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## Design Of E-Learning System: M-Learning Component

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### Abstract

Nowadays the progress in information technologies filed is opening great new possibilities for people in all areas of living. As education is fundamental step in every person's life we have to increase its' popularity, availability and convenience for everybody. Information technologies present a lot of new tools and approaches which expand the infrastructure of the educational process. Our idea integrates the simplicity and reliability of client-server architecture and usability of various forms of user interfaces. The design describes an e-learning system, which has an m-learning interface, and several new modules which increase the efficiency of the studies. For these purposes we propose module for preliminary homework checking, statistical module and feedback module that can be extended to the separate rating system. The variety of interfaces is supported by three components: desktop application, mobile application and web-based application. Although we concentrate on desktop and mobile forms as according to the statistical data they are more usable. The difference of European, American and Russian systems of education predetermine some aspects in the design approach. It allows to use the strongest advantages of every model in the solution and to share the multinational experience. The paper describes in details the highlighted moments.

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### 1. Introduction

Nowadays the progress in information technologies filed is opening great new possibilities for people in all areas of living. As education is fundamental step in every person's life we have to increase its' popularity, availability and convenience for everybody. Information technologies present a lot of new tools and approaches which expand the infrastructure of the educational process. During the last few years this area has significantly changed: constantly growing number of online universities, online courses, etc. Internet has become the best friend of the student. Unfortunately, some young people prefer not to go to the Universities but just to study themselves; this is a very disappointing fact. The reasons can be absolutely different but nevertheless that means that from our side – from the University side – we have to provide more and more possibilities to young people, to increase their interest to the

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educational process. To our concern one of the easiest ways to attract people's attention is increase the role of the gadgets in the educational process. For example, the statistical survey about Christmas gifts states that about 76% of the audience want a gadget as a Christmas present (Pastor, 2012). This is an outstanding result. Every young person, even school children, has a combination of different devices which he is using in his everyday life: a computer or a laptop, a tablet, a smartphone. The technological progress is enormous nowadays and we see and experience new things every day. For example, the recent Google achievement is Google Glass. We used to watch this in the movies not long ago but now it is already a reality. Therefore we have to use all the power of devices in the educational process. There are pros and cons and it is not easy to start at all but the one who does not risk does not win the game. First of all we turn our attention to e-learning. It is already out there, successfully deployed by various universities all over the world. But now it is not enough. There is a new term – m-learning. It suggests learning with the help of mobile devices – primarily smartphones and tablets. So our main idea is to use both e-learning and m-learning in the educational process and unite it in the one convenient system which will help both students and professors to stay updated and to achieve maximum usefulness and usability. The baseline of the system is one server-side versus various interface representations. Besides that we propose several utilities which will help students and professors in their everyday college life, such as statistical information, preliminary homework checking module and feedback module which can be transformed to a separate rating system. In this paper we are going to present first the design of the system, then discuss separately each module and discuss some pros and cons. Although first of all we will talk about the international experience in this area and answer one of the main questions is why are we doing our own design but not using someone else's product.

