Impact of ICT Based Education on the Information Society

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Abstract

In the last ten years the continuous growth of internet penetration and the wider palette for spreading ICT tools have changed the availability and quantity of information, communications methods and the learning processes. ICT tools are already extensively used in education and we have reached the turning point when, after the era of PCs and laptops, e-learning based on internet connected tablet PCs is here. This educational model, developed on a radically new basis, poses a number of questions and is going to affect social processes at macroeconomic levels.

We analysed the possible future impacts of widespread ICT tools in education by applying the Futures Wheel method. This method gives a base for scenario building. Of the possible impacts of ICT tools, we highlighted two: the aspect of physical, mental and social existence and that of knowledge-searching and sharing. On these grounds, we drew up four scenarios: 1. Healthy, knowledge based net-society, 2. Antisocial impersonal knowledge-society, 3. Lonely ill rebels, 4. Limited information-society.

Keywords: tablet PC, ICT-based education, education's future, impact of ICT

Introduction

Technology has an undeniable impact on social processes. Thus, we are going to briefly outline what makes a new technology acceptable and spread widely in the society and to what extent tablet PCs conform to these criteria. Based on this, we will study if tablet PCs are really suitable for widscale educational use, and if they are; then to what extent. After that, we will discuss the importance of change in the education system, observing education as part of the economic process. This is the ground on which we will explore why the wide-scale application of ICT tools is important in education.

1.Methodology

We use the Futures Wheel method to analyse the introduction of tablet PCs and other ICT tools into the educational framework. With this method we describe what changes can occur in the upcoming 5-10 years. A high budget investment project, extensive preparations and organization work is needed well before the actual implementation. If we look around the world we can see that South Korea is already a pioneer within this field.

The South Korean government has ordered that all paper-based educational materials have to be digitized by 2015. This will also help students to learn more easily outside the school (Kim, 2011). The government plans to introduce smart phones, tablets and smart televisions in education, aiding the entire school curriculum through a cloud-based solution. By using cloud-based services, all digitized learning materials will be easier to access (Guelphmercury, 2011).

The Ministry of Education will spend 2.4 billion US dollars for tablet PCs and for the digitizing of educational materials. Additionally, they want to improve the digital text materials required for teaching multiple school subjects. During the initial period, parallel solutions (i.e. conventional paper-based and digitized) will be used. In the case of digital texts, a number of references will facilitate the learning, including multimedia solutions and other useful elements such as FAQ[1] (Ortelt, 2011).

According to the OECD[2], South Korea can create the world's most well-equipped educational system for 14-year-old students in terms of IT, including internet access.

The elements of Futures Wheel are grouped in four fields (environmental, economic, technological, social). We created three main groups (Informatics, Human and Business) to re-categorize the impacts of Futures Wheel by using the driving forces scenarios. All driving forces are evaluated according to impacts and uncertainty. We highlighted two larger main categories as the axes of scenarios. The fields of axes are different: one axis is a societal category and the other one is an economic category. We paid attention to the factors which can occur with larger probability and impact in the future.

2.Methods used

2.1. Futures Wheel

We are going to analyse the new educational system by applying the "Futures

Wheel" approach, which observes a given situation as part of a complex system. This method was invented by Jerome Glenn in 1971 (Glenn, 1972). We will carry out the analysis through the brainstorming method, which can be done with the participation of experts and/or non-experts. This method focuses on identifying and organizing the primary, secondary and tertiary effects of trends and events, as well as mapping the strength of their interconnections. Additionally, it can also aidin the building of alternative scenarios (Glenn, 2003).

Using the above approach, we present an overview of the primary and secondary effects of tablets used in education. We based our effects analysis on relevant scientific articles and research, ultimately adopting an experts' point of view. In our focus the impacts of ICT tools are shown in the lives of students and their environment. We used four different colours to symbolize and distinguish each fields: society (orange), technology (grey), economy (red), and the environment (green). After defining the first impact of a future event, we searched for secondary impacts. We wanted to use the collective knowledge of one special group. In November of 2011, in co-operation with Professor Erzsébet Nováky, head of the Futures Studies Department at Corvinus University of Budapest, we organized a brainstorming session with 25 MSc students working on futures research. These students of Futures Studies Master courses were selected because they studied a wide range of futures studies' related mindsets and tools. They were able to participate in this work because of their high level of futures orientation. The presentation of our earlier research and the Futures Wheel was shown to them. During and after the lecture we discussed the impacts and their correlations. The whole process with students took 80 minutes. Aside from showing the effects, we will also present proposals and recommendations to deal with the possible negative consequences.

The technique used to organize our thoughts and questions concerning the future (structured brainstorming) is illustrated by the chart below (Figure 1). It groups the effects to be studied from various points of view, including: the cultural, psychological, public welfare, technological, educational, political, environmental and economics.

The Futures Wheel can be used for several purposes: to review the possible effects of existing trends/expected future events, to organize our thoughts on future events/trends, to make forecasts through alternative scenarios, to illustrate complex interconnections, to present a different way of future research, to work out multiple concepts, to strengthen a future-focused approach, and to facilitate collective brainstorming (Glenn, 2003).

