

Transfer of Technologies to the Governmental: Practice Development, Usability and Challenges

Hana Skalska

University of Hradec Kralove, Hradec Kralove, Czech Republic
hana.skalska@uhk.cz

Abstract— ICT is the most influential determinant of changes in the network society. Newly adopted technologies and processes based on the Internet, clouds and virtual networks allow high mobility to users and can contribute to the highest efficiency of processes. E-government as public service is developed in most countries and different aspects are summarized. Effectiveness of e-government is conditioned by its design, ICT model, implementation quality, and user’s satisfaction. Advantages to the citizens must meet expectations about complexity, quality, security, accessibility, and friendliness of services. Education of citizens, development of channels for feedback, and education IT experts understanding to public services are components, necessary for higher effectiveness of e-government.

Keywords— e-government; multi-channel e-government; e-government and development; digital divide; users and attitudes; satisfaction; strategy; education; cloud computing; virtual environment

I. INTRODUCTION

In the past decades, the process of changes our world due to technologies and rapid progress of the Internet and World Wide Web, resulted in a phenomenon of global society. This is a result of international integration of unforeseen possibilities in human connectivity and interchange of worldview, products, ideas, and other aspects of culture [1]. Information and communication technologies (ICT) penetrated a wide range of activities in society. The technology contributed to this progress as its capacity increased, cost has fallen gradually, and technology became accessible to almost everyone. The global changes in economic, social, cultural, and political life were initiated by increasing usability and accessibility of technology.

The aim of this paper is to summarize the process of implementation ICT into everyday practice, its consequences and implications. Findings are based on literature review and synthesis. Some peculiarities in implementation ICT into public use and its present questions related to e-government tasks are described. Contemporary practice and application of e-government principles in Czech Republic are mentioned. Some challenges for education and research are pointed out as a conclusion.

II. PROGRESS IN TECHNOLOGY AND CONSEQUENCES

Today’s society is characterized by continuous change and development of ICT. Activities and progress in social

organizations are almost solely based on ICT including networks. An association between the development of society and progress in technology is bi-directional [2]. An explanation of interdependency between ICT and users in network society supports the idea of necessity to stress attention to the user.

A. Network Society

ICT does not only determine changes in society, but affects each specific component in society (people, processes, market, corporations). Technology influences needs, interests, and acts of each component in society and generates new knowledge. One of the most important technologies is digital networking. According [2] “digital networks can, at the same time, be flexible and adaptive, thanks to their capacity to decentralize performance along a network of autonomous components, while still being able to coordinate all this decentralized activity on a shared purpose of decision making”. Networks can manifest themselves in different forms (cultural, institutional, based on historical roots, etc.). Components in digital network coordinate their activity with other networks on the base of common interests. This logic can be extended to the global networks of capital, goods, services, labor, information, science, technology, and communication. Then globalization can be referred another way as the network society [2].

ICT affects each component in society in one direction. The other direction means that ICT development is influenced by needs and interests of component parts in networking process and the process is sensitive to the needs of users. Users of ICT shape technology into their needs through their demands. New demands of users are specified and determined by their ability to use and benefit from new technological systems, from new computing possibilities, and from an advantage of digital communication. Use of computers and digital communication tools resulted incrementally in development of new social structure, the network society, which shapes technology by its mind. The development of technology is accelerated by needs and interests of ICT users in society as users are able to benefit from this progress. They demand resulting products and profit from them, this way new progress is evoked. Different arguments and logic styles are used for explanation of the mechanisms of ITC changes and their consequences to the resulting social structure called as information society, knowledge society, network society, or digital society [2],[3].

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B. Progress in Everyday Activities Due to ICT Use

Knowledge, skills and ICT allow to anybody to participate on progress in society and benefit from it regardless on current location. Tablet PC, smart phone, iPad or laptop together with mobile connection to the Internet can bring an advantage of liberty in action. ICT offers a potential to transform all activities (related to the business, occupation, public administration, government, personal life) to the highest level of quality and efficiency.

The progress from the use of ICT is in increasing quality and security of operations or decrease cost: (1) Lower (time and money) transaction costs (digital communication channels). (2) Increased speed of feedback, the possibility to share and use information effectively. (3) No geographical and daytime limitations. (4) Cooperation, cheaper labor delivery, and digital services accessible by digital channel. (5) New services and products (communication systems, telemedicine, videoconferencing, smart appliances and monitoring devices. (6) Mobile office (virtual desktop). (7) Virtual computing environment, remote access to data and applications in clouds.

C. ICT Impact on Jobs

Since the birth of information society unemployment and change in nature of jobs have been reported, explained, and predicted as a logical consequence of technology use and development [3],[5]. Administrative work was automated (electronic payment systems, electronic documents delivery services, mobile systems, cell phone banking) and some workers lost their jobs or professions were changing. The Internet has opened possibilities for digital public libraries. Librarians have got new jobs as knowledge workers, information managers, information consultants, and seek the possibility to utilize their knowledge in public knowledge service delivery. Nurses are getting jobs as partners in health-care delivery in community (mobile health, SMS messages awareness) and profession is changing as hospitals reduce number of beds (highest effectiveness due to ICT use). One stop government approach offers to the citizens an access to as many public services as possible from a single location Where ICT and other channels are concentrated. Drop in the skill requirements for the street-level staff was assumed. Network character of this organization makes it difficult to control all unexpected situations with the use ICT only. Employees had to solve new working situations which need dynamics in decision, cooperation across organizational boundaries, and the development of specific mechanisms to cope with requirements of citizens [6]. Broader skills for these workers are necessary in opposite to declared one.

Changes in technology influence on structure of economy, new professions and skills are required. Many jobs changed the nature and become more information intensive and new professions appeared. Workers spend a great proportion of the day with processing information, working with information technology, communicating with information systems. Employers require more flexibility and adaptability from employees. In addition to professional knowledge, employers seek applicants with communication skills, computer literacy, analytical skills, leadership, teamwork and other abilities and personal values. Skills, knowledge, experience, hard-working,

and willingness to learn are key factors of competitive advantage on labor market. All requirements of employers altogether with competitive labor market can impact on higher insecurity of employees. The challenge and opportunity for educational system follows from the necessity to detect the potentials of these needs for educational system. University has to follow these changes and link appropriately designed and managed courses and with emerging requirements of practice.

III. TECHNOLOGY AND PUