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Bringing Together High School Actors Using Mobile Applications: A Conceptual Model Proposal

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Abstract

Communication among the different actors present in the school ecosystem is an essential issue. However, in a hectic world where parents do not have much time to visit schools regularly, it is crucial to create mechanisms to better monitor student's success and school demands. The interaction among school, students and parents presents a growing complex challenge. Technology has, in recent years, shaped the concepts of learning support and monitoring – both in school and out of school – as well as the way information flows among all actors in the school ecosystem. Emergently, the evolution of mobile applications, coupled with the evolution of mobile device capabilities, has made possible to create new and more effective intercommunication mechanisms, with ubiquitous approaches and in a predictable scenario of less willingness to physically interaction of the different actors. Based on these assumptions, this paper reflects on the potential of mobile devices and their applications to support new models of intercommunication among parents or school sponsors, students and teachers. Accordingly, a conceptual model is proposed that represents a work in progress that aims the creation and evaluation of a prototype system capable of improve de intercommunication and the overall success of the school learning system societal challenges.

Keywords: conceptual model, mobile devices, mobile applications, school ecosystem, education

Introduction

The use of Information and Communication Technologies (ICT) is changing organizational systems and the way they respond to their main actors' needs. In the school ecosystem, where is what we can name "the base foundations of society" the developing of appropriate solutions becomes even more fundamental. Society daily routines are increasable demanding – teachers need to face the constant developments of knowledge and how to pass it on to students; students are starving for more suitable and innovative solutions for learning and express their needs, back to the school ecosystem; parents/sponsors of education have less time to monitor the performance of their students and respond to requests from school (like they physically do in the past). This new reality forces for new ICT based proposals for the school ecosystem that can respond to their needs and expectations.

Mobile devices, mainly smartphones, are embedded in people' daily routines and represent the most common and widely used technology today. Smartphones are the most popular technological gadgets that have modified the face of communication and conduct to an irreversible impact on psychosocial behavior of consumers (Alsayed, Bano & Alnajjar, 2019). This suggests that educational level is not a

severe barrier to their use. The increasing number of features such as internet connection, big screen, high processing capacity and modern computers-human interaction technics, have made the smartphone a technological device upmost suitable for running applications for multipurpose tasks in a fashion easy way.

According to Ersoy-Babula & Babula (2018), experienced teachers who adapted to Virtual Learning Environments (VLE) should have taken advantage of new mobile technologies to produce active learning outcomes. Also, students are today a massive group of mobile devices users. Thanks to the popularity of mobile devices, mobile learning has become a great tool for delivering educational resources (Paulins, Balina & Arhipova, 2015). Mobile devices provide opportunities for students to access learning-content and to interact with teachers and other students wherever they are located (Gikas & Grant, 2013). Mobile learning and mobile-based pedagogies have in recent years increased in interest regarding their benefits and constraints in the teaching and learning process (Burden et. al., 2019).

In what concerns to parents, many times, they have difficulty in understand where the line lies between constructive use of digital technologies that can support their children's learning, and the negative use of these devices – unhealthy use of technology (Papadakis, Zaranis & Kalogiannakis, 2019). However, research made by Özdamlıv & Yıldız (2014) focus on the importance of mobile technologies in school family cooperation process confirming that parent's opinion is generally positive on the educational purpose. Also, parents' working duties and availability for use technologies for personal advantage purposes on their job schedule, make mobile devices, like smartphones, the most suitable tool to develop interactions with their children's schools, by their ubiquitous capability in access to school information and services.

This paper explores the potential of using mobile applications to support intercommunication strategies among key actors in the high school ecosystem, contributing to a better communication among these actors, as well as better monitoring of student performance by their parents or sponsors of education. After an overview of the state of the art regarding technological aspects that have been introduced into the school ecosystem, a conceptual model is presented and discussed. This work, being a work in progress, aims the creation of a prototype system that, once implemented, will be evaluated.

Literature and Existing Mobile Applications Background

Above is made a literature overview about the use of ICT in the interaction among school actors using major citation index databases and analysed the functionalities of thirty related Android applications.

Literature background

Several studies show that ICT can promote and leverage the interaction among school stakeholders, particularly, but not only, teachers, students and parents. In an article about engaging parents through better communication systems (Kraft, 2017), the author argues that “Digital technology must be an integral and purposeful part of schools' communication infrastructures” since mobile phones are used by almost every adult from every socioeconomic level and, as such, texting and mobile applications could be used to easily connect schools and families of all backgrounds.

