

Mobile Devices and e-Learning

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Investment and development are the keys of our society. This paper presents the impact of the technology and how we can use all the facility of this in education to produce knowledge and innovation. The technologies are the most important support for development of education.

Keywords: Technology, Knowledge, Innovation, Education, E-Learning, Economic Crisis

Introduction

This paper discusses whether the investment in e-learning to produce knowledge and innovation is a significant part in educational system.

In our age the innovation depends on the access to more and more knowledge and information. Innovation consists in the design, development and diffusion of a technology (or a practice) which is new for the society concerned.

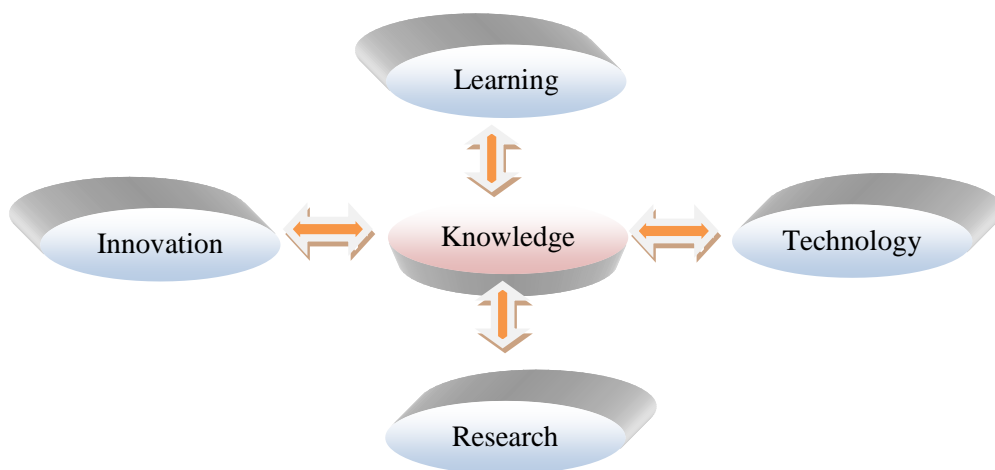
Innovation requires for good solution:

- 1) a climate favorable to communicate information (eliminate bureaucratic and other obstacles);
- 2) interactions between the local business world and the different sources of knowledge.

Those knowledge sources include university or public laboratories, etc.

In Oxford Dictionary knowledge is define like “a theoretical or a practical understanding of a subject”, but on the other hand **Denham Grey** said “knowledge is the full utilization of information and data, coupled with the potential of people's skills, competencies, ideas, intuitions, commitments and motivations” [16]. So, the knowledge reflects in fact a deep using and understanding of information and this entire interconnecting witch the use of technologies.

Knowledge and new technology infrastructure, research, innovation and a continue process of learning are interconnected (figure 1).



result of someone inventing a better way of doing something, a better tool. In a crisis the need for innovation is as high as ever and with the kinds of abilities we today have, so long as there is electricity and internet connection the opportunity for innovation is huge, perhaps even despite the collapse of the financial system.

2 Support of investment in e-learning

At the Mobile World Congress in February was confirmed the importance of mobiles to youth in that today they spend \$270 billion a year on mobile — 10 times more than the entire global recorded music industry — and that youth are spending more on data and less on voice. In the report, youth are defined as teens (12-17), students (18-22) and young adults (23-27) [10].

Mobile learning is significant because it's a quickly growing trend, in US demand for m-learning products and services is growing at a five-year compound annual growth rate of 21.7% [22]. Compared to just a few years ago, mobile learning devices are become a solution of easy student-computer interaction. In this model information processing has been thoroughly integrated into everyday objects and activities of students.

