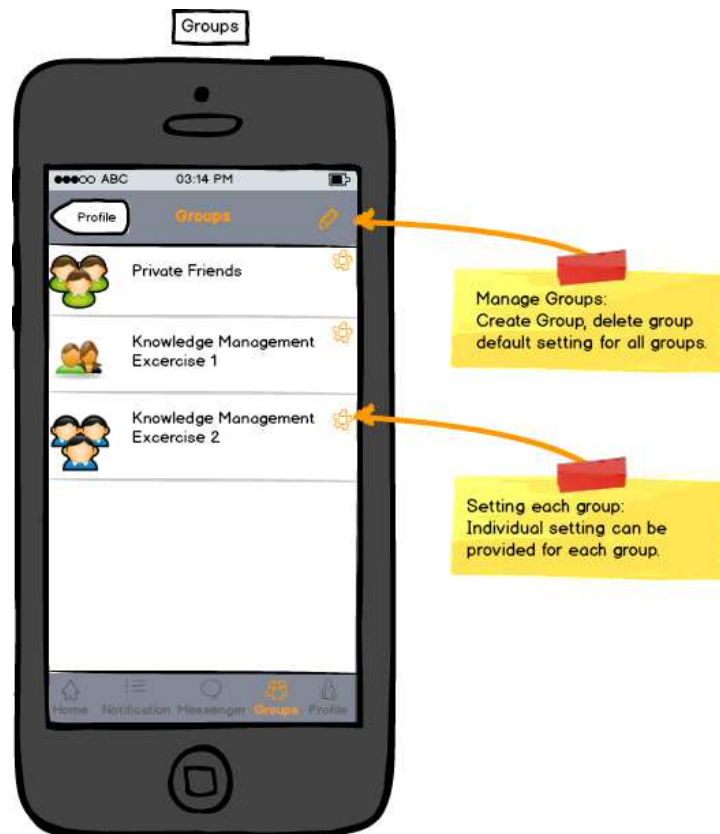
Figure 5.8: *Groups* mask of the application

By checking-in to a place, a user can get tips and recommendations on the application that other users already left about a place or an event accruing there. User can search for the nearby places on the application connecting to a map. Besides, it can be visible who has already checked-in to nearby places. This feature would be helpful to find the location of friends, colleagues or teachers. User can search for nearby places, restaurants, libraries, institutes, lecture, seminar, labs and internet rooms. *Nearby places* page of the application is shown in Figure 5.9.

For each defined place in the application, it is possible to view its location on the map to see the direction and to find the path to that place. Users can also leave a recommendation leading to find the easiest path to a spot, for example a lecture room.

5.8.3 Defining Badges

There are badge builder tools which will guide the user step-by-step through creating a badge image. These badges may be used in different social networks. Badges can be defined for big or small achievements. Mini badges can represent small efforts, where earning an amount of them can lead to earning a bigger badge. Badge designers and creators should be careful about choos-

Figure 5.9: *Nearby places* page in the application

ing an appropriate image for each badge, since this image is symbolising a skill, achievement or competence. It should be simple and relevant.

Badges may be earned by users for different reasons such as, doing couple of check-ins at a place, completing exercise, taking quiz and exam, leaving comments, giving feed back, availability at different places in the campus and many other things. Different type of badges will be designed for different type of users. For examples professors and students both can give feed back to each other and to another students and get two different kind of badges. Earning badges is not only for grading purposes, but also to lead the student to a better learning path. For this reason badges should be designed in a way to increase user's interest in being involve and to enlarge their participation in different learning activities and events.

As we mentioned before, there are practical scenarios that users can earn digital badges by 'check-In' to a location at learning environments. There are plenty of scenarios that they can be discussed using this application to earn digital badges for learning purposes. Specially in the

exercise parts of the lectures a student can earn badges by for example uploading exercises on time, taking quizzes, taking part in discussions, sharing knowledge, communicating with other students, tutors and teachers, finishing projects and sharing their activities on another social networks such as Facebook and Linkedin.

Digital badges that can be earned in scenarios described in Chapter 4 are listed as follows:

- Participation Badge: Can be earned after a number (a variable which can be defined by teachers) of check-ins to the lecture class.

- Lecture Terminator Badge: It can be defined that after check-in at the last lecture of a course, student earn this badge.

- Attendance Badge: If the user is a professor, teacher or tutor, s/he may get this badge for participating in lectures.

- Punctual Badge: It can be defined in the system that teachers after ten times (a variable which can be set up for different lectures or exercise classes) of check-in at the exact beginning time of a lecture earn this badge.

- Assistance Badge: Tutors earn this badge after presenting a defined number of exercise classes or after a number of participation at a lecture in order to assist teachers.

- Explorer Badge: It can be defined that after adding a number of places, user earns this badge for exploring new places.

- Kick-off Badge: Students earn this badge by attending the first presentation (check-in to the location of the presentation) of the project course.

- Tutor Kick-off Badge: Also tutors earn a badge for starting a new project group.

- Collaboration Badge: After a number of group meetings, only when all the members attended all the meeting appointments, they would get this badge as a reward for working in group.

- Mini Badge: After each meeting with the tutor, students and the tutor earn a mini badge.

- End Project Badge: On the last meeting with the tutor and professor the working group will present their work and they will be rewarded with a badge for completing the project.

- Project Badge: Also tutors will be awarded with another kind of badge for completing their work on the project.

- Presenter Badge: The person who presents the end presentation will earn a badge as a reward for this soft skill.

- Documenter Badge: The person who documents every time after a meeting the protocol and decisions made will get a badge for that.

- Designer Badge: The person who designs the user interface or the prototype will earn a badge for this skill.

- Organizer Badge: The person who is organizing all the meetings, event and shared documents will earn this badge.

