THE DEVELOPMENTAL TENDENCIES OF THE IT TOOLS AND THEIR PARTICIPATION IN THE EDUCATION OF FUTURE

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Abstract

The progress of the civilization and intensive development of computer tools influence on changes in the sphere of information, communication and education. Modern techniques, software and mobile solutions have direct impact on the users. In the chapter, the attention is paid to the fact, that the changes concerning the information society, which are caused by dynamic development of the computer tools, particularly taking part in processes: communicating, access to information, connecting with other users, learning and teaching. The development of new technologies, miniaturization, digitalization, wider accessibility to the modern mobile and wireless devices set new trends, which will revolutionize education in the near future.

Key words: Information Technologies (IT), Information Society, mobile device, digitalization, Augmented Reality, Educational Technology

1. Introduction

Rapid civilization progress, gathering huge resources of information, fast development of Information and Communication Technologies (ICT) are the phenomenon which characterize changes ensued in recent years. Time, which we nowadays live in, is the time of computers, mobile phones, Internet and social websites. Global computer network became the most addictive and the most intrusive informative medium in our life [20, p. 38].

Particularly, using the mobile technologies permits to access the information “any time” and “anywhere”. Because of that, potential influence of the mobile devices on the society will be considerably bigger than of the traditional computerization in the near future. The Polish school of twenty first century needs changes, modern education adapted to the requirements of the surroundings and including the new trends, which are the vital elements of the modern life of students – generation (“digital native”) who commonly uses Internet and mobile phones and what is more, who grows up with the symbiosis with the virtual world.

2. The development of the information society – the civilization of the twenty first century

Rapid civilization development, and particularly the fast improvements of the communication means, ubiquity of the IT solutions in the everyday life and furthermore, accumulation of the enormous information resources are the phenomenon which

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accompany creating of the new civilization. Several terms which describe occurring changes and characterize the new type of information society appear in numerous scientific publications. In the article: “The development of the information society” Anna Michalkiewicz mentions the most popular terms for the conditions of the society development and there are [15]:
- the Information Society (K. Koyama 1968),
- the Era of Electronic/the Era of Information (M. McLuhan 1969),
- the Knowledge Society (P. Drucker 1969),
- the Technotronical Society (Z. Brzeziński 1970),
- the Telematic Society (J. Martin 1982),
- the Third Wave (A. Toffler 1987),
- the Postindustrial Society (D. Bell, R. Dahrendorf),
- the cybernetic Society.

Terms mentioned above, we can complete with the phrases using at present: the postmodern society (Z. Bauman), the network society (M. Castells), the mobile society, the open society (K. Popper), or the mobile – network society (Figure 1).

![Fig. 1. The graphic presentation of the definition of the mobile – network society [14]](image)

Regardless of common use terminology, present society is characterized by **high level of using information in everyday life by most of the citizens and organization; using homogenous information terminology for own use, for the use of society, education and professional activities, the ability to transmit and reactive and what is more, exchange digital information despite the distance** [13, p. 71-72]. This situation is possible as a result of taking various actions on account of the societies development – as a followed example: the realization of “Strategy of the development of the information society in Poland to 2013” in three spheres: human, economy and state [19].

- The area concerning HUMAN – includes acceleration of the development of the intellectual and social capital of Polish people, as a result of using the information and communication technologies.
- The area concerning ECONOMY – includes action connected with the increase of efficiency, innovation and competitiveness of the company, and thus, the Polish economy on global market; make the cooperation between entrepreneurs easier due to using the information and communication techniques.

- The area concerning STATE – connected with the grow of accessibility and efficiency of the public administration service as a result of using information and communication technologies to rebuild the internal administration processes and service delivery.