There are six main reasons that could be invoked in support of mobile learning:

- **Flexibility;** Firstly, learning can take place anytime, anywhere. Learning can happen across locations. These opportunities are offered by portable technologies. Students are overtime in go, so they are interested by more flexible kind of learning.
- **Collaboration;** Secondly, through e-learning everyone uses the same content, which will in turn also lead to receiving instant feedback and tips. This learning will reduce cultural and communication barriers between faculty and students by using communication channels that students like.
- **Motivation;** Thirdly, multimedia resources can make learning fun. With this kind of learning, it is much easier to combine gaming and learning for a more effective and entertaining experience. This is a great

point of view because most of students are learn more when they are do something just in play.

- **Accessibility;** Fourthly, portable device is accessible virtually from anywhere which provides access to all the different learning materials available.
- **Portability;** Moreover, the small size and weight of portable devices means they can be taken to different sites or moved around within a site.
- **Reduce of time;** Technology expands time and compresses space. There is no need for students to be in the same place at the same time in order to have a sense of live exchange. So, in this mode university can build relationship on different continents.

While the student in past learned how to manipulate objects and memorized actions, the student in the modern society learns how to think, learn, apply information to a task and produce knowledge.

Educational mobile software application represents great benefits for both students and teachers. The increase in use is attributed to the portability that mobile device offer, making it possible for each user to have access to a computer at any time and any place. No longer dependent on computer labs for computing capability, students can work on mobile devices right at their desks. Students can also take mobile devices on field trips to collect, store, and analyze data on site.

Students need to engage in activities that allow them to approach problems from different vantage points, testing out assumptions, and redefining meanings. Students need to engage in the social, collaborative exchange of ideas to pose hypothetical problems, general hypotheses, conduct experiments and reflect on outcomes.

3 Significant challenges of e-learning

On the other hand for these implementations of e-learning in University to be successful, teachers and technology developers must to have in view significant challenges:

- **Mobility:** the ability to link to activities in the outside world also provides students with the capability to 'escape' the

classroom and engage in activities that do not correspond with either the teacher's agenda or the curriculum. The 'anytime, anywhere' capabilities of portable devices encourage learning experiences outside of a teacher-managed classroom environment. Both scenarios present significant challenges to conventional teaching practices.

- **Informality:** students may abandon their use of certain technologies if they perceive their social networks to be under attack. The benefits of the informality of portable devices may be lost if their use becomes widespread throughout formal education. We need to bring information to students, not the students to the information. [15]
- **Ownership:** students want to own and control their personal mobile devices, but this presents a challenge when they bring it in to the classroom [23]. For example, a group of researchers decided [24] to offer portable devices for students (150 students) to see if they use them for other things at home, but not for learning. Most of them use portable devices for the things they enjoy most (instant messaging and downloading music), a few of them accessing internet pornography at home and two students hacking into teachers' computers. Only a few use mobile devices for improve their knowledge. The results prove that ownership of portable devices does, however, present a challenge to conventional teaching practices.

Technologies are profoundly changing how research and creative activity are undertaken, for example by enabling distributed research, grid and cloud computing, simulation, or virtual worlds. They are also changing the organization of science, research, learning and innovation, by linking the creativity of students and allowing institutions to collaborate, pool distributed computing power and exploit new ways of disseminating information. This is fostering competition, stimulating the restructuring of institutions, with potentially major impacts on innovation and growth. Technologies account for a

significant share of total research and development.

Technologies are also transforming platforms for delivering news, entertainment and other information.

The technologies affect every activity and suppose changes in all domains: in administration (e-government), in business (electronic commerce), in education (long distance education), in culture (multimedia centers and virtual libraries) and in the manner of working (long distance working). Technologies facilitate communication, processing, and transmission of information by electronic means and this plays a capital role.

4 Problems in e-learning from mobile devices

E-learning has some unique problems originating from the mobile devices. In this section I identify the problems that appear when we try to use mobile device for e-learning (figure 2).