- Developer Badge: The person who is doing the programming part of the project will get a developer badge for that.

- DBA Badge: This badge will be earned by a person who is modelling and implementing the database for the project.

- Group builder Badge: The tutor will earn this badge after creating the working group and assigning the roles to the group members.

- Commenting Badge: The user will get a badge after leaving a number of comments on places pages.

- Availability Badge: A student would earn a badge after a number of check-ins to different locations at the campus for being available at the university.

- Library Badge: A student may get a badge for checking-in many times in a row at a learning place such as Library. This badge can be designed for various places at the campus such as internet rooms, seminar rooms, institutes, buildings, lecture rooms and labs.

- Social Badge: Users will get this badge for sharing their locations or earned badges on social networks.

- Feedback Badge: Teachers or tutors will earn this badge after leaving comments or feedback on students questions or files.

- Student Feedback Badge: Students can give feedback to educators and other students and earn a badge after giving a number of feedbacks.

- Seminar Badge: Students earn this badge after attending a number of seminars.

- Seminar Presenter Badge: It can be defined that teachers earn this badge after presenting a defined number of seminars.

- Seminar Guest Badge: International students may earn this badge for attending a talk, seminar or presentation as a guest.

- Epilog Badge: Students who attend the Epilog event for presenting their thesis poster earn this badge.

- Mini Prolog Badge: For Prolog, students are supposed to take place at a number of presentations of different lectures. Their attendance can be rewarded by this mini badge.

- Prolog Badge: After attending a number of seminars, students will be rewarded with this badge.

- STEG Badge: Each student after attending the STEG event will earn this badge.

In the next chapter a prototype will be implemented in detail for the second scenario mentioned in Chapter 4, *Working Groups*. It will be discussed how this application will be used by different users while working on a project in a group.

CHAPTER 6

User Interface Prototype

"Some people think design means how it looks. But of course, if you dig deeper, it's really how it works.", Steve Jobs

In this chapter we will present our designed prototype for the second scenario, 'Working Group', that we explained in the previous chapter. We will discuss the activities that can be done using this application for performing a group project. In this case we will design our example for an exercise working group which is working on an advanced software engineering project. The screen shots of the application pages, presenting the features which are useful for this scenario, will be shown in detail in this chapter.

6.1 Prototyping Tool

In order to find an efficient tool for application design and prototyping many tools and softwares has been reviewed and analysed. A list of tools with a small description is shown in Table 6.1.

6.1.1 Balsamiq Mockups

Afterwards it was determined that a tool named *Balsamiq Mockups* [32] fulfills our needs and can be used for implementing our application design. Balsamiq Mockups is an adequate tool which is easy to use, interact and share the result. The output can be exported as .PNG images as well as .PDF files. In the .PDF file the links between different masks can be shown very divinely with jumping from one page to another by clicking in the exact Icon in the application. It can simulate precisely the masks of an application and can be designed for iOS such as iPhone and iPad. This tool can be used for collaboration between designer, developer and Project manager.

Table 6.1: Prototyping tools comparision

Program	Description	Fees	Advantage	Disadvantage
Balsamiq Mockups	Offers a standard collection of interactive screen elements. Design for browser, iPhone, iPad. Either directly in the browser or desktop program.	USD 79, free demo available	Intuitive user-interface. Widespread (helps in working with external concept developers and team members). Export to PDF or JPEG.	
Proto.io	Design for iPhone, iPad, Android-Smartphones, Tablets, Windows 8. Runs directly in the web browser.	Free plan available which is good for one small (five screen) project. Paid subscriptions for USD 24 and USD 49 per month.	Mockups can be viewed directly on mobile device.	
Lumzy	Flash-based Mockup creation and prototyping tool. Supports chatting environment.	FREE!	Real-time editing and collaboration. Export to PDF or JPEG.	No desktop or offline versions.
Mockup Builder	Prototyping solution for designing software or websites.	Depending on the version,,between 7, 14, 27 and USD 99 per month.	Supporting desktop, browser, iOS and Android components. Export to PDF or JPEG.	Microsoft Silverlight based. Takes time to load. No desktop or offline versions.
Microsoft Sketchflow	Part of Blend for Visual Studio 2013. Two types: client-based App. and Silverlight in browser.	60 Days free Trial.	The test runs in the SketchFlow Player in the browser.	Only runs on Windows, based on the Silverlight plug-in.

6.2 Application Design for scenario 'Working Group'

In this section a prototype of the designed application will be implemented for the second scenario, *Working Group*, which was mentioned in the previous chapter. This scenario is about a couple of students who are attending a higher education course at Informatics Institute, which for the completion of the course requires implementing a project. All the stakeholder of this course

are using the designed location-based social network for learning purposes. A description about the sample project group would be as follows:

- Stakeholder: Professor (John), Tutor (Martin), Students (Mary, Sarah, Sam, Tom, Julia).

- Project: Designing and implementing a City Guide Website.

- Duration: Three month.

- Number of meetings with Tutor: Four.

- End presentation: the last meeting with Tutor including the Professor.

- Number of group meetings without the Tutor: Two meetings before each meeting with Tutor.

