iOS Applications to Improve Learning and Management System in a University Campus

Mario Collotta, Giovanni Pau, Valerio Mario Salerno, Gianfranco Scatà

Real-Time Systems and Networks Laboratory, Kore University of Enna

Summary

Mobile technology is increasing in different contexts (educational, healthcare, networking) and many institutions have already developed applications for Smartphones and Tablet PCs, including those for iOS systems that are undoubtedly the most popular. This paper describes an iOS application for university campus, which is the official application of Kore University of Enna for iPhone, iPod touch and iPad. It was developed with the aim to simplify the livability of the University for students and professors, researchers and officials, and to witness the growth and technological development of the university. This paper shows the scope of this application, describing the features for students, teachers, researchers and officials of the university in order to involve them in real time about events and both educational and scientific activities of the university.

Keywords: iOS, iPhone, iPod, iPad, educational.

1. Introduction

The rapid development of electronic devices and network communication suggests improving the learning and teaching environments through mobile technology. Moreover, the launch of modern smartphone, where the phone from a simple telephone terminal becomes a real mini-computer, and of the iPad, announced in January 2010 by Apple, have encouraged the submission in the App Store (September, 9 2010 iPhone version - December, 23 2010 iPad version) of the official iOS applications, called "Kore University" (KU). It was the first time for an Italian university, even if it is already common practice in other universities. However, we are facing some challenges and opportunities that arise from introducing technology into learning and teaching.

The goal of KU, developed for iPhone, iPod and iPad is to aim at the quality of the studies, growth and technological development of the university. In this paper, we present the potential of KU application and the features available to students, teachers, researchers and officials of the university in order to involve them in real-time information on educational, scientific activities and events of the university and international networks connected to it. The paper will show several features that have already been implemented in KU, which is currently available [1] [2] in Italian release. In this work we will also show other features implemented in the new version (English release) which will be available for App Store download as soon as possible.

The application here proposed is useful in an academic context such as that one of our university, but it can be spread at any campus kind. In fact, the approaches used and the features implemented are not tied to a specific context, but they have a much broader significance: KU application suggests technological innovations that improve quality and control of a public structure that involves a large number of people with tasks and different responsibilities.

This paper is so organized: Section 2 shows a comparison of the popular operating systems for mobile devices. In Section 3 it is discussed a brief overview on iOS functionality used in this work. Section 4 describes the potentiality of our KU Application. While Sections 5 and 6 show the iPhone/iPod touch and iPad KU versions respectively. Section 7 summarizes the paper by discussing several future works and showing overall impressions of University peoples.

2. Background

Recent researches ([3] for example) show that global sales of smartphones for the year 2008 reached 139 million surpassing the sales of laptop computers. There are several operating systems on the market: Google Android [4][5], Symbian [6], Apple iOS [7], to mention some. In KU application we have chosen to adopt Apple iOS, known for its good potential, as highlighted by recent studies [8] [9] in several areas, including educational [10] [11] [12], healthcare [13] [14] [15] and networking [16].

The basic differences between Android and Apple iOS are two. The first one is that Android is open source, i.e. source code is freely available and editable for everyone. The other difference is the programming language used to develop the operating system: Android is Java based and iOS is written in Objective-C. Android, therefore, can run on very different hardware but the ensuring of this takes a large amount of resources (CPU, Memory). As for iOS, the Objective-C uses a Software Development Kit (SDK) to compile the code for a specific Apple device and therefore it runs very fast. That is the reason of the great success of iOS, thanks to the fixed hardware resources it

is always faster than any other Android device. It is designed and written to run on a specific hardware device differently from Android, which can be defined as an operating system "general purpose". This feature is the main reason that led us to choose iOS than Android. Android applications don't always run correctly on different brands of devices because the hardware compatibility is not always guaranteed. In addition, although iOS is not open source it is possible to have it for free. In fact, the SDK is completely free, and it allows developing applications and testing them directly on a simulator on own Mac. Finally, in order to test and sell the applications, without charge, it is simply necessary to pay the developer fee, which allows you to install the application on 100 iPhones, iPods or iPads - useful for beta-testing - and to publish on the App Store. You can also purchase the rights for the internal management business.