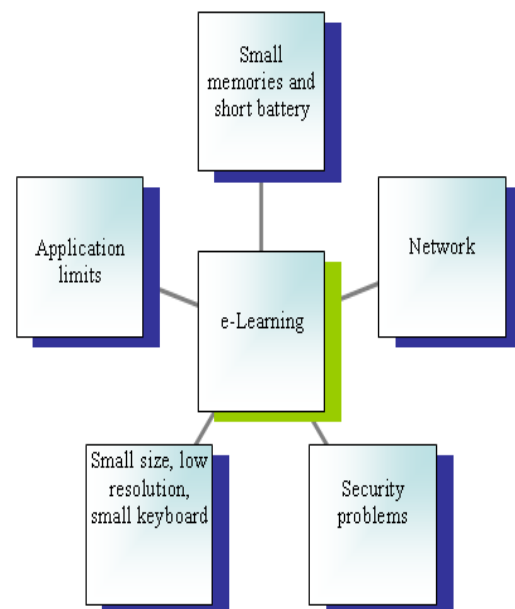


Fig. 2. Problems in e-learning

The mobile devices have small memories and short battery life which don't help us in our process of e-learning.

Second we have some limits for application which can be use on mobile devices, so they can't help us in any moment in this condition.

On the other hand is a wide variety of devices, possessing different characteristics, and the application must be adaptable to all of them.

Third, the use of the devices is uncomfortable because of their size, tiny screens, low resolution, and small keyboards that are difficult to operate. For a lot parts of people this problem are essential because they don't see very well and they can use the mobile devices only for short time.

Fourth, security problems can arise when devices are lost, due to possible unauthorized access to sensitive data. A lot a problem can appear when them are lost, maybe in further will have access to our data only if we can't demonstrate that we are the person how are the proprietary of mobile device.

Fifth, we have a lot of problem with the network which causes other problems, including: limited bandwidth, inconsistent connection stability, transfer delays, and varied standards and protocols, some with high overhead, decreasing the performance level.

Moreover, when users operate the system during mobility, the connection point to the network can change, obstacles can disturb, causing temporary disconnections, interruptions, or disturbances.

All this problems intensify when a lot of people are use in parallel one application and want access to the same cell.

5 Measuring mobile devices use to access the information

To measuring the mobile access to information is important to start for the recent study made in the first part of this article where we identified six main reasons that could be invoked in support of mobile learning. Start from this we can define one system of metrics to measured the mobile devices use in our life.

Portability includes the adaptability and co-existence. The application operation in the mobile device needs to exist harmonically, sharing common resources, with other applications installed in the same device, especially co-existing with the telephone facilities.

Accuracy represents the percentage of the number of times the mobile device has

provided accurate results to users' requests.

The *degree of satisfaction* [12] can be computed as:

$$DS = \frac{\sum_{i=1}^p DSR_i}{TR}, \text{ where:}$$

DSR – the degree of satisfaction for the requirement i

TR – total number of requirements

p – the number of requirements

The degree of satisfaction for a user of executive requirement is a value from 0 (no satisfaction) to 1 (fully satisfied).

Cost represents the fee that has to be paid to access the service through one mobile device. It can be expressed as per-use cost or per-membership cost. Per-use cost implies that the user is going to pay a fee every time he is accessing the service, where per-membership cost implies that the user pays a fee once a period, usually in advance, and gets access to the e-service for that period.

In [12] the *cost of resources* takes into account the category of resources and the cost per unit for each category:

$$C = \sum_{i=1}^w NR_i d_i p_i, \text{ where:}$$

NR_i – number of resource from the category i

p_i – price per unit for the resource category i

d_i – units of usage for the resource category i

The total cost of e-service can be defined as:

$$C_T = \sum_{i=1}^k c_i, \text{ where:}$$

k – the number of project phases

c_i, - the cost of all resources from the phase i

Request of satisfaction based on time represents the time consumed to access the application on mobile device. Depending on the application nature it can be expressed in seconds, minutes, hours, days, month and even years.

$$R_2 = \frac{\sum_{i=1}^n O_i}{T}, \text{ where:}$$

T – period of time

O_i – the output *i* (deliverables, results)

Efficiency determinate us to have in view the resource utilization. Mobile devices include small memory and low processing resources, so applications must be aware of these restrictions and optimize resource utilization.