The course begins with a first presentation, 'Kick-Off Meeting', from the Professor and tutors who will explain the project to the students. Students who are attending the Kick-off meeting will earn a *Kick-off Badge*. This Badge will appear in person's Badge page on the application and can be shared to other social networks. Then the Tutor creates working groups of five people to implement one project together. Different meetings with the Tutor will be scheduled during working on the project. The Timeline of the project is shown in Figure 6.1.
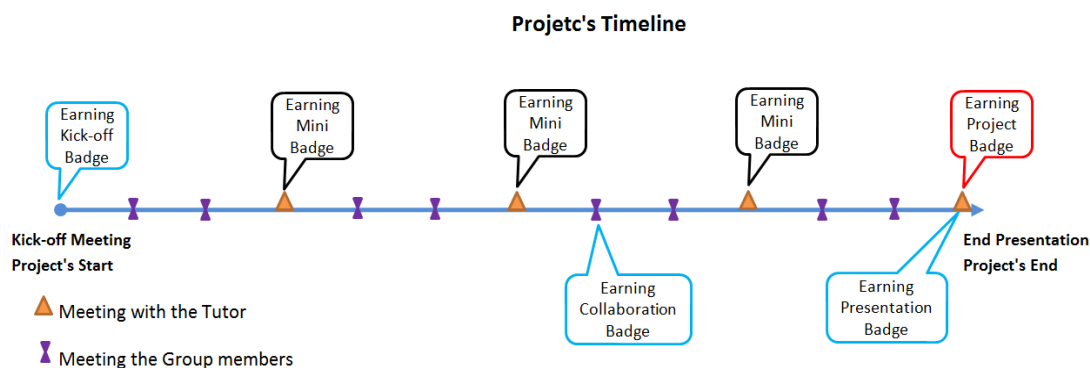
Figure 6.1: Timeline of the Project including number of meetings

In this first meeting the working groups will be created officially. Each Tutor is responsible for one or more working groups. Tutor will create the *Group* page on the application in the first presentation with providing a Group name, a description about the project and changing the *Privacy* setting of the Group from *Public* to *Defined people*. Here the Tutor can chose which users can have access to this page and are allowed to view all the posts.

In the Group page of the application all the activities of the Group during the Project will be shown. In addition, a view of the group members, uploaded files, events and earned badges is available on the Group page. In the next sections some activities that can be done by the Group members will be shown on the application.

6.3 Creating Group

In general, any user of the application can create a Group and add different users as members. In our case, the Tutor is responsible for creating Working Groups, assigning a project to each group and adding students as members. As it is shown in Figure 6.2 when Tutor is logged in to the application, by going to his own Group page he can create a new Group. By clicking on *Create a new group*, he will be linked to another mask to give a name to the Group and set the privacy. Here it can be specified if this group can be seen by *Public* or by a *Defined Group of People*. In this case it is Professor, Tutor and the students who are member of this group. The Tutor then adds the group members, which are the students, to the group. Students get an invitation on their application to join the group. By accepting the invitation they have access to the group page. All the group members can edit the *Group Settings* , write *Posts*, upload and share *Media* and create *Events* which will be visible for all the group members. The Tutor earns a *Group builder Badge* after creating a working group.

Figure 6.2: Visiting the *Group* mask, a user can create a new Group

The Group page has links to masks such as: *Add Member*, *Group Files*, *Group Badges* and

Group Events. Each student by accepting the group on the application, accepts to be a member of the project group. The masks for creating Group are shown in Figure 6.3.

Figure 6.3: Create a new *Group* masks

6.4   Add Members

The user who creates the Group can add members to the Group. In our case it is the Tutor who would add students to the working group. He can search by name and find the users on the application and add them to the group. Students will get a notification on their application that somebody has invited them to join a group. They may accept or decline. See Figure 6.4. For this project five students will be add to the group. Students in Kick-off meeting can propose to the Tutor which roles they want to have in the project. Depending on the skills that they already have, they can choose to have these roles: designer, programme or developer, data base administrator, documenter, organiser or presenter. Then the tutors assigns different roles to the students in order that later they earn relevant digital badge for their roles. A student may have more than one role in a project.

Figure 6.4: Students get *Notification* when tutor invites them to join a group

6.5 Group Setting

After creating a Group, the creator and the members can change the settings for the Group. Privacy and settings for shared Files, Badges and Events can be customized. There it is also possible for a member to leave the group any time desired. The *Group Setting* page is shown in Figure 6.5. Imagine that a member wants to drop the course, so it should be possible to leave the group as well.

6.6 Earning Badges

During taking part in a working group there are many possibilities for the students and tutors to earn badges. We already brought up some situations that the student would earn a badge. It is also possible for the Tutor and Professor to earn badges concerning the group project. In addition, each student according to the role that s/he has in the project might earn some soft skill badges. These kinds of badges are very important for evaluating skills that are normally not evaluated. This way the achieved skills will appear on User's profile for future needs. During the project work some of the badges will be earned after completing mandatory tasks, however

Figure 6.5: The mask of *Group Setting*

there are other badges which are optional and can be earned by completing optional tasks or soft skills. Some situations for earning badges, while working in a group, can be listed as follows:

6.6.1 Mandatory Badges

These badges will be achieved during the project work after completing essential tasks. In order to finish the project successfully, students should earn these badges.

- Kick-off Badge: Students earn this badge by attending the first presentation (check-in to the location of the presentation) of the project course.

- Tutor Kick-off Badge: Also tutors earn a badge for starting a new project group by checking-in to the first presentation.

- Collaboration Badge: After five group meetings, only when all the members attended all the five meetings, they would get this badge as a reward for working in group, since this shows collaboration which is a soft skill and can be valuated. If one or more members were missing at a meeting, this badge will be postponed to the next group meeting.

- Mini Badge: After each meeting with the tutor, students and the Tutor earn a mini badge.

- End Project Badge: On the last meeting with the Tutor and Professor the working group will present their work and they will be rewarded with a badge for completing the project.

- Project Badge: Also Tutors will be awarded with another kind of badge for completing their work on the project.

6.6.2 Role dependent Badges

In a working group different roles are assigned to the members. Each person according to her/his role will earn some defined badges. These badges are also essential for finalizing the project but not all the members should earn all of them. As we mentioned in the beginning of the chapter, we have different roles in a Project's Group: Professor , Tutor , Students and their roles: Designer , Designer and Organizer , Programmer , Database Admin , Documenter. The tutor, while creating the group, will assign the roles immediately to the students in the system and they will earn the associated badge for their roles.

- Presenter Badge: The person who presents the end presentation will earn a badge as a reward for this soft skill.

- Documenter Badge: The person who documents every time after a meeting the protocol and decisions made will get a badge for that.

- Designer Badge: The person who designs the user interface or the prototype will earn a badge for this skill.

- Organizer Badge: The person who is organizing all the meetings, event and shared documents will earn this badge.

- Developer Badge: The person who is doing the programming part of the project will get a developer badge for that.

- DBA Badge: This badge will be earned by a person who is modelling and implementing the database for the project.

- Group builder Badge: The Tutor will earn this badge after creating the working group and assigning the roles to the group members.

6.6.3 Optional Badges

These are alternative badges which will be achieved during the project work after attaining optional tasks or soft skills. Earning these badges will have a positive effect on final grades.

- Commenting Badge: The user will get a badge after leaving a number of comments on places pages.

- Availability Badge: A student would earn a badge after a number of check-ins to different locations at the campus for being available at the university.

- Library Badge: A student may get a badge for checking-in many times in a row at a learning place such as Library. Earning this badge is shown in Figure 6.6.

- Social Badge: Users will get this badge for sharing their locations or earned badges on social networks.

- Feedback Badge: The Professor or the Tutor will earn this badge after leaving comments or feedback on students questions or files.

- Student Feedback Badge: Students can give feedback to educators and other students and earn a badge after giving a number of feedbacks.

- Explorer Badge: It can be defined that after adding a number of places, user earns this badge for exploring new places.

Figure 6.6: Earning *Library Badge* for a number of check-in at the library

Figure 6.7 pictures an overview of the digital badges to earn while working in a group, in a hierarchy form.
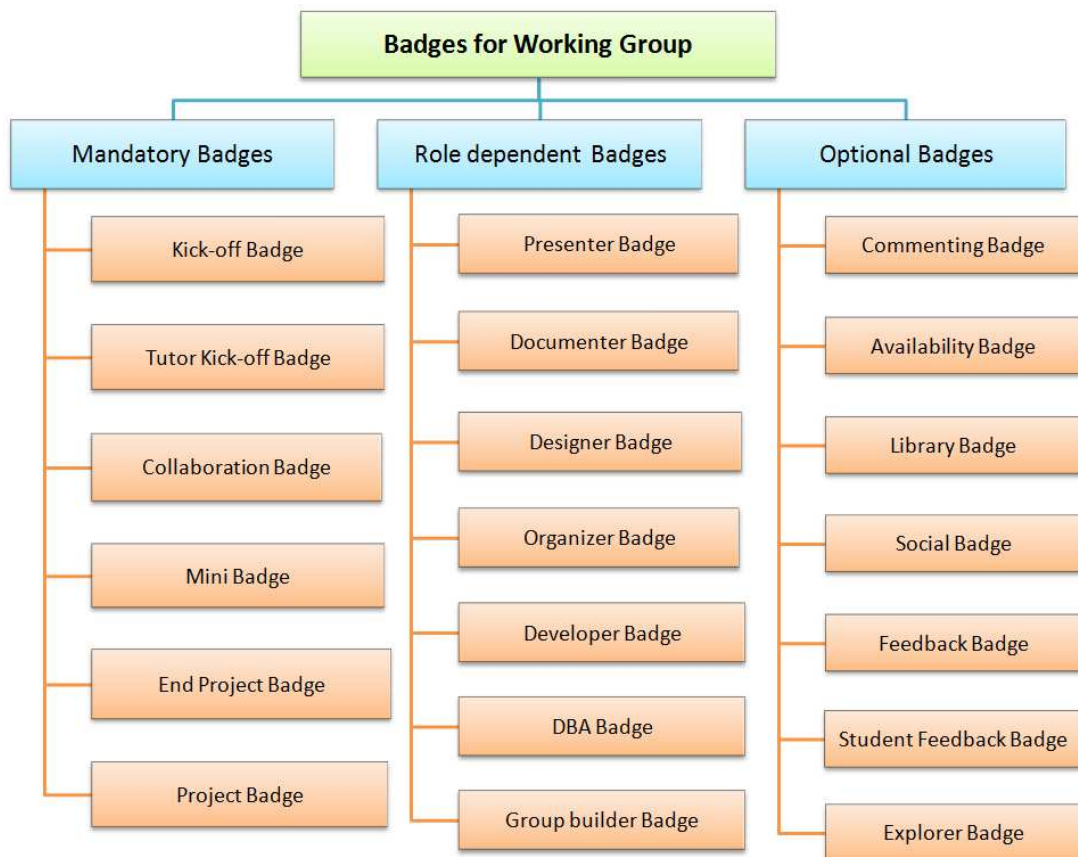
Figure 6.7: Possible badges to earn while working in a group

6.7 Upload files and share Media

During the project students can post and share their files such as photos or .pdf to the Group page. This way they can present their actual work to the whole group and all the members can give feedback and leave comments. Professors and tutor may also leave feedback on students' posts or shared files. It can be defined that a professor or tutor earn a *Feedback Badge* after giving five (this is a variable which can be defined for each course) feedbacks to the students. Also students may give feedback to other students and also to professors and tutors. They may also earn a *Student Feedback Badge*, designed for students, after five times of giving feedback. They can also share a video or the link to a social network so that everybody have fast access to the useful information. In the mask of *Group Files* in the application all the media uploaded through the group members can be viewed, including the uploading date. This mask can be seen in Figure 6.8.

Students share their questions on the application when they are meeting group members for working on the project. Professor and tutor may follow their progress and leave a comment as a

solution or feedback. Then they may see in their pending badges that after another four times of leaving comment they will earn a Feedback Badge.
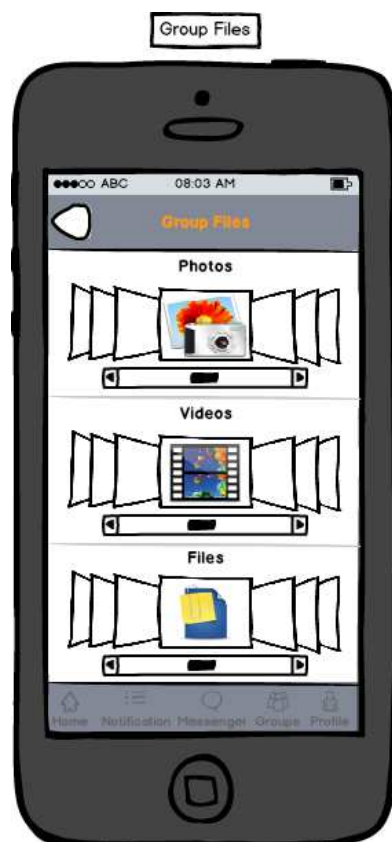
Figure 6.8: In the mask of *GroupFiles* all the media and files of the group can be viewed

6.8   Sending Messages

Users can send messages using the application. In our case the Group members can easily send message to one person or to the whole group. They can also attach files to their messages. Users can search by name to find another user to send message to. The Messenger page of the application is shown in Figure 6.9.

Students can also send messages to the tutor to ask him some questions that they need to get the answer fast. Sending email might take more time for the tutor to answer, but when he gets the message on his phone, where ever he is, he can answer students fast and easily. Messages are also an easy and fast tool for the students to communicate to each other. For example a group member is present at the campus and sends message to all the group members to ask who is also

at the campus. In addition, students may also follow the check-ins of other students to find out their current location.
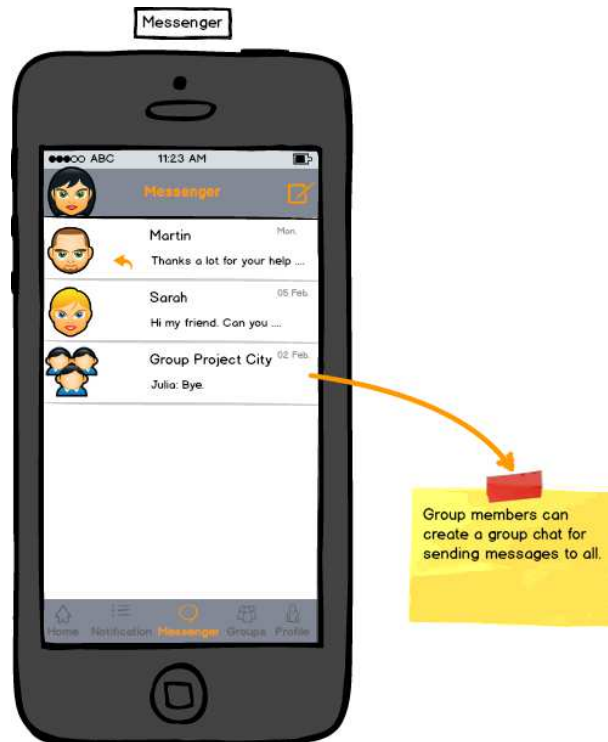
Figure 6.9: The *Messenger* page of the application

6.9 Creating Events

Group members can create *Events* in future to attend. For example any meeting with Tutor or just a meeting between students can be added to the Group Events as a new event. The creator of the event can add a name, description, privacy of the event, location, date and time to the event's page. The mask of *Group Events* is shown in Figure 6.10. Students create events for group meetings in order to work on the project. After first meeting with the group members, students can see on their pending badges that the Collaboration Badge is pending. Later they earn a Collaboration Badge after five times attending group meetings. Sometimes a student can not attend a meeting. With the check-ins that they make at a place of the meeting, they can show their participation. Professor or tutor can track students working activities by viewing these check-ins.

Tutor is responsible for creating an event for each meeting with group members. He can send invitation to the students to attend the meeting. If students are not able to attend the meeting on the mentioned date, they may propose another date for the meeting. Students receive invitation on their application to join the event. After attending the event (by checking-in to the event's

place) students and tutor earn a Mini Badge.

Figure 6.10: The *Group Events* mask is visible to all the *Group Members*

For adding a *Location*, user can search for a place to add as the event's location to the event. An example for this scenario is shown in Figure 6.11. As we mentioned before, there are places which are already defined into the system, however new places may be added to the system by users. Imagine that tutor wants to add a place to an event which is created for the group meeting. He searches in the system, if the place already exist on the application, he adds it to the event, if not he should add the place to the system in order to add the location to the event's page. This way students will easily find the meeting room.

6.10 'Check-In' Process

Any time that group members are meeting up together for working on the project, they can 'check-in' to the meeting's location. They might also add a comment to the 'check-in' as a short description of what they want to do today. Comments like 'working on the design part' or 'Brain storming', etc. This way they can document their meetings including the information about the
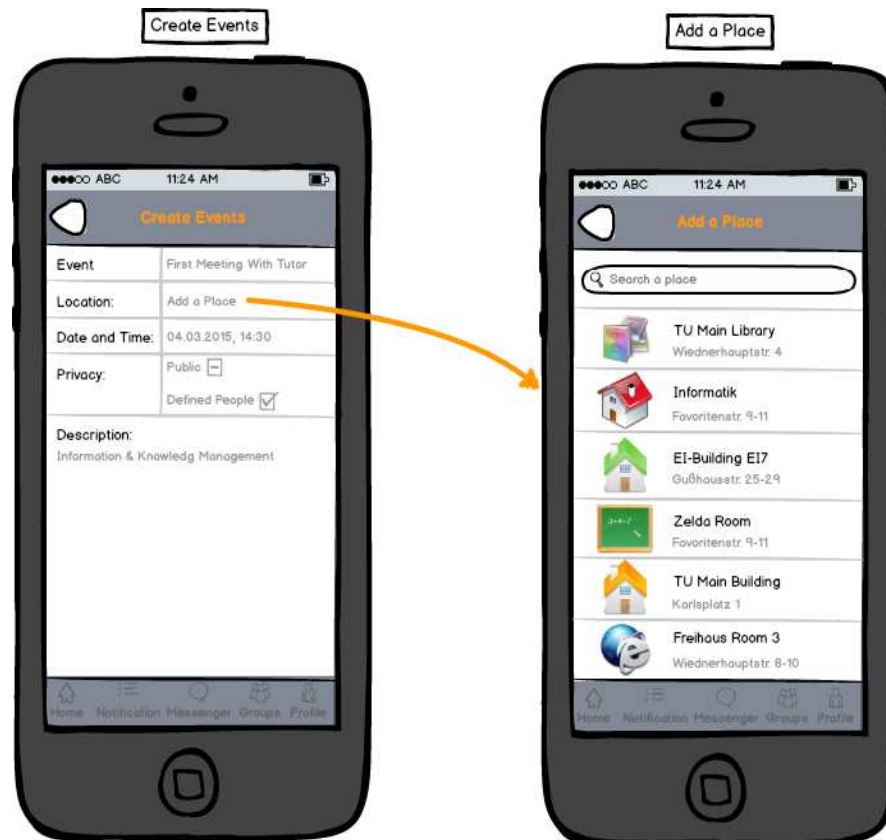
Figure 6.11: Users can add a place to their *Events* while creating the event

place, date and time. Also the Tutor can get this information and have an insight to their group work. As it is mentioned, it can be determined that all the group members after five times of 'check-in' to a place for working on the project earn a *Collaboration Badge*, but they only earn it if all the members attend all five meetings. This Badge appears on the Group's Badge mask, and also on User's Badge page. See Figure 6.12. Maybe a student does not want to show this badge to public for personal reasons, but another student wants to show the badge public also to share it on social networks. For this reason it is possible for each user to manage each earned badge individually.

Check-in is a feature that is used all the time by almost all the activities which are possible on this application. Students check-in to different places in order to earn digital badges, to show their participation and many other reasons. Students of the working group can apply time management for their project also using their check-in information. They can save how much time they spent on each meeting to estimate how many other meetings they need to complete the project. They check-in at the beginning of the meeting and simulate check-out by check-in to another place to show the end of the meeting. Furthermore, it gives the professor an insight to

Figure 6.12: Earning *Collaboration Badge*, after 5 times check-in for group work

the project working time, which can be used in the future.

Group members may also earn a badge for example by checking-in ten times in a row at the main library or internet rooms. Another possibility to earn badges by 'check-in', is to check-in to different places at the campus anytime being available there. This way after a number of check-ins the user earns a badge for being present at the campus. This badge is shown in Figure 6.13. This way the group members can share their locations to the network and they might find each other at nearby places in order to discuss the project issues, apart from official Group meetings. While checking-in to a place, the user can add another users to her/his check-in or share own location immediately on another social network like Facebook.

At the end of the project tutor creates an event for the end presentation. Professor and students are invited to this event. By checking-in to this event students earn the End Project Badge and tutor earns Project Badge.

Figure 6.13: Earning *Available at Campus Badge*, after a number of check-ins at campus

6.11 Leaving Comments

Users in general can leave comments on places and share information about the place to the network. They can determine if this comment can be viewed by public or by defined group of people. People working on projects in different groups might benefit from this feature. They can read the previous tips and comments about a location and see if it is appropriate for group meeting. For example, they can find out if a room is a silent room or is it possible to talk to each other in that room. Students can also find information about the best way to get to a specific location, for example by walk, by using stairs or lift. Furthermore they may get information about the Wifi availability at different places. The information shared as comments will not be limited to these examples. There are plenty of useful information which can be shared as comments and used by the users. It can be defined that after ten times (a variable which can be defined in the system) of leaving comments on a status, place or uploaded file the user earns a digital badge. In Figure 6.14 an example of leaving a comment on a place's page on the application is shown. In this example the student earns a badge after leaving the comment.

Figure 6.14: Earning *Comment Badge*, after leaving a comment on a place

Students get so much benefit from reading comments and tips. A student can give tips to other student of the group to help her/him with solving a problem. They can give comments about their ideas about different parts of the work which is done by others. Also tutor and professor can leave comments for students in order to help them with decisions and problem solving. For example a group member, Mary, has a problem with a part of the project. She can share the problem on the group page and other members, tutor or professor can answer to her by leaving comments on her question.

6.12 Availability Check

As it was mentioned before, students can check-in to different places at the campus. By searching in the application, group members can see who is already available at the campus. They can even look up in the application if a tutor or professor is available at her/his office. However a user can chose the privacy setting for own check-ins. It means if for example a professor does not want to share his location, it is possible to keep the check-in private.

Let us imagine that a student from our working group, Sam, is at the university. He wants to work on his part of the project but a problem shows up. He needs the help of other group members. He can check on the application who has checked-in to any nearby places at the campus. He finds out that Sarah already checked-in to the library and wrote that she is learning for an exam. He thinks she might have some minutes to help him with the problem. He send her a message on the application and asks her if it is possible for her to meet up for some minutes. Sarah gets the message and replies that they may meet at the library. They meet up five minutes later at the library and check-in there. They add this comment to the group page so that other members also know that they are working on the project now. All these small activities can be saved on the application for further evaluation.

It might be that none of the students of the group are available at the campus, but the tutor. Sam can send the same message to tutor and ask him for a short meeting. If he has time, they meet up at a place to solve the problem together.

6.13   Path Finding

The action of path finding is not only possible by connecting to a map, but also by reading the tips that other users already left on the location's mask. People can share their ideas of the best way to get to a place. They can share on the place's page if for instance the lift is not working or if there exist backstairs as a shortcut to reach a place.

For example a student of the group work, Tom, wants to go to a meeting that they have with the tutor. The meeting is taking place in a room which he does not know how to get there. He searches the place on the application and fortunately he finds it there. He reads the comments of other users on the place page. They wrote that it is easier to take the backstairs instead of the lift since the room is far away from the lift. Using this information, Tom finds his way to the room easier.

6.14   Manage Working Groups

A student may participate in several working groups related to different exercises and courses. In the Group page of the application s/he can easily manage each group individually. The activities of each group can be set to be visible to a defined people like group members and the related professor. A user can decide to leave any group anytime desired.

Students, tutor and professor can use the application for many activities for the reason of communication, interaction and cooperation. At the end of the project students may give feedback also to each other on the group page. Professor can use these feedbacks for evaluation purposes. All of the activities of the group members will be considered by the professor for grading and other evaluations. Students can manage earned digital badges to show gained skills and achievements to their network. Tutor and professor are also able to show their badges to

their network and to share them on other social networks. Several efforts and skills will be recognized by digital badges which may improve user's motivation for future group works.

Evaluation Methods and Future Work

"With the new day comes new strength and new thoughts.", Eleanor Roosevelt

In chapter 1 it is argued, despite the fact that most of online social networks that currently exist have not been designed for educational purposes, yet they have certain features that may prove to be very interesting and important when applied in an educational context. Therefore several studies proposed hypotheses and discussed that using a location-based social network could have several advantages in learning system by enhancing interaction and information sharing among users. In this work scenarios are presented and user interface for the application is designed to analyze how these advantages are covered in such a system. As evaluation of this work, it will be examined how discussed hypotheses are now proved by using the proposed LBSN:

1. Creating an atmosphere of cooperation, collaboration and easy interaction among users is possible by connecting users through social impact of LBSNs such as adding friends, sending messages, giving feedback and creating groups. Using the visions of Web 2.0, users can easily interact with other users. As it is discussed in scenarios, users communicate by sending messages, writing comments or sharing files. Usage of LBSNs and digital badges motivates students for collaboration with other learners and educators using digital badges as reward for group work, meetings, discussion in lectures, giving and receiving feedback. Furthermore, it helps students to find other students, group members, tutors or teachers who are available at the campus. This is done through check-ins that users make all the time on the application and it is shown on the news feed of users.

2. To enhance information and knowledge sharing between users through sharing questions and solutions, broadcasting users location and leaving tips and recommendations on users posts. It is possible also by motivating users to get digital badges as rewards for sharing information. Moreover providing digital badges which are designed for teachers and tutors would motivate them as well. Badges like feedback Badge, which educators earn after giving a number of feedbacks, or Final Project Badge, which can be earned by tutors.

3. To encourage users active participation by improving their motivation through earning digital badges after checking-in to different lectures, exercise rooms and various events. An example would be Participation Badge. Furthermore, teachers can track students participation for further evaluation.

4. Usage of LBSNs assists controlling effort required for projects and exercises by using extracted information for time management. This is done through creating group meetings on system and tracking check-ins and check-outs of group members. This way it can be measured how much time users spent on a specific project.

5. Digital badges and LBSNs help to recognize, evaluate and acknowledge skills, achievements and small efforts by providing digital badges for soft skills such as teamwork, presenting, programming, exploring, leading a group and checking-in to different learning rooms. Furthermore, they support educators to follow student's progress by connecting badges with course objectives and applying soft skills and achievements (like Student Feedback Badge, Presenter Badge, Availability Badge or Mini Badge) as positive influence on students grades. Sharing earned achievements on other social networks is possible through sharing earned badges on other social networks and Mozilla backpack. Comparing own badges with other users encourage students to take more challenges.

6. Information provided in LBSNs together with digital badges present a flexible learning path to students through visibility of possible badges which can be earned during a lecture, exercise class or badges which can be achieved for showing soft skills. Pending badges and Possible badges in the application leads students to a flexible learning path.

7. With the location-based aspect the gap between real and virtual world is becoming smaller. An example would be finding the path to learning areas, rooms and buildings by using not only the map on the App. but also recommendations and tips that other users already shared on the place's page. Moreover, searching nearby places of interest or a specific kind of place such as libraries, institutes or restaurants is possible. Creating events and adding location to the events page is another example of benefiting from the location-based aspect of a LBSN.

7.1 Evaluation Methods

Recently the majority of people own a laptop, smartphone or a tablet. Therefore developers are proposing new ways of adopting mobile technologies to support learning. This makes the evaluation of this work possible by implementing the proposed prototyped as a web based and mobile application (software project). After implementing such an application software testing and usability evaluation would be conducted to validate the prototype. The application would be developed to be used by the students of a lecture or other course in different semesters.

It is considered, for the purpose of evaluation, to use the application consecutively in a lecture or exercise class at Vienna University of Technology. It can be granted as a mandatory

exercise part of the course to make the evaluation possible. Comparing the grades, motivation and shared knowledge of the students and educators using this application, to the students of previous semesters of the same course using traditional methods of learning, would be the evaluation of this work. The number of the students participating would be the number of the students registered in a semester to the lecture. This could vary between fifty to hundred students.