The use of ICT in school context, with focus in mobile devices and applications, can be explored at different levels. Messaging is an obvious one, can be done automatically or by request, to a group or individualized, one way or two way. But also, resource sharing, payments, reports, registrations, calendars and schedules, information search, student monitoring and transport tracking, to name a few. In fact, a lot of research is going on this subject and, following, we present some different approaches.

Sumathi, Umarani, & Abinaya (2017) presents a mobile application for interact with a centralized student information system to be used by parents, students and faculty members for effective communication among them. Each type of user accesses a well-defined module, with specifics purposes, like lecture notes, announcements, attendance and academic performance and discussion forums. The system was developed using XML, Java, MySQL and PHP.

An electronic booklet has been introduced as a new way of collaboration and communication between

schools and families (Abreu, Rocha, & Cota, 2015). Most of the teachers and parents questioned expressed interest in the adoption of that tool, thinking that it could have more advantages than the traditional one, in paper format, improving the communication process between them, since it allows “Faster, more efficient and safer communication” and “Customized access to information, at any given time and place”. The electronic booklet would be a responsive web application, replicating the functionalities of the paper booklet as an improved direct communication channel between teachers and parents.

Also, for students that need attention related with their health, the use of mobile phones can be beneficial. A smartphone-based system has been developed to help autistic children (Chuah & Diblasio, 2012). The sensors embedded on smartphones were used to correlate environment data (e.g., audio background) with stereotypical behaviours of autistic children, sensed by the accelerometer, allowing not only to alert the teacher in case of the occurrence of that behaviour, with intervention instructions based on the behaviour type, but also to prevent those behaviours, alerting when some environment trigger is detected. And, in countries where recommended vaccines are received through school-based programs, SMS reminders to parents/guardians could bring higher levels of vaccination uptake (Tull et al., 2019).

To monitor the children during school bus transportation there are several solutions using different technologies. For example, Radio Frequency Identification (RFID) tags to detect children and SMS to notify parents (Shah & Singh, 2016) or Bluetooth Low Energy (BLE) to identify the student and a mobile application for the parents to track his children in real-time (Pratama, Zainudin, & Yuliana, 2017).

Existing Mobile Applications Background

To get a sense of the available mobile applications related to our work and the features provided, we made a search on Google Play, the official app store for Android, the most used mobile operating system (76% of the market share according to StatCounter, 70% according to NetMarketShare, in July 2019). Searching for the words "school" and "parents" returned about 250 results. However, some of them were the same application but customized for different schools. After that, we selected a sample of thirty different apps that offered the possibility of communication between the school and the parents and analysed their description and their website, when accessible.

Table 1 shows the key features of those applications and the number and percentage of applications that provide them. Others can exist but they aren't explicitly announced on their description or on their website.

Table 1: Main features of the mobile applications

Information / News	28 (93%)	Social	11 (37%)
General information/news	28 (93%)	Photo Gallery (activities)	9 (30%)
Teaching activity	21 (70%)	Internal Social Network / Forum	2 (7%)
Absence consultation/notification	19 (63%)	School transports	10 (33%)
Schedule	15 (50%)	Transport localization	10 (33%)
Homework (consultation)	12 (40%)	Student localization	6 (20%)
Important events (exams)	11 (37%)	Chat system	3 (10%)
Grades	11 (37%)	Reports	10 (33%)
Summary consultation	5 (17%)	Individual Progress Reports	9 (30%)
Absence justification	1 (3%)	Daily Reports	2 (7%)
Homework (submission)	1 (3%)	Administrative Issues	8 (27%)
Messages / Notifications	19 (63%)	Personal data	5 (17%)
Receive from school	19 (63%)	Permissions	3 (10%)
Send to school	6 (20%)	Student ID	2 (7%)
Read receipt	1 (3%)	Pre-Enrolment (school, social support)	1 (3%)
Accounting	14 (47%)	Extracurricular activities (registration)	1 (3%)
Balance Inquiry	14 (47%)	Forms	1 (3%)
Payments	5 (17%)	Meals	2 (7%)
Invoice and Receipt Inquiry	2 (7%)	Menu consultation	2 (7%)
Calendar	13 (43%)	Reservation	1 (3%)
Events	11 (37%)	Attendance	1 (3%)
School calendar	3 (10%)	Health	1 (3%)
		Clinical data (allergies, etc.)	1 (3%)

As we can see, most of the applications focus on topics related with general information/news, teaching activities and messages/notifications. However, when we compare those topics in more detail, we can see that functionalities provided among applications are not homogeneous. Even more notorious is the asymmetry on the directionality of the communication flows. In fact, the vast majority don't allow parents to interact with school. For example, there are 63% of them who allows absence consultation and/or notification, i.e. from school to home, but only 3% of them allows absence justification, i.e. from home to school. The same happens with general messages/notifications, where the parents can receive messages from school in 63% of the apps but can only send in 20% of them.

In our opinion, there is an opportunity to develop new systems allowing better integration and interaction of the school ecosystem actors, capitalizing on the ubiquity of mobile devices. Considering this, following we will propose a conceptual model for such system.

Also, we think there is space to explore innovative ways of interaction between parents, students, teachers and school staff using different technology solutions, but that will be explored in future work.

Conceptual Model Proposal

The system we propose aims to be a facilitator agent at the communication among teachers, students and parents/students sponsor of education. The proposed model intends to be supported by integration of server-side technologies with mobile devices applications to deliver information and services to the identified actors.

In this section, we intend to present and describe the functional aspects of the proposed system. For this we use UML Use Cases diagrams aims at the identification of the functionalities of the system, the actors involved, and the role that each actor has in the functionality of the system.

School Functionalities

The school activities supported by the proposed system are identified in the use case diagram shown in figure 1, focusing essentially on the actors: teachers and class directors.

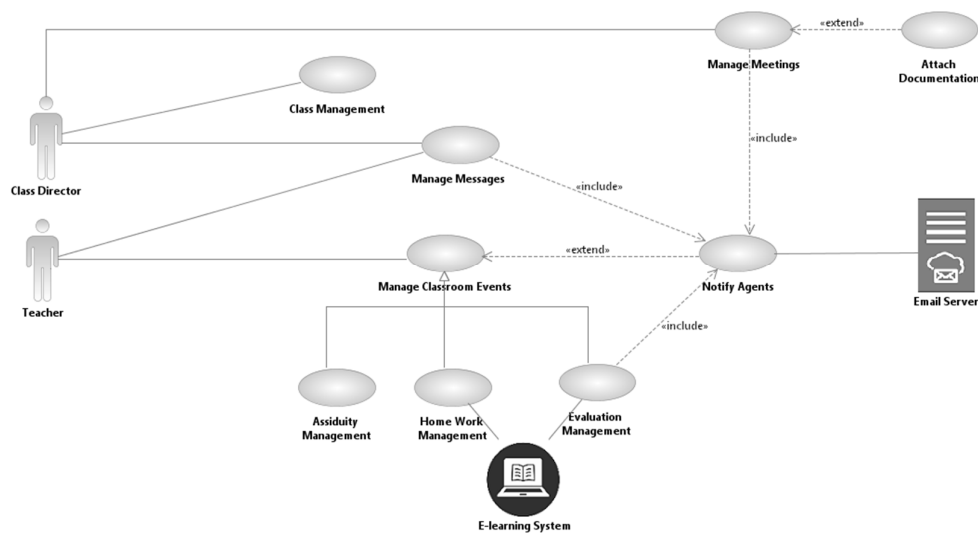


Fig. 2 : Use Case Diagram "support of school activities"

The management of the class is the responsibility of its director, whose function is supported by use case class management. The class director may schedule meetings, and for this purpose he or she may share documents.

The teacher is responsible for the management of classroom events, such as: absentee reporting, homework scheduling, scheduling of assessments, reporting of grades, among others. The system also allows agents to exchange messages or notifications.

Home Functionalities

Figure 2 shows the use case diagram with the main functionalities provided by the system, especially focused on the parents or guardians (sponsors of education) and the monitoring of students' academic activities.