Accessibility

Mobile users may not be able to concentrate on the system use, so the application should not be complicated, the input must be easy to insert, intuitive, and simplified by using

location. The accessibility is affected by the mobile device attributes: screen size, keyboard or numeric pad, etc., which restrict input and output interaction possibilities.

A recent IBM study found that “over half of today’s desktop computer users are willing to trade the PC for a mobile device for Internet use.” They predict that by 2013 the mobile Internet user base will be up 30 percent to 5.8 billion users. [10]

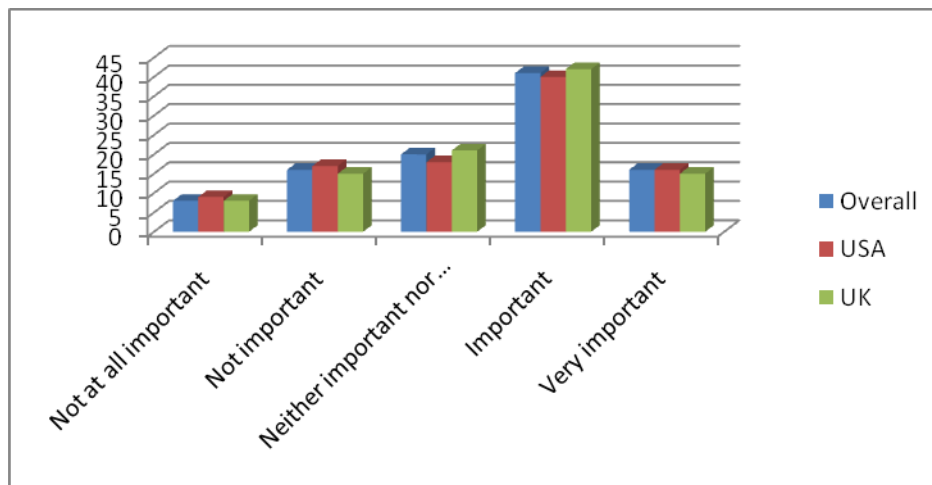


Fig. 3. Mobile device use for Internet

As we can see in figure 3, the data were from the study about Mobile Internet [11], the importance of mobile Internet access is evident

in our age and the mobile device become indispensable of or life.

Table 1. Mobile data and communications activities

Mobile data and communications activities		
	users how have ever done this	users how do this on typical day
send and receive a text messages	65%	45%
take a picture	66	19
play a game	27	9
send or receive mail	25	15
access to internet	25	14
record a video	19	3
play music	21	12
send ore receive instant message	20	10
get a map or direction to another location	17	3
watch video	14	3
have done at least one of the activities	81%	52%
have done at least two of the activities	65	31
mean number of activities	3	1,31
median number of activities	2	1

Other studies made from the Pew Internet & American Life Project announce the growth of number of people's use of their mobile device for non-voice data activities (table 1).

A recent survey by the Pew Internet & American Life Project predicts that by the year 2020, most people across the world will be using a mobile device as their primary means for connecting to the Internet. Already these devices are becoming indispensable tools in many disciplines, while the line is blurring between the mobile smartphones and the computer most everywhere. [10]

6 Conclusions

I personally believe that on the basis of the evolution of our society is important to understanding the notion of knowledge and technology implication in education.

Education is the fundamental part of solutions of the economy problem. Well educated and skilled people represent the key for creating, sharing disseminating and using knowledge effectively. The good economy requires an education system which is flexible and encourages creative, critical thinking, innovation, and a system of lifelong learning, too.

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