Symbian cannot cope the users demands because, at its birth, it wasn't designed to be used on touchscreen devices. Moreover the company that has spread Android, decided to abandon it by signing a trade agreement with Microsoft in order to use the operating system Windows Phone 7 [17]. Therefore, it would make little sense to design an application for an operating system almost obsolete. Windows 7 Phone is an operating system, which marks an absolute detachment from the old Windows Mobile from Microsoft. Conceptually new, it is not trying to copy iOS and it is quite interesting. Microsoft has chosen a right way to avoid excessive fragmentation of the hardware, forcing on manufacturers to use a very similar hardware for their devices (to avoids falling into Android similar problems). However this operating system is still too young, the gap against rivals is still high and the market applications are currently very little.

These considerations led us to design and implement KU application relying on an operating system already established as Apple iOS, encouraged by a solid market for applications such as App Store.

3. A brief overview on iOS

Apple iOS is developed and used by Apple for iPad, iPod and iPhone, and it is based on Mac OS X. It is certainly one of the most reliable operating system in terms of hardware, defined lightweight and extremely powerful, it has a perfect management of battery life and multitasking. To develop software, Apple provides developers with tools contained within the iPhone SDK: "Xcode", "Interface Builder", "Instruments".
"Xcode" is the software needed for editing operations (insertion and processing of the code), compilation and debugging. Xcode is also the starting point to test the application on the simulator or on the iPhone and to organize files.
"Interface Builder" is the software used to create the GUI application and it works in close liaison with Xcode. In it, there are all standard components of devices, from the text fields to the scroll bars that, with simple drag and drop, can be inserted in the application.
"Instruments" is debugging software capable of controlling the performance of the application and perform analysis on resources used and performances. Also it allows loading the application in the simulator or the physical device. It checks memory usage and other important applications activities, to ensure performance and weaknesses management.

4. Kore University application

KU application brings on iPhone/iPod touch (Figure 1) and iPad (Figure 2) all real-time information on educational and scientific activities and events related to the university. KU boasts full support to the Retina Display, geolocation - through which it is possible to reach all the facilities of the university - and the chance to benefit directly from the device of campus services, such as booking exams for any course degree or access to library resources. Furthermore, it provides a mechanism for real-time interaction between students, teachers and researchers. Thanks to the GPS inside the iPhone, iPod touch and iPad, KU already offers in fact, in the Italian version downloadable from the App Store, a geolocation service.

Figure 1. KU for iPhone/iPod: Splash Screen

From an analysis, users (students, professors, researchers and officials) have shown a particular interest in the

implementation of new mechanisms of geolocation: instant messaging (IM) and file sharing (FS). The IM implemented, but not yet officially released, allows students to know in which area of the university their colleagues are, for example studying room or library, but mainly it is in a position to know the places of classes (classrooms, laboratories, etc.) and the position of teachers in office hours, if they are in their private offices, laboratories or in any classroom.

Figure 2. KU for iPad: Splash Screen

The new version of KU, that will be officially released as soon as possible, implements a mechanism that, thanks to a GPS antenna located on the "Kore Bus" (the bus used by students to move around the city to the university and vice versa) enables students to learn real-time bus position, so they can see whether or not they are late to reach the stop. Among other new features, implemented, we highlight the ability to store the sites visited most frequently, to send images to own contacts taken directly from camera or photo gallery, and voice messages, using the wireless connection or the connection details of their device.

The application developing has been implemented using the basic rules of interaction design. In order to ensure the direct control, in fact, we decided to make the TabBar and the SplitView co-exist [18]. The navigation has been carefully designed to be lean, practical and, at the same time, easy to use. The interface is highly self-explanatory, but it has also areas where you can view a legend. The images chosen for the buttons are intuitively related to the content, which they refer and colors were carefully chosen in order to make it easy to view and use the app to read the content.