To apply the Futures Wheel method, we must set a timeline. For South Korea, the starting point will be reached by 2015. This means that we must study the impacts of the 2015 situation first, which we can call the primary effects of the future event. The secondary effects are expected to appear in 2025. The development of South Korea is not the average level. It is worth to analyse other developing countries. Hungary for example is closer to the average level. The spread of ICT tools, the digital illiteracy and other factors are far from the best and worst developmental levels. In the case of Hungary, the starting point will be reached by 2020-2025, whereas the secondary effects are expected to come in 2030-2035. Our goal is not to draw a comparison between these two cases but to identify the major effects. The primary impacts are shown on Figure 1. Our analysis is based on an

improved technique, which separates the expected effects into different areas. Using the STEEP analysis, we set up the following categories: Sociological, Technological, Economic, Ecological or Environmental, and Political.

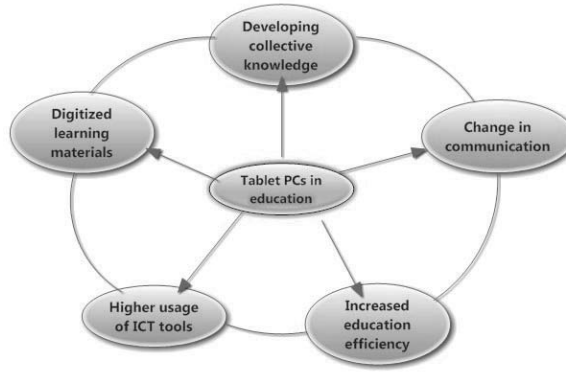

Figure 1. Primary impacts of tablet PCs use in education; Source: own compilation

We will describe the effects and the most relevant impacts in the following section without detailed description. We expect that the introduction of tablet PCs in the South Korean educational system in 2015 will have the following primary effects:

2.1.1. Developing collective knowledge:

In the new educational system, learning materials will become easily available through cloud- based services (e.g.: iCloud). Students will be able to react and send feedback more easily. E-learning will be the new method of education. The fact that all learning materials will be uploaded and stored in a unified given system and that the widely spreading web 2.0 approach will be utilized, will generate changes. Within the ICT system, a sense of community will develop. Users will be able to make their own profiles, comment on the content and maybe upload new materials. Educational ICT systems are increasingly based on these grounds. The exact concept is not yet known, but based on the web 2.0 approach, it is likely that users will be allowed to upload their opinions and knowledge to the schools' ICT systems.

2.1.2. Easier communication:

By using tablets, students can make voice and video calls and start chat sessions. Because of this, phones will be used less frequently. Communication will also be facilitated by the fact that the availability status and information of classmates are publicly shared, e.g. in which classroom a classmate can be reached at the moment. Former research (Fried, 2008) shows the effects of laptops on education. Laptop use increases the students' motivation and willingness to cooperate, develops better interconnection between the various school subjects, narrows down digital fragmentation, improves problem solving abilities and facilitates academic performance. *(Finn & Inman (2004)*, *Lowther et al. (2003)*, *Mitra & Steffensmeier (2000))*. However, some other studies were also published, claiming an overall negative effect *(Fried, 2008)*, *(Gay et al.,2001)*.

A clear advantage of laptops and tablets is that they allow for greater mobility.

For example, by offering the possibility of using a digital pen (in the case of tablets) he traditional pen-paper input method is also available. A great problem of the traditional educational system has been that it does not facilitate cooperative group learning. *(Alvarez et al., 2011)*

Students preferred tablets to notebooks because the former strengthens collective communication abilities and facilitates the use of richer and more natural body language. Members of this focus group studied by Alvarez, gained more self confidence in expressing their ideas by using the digital pen and e-paper of tablets than working with the display and keyboard of traditional notebooks. The use of tablets improved the communication of ideas during group work *(Alvarez et al., 2011)*.

2.1.3. Increased efficiency in education:

Education will become more effective due to the fact that uploaded learning materials and the related illustration, comments, information will be available instantly to students by the use of tablets. Group learning is faster, especially if the new opportunities offered by these ICT tools are used together with creative techniques facilitating collective learning. A great advantage of the e-learning system is the reference links in the digital texts which emphasize the interrelation between school subjects-- thus supporting an interdisciplinary approach. This interdisciplinary structure of the curriculum helps to develop systematic thinking. Digital learning materials follow a logical structure as opposed to a linear one.

2.1.4. Higher usage of ICT tools:

The use of ICT tools by the students will decrease the digital gap not only between members of their own generation but between the different generations as well because the students' learning will have a strong influence on their own families. The effect is all the more intense, the younger the student is and the more time he/she spends at home and the stronger his/her family ties are. The more people use these ICT tools, the bigger the need will be for software applications developed for this platform. It thus triggers the development and improvement of software applications, which in turn facilitates the development of new ICT tools. Technology and society develop together in continuous interconnection with each other.

2.1.5. Digitizing teaching materials:

Digitizing the learning materials makes them easily available on-line for every student and the students can easily take them home, therefore the acquisition of knowledge itself will become easier.

Now let us examine the secondary effects that may appear in 5 years from the introduction of tablets in education, i.e. during the period between 2015 and 2025. Some of these effects may not have further impacts on the future and they fade away.

2.1.1. Developing collective knowledge (Figure 2):

Figure 2. Impact of collective knowledge development; Source: own compilation

2.1.1.a. Research Knowledge:

The more knowledge is stored in the schools' e-learning system, the more base material it offers for researchers so that they can conduct better-grounded research. As the digital world progresses, data can be more easily collected and monitored. With the help of the researchers, analysable and useful data can be extracted from a great part of the available information. This data will be a valuable asset after the analysis.