## **2. E-learning all over the world**

Nowadays it has become a common practice to use different technologies in the educational process. Not long ago the professors used to have only blackboards and chalk, now we see at least whiteboard and markers instead or even multimedia boards, projectors, laser pointers, etc. Mostly it depends on the financial support the Universities have. Nevertheless it depends on the professors themselves if they are ready to use all latest devices and to change their usual teaching process. For example, create online courses, answer student's e-mails, moderating forum that was created specifically for their course, etc. From the teaching point of view we should be open to these technologies that surround us. Therefore we have to be open to the Internet revolution that have happened during the recent years, go online and to increase the amount of tools that we use. Unfortunately, it is not the same everywhere. The progress significantly depends on the current situation in the country, both economic and social. During the Soviet period the cybernetics was an abundant science. We experience the consequences of this now. Not only in the lack of professors but also in the lack of the usage of technological progress in our universities. Only nowadays the information technology (IT) area starts growing in Russia. And we have to follow the way our European and American colleges has already done. All that also explains the differences in the educational process. The education in the Soviet Union was one of the best in the world, but the USSR is gone and its heritage is also gone. Like a phoenix we are trying now to get back to the top universities in the world. But everything needs time. This is the main reason why we are not able to use products that are used by different universities all over the world. The system is completely different. In Russia we have switched to the Bologna system of education only several years ago and now we have our first graduates with bachelors and master degree out there. There are a various number of examples of the successful usage of e-learning in m-learning technologies. And the systems that the foreign (relatively to Russia) universities use cover the wider area than just courses and homework. They are modular and have different modules for specific needs for people who play various roles on campus: students, professors, finance people, faculty staff, etc. It is all integrated in one system that shows the life of the whole university. One of the reasonable questions that should arise at this point – how much does it cost? Here we also can find different solutions. The variety of products on the market allows choosing. There are big enterprise solutions which are sold by the top IT companies, there are big open source projects, which are open-source but include several universities that are developing them, there are small projects, we can call them individual contributors, that also create educational infrastructure for their universities (<http://www.kuali.org/>). Each of them has some pros and cons, therefore each university can select what is more suitable for it's' needs. Usually the first idea that comes is “Let us try some popular framework! So many people use it!” Most likely it ends up either with the financial problems

which make the problem unsolvable or with the extremely long process of tuning up a solution in a box to the specific university. The open-source is also is not always the best choice. It is tuneable but from the programmer's point of view it is always difficult to dive into someone else's code. The theory of the postponed expenses works in this case. That is why we think that creating something of our own is the best choice. Also one of advantages of this approach is that you can always add something new which is very specific to your company to this project. And you do not have to wait for some third party that is saying that they will try to fit your request to the next release of the product. Eventually we believe we will be able to use all the experience our European and American colleges have, but for now we have to build something of our own. For the first step we cannot plan developing a huge system which will unite all the resources of the university like finance, management, library, etc. But we can start with the basic needs that will allow students and professors to stay constantly involved in the process: be updated, be in contact, etc. We believe that it will increase the level of understanding between teachers and students and will allow them to feel the cutting-edge of the technologies in the education. All figures should be numbered with Arabic numerals (1,2,...n). All photographs, schemas, graphs and diagrams are to be referred to as figures. Line drawings should be good quality scans or true electronic output. Low-quality scans are not acceptable. Figures must be embedded into the text and not supplied separately. Lettering and symbols should be clearly defined either in the caption or in a legend provided as part of the figure. Figures should be placed at the top or bottom of a page wherever possible, as close as possible to the first reference to them in the paper.

### **3. Our solution**

As we have discussed before due to the differences in the educational system we cannot easily inherit or extend popular systems that are widely used abroad. Our main idea is to unite the single server-side with the multiple implementations of the interface. The client-side can be a desktop application, a web-based application or a mobile application. This is the standard client-server application approach but here we want to concentrate on two parts: desktop and mobile implementations. Each client-side representation has its' own peculiarities, advantages and disadvantages. But the overall picture shows that only the unity of all these features can provide the maximum usability and effectiveness to the users. Statistical surveys say that nowadays the usage of the mobile applications is greater than the web-applications (Newark-French, 2012)The graph on Figure 1 shows the data during the 2010-2011 period but we can see the major tendency and imagine what will be happening in the nearest future. The general picture is the same over all countries with the developed IT infrastructure. Some interesting statistical analytic can be also found here (Blinov, 2012)Although the number of users of mobile devices is less in Russia than in the United States, for example, it keeps growing constantly. J'son & Partners consulting states that the cost of the mobile apps market during 2012 in Russia has reached \$160 million, comparing to 2011 we see 256% growth. The numbers are talking for themselves. The future forecasts by J'son & Partners Consulting say that the growth of the mobile apps market in Russia will be comparable to the worldwide rates. By 2016 the cost of the market will be about \$1300 million, which is 8 times greater than in 2012 (J'son & Partners Consulting, 2013)