5. KU application for iPhone and iPod

The application has been implemented and organized using the model of the Tab Bar Application (Figure 3), which allows users to easily navigate among various functions. The UITabBar in iPhone programming is characterized by a modal interface that allows to change the items provided through the UIView.
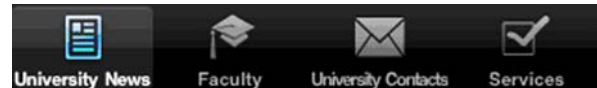

Figure 3. KU: Tab Bar Application

In KU application has been used 4 Tab Bar Item: University News, Faculty, University Contacts and Services.

University News area (Figure 4) is updated real-time with information about classes, exams and opportunities for students and university events.
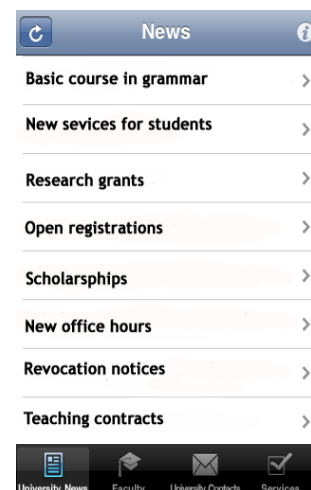

Figure 4. University News

It is possible enter in the "Faculty" area and scroll through all the information about courses degree (Figure 5). For each faculty, the application provides the specific services, news, information about active courses and the contacts of professors to whom it is possible send e-mails directly through the application.

Figure 5. Faculty

Another interesting feature provided in the application is the geolocation (Figure 6), through which it is possible to get directions to the University facilities. This section provide a service that allows students to know in which area of the campus their colleagues and professors are working or studying, as well as the position of "Kore Bus". It also be possible to store the most frequently visited places and send the pictures, taken in direct or choices from your photo gallery, and voice messages through the wireless connection or data connection of the device.

Figure 6. Geolocation

Under section "University Contact" (Figure 7) there are addresses, phone numbers and e-mails of the institutions of the University and of the administrative offices. In addition, you can find a list of services offered by Kore University and by the Board for the Right to Education, including information on the canteens contracted.

Figure 7. University Contacts

The "Services" section allows to have access to all services implemented and they are available to the user: for example the booking of exams (Figure 8) for any degree course directly from iPhone or iPod touch. This feature is particularly useful for non-resident students, which can book then the exams and review of real-time information on the location or updates schedules.

Furthermore, it is possible, visiting the podcast area, to download media files of the lectures and educational activities in general in order to improve learning for students, offering them the opportunity to use modern multimedia systems.

Figure 8. Book exams

6. KU application for iPad

Recently, Apple has developed the iPad that is a device halfway between an evolved phone and a laptop computer. iPad, unlike the iPhone and iPod touch, allows the use of more complex software, specially made and available on the App Store. Many universities, attracted by this new idevice, have developed their official applications [19] [20] [21].

Kore University HD is the version for iPad (Figure 9 - 10) of KU. It is not simply a port of the application for the iPhone and iPod touch, but it is a real stand-alone application, specially created and designed to maximize the features of the iPad.

Figure 9. KU for iPad: Contacts

So even if the functionality presented in KU for iPad are equal to those described for the iPhone and iPod touch version, but the design mode and the implementation of the application is completely different. The design criterion is different from both a hardware point of view (larger display and better performance of the processor) and software perspective (availability of additional libraries), as well as from the interaction design. Specifically, it is possible to use multiple Tab Bar Items - which are always visible - Split View and Popover. The Split View provides a dynamic layout depending on the orientation of the device. Holding the iPad in landscape mode (horizontal) SplitView is the union of a classic Tableview (left), used as a menu choice to the user, and a UIView (right), or better DetailView, for the contents. In portrait mode (vertical), instead, there is the UIView, this time in full screen, accompanied by a Popover (a table that will appear after a tap into the key associated to it).
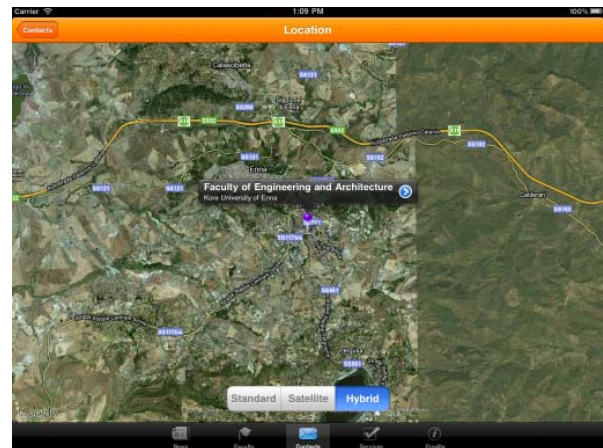

Figure 10. KU for iPad: Geolocation

7. Conclusions and future works

In this paper we have showed a real implementation of iPhone, iPod and iPad application "Kore University". We diffused the first versions of KU application (in Italian language) to test its effectiveness. We have evaluated the benefits of this application used by students, researchers and professors in our university. The overall impressions from people have been very positive. The students have realized that is important to use an application that facilitates their studies. Kore University application has been appreciated. This is a clear signal that students, researchers, professors and officials see the future of mobile platforms in Information Technology (IT).

Overall, we feel this has been a success. Supported by that, we have decided to develop English versions of the applications discussed here, in order to ease international initiatives and cooperation between students and researchers around the world. The next challenge concerns the introducing of new technologies to IT for the students, which will always be part of IT education. Moreover, we are studying how to introduce in KU, here described, some future learning applications.

The main challenge is to continue and keep high student excitement, so that we will be successful in introducing new learning approaches to the students and a new efficient management of university resources with quite simple and flexible design, both for management university systems and for the development of educational products.

References

[1] Kore University: http://itunes.apple.com/it/app/kore-university/id390459808?mt=8,Accessed 15/03/2011.

[2] Kore University HD: http://itunes.apple.com/it/app/kore-university-hd/id410911661?mt=8&affId=1507406, Accessed 15/03/2011.

[3] C. C. Teng, R. Helps, "Mobile Application Development:Essential New Directions for IT", Seventh International Conference on Information Technology, pp.471.475, Las Vegas, US, April 12-14, 2010.

[4] B. Wu, A. I. Wang, A. H. Ruud, W. Z. Zhang, "Extending Google Android's Application as an Educational Tool", IEEE International Conference on Digital Game and Intelligent Toy Enhanced Learning, pp.23-39, Kaohsiung, Republic of China, April 12-16, 2010.

[5] Google Projects for Android, http://code.google.com/intl/it/android/, Accessed 15/03/2011.

[6] Symbian SDKs, http://www.forum.nokia.com/info/sw.nokia.com/id/ec866fab-4b76-49f6-b5a5-af0631419e9c/S60_All_in_One_SDKs.html, Accessed 15/03/2011.

[7] iPhone Dev. Center, http://developer.apple.com/devcenter/ios/index.action, Accessed 15/03/2011.

[8] J. Laugsen, Y. Yuan, "What factors contributed to the success of Apple's iPhone?", Ninth International Conference on Mobile Business, 2010 / Ninth Global Mobility Roundtable, pp.91-99, Athens, Greece, June 13-15, 2010.

[9] Wei-Ming Yeh, "A marketing research of new digital readers and iPad in comprehensive aspect", International Conference on Computer Application and System Modeling (ICCSAM 2010), pp.320-323, Taiyuan, China, October 22-24, 2010.

[10] R. C. Meurant, "Providing Every Student with an iPad as a Means of Helping Develop Korean EFL Digital Literacy", Sixth International Conference on Networked Computing and Advanced Information Management (NCM), pp.242-247, Seoul, South Korea, August 16-18, 2010.

[11] E. Carillo, R. Kadobayashi, M. Chikama, S. Shimojo, K. Rodriguez-Echavarria, D. Arnold, "Making History Alive and Interactive – Designing an iPhone App to Present the Summer War of Osaka Byòbu", 16th International Conference on Virtual Systems and Multimedia (VSMM), pp.365-368, Seoul, South Korea, October 20-23, 2010.

[12] M. G. Corazon E. Sicat, J. M. Flor, "iPad: Integrated Paperless Document Checking and Template-based Editor for Electronic Thesis Complilation", Second International Conference on Computer and Electrical Engineering, pp.189-193, Dubai, UAE, December 28-30, 2009.

[13] R. LeMoyne, T. Mastroianni, M. Cozza, C. Coroian, W. Grundfest, "Implementation of an iPhone as a wireless accelerometer for quantifying gait characteristics", 32nd Annual International Conference of the IEEE EMBS, pp.3847-3851, Buenos Aires, Argentina, August 31 – September 4, 2010.

[14] A. Hamou, S. Gut, B. Lewden, A. Bilyea, F. Gwadry-Sridhar, M. Bauer, "Data Collection with iPhone Web Apps – Efficiently Collecting Patient Data Using Mobile Devices", 12th IEEE International Conference on e-Health Networking Applications and Services (Healthcom), Lyon, France, 2010.

[15] R. LeMoyne, T. Mastroianni, M. Cozza, C. Coroian, W. Grundfest, "Implementation of an iPhone for characterizing Parkinson's disease tremor through a wireless accelerometer application", 32nd Annual International Conference of the IEEE EMBS, pp.4954-4958, Buenos Aires, Argentina, August 31 – September 4, 2010.

[16] B. Stelte, I. Hochstatter, "iNagMon – Network Monitoring on the iPhone", Third Internationa Conference on Next Generation Mobile Applications, Services and Technologies, pp.534-538, 2009.

[17] App Hub: Develop for Windows Phone & Xbox 360, http://create.msdn.com/en-US/, Accessed 15/03/2011.

[18] X. Pan, "Reaearch of iPhone Application UI Design Based on Children Cognition Feature", IEEE 11th International Conference on Computer-Aided Industrial Design & Conceptual Design (CAIDCD), pp.293-296, Yiwu, China, November 17-19, 2010.

[19] Creightton University Medical Center: http://itunes.apple.com/us/app/creighton-university-medical/id426729471?mt=8, - Accessed 25/03/2011.

[20] Kaplan University for iPad: http://itunes.apple.com/us/app/kaplan-university-for-ipad/id415644536?mt=8 - Accessed 25/03/2011.

[21] Cleveland State University: http://itunes.apple.com/us/app/cleveland-state-university/id386527864?mt=8 - Accessed 25/03/2011.

Mario Collotta received the BD in Telematics Engineering at the University of Catania, 2004; and the MD in Telecommunications Engineering at the Kore University of Enna, 2007, Italy. He received the Ph.D degree in computer engineering and telecommunications from the University of Catania, 2011 Catania, Italy. He is currently an Assistant Professor with tenure in the Engineering Faculty, Kore University of Enna. His current research activity mainly focuses on Networked Real-Time Embedded Systems, with a special focus on Industrial Communication, Wireless Sensor Network and Real-Time Scheduling Network. He is senior member of International Society of Automation (ISA) and advisor of Kore ISA Student Section.

Giovanni Pau received the BD in Telematic Engineering from Catania University in 2008 discussing a thesis entitled "Study and development of an algorithm for the assignment of cardinality in low power wireless networks." and the MD in Telematic Engineering from Kore University of Enna in 2010 discussing a thesis entitled "A dynamic control approach to manage real-time traffic light timing through a wireless sensor network". Now he is working at Real Time Systems and Networks Laboratory of Kore University of Enna as researcher. His research interest includes wireless sensor networks, road monitoring and real-time systems. He is a member of International Society of Automation (ISA).

Valerio Mario Salerno received the Telematic Engineering degree from Kore University of Enna in 2010 discussing a thesis entitled "An innovative experimental approach to control Home Automation Environment based on IEEE 802.15.4/ZigBee real-time network". He is attending the master degree and he is working to final thesis. His research topic regards Home and Building Automation and design of real-time networks. He is member of International Society of Automation (ISA) and president of "Kore ISA Student Section".

Gianfranco Scatà received the bachelor degree in Computer Science Engineering from Catania University in 2008 and the Master Degree in Telematic Engineering from Kore University of Enna discussing a thesis entitled "An innovative approach for traffic detection through a video monitoring wireless network". Now he is working at Real Time System and Networks Laboratory of Kore University of Enna as researcher. His major research activity includes mobile systems and the study of innovative techniques for managing QoS in Wireless Sensor Networks. He is member of International Society of Automation (ISA).