2.1.1.b. Self-learning organizations:

Self-learning organizations are able to incorporate both tacit and explicit knowledge and to improve their own processes. Self-learning organizations offer a motivating atmosphere where individuals are willing to share their knowledge with others because they will be recognized and supported for doing so. Higher education institutions can become such self-learning organizations if supported by an appropriate framework of ICT tools and the collective effort of all their members focusing on development. This new educational system best be developed on a two-loop model, improving the system by continuous feedback. It is important to study the opinion of teachers, IT professionals and students and to incorporate the results in later development projects.

2.1.1.c. Administration/learning ratio:

The less time is spent on administration, the more time remains for learning. Digital-pen input is faster than traditional handwriting. The average speed of digital writing is 33 words per minute (wpm), whereas expert typists can put down 50-80 words per minute (the maximum is at around 120 words per minute). The average speed of traditional handwriting is 31 words per minute for memorized texts and 22 words per minute for copying *(Wikipédia, 2011)*. In the traditional educational system most of the submitted materials are requested in digital format but no ICT tools and framework are provided. The introduction of educational ICT tools will make an effective flow of information accessible to everyone in the educational system, in terms of both content consumption and content creation. Teachers can have more time left for self-development and preparing for their classes since correcting the test papers, maintaining the attendance sheets and several other administrative tasks can be done automatically with the help of ICT tools.

2.1.2. Changes in communication (Figure 3):

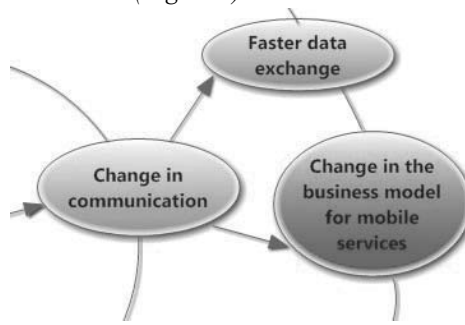

Figure 3. Impacts of change in communication; Source: own compilation

2.1.2.a. Faster data exchange:

By making data easily available, the exchange of information becomes faster. This includes data exchange through voice and video communication. With these changes in communication, the sense of community will be strengthened and studentcooperation will improve. Social relationships will impact community building and the active maintenance of contacts. At the same time, it would be important to develop and spread a proper IT culture. By "IT culture" we mean that users become aware of the usage conditions and consequences of the various software applications, so they have the skills for information searching and using (information literacy) and they are able to express their individuality in the digital culture (Rab, 2007). It also means that they know the purpose of the different applications and how they can use these apps for their own benefit. Additionally, it would be necessary to establish a common ethical code, we can call it an IT-etiquette, concerning communications via cell phones, tablets and laptops (unclear behavioural rules may often lead to offending the other party). Another important area is information management.The searchability of the stored data in the long run can only be possible in a well-constructed structure through appropriate data management. Also, with faster information flow, comes the issue of data security and the ease in which users can be traced and spied on, as a major danger which must not be disregarded. Unfortunately, this is an unavoidable side effect of IT development. The most we can do is to share the least possible personal information on community websites. We should talk students about the dangers and cautious use of these websites

2.1.2.b. Change in the business model for mobile services:

With changes happening in communication, paid mobile services will lose ground, which will call for a new type of business model on the part of the telecommunications companies just like it happened in the music industry.

2.1.3. Increased educational efficiency (Figure 7):

Efficient education helps the development of a knowledge-based society. With a knowledge-based society, globalisation appeared. However, in a globalised society, competition is stronger. Therefore, self-development and self-training will play an increasingly important role. With the use of digital tools offering a more complex, interactive way of learning through multimedia equipment and audiovisual

communication (video, pictures, chat etc.) education becomes more effective (see Figure 4).

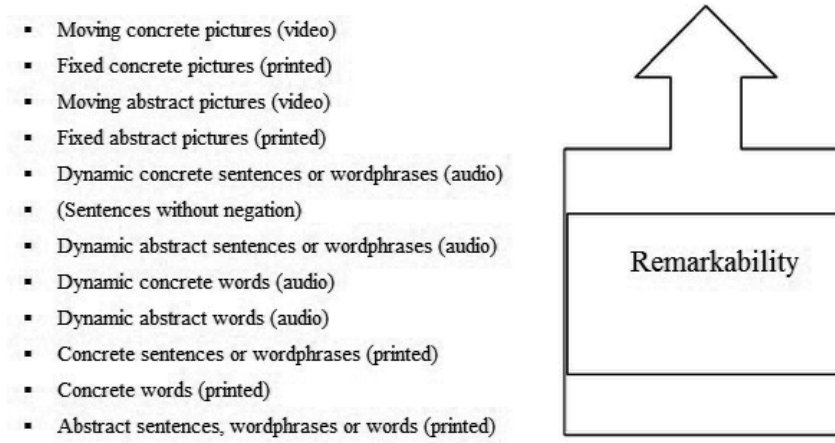

Figure 4. Levels of memorability; Source: (Törőcsik, 2007)

One part of education has been changed by online learning, but it has not replaced it: it just complements it. Its benefits were presented in a TED conference in 2012. (Daphne Koller: What we're learning from online education, 2012.08.01[3]). Online learning supports individual learning, making it twice as effective as the lecture learning. Benjamin Bloom calls this the "two sigma problem". Figure 5 shows Mastery Learning and Classroom Learning being used to teach 30 pupils by one teacher. The difference noticed is that during the Mastery Learning students got feedback to the filled tests (Bloom, 1984). Unfortunately few people can afford to participate in individual learning. I Informatics could solve the issue of feedback making visible what has been understood by the pupils and whichquestions were answered incorrectly by the pupils (a good example of this is the Khan-Academy).