It is important to stress, that actions connected with development of the telecommunication infrastructure (for instance realization of the “Digital Poland” program) are associated with [22]:
- the possibility to obtain access to fair information or safe service, needed for the citizens and entrepreneurs,
- the lack of the discrimination in the accessibility to the information, and particularly, to public information,
- the aspiration that the sharing in the information resources will be obvious and the most widest, and what is more, the offer of the products and services of the information society will be the most extensive,
- the ensuring to reach safely to the required information in the fast, easy way and independent of using technology.

Simultaneously, besides the teleinformation infrastructure, the ability to use by citizens the contemporary IT tools is one of the basic factors which stimulated the civilization progress. There are used to get, gather, process and exchange the information. In the modern world this ability becomes the desirable and very powerful tool, which supports the economic and social development. It is also the good in demand, which must be competently use by the users, because of an excess of massages, which “come” from many differ source of information [8].

The dominant role in operating the information in the postindustrial society is played by Internet – computer “global network”, which as W. Gogolek emphases, forms some kind of network communication generating sort of threats, caused, for instance, by transmitting information through machines - that stop to be only the passive store keepers [9]. Fears associated with this, were enclosed in the report: “Being Human – Computer Interaction in the year 2020”. The authors of the report predict further trend intensification, which are to be found at present and consist in unintentional interaction between human and machine. They also suggest that humanity comes into computer expansion period, which they calls the era of mobility, and in a future: ubiquity [4]. Changes will be noticeable in the sphere of interactions between human and computer: people will increasingly get information through computer, and moreover, computers will be able to predict human’s expectations.

In fact, we more and more depend on machines and new technologies. The harder we try to adapt them to our needs, the more subordinate our life and habits become to meet their expectations. They become indispensable elements of our everyday life. The access to the information anytime, form anywhere in the world is unlimited.

Morgan Stanley describes and illustrates the occurring changes in the history of computers (Figure 2). He distinguishes: the era of content provisioning of own computer (input), the era of output of the computer in a network (output) and the era of sharing (sharing).
The development of new technologies, miniaturization and greater availability of the contemporary mobile and wireless devices set new trends and simultaneously they are the answer on consumer’s needs. The new type of computer devices - mobile devices serve increasingly consumption and sharing, and the information management is being done by using mobile Internet.

3. The era of mobility and its consequences

Mobility becomes a standard of leaving. Possession of mobile phone, laptop or palmtop is no more the expression of high social status, it is rather the require of the everyday existing. Those devices are used by people regardless of the age, sex or social status and furthermore, those devices accompany steady.

Mobile devices allow not only keep in touch with friends, but more often, let them work, have fun, use the infinite resources of the Internet. Nowadays, it is possible not only in the stationary conditions, but also during the movement and/or outside the permanent residence and work. Easiness of the new services realization, including multimedia is essential advantage from the end-user point of view.

According to the researches carried out by iPlus – “Mobility 2010”: about using the mobile Internet by Polish people – the everywhere and anytime access to the Internet is increasingly exploring. 97 per cent of respondents confirms, that the Internet for them is the routine, the daily life. Users do not treat it as new medium, but use the concrete solution [12].

Adopted phones become some kind of “window on the world” – they offer access to latest news, e-mails, social websites, they allow to enjoy the entertainment, they help to keep in touch with friends. The need of easy and permanent access to new technologies has been increasingly noticeable. Telecommunication corporations and mobile operators turn out to meet the expectations by competing in making the rapid network of broadband Internet – 4G accessible. Poland is the fourth country where this Internet has been launched (Figure 3).
Modern networks offer not only wider range and higher speed, but also better quality of voice calling and stability of information transferring. In accordance with the European Union in 2013, 100 per cent of households in EU countries will have the access to the broadband Internet [2].