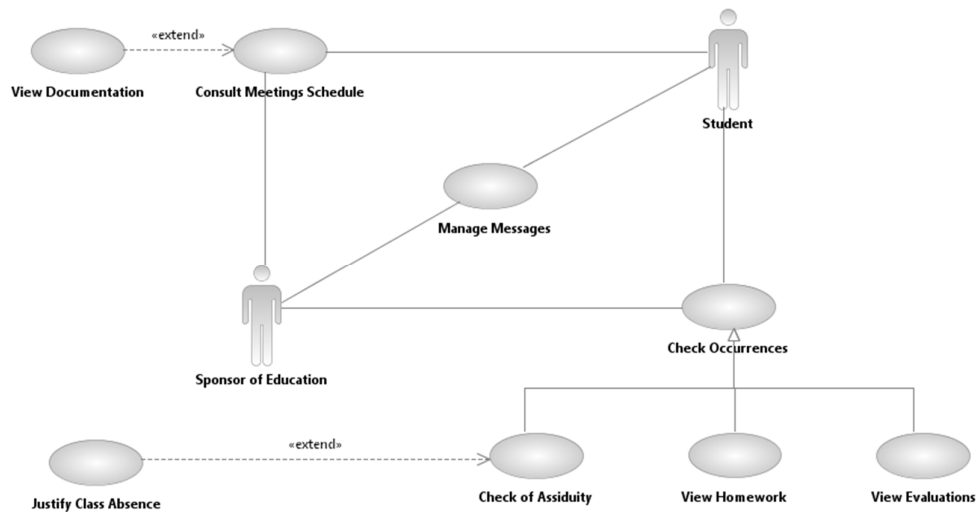


Fig. 3: Use Case Diagram "academic accompaniment of the student"

Both agents, students and sponsors of education will be able to check the occurrences previously registered by the teachers, consult the scheduling of meetings and consult and send messages.

As can be seen in the diagram, the system also provides a functionality that will allow to communicate the justification of absences to classes.

Discussion

The creation of technology-based mechanisms to interconnect the main actors of the school-system is, in our opinion, in a growing trajectory that can't be denied. The expectations of the young students of the generation Z and the recent generation Alpha, who were born surrounded by technology, Internet access and who consider an extension of their body mobile devices such as smartphones, will force that researchers and/or technological enterprises that design and develop technological solutions, reengineer their solutions. Provide innovative tools for support the interaction among the various school actors is a today need, and a growing one.

For parents or sponsors of education, the modern dynamic of their daily routines (and school's routines also) represents new challenges in what concern to the correct accompaniment of their students. Also, for them, innovative solutions that manage properly their digital illiteracy, that in some cases still remains, and enable monitoring the most important aspects of the education process is of utmost importance.

For teachers, that also are leaning innovative approaches for interact with students in what concern to the teaching and learning process – either at universities during their degrees courses and/or in various formations that they attend during their teaching careers) – it is crucial to develop solutions for enable a better accompaniment of their students in classroom and out of classroom. Also, because students in high school typically are underage, is very important to have access to solutions that enable teachers to

interact with students' parents or sponsors of education.

The development of technological solutions to help the above needs should be, in our opinion, designed as a whole (without exclude that collateral tools can be used) with available features varying according to educational level of the student.

The proposed conceptual model tries to respond to the main needs of the three most important actors of the school ecosystem – students, teachers and parents/sponsors of education. The main goals are increase the communication, monitoring and explore innovative school approaches, based in mobile devices applications, most aligned with the Z and Alpha generations.

Conclusion and Final Remarks

The school ecosystem is constantly changing thinking and needs. New teachers yearn to apply new teaching strategies; new generations of students see technology as a mandatory tool; parents/guardians are desperate for more appropriate solutions due to lack of time to accompany their learners and interact with schools. This reality requires new solutions to be developed to meet these new challenges. Accordingly, the development of integrated and ubiquitous solutions is the way forward.

This paper start framing the reality of school ecosystem, review the potential of using mobile devices applications to support an integrated information system to support a more suitable intercommunication among students, teachers and parents/sponsors of education. We have also overviewed the state of the art with a mix strategy – papers analysis among several bibliographic sources and a search and analysis of several Apps available for, any part of, the school ecosystem. After, we have proposed a conceptual model, focus on the three main school actors – teacher, student and parent/sponsor of education that we have discussed based on an integrated-actors approach and their main intercommunication needs. For future work we are starting the development of a prototype system that we intend to test in a high school class, with their teachers, students and parents/sponsors of education.

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