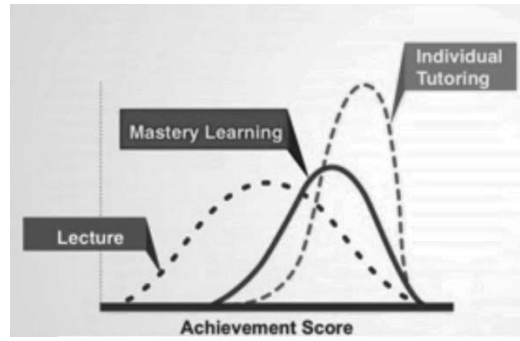

Figure 5. The achievement score of different learning forms (Bloom, 1984)

Other benefits to this Mastery Learning is that the students become more motivated to participate in the lesson, they are in a better mood and more commited to learning. (Deslauriers et al. 2011).

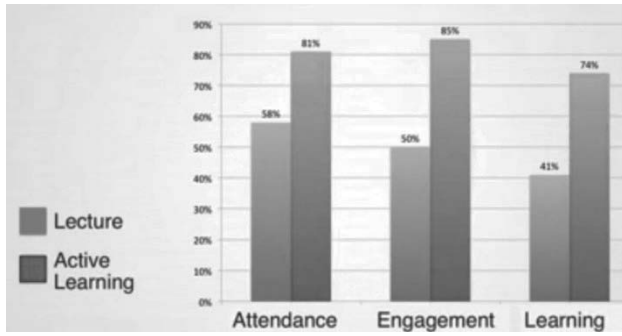

Figure 6. Attendance, Engagement and Learning during learning (Deslauriers et al. 2011)

Internet Learning means the disappearing of physical boundaries, thus making it easier to build international contacts.

Figure 7. Impacts of educational effectiveness; Source: own compilation

2.1.3.a. Better qualified experts:

Students choosing professional research work will be able to conduct research more effectively due to the availability of digital knowledge and to having aquired faster learning skills at school. Also, through conscious social connectionbuilding, networking can facilitate the realization of joint international projects.

2.1.3.b. Better qualified business specialists:

These highly qualified graduate students coming from this new educational system and entering the field of business will have better skills and professional knowledge than their job-seeking peers who have not had access to such high-tech tools. These graduates have a higher prestige in the labour market.

2.1.4. Usage of ICT tools (Figure 8):

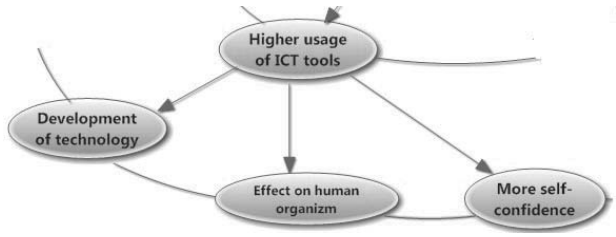

Figure 8. Impacts of using ICT tools; Source: own compilation

2.1.4.a. Development of technology:

Technological development is affected by not only the emergence of new technologies but, more importantly, by the acceptance and spread of these technologies.

2.1.4.b. More self-confidence:

The lack of ICT experience and the inadequate use of ICT tools can decrease teachers' self-confidence. Teachers' self-confidence can be boosted, however, through appropriate training.

2.1.4.c. Effect on the human organism:

The continuous use of ICT tools can have some negative effects. Such drawback can include alienated and shallow personal relationships. Nowadays, people may develop more relationships but these relationships may be less intense and deep because of the inappropriate use of ICT tools. Faster, virtual communication cannot make up for in-person communication. In virtual discourse the participants cannot express non-verbal elements to such depths and cannot react as quickly or clearly. A dangerous factor is that real-time information flow brings us an increasing amount of information. This speed-up time-space continuum requires different abilities from people, but the human organism cannot adjust to the rapid technological changes at such a high speed. Our brain cannot keep pace with this overwhelming flow of information due to its limited input capacity. Our current lifestyle can have unforeseeable psychological effects on us, not to mention the physiological health problems of digitalization caused by the lack of physical exercise and incorrect posture while working with ICT tools. Another phenomenon is our apparent alienation from nature. The development of these problems depends on the user's behaviour. It does not necessarily follow that these problems are the consequence of digital education; our intention here is to draw attention to these threats.

2.1.5. Digitizing teaching materials

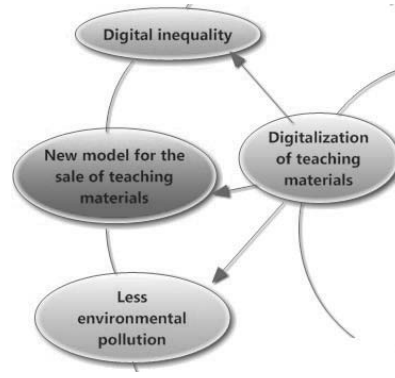

Figure 9. Impacts from digitizing of teaching materials; Source: own compilation

2.1.5.a. Digital inequality:

Digital inequality can be eliminated or reduced to a minimal level if all students are equally provided with ICT tools and ICT-based education right from elementary

school level. The students' social variables (e.g. sex, place of birth, parents' education) clearly affect their learning performance. These social differences can be reduced by the use of ICT tools. Using personal tablets at primary school contributes to the diminishing of social disadvantages and the reduction of gender differences (Fig. 13) (Ferrer et al., 2011). The table below shows that there is a significant correlation between tablet use and the students' in-class participation and their time spent on learning.

Average grade in the pupil's academic record according to the impact of the tablet PC on the pupil.

	Average grade (Average)	Standard deviation	T of the STUDENT Significance
I participate more in class			
Yes	3.33	1.19	0.00[a]
No	3.61	1.20	
I learn more			
Yes	3.36	1.20	0.00[a]
No	3.63	1.16	

[a] Significant at the 0.01 level (two-tailed).

Figure 10. Average grade in the student's academic record in relation to tablet PC use; Source: (Ferrer et al., 2011)

Some claim that in 2012, almost 50 percent of the population in Hungary is digitally illiterate. Therefore, the country aims at spreading digital literacy (Amerikai Magyar Tükör 2012). The number of digitally literate people is to be raised by 1 million within a total population of 10 million, as stated at the Parliament of the Information Society Conference on June 14, 2012. Often digital literacy gaps appear not only between different age groups but between other groups due to their demographics, qualifications or other factors.

2.1.5.b. New model for the sale of teaching materials:

By digitizing the educational materials, information becomes freely available; this also means that the students are not going to buy printed schoolbooks as before. The question is then, why would schoolbook authors find it worthwhile to write educational materials at all. To solve this problem, a new sales model must be developed because no one can be expected to give his/her intellectual and professional knowledge without being fairly compensated for their work.

2.1.5.c. Less environmental pollution:

It is no longer necessary to print out hard copies of learning materials in education. This trend can also be observed in the corporate sector, partly due to CSR[4]considerations, where an increasing number of companies have become "green companies" stopping the traditional practice of printing documents. An important issue now is what to do with the large numbers of obsolete technological equipment. An effective solution for the recycling of educational ICT tools should already be in place. We should have already developed a contracting framework for the suppliers of ICT tools that incorporate strict environmental requirements.

The environmental impact of tablets was studied by Moberg and Johansson, comparing the complete lifecycle of printed newspaper and tablet e-paper. The use of tablets to read the newspaper was found to be more environmentally friendly than reading the printed newspaper (see Appendix) (Moberg et al., 2010).

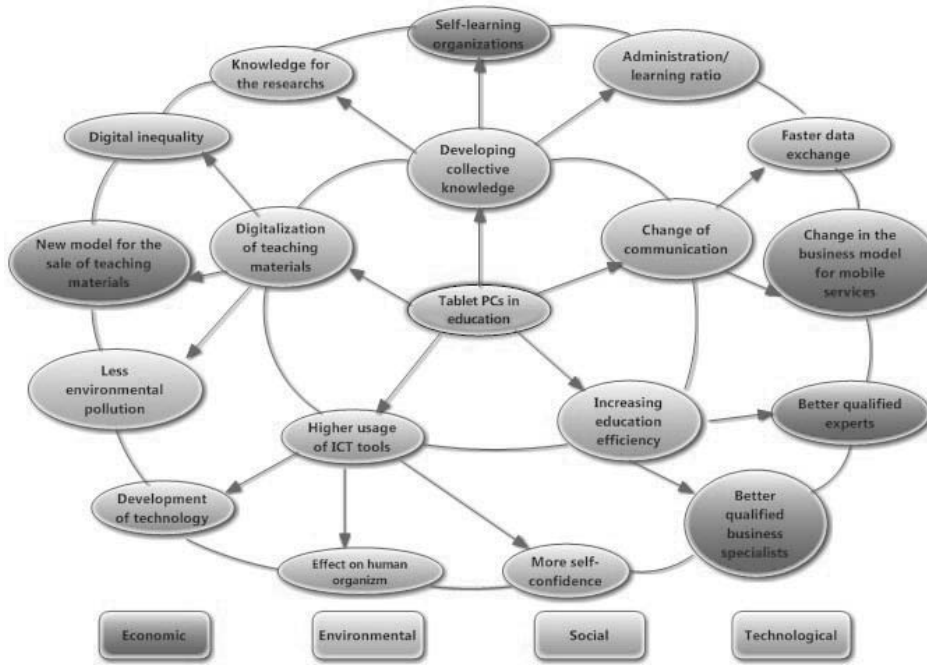

Figure 11. Primary and secondary effects of using tablets as educational tools; Source: own compilation

2.2. Scenario building

Now we will describe the developed visions and the scenarios which leadto these visions. We take the opportunity to focus on wider aspects of ICT tools. The young generation will be important as part of the society. The youth impacts all members of the family therefore we don't separate education from society. This is why we also describe the scenarios of society and not just those of education. The effects of education on the whole society can be perceived not just in the present but also in the long term. .

Scenario building means the crafting of possible future outcomes so as to rehearse the future in advance. Possible outcomes can be subjective and against this subjectivity we used the scientific literature review and collective knowledge of students. Sometimes wild card are built into scenarios. Wild cards are events which may have enormous impact and low occurrence probability. The logic of using a wild card is to stimulate thinking of improbable or impossible events. We wanted to narrow our focus and therefore scenarios were defined according to impacts at the centreof the Futures Wheel. When examining a complex system, the processes and changes can be easily followed by this method. It requires a synthetic approach to processes, phases, interconnections and events. A scenario is an assumed series of events to focus on the cause-and-effect relations and the decision making points (Kahn & Wiener, 1967). It is also a tool to aid decision making by decreasing uncertainty and increasing our level of knowledge (Masini, 1993). By another definition, scenario crafting aims at the logical exploration and evaluation of the interrelations between a series of events and trends and, based on this, drawing the consequences (Nováky, 1997). The main benefit of a good scenario is not accuracy

but its plausibility and coherence, describing cause and causality relationships, its usefulness in decision making and its completeness and relevance. The goal is not to predict the future but to analyse the factors affecting the future. . Mapping out the interactions between the elements of the system clarifies which alternatives come in the order of time. This method also aims at giving "if ..., then ..." logical steps presenting alternative futures that differ from each other in terms of quality and desirability , underlining uncertainties and transforming them into decision making points. Instead of determining the most likely future, we must combine the possibilities into manageable scenarios.