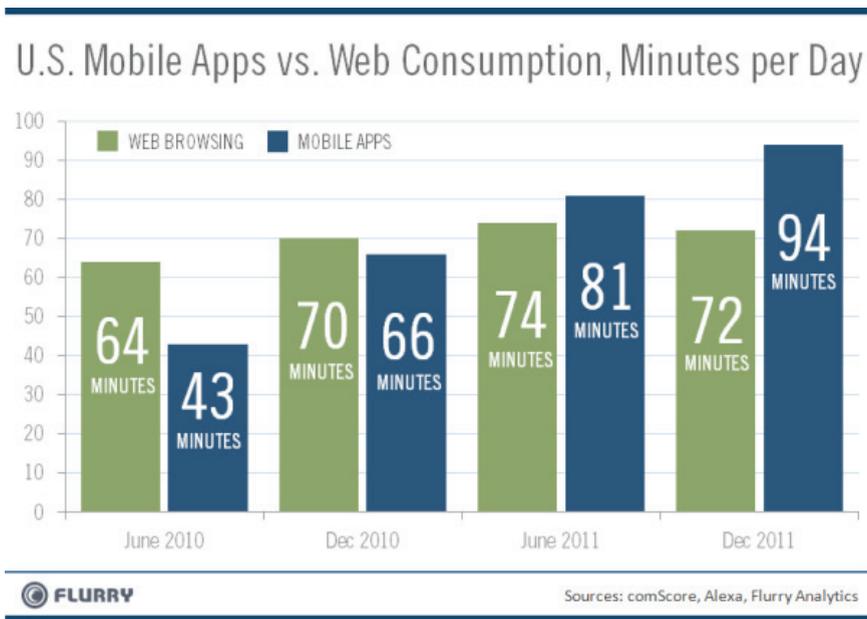


Fig.1. U.S. Mobile Apps vs Web Consumption, Minutes per Day (Newark-French C. 2012)

Taking into consideration all advantages and disadvantages of different implementations of the client-side we should strictly distinguish the functionality. For example, it is obvious that from the small screen of the smartphone it is very inconvenient to write an essay. But to get the latest updated from professors about class cancellation is just a right use case. The desktop application is definitely the most powerful implementation but in everyday life people spend more and more time with their mobile devices. According to some statistics the tablets are becoming more and more popular and decrease the laptops and desktops usage. So if we define the primarily goals of each implementation of the client-side the mobile application will first of all include notification services (getting and sending some informational messages), modules that will allow to review the course materials (lectures, practice guides, multimedia files), desktop application will also include modules for submitting homework, statistical modules, testing modules. Basically the web-application is very similar to the desktop application; there is a separate use case for it. Desktop application is more convenient for home usage but to the web application the user can easily access from any computer connected to the Internet.

The dedicated users of the application are students, professors and faculty staff. Therefore we design a separate role and privileges mechanism. The set of users define the corresponding roles. Besides that there are administrator roles which can control the system state, register users and provide initial technical support to the users that have problems. The very important step at this point is to provide the user-friendly interface to decrease the number of users who can have problems while working with the system.

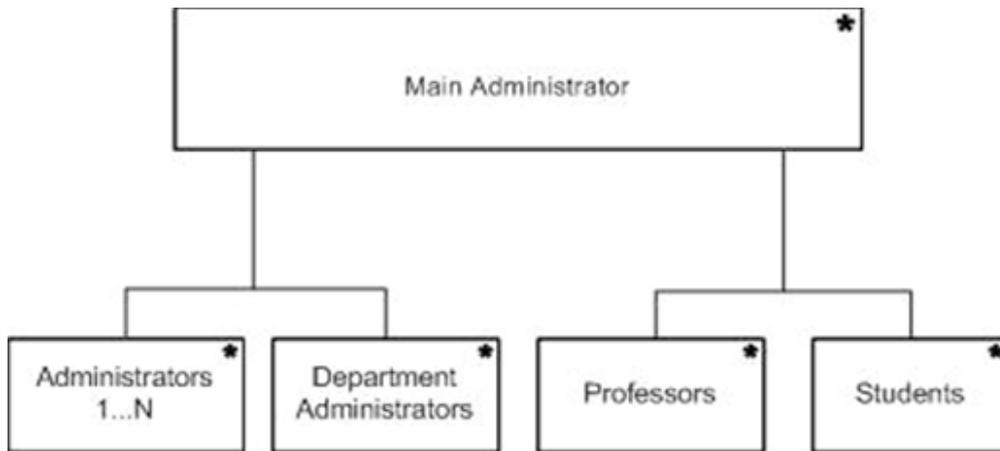


Fig.2. The hierarchy of the user roles.

The roles of students and professors are clear and straight forward. Let us elaborate more on the staff segment. One of the major differences is that in Russian Universities students do not select the subjects themselves; there is no such step like “Course Registration”. The timetable is defined by the faculty staff and students don't influence it. From the architecture point of view that means that only user with staff privileges can assign courses. Besides that this role will allow to touch the administrative part of the university organization. As we have been mentioning before there is a separate cluster of modules dedicated to finance and infrastructure in the systems that are used for a long time in some universities. Defining a separate role for the department staff allows creating a link to the future development. One of the advantages of our approach that we have mentioned earlier is that we can add our own modules to the system. We have designed several modules that will help students and teachers in their university life. The modules are the following:

1. Analytical statistics for teachers.
2. Preliminary control system for homework for students.
3. Feedback.

The first module is primarily for professors although it can also become popular among the students. It will collect the information about various parameters that professor will predefine for each course like homework or attendance, tests or exams. The statistical data will allow teachers to evaluate the average performance of the class, individual performance of students, to see which tasks were more difficult and maybe the scores should be curved. All this data can also be interesting to students, who can easily calculate their final marks for the course. This is a convenient option for the multiple reports that professors are usually building. From the implementation point of view, the statistical module should use some analytical algorithms and can also be developed with the help of neural nets. The module of preliminary control of the homework supposes the initial checking process that is done at the step of uploading the homework to the system. The main idea of this module is to increase the quality of the homework. There are two sides of the question. From the students' point of view the system checks the submission and performs some primarily testing. For example, for computer science students it can be a check if the program can be compiled, for some mathematical problems it can be a verification of the answer, etc. From the other hand, the professors should put some additional effort into this. For each homeworks, they should define a set of initial checks. But overall that should increase the results that students are showing and decrease the effort of the professors in terms of finding primitive errors that could be easily controlled by preliminary checking.

Nowadays the feedback process has become one of the important tools for creating the description of the current situation in any area. We offer the module which will support two types of evaluation:

- Evaluation of teacher will help the future students to know the advantages and disadvantages of the professors and will help professors to know what students think should be changes.
- Course evaluation allows showing how effective the course was, what should be changed in the course or maybe to which sections more attention should be paid.

That information is also important to the head of the faculty and to the staff who is responsible for the organization of the educational process. The module will have a simple set of basic questions that are general for all courses and professors but at the same time it can be extended for each specific case. Such mechanism can be turned into a separate rating system which will help students to know the courses and professors will stimulate the professors to enhance their courses and will show the faculty which courses are not really effective.

The novelty of our approach is not only the multi-client application but also the extra modules that we present. From the developers' point of view the educational system is a complex application which includes different components not only from their purpose but also from the implementation side. Nevertheless the effectiveness of such approach seems to be a justified effort.

#### 4. Conclusions

Combining e-learning and m-learning approaches is a big step for the educational process. That will allow us to increase the interest of the students which is very important in our modern life when people can just buy a fake diploma online. Definitely there will be problems, for example, for professors it is not always easy to work with some new tools and innovations. But we believe that the future is after the integration of information technologies and educational process. The international experience just proves that perfectly. Therefore we should use it and follow the leader in this area that will bring the positive effect to our society.

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