For the evaluation of the proposed application, it is suggested to use mixed methods such as:

- User interview,

- Questionnaire,

- Comparison of grades with previous semesters,

- Comparison of shared knowledge with previous semesters.

Interview and questionnaire would be used in order to gather feedback and comments of the users. In Table 7.1 sample questions are presented, which can be used in the questionnaire. The questionnaire can be handed out, at the end of the semester, to students and educators.

7.2 Future Work

Future work could be the development of a location-based social network application which works under multiple platforms according to the design specification. The proposed data model in chapter 5 can be used as a resource for defining entities and their properties. This application can be implemented and be used for different higher educational courses at the university. There might be also extensions of features and services provided by the application. As we mentioned before, existing location-based networks have problems with accuracy of finding location of the user for 'check-in', and they are based on the basis of *trust*. Convenient solutions might be helpful for increasing reliability and accuracy of the application with regard to location services and 'check-in'.

Moreover a part of future work could be to design a link between this application and the web portal of the university. In our case it would be a link between the LBSN application and TISS [48]. This will make it possible for example to import TU Calendar to the application or perhaps to find out which students are registered to a lecture which is using the application for exercises or group works. It can be analysed how these two systems could be connected and how a secure data transfer can be managed. Furthermore, the application might also be linked to TUWEL [11] for grading purposes. The points and badges earned in the App. would be imported to TUWEL and together with the exercise notes would lead to a better evaluation of the students activities and participation during the semester.

Table 7.1: Sample questions for evaluation

	Question	Yes	No	Others
1	After using the LBSN App. in the course, are you more motivated for learning?			
2	Did you use the proposed LBSN App. frequently to check-in at the university?			
3	Do you like to use the App. in other courses?			
4	Do you think you could give and receive feedback easier using the App.?			
5	Did you find a learning path?			
6	Do you think, using the App., arranging meetings for group work was easier?			
7	Do you find privacy concerns has been covered in the privacy settings of the Application?			
8	Using the App., did you have a faster and better access to the information needed for exercises or group works?			
9	Did using digital badges as reward in the App. raise your motivation for presence in the lecture?			
10	Did using digital badges as reward in the App. raise your motivation for participation in discussion?			
11	Did using digital badges as reward in the App. raise your motivation for presence at the campus?			
12	Did using digital badges as reward in the App. raise your motivation for sharing knowledge?			
12	Did using digital badges as reward in the App. raise your motivation for giving feedback?			
13	Did you find recommendations on the App. useful?			
14	Did you find the App. useful for finding places at the campus?			
15	Did other student's badges status and points affect your motivation for learning?			
16	Do you find the App. helpful for evaluating soft skills?			
17	Did you share your earned badges on another social networks?			
18	Did you send your earned badges to your back pack?			

CHAPTER 8

Conclusion

"Writing means sharing. It's part of the human condition to want to share things - thoughts, ideas, opinions.", Paulo Coelho

This chapter concludes the thesis with providing a summary of the presented approach, methods and solution that have been discussed. Then writer's personal opinion about the work is presented, following by discussing a statement about the limitations of the work. Afterward a comment is given about the future work and implications of the work for future research based on what have already been discussed.

8.1 Summary

This thesis starts with an introduction to *Location-based Social Networks*, their nature, features and use in different fields following by presenting motivation for the use of LBSNs in higher education. It is discussed how students and educators can benefit from such a system and how it can increase their motivation and participation at different lectures, exercises, working groups and another places or events at the university. The chapter is followed by the state of the art, which reviews the most important existing approaches in the field of using Online Social Networks and Location-Based Services in learning environments. Afterwards, a review on Location-based social networks is given, considering the already existing features which would be helpful to use for the purpose of improving learning methods, along with features which shall be improved.

Later, different stakeholder of a LBSN are analysed, which will be used in educational environment. Then, interesting scenarios for higher education are presented, which benefit from using a LBSN for collaboration between users. The requirements for such a system are derived from scenarios and analysed.

In the design chapter it is discussed, how lack of some properties, like absence of *digital badges* or an appropriate privacy setting and group manager, in already existing LBSNs, such as

Foursquare or *Facebook places*, hold us back from using them as a platform for implementing provided scenarios. Therefore a preferable design for such an application including the data model is proposed. Thus the user interface of a LBSN application is designed. It is explained how students, tutors and professors can log-in to the system as users, create own network or groups, check-in to various places at the campus and earn digital badges as achievements after completing some tasks or attaining some challenges. Moreover a prototype for the proposed application is implemented for mobile phones, along with explaining scenarios and use cases.

In the evaluation part, the advantages of LBSN in education are discussed and explained how these advantages are possible using the application. Then it is proposed to use mixed methods for evaluation, such as interview, questionnaire and comparison of grades and shared knowledge after implementing the application for a lecture at higher educational environment.

8.2   Limitations and path to the future

There are possible improvements and future works which can be done as a consequence of the work presented in this thesis. Although it has been tried to design the prototype in a way to benefit all the potential capabilities of LBSNs, but development of new technologies, which is growing very quickly in this area, would reveal innovative ideas. There are some limitations for implementing all the desired scenarios because of the restrictions of available technologies, which might be solved as future work. Furthermore convenient solutions may be provided for privacy, reliability and efficiency issues. Some possible improvements might be applied for integration of information about the courses in the application in addition to accuracy of the 'check-in' process.

We already discussed that the concept of Location-based social network has been growing very fast in the last years and is attracting more people with different ideas and interests. Therefore, we believe that using this technology in educational environment will improve the learning system. The society is changing everyday to a more active society with the culture of sharing and linking, so should the learning system. Information technology is a powerful assistance to support these changes in different fields and to manage the knowledge provided.

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