The scenario method involves two more steps. The first step involves finding the most important driving forces. The driving forces are the factors which are influencing the future situation. Besides identifying the earlier categories mentioned (economic, environmental, social, technological) in the Futures Wheel, we also wanted to create more detailed categories (see above Figure 12) to understand the mechanism of action. The following additional categories were defined:

1. Informatics group: the driving forces which contribute to the development of hardware or software in direct or indirect ways:
   - The development of technology
   - Security from possiblecyber-attacks
   - Data mining and data processing, the question of data or information, effective information storage
   - Faster data exchange
2. Human group: the driving forces which influence humans emotionally, physically and/or mentally:
   - Physical impact
   - Mental impact, information overload, decreased ability to concentrate
   - Emotional impact, isolation or more social network
   - More self-confidence
   - Possibility of technology dependence
   - More effective group work, social connections strengthened
   - Increased possibilities for creativity, presentation skills of students improve
   - Less digital inequality, the reduction of socio-educational inequalities amongst pupils
   - Less environmental pollution
3. Business group: the driving forcesin connection with business
   - Changes in the business model for mobile services
   - Better qualified workforce
   - New model for sale of teaching materials
   - Self-learning organizations, learning materials more easily available, collective knowledge increased
   - Administration/learning ratio
   - Better information processing skills

The second step analyzes these driving forcesaccording to dimensions of: uncertainty (X-axis) and impact (Y-axis) (Analysis, 1999). The driving forces are shown in the next matrix. The forces have a larger impact in"C" and "D" quarters, so we built these influential elements into the scenario method. The "A" and "B" quarters contain less important elements, so they were not built into the scenarios. This is a very useful structure because we can visually see which elements have

influential impact roles in the shaping of the future and also see their levels of certainty and uncertainty to appearin the future.

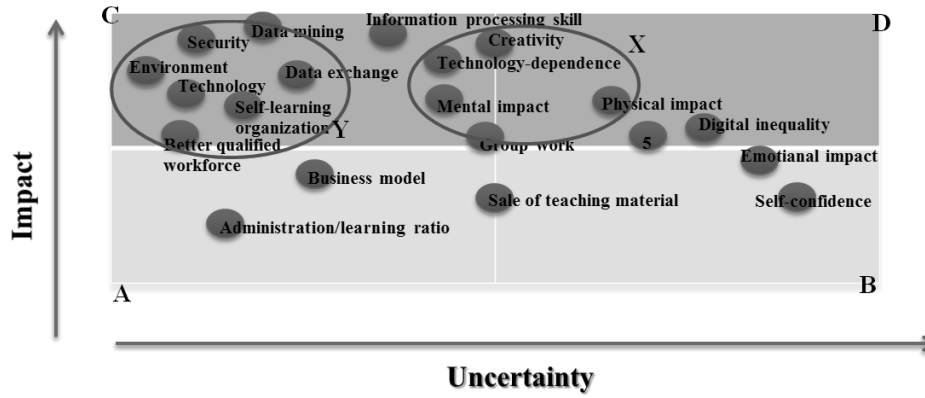

Figure 12. Evaulation of driving forces according to impact and uncertainty

The few evaluated elements in the matrix are close to each other. The factors with the greatest impact and highest probability of occurring in the future are: data mining, information security, development of technology, faster data exchange, less environmental pollution, self-learning organizations and a better qualified workforce. These elements are connected to the process of "Knowledge searching and sharing". There are other possible occuring elements in the matrix with great impact on our information society. These are: creativity, technology-dependence, mental impacts, effective group work and physical impacts. These elements are connected to the process of "Physical, social and mental existence". Now the "Physical, social and mental existence" category becomes the Y-axis and the "Process of searching and sharing knowledge" category becomes the X-axis in creating more scenarios

By using scenario logic we can use different scenario-types (Godet, 1997; Imre, 1996; Nováky, 1997):

- Individual, sectorial, macro
- Explorative, miscellaneous, anticipated
- Descriptive, dynamic, normative
- Trend, complex, peripheral.

The bases for our logic is the Futures Wheel method using the explorative and descriptive scenario types. Exploratory logic means that we analyse the event based on the present inthe direction of the future. Descriptive logic focuses on the relationship between cause and effect. With the use of the Futures Wheel method we searched for the effects of a starting eventbased on the present in the direction of the future.

We formulated four scenarios which are illustrated on a 2-axis coordinate system. The X-axis is the effect of ICT use on "knowledge searching and sharing", from weak to strong, whereas the Y-axis is the effect of ICT use on our "physical, social and mental existence", from low to high. The four alternative scenarios are:

#1 If the ICT-based educational system is a success, then a Healthy knowledge-based net-society will result.

#2 If ICT use has a positive effect in terms of "knowledge searching and sharing" but has a negative effect on our "physical, social and mental existence",

then an Anti-social, impersonal net-society will be the outcome.

#3 If the use of ICT tools has negative effects in both fields, then it will give ground to a society of Lonely, ill rebels.

#4 If ICT use has an overall negative effect on "knowledge searching and sharing" but it has a positive impact on our "physical, social and mental existence" then a Limited information-society will emerge.

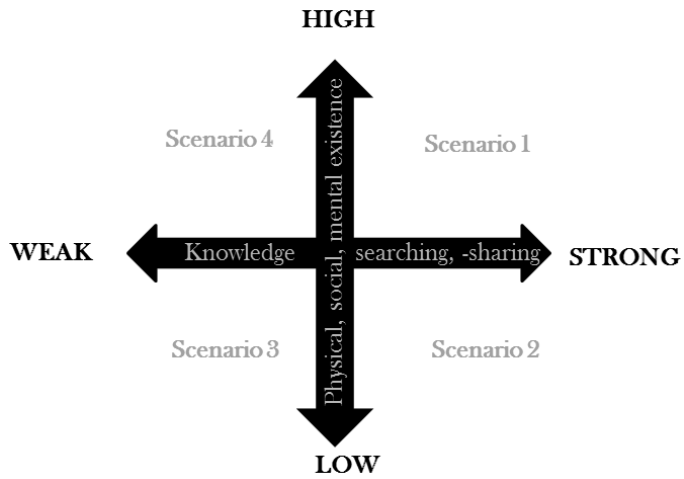

Figure 13. Scenarios defined by two axes

The description of the first desirable scenario will be significantly longer than the other three because our purpose here is to support this "healthy knowledge-based net-society" scenario; the other three scenarios can be interpreted in the light of this first scenario.

Scenario 1: Healthy knowledge-based net-society

In this scenario, ICT tools have a considerable impact on "physical, social and mental existence". It forges a stronger sense of community in the virtual space. Additionally, ICT tools play a positive role in "knowledge searching and sharing". requiring a high level of ICT knowledge and an approach focusing on continuous development and learning. The users are continuously developing their high levels of ICT knowledge and are able to understand and fully utilize the new applications. Members of the society take part in the process of knowledge searching and sharing because they are used to the advantages and possibilities offered by teamwork since their early primary school years. They consciously focus on the non-virtual aspects of social relations, supporting it by the use of community applications. On the other hand, people are fully aware of the business value of net-society and they know that companies make an effective use of ICT tools to achieve their business goals. ICT technology is incorporated into everyday life to an extent where users recognize the importance of regular physical fitness training and activities and correct posture while working with ICT tools. Therefore, everyone uses notebook stands, external keyboards and other auxiliary accessories to improve the quality of their life and work. Unemployment drops due to the spreading of home jobs through on-line distance employment and communication, helped by the prestige of

high level development of ICT knowledge of the population. At work and in their private lives, employees seek opportunities for in-person meetings and traveling. This means that the amount of travel may even increase, which could increase environmental pollution. In general, this particular scenario shows a continuous developing and improving educational system and society, in which individuals are capable of utilizing the opportunities of technology for their own benefit, and without becoming slaves to technology. This kind of society can even reach the point where a framework is developed ensuring the compatibility of the different applications i in which business interests are overridden by the interest of the society as a whole, resulting in a business framework that, at the same time, also offers development and market possibilities for the companies. This part of the scenario is almost utopian. For example, all homes and flats for sale and rent will be displayed through a unified central application, searchable by almost any requested criteria. Real estate agencies will still be competing with each other but the "user interface" will be unified to help the users in effective information search. The unstructured part of information on the internet becomes easily manageable by appropriate search applications. Text and web mining allow for the effective search and organization of information, thus on-line information can function as true data. This type of society boosts the development of knowledge-intensive businesses.

Scenario 2: Anti-social impersonal net-society

This scenario assumes that ICT tools have a negative impact on our "physical, social and mental existence" and people develop a weaker sense of community. On the other hand, it also assumes that ICT use has a positive effect on "knowledge acquisition and sharing". Users can produce and store more and higher quality of knowledge. People are spending an increasing amount of time in the virtual space; more and more activities are moving from the physical world to the virtual one by finding the appropriate applications. Members of the society are able to do many things on-line, from their home. They can effectively communicate with each other, hold video conferences and meetings, travel and pursue their passions virtually through the web. Yet, social relationships are becoming increasingly impersonal resulting in a larger number of shallow relationships, making the individual feel lonel. On the one hand unemployment has decreased due to the spreading of home jobs through on-line distance employment and communication, facilitated by the high level of ICT knowledge of the population. But on the other hand people are more physically and emotionally isolated with the in-person physical cultural traditions losing importance. This scenario foresees an economically efficient but lonely society, disregardinghumans as social beings. This kind of society will bring physical and mental health problems to a lot of people, which will be difficult to change in the future.

Scenario 3: Lonely ill rebels

This is the most pessimistic, worst case scenario where ICT tools have negative effects on both our "physical, social and mental existence" and on the "acquisition and sharing of knowledge". On the one hand, members of the society become lonelier, and on the other hand, too much unnecessary, hard to search and find information is generated in an unstructured technological setting. . People feel that they should develop their knowledge of ICT applications but there is no internal

will to do so, and resistance sets in. Users receive a huge amount of information but they cannot process, store and later search it effectively. The time each user would save utilizing intelligent applications and well-founded ICT knowledge would be enough to engage in activities in the physical world; like physical fitness training and in-person social interactions. This kind of society will ruin itself because it utterly depends on ICT technology but cannot effectively manage it and exploit its possibilities. Even worse are the social and physical processes negatively influencing people's condition in the long run. This scenario shows a group of alienated and offended people, unwilling to learn.