LTE (Long Term Evolution) is the successor of the technologies such as: GSM, UMTS and HSPA+. Nowadays, average information transfer of the UMTS is the download speed to 7,2 Mb/s, HSPA+ is 21 Mb/s and LTE is to 150 Mb/s. It is necessary to highlight, that currently, there are completed work on long-awaited LTE Advanced (LTE – A). At the meeting organized by the 3GPP (3rd Generation Partnership Project) in Taiwan, the main producers of mobile phones initially accepted the technical specification of the LTE, which allowed to begin work on final version of the specification. Finally, its publication will be announced in Kansas City in March 2011 during the 3GPP plenary meeting [16]. The specification has become the part of the IMT – Advanced – a set of specifications, which is called “the true 4G”. The key features of the IMT – Advanced System are [7]:

**Fig. 3.** The access to the Internet in Europe (information in per cents – IX.2010th year) [17]

**Fig. 4.** The technologies of access to the Internet – the possibility of wireless connection [5]
- cooperation and compatibility with other radio systems,
- high quality of mobile services,
- user’s devices work all over the world,
- applications, services and devices which are user-friendly,
- supporting the global roaming,
- high rates which supported advanced services and applications (100 Mbit/s for high mobility and 1 Gbit/s for low mobility).

Thanks to the incredibly fast network speed and delays reduction, customers can use wide range of Internet application in real-time, even when they are in a move. LTE has to meet the requirements of new and still improving mobile applications based on Internet, and moreover, meet the needs of Web users. Especially, it concerns young people, brought up in the media world – digital native – generation, which “think” by using modern gadgets, such as mobile phones, computers, smartphones, etc.

Using the portable computer devices with wireless access to the faster and faster Internet, enable, for instance, to mobile educational services and extended the learning – teaching process outside the traditional class. Schools usually complain about the lack of appropriate computer hardware, however, practically 100 per cent of students all over the world are equipped with mobile phones, which assist them wherever the they are. Because of that, in near future, it is likely, that the mobile devices will become the important educational tools. Nevertheless, before it would happen, the suitable educational software and learning platforms should be prepared and adjusted, which would help young people in many cases.

Meanwhile, in Poland, the using of the mobile devices during the lessons is not widespread, or it is even forbidden. Students are obligate to turn off their mobile phones during the lectures. There are understood rather as some kind of the fashion trends and because of that, it happens to take it half seriously and what is more, the realization of the vital educational aims thanks to the mobile telephony seems to be something very unlikely. Referring to the one of the most essential study in the world, which is devoted to the trends in the contemporary education, The Horizon Report 2011 [11], being influenced on school and university reality and additionally, on the activity of the educational institutions, it will be real soon. The authors of the report seek for further expansion of the mobile telephony and changes which are taking place in the processes of communication, accessibility to the information, connecting with other users and friends or learning through portable devices.

4. The potential of the mobile devices in education

Rapid changes and unlimited access to resources of information and in addition, the development of the mobile and wireless information technologies make that the education faces the new opportunities and challenges.

The contemporary IT tools excite, their potential in the improving the quality of life is colossal. However, schools do not use this potential at any stage fully. It is more worrying because, the influence of the technologies on everyday life is and will be stronger. We must bear in mind, that the potential of the mobile devices will revolutionize the learning process almost immediately. The main trends in the coming years according the Horizon Report 2011 are [11]:
- the development of the mobile technologies,
- the development of the electronic books (e-books),
- using the Augmented Reality,
- teaching based on the games,
- computer processing the motion,
- analyst of the learning process

The development of the mobile technologies, and thus, the easiness of access to the Internet make that more and more contents have the digital form. The amount of publications, e-books and open educational resources are improving in surprising speed. There are built progressively digital libraries, which have the electronic version of the books published by main Polish scientific publishing house. Another example is the Google Books project, which will provide as the creator of the biggest world digital library. Thanks to that, many books will be available for wide group of receivers. E-books, which are devices and software to replay them in fact, have a lot of advantages. Among them, there may be mentioned:

- current information,
- relatively low cost of acquiring information,
- easy and efficient navigation and search system,
- practically, unlimited capacity of the electronic materials,
- trouble-free archiving and easy access to the books,
- increasing range of available book titles.

The content in the electronic form is easily gain, and because of that, students have all of the needed information to learning with them. What is more, students treat the information came from this carriers as the equal rank transmission to the books, and even better than the traditional one, because it is less demanding but also more attractive in reception. Paper books and traditional ways of teaching are for present students boring and not interactive enough. They occasionally visit traditional libraries and they search information in classical encyclopedias – instead of this, they use Google, Yahoo or other Internet searches.

This approach should induce teachers to act. Information revolution gains from the mobile devices the new driving force and the possibility to extend the learning - teaching process outside the traditional class. The education of future will be perhaps the mobile education.

Facing these expectations, there are made some decisions and new actions. The perfect example is Foundation of the Development of the Educational System, the National Program Agency “Learning throughout life”, which announced contest: EDUinspiration 2011 under the slogan: “Mobility form junior to senior”. Its essence is showing the meaning of mobility in the process of learning at all stages: from pupil, through student, worker, manager, to the elderly people within the frameworks of continuing education. It is worth to mention the Katarzyna W. Witek’s article: The value of m-learning for continuing education in the context of exemplary European projects [21]. Author gives concrete European examples of using m-learning:

1. Using mobile phones during learning Irish – the idea of this project were, besides the development of language competences and students’ motivation to learning this language, also the establishment to which extend the application of information – communication technologies (including the mobile phone) can be useful to the process of oral asking questions, for certification. Using phones and Internet chat may function as the tools which students know them well.
2. Using mobile phones to learn how to make quick strategic decisions – in this case, the simulation of emergency management during floods were carrying out in the Aberdeen
University in Great Britain. During those three days of simulation, students get text messages with the information concerning the situation in the city affected by flooding. On the base of obtained information, they must have made a quick decision - how crisis staff should have reacted in particular situations, and next, by mobile phone or e-mail send as fast as possible a feedback message.

3. The use of the m-learning finds a place in teaching the basic skills – writing and counting among young people threatened by social exclusion – the aim was to create conditions for individual learning (including learning with each others).

4. BBC mobile learning – that is the example of the service which includes didactic materials resources specially prepared to be downloaded through mobile phone and which is addressed to different age groups of people.

The uses of m-learning mentioned above show exemplary possibilities of using the mobile technologies in education. Materials prepared specially for m-learning mainly should inspire and motivate to further learning due to their attractive form.

They may successfully be:
- technology – added – enhanced learning
- lifelong learning
- workplace learning
- just – in – time – learning

Another tool, which has the substantial educational potential and which dynamic development is predicted in couple years, is Augmented Reality (AR). This term means the system which connect the natural world with the world computer generated – that means, that in the picture of the real world it is put the digital generated information: interactive and in real-time, and what is more, available, because of the variety of mobile devices. In the picture captured by camcorders there are put elements which are computer generated. We can interfere with those elements through the movement in front of the camcorder or the movement of the camcorder itself. This technology becomes the essential information channel delivered by computers, phones, multimedia players, films and printed books. Thanks to that, in near future, this technology may become very vital (because practical) supplement of other learning methods. Even at the moment, there are special course books and atlases, which with the use of Web cameras, transfer essential information covered in video materials, graphics 3D models (Figure 5).

![Fig. 5. The example of encyclopedia in AR technology [1]](image_url)

The main educational potential of the AR is focused on the opportunities to put computer generated information on real objects and work on virtual objects in real surroundings.
The example of this kind of application is training program, for instance: BMW prepared software, which suggest mechanic how to repair the car. Mechanic uses eye sight glasses, which put virtual models on repaired elements and show what to do and discuss the each steps (figure 6).

Fig. 6. BMW Augmented Reality [6]

Other example may be the use of AR technology in museums, on exhibitions or in galleries. Use in an efficient way, it not only increase the interaction between visitors and the surrounding, but also AR has enabled presenting the exhibition in more attractive form than so far. The possibilities of projecting additional information about the exhibit, extend not only the perception of viewing masterpieces, but also increase the group of receivers. New technologies as medium, attract young people to the museums and galleries. Before it, seldom does it happen that those people visit museum halls.