Scenario 4: Limited information-society

The fourth scenario where ICT tools have a positive impact on our "physical, social and mental existence" but exert a negative effect on the "acquisition and sharing of knowledge" can still be called an information-society. However, as opposed to the former scenarios, its most prominent feature is that this society offers only limited possibilities for ICT knowledge searching and sharing, hence comes the name Limited information-society. In this scenario, ICT users do not co-operate in knowledge acquisition and sharing" and they do not make an effective use of the available ICT tools and applications: these users are motivated to consume "information rather than create content due to their embedded bias. The main problem in this kind of society is that although technology is incorporated in everyday life, people are not able to use it efficiently. Despite the technological dependence of these users and the increasing amount of information available to them they lack the sufficient ICT knowledge to search and share effectively. Many users feel uneasy and powerless about their situation, getting tired of the constant and overwhelming flow of information. Many fall behind, unable to capitalize on the available opportunities. In extreme cases, certain groups of users will try to exploit the weak points of ICT systems and computer crime or rebellion may appear in various forms such as hackers trying to trigger negative public reaction to paid software by preaching "free software". On the other hand, community media uses the ICT system not as an exclusive tool, but as a supportive one. In this scenario, people carefully manage their business and private relationships separately, focusing on in-person contacts. They are just as aware of the importance and role of business applications as of social media, making maximum use of bidirectional communication (blogs, posts, comments etc.) offered by the web 2.0framework. This scenario projects an inefficient but amiable and well-rounded communicative society.

Conclusions

Technology appears in our everyday life to an increasing extent, and this development is greatly facilitated by the spread of ICT tools. These tools are also being adopted into one of the most important sectors of society, the educational system. In an ideal case, this process would happen in an organized and conscious way. The role of teachers is changing. Nowadays, students can communicate better and easier, study more effectively, access information online faster and protect the environment through the use of ICT tools. And now, teachers' roles are to coordinate students' work, motivate students so they can performanceand express

their ideas better, mange the development of pupils' educational growth and provide them with help in the form of consultations. Students' successful implementation of new tools and the application of information technology can be achieved with the coordinating guidance of teachers; a teacher is a student's personal facilitator. We can notsuccessfully aquire the tools without the personal human factor. Because we cannot yet foresee the results, the effects and/or the inherent possibilities of this phenomenon, we must continue to study the many possible future scenarios. We have used the Futures Wheel method to show the impacts of the introduction of ICT tools in the educational systemand in the information society; on this basis we have built social scenarios.

By using 2axes, four future scenarios were outlined. The “knowledge searching and sharing” axis has an impact on the economy. The “physical, social and mental existence” axis has an impact on society's well-being, communication and the behaviour of people. Both express the technology’s potentials, its ignorance and/or the technological dependence and their negative effects. The Y-axis approaches the relationship of technology and humanity from the point of view of the society and the X-axis approaches it from the point of view of the economy.

Some elements of these scenarios are already present in our society. In this paper, we wantto urge decision makers and ICT users to develop an approach, a behaviour that capitalizes on the possibilities and avoids possible dangers. Of the four scenarios presented, the first is the ideal one, the second and fourth are acceptable, and the third one must be avoided. For the first scenarioto become a reality in the future, a national plan of action based on a multi-faceted approach will be needed.

Appendix

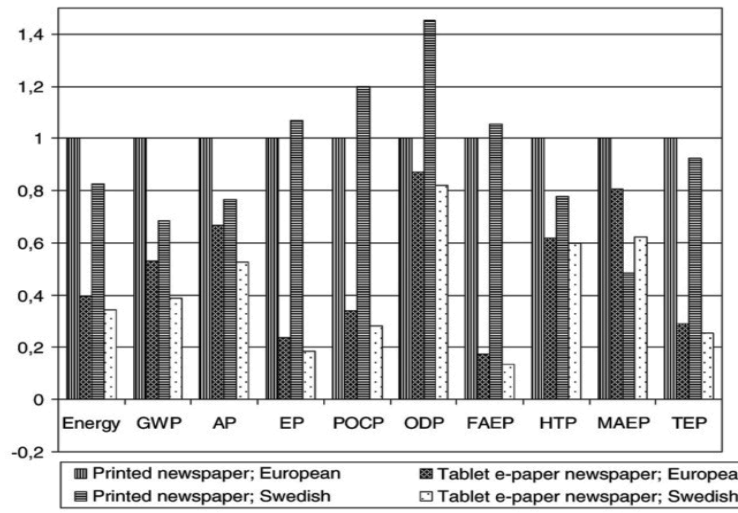

Figure 14. Environmental load of newsprint paper and e-paper; Source: Moberg et al., 2010

The bar chart above compares the environmental load of conventional newsprint paper and digital e-paper in European and Swedish scenarios based on the following indicators: Energy: total energy demand; GWP: global warming potential; AP:

acidity potential; EP: eutrophication potential; POCP: photochemical ozone creation potential; ODP: ozone depletion potential; FAEP: freshwater aquatic ecotoxicity potential; HTP: human toxicity potential; MAEP: marine aquatic toxicity potential; TEP: terrestrial ecotoxicity potential.

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Notes

1 Frequently Asked Questions
2 Organization of Economic Cooperation and Development
3 http://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education.html
4 Corporate Social Responsibility

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