Fig. 7. AR in the National Museum in Cracow [23]

We should bear in mind that, the National Museum in Cracow it the first museum in Europe, which enrich the chance to visit and explore exhibitions with the possibility to use Augmented Reality. At the same time, this museum was first to decide to use mobile application “New dimension of Main Market Halls”, using AR technology, which is the version for iPhone users (Figure 7).

Thanks to this kind of connection modernity with tradition, tour to the museum will remain long in the visitors’ memory and viewed pictures will be associated with proper historic and cultural context.

New technologies increasingly support the cognitive processes, and because of the more realistic and interactive teaching aids, through, for instance, extended reality (AR), they may be used, for example, to [10]: 
- obtain additional information about the physical object directly in the space – time point, which this information concerns
- fill the traditional course books in three – dimensional, moving and interactive objects
- generate interactive teaching aids, rich in high level of realism
- carry out the realistic simulations of the physic, chemists, and biological experiments, without the risk concern the harmful substances, dangerous targets and chemical reaction.

Outlining today the use of educational Augmented Reality (AR) and predicting their development direction allow to assume that those kinds of systems may deliver tools and methods, which are adequate to educational needs of the present generation – people who grow up in the surrounding of the technologies and digital achievements of twenty first century. They are the most likely intuitive interface available today, which makes that students can in easy and attractive way operate the information. The use of AR in education certainly improve students’ activity and involvement during the lessons.

In many cases, AR technologies are integrated with educational games, and because of that, students can acquire knowledge additionally through the entertainment. The next direction of activities connected with the education of future points precisely on educational games, which can be the essential and efficient element of the learning process. They are able to support the development of one student, as well as the whole group at each stage of school education. They can be effortlessly use in the classrooms, and also in the Internet. Because they reflect the reality, they can be use to practice, for instance, behaviors and checking skills and abilities. Additionally, there is no problem with including them to the teaching program, because more and more those kinds of applications are being prepared for the mobile devices. As a consequence of this, in near future, lessons will be more attractive due to using AR technologies.

The following direction of the development the IT tools, which will have the vital influence on school and universities reality in near future, is the new dimension of the interaction between human and computer. The progress of this technology may be dynamic for the reason that, devices like Kinect appear - which allow controlling the game using body movements. The crucial achievement in this sphere is the invention of the German scientists of the Technical Institute at Franunhoffer. They built the system which recognizes not only the hand movements, but also the movements of fingers. Furthermore, they can replace those movements for commands (Figure 8).

![Fig. 8. Multi–touch Prototype for Augmented and Virtual Reality [3]](image-url)
Systems of this type using gestures are important elements of the interaction between human and technology, which has the huge poetical and can be use on many areas, for instance in education, or as the method of presenting complex information.

Speaking about the development of the IT tools, it is finally worth to stress, that tools and techniques of the artificial intelligence help uncover knowledge from the information. Especially recently, when the education has been gained the global character, it is vital to devise intelligent methods of distribution knowledge and what is more, to build learning systems which achieve automatic categorization of knowledge and personal competence on the base of student’s activity and the progress. The intensive development of the sphere of the information exploration allow to adapt schools to the student’s needs and capabilities to enhance the process of learning and teaching - constant improvement of the teaching program to learning takes place and progress evaluation at the same time.

5. Conclusions

Miniaturization of the communication devices, which goes hand to hand with its increasingly efficiently and multifunctionality, is the process, which dominates in the twenty first century and makes real the vision of the future of education. Changes which have been shown due to the information society caused by the development of the IT tools and technologies, and moreover, which enormously influence on education processes, demonstrate the progressively more poetical of the mobile devices, didactic games, Augmented Reality and Superficial Intelligence. Therefore, it is essential at present to be prepared for the education of the future with the use of the new tools, which will soon revolutionize the learning process.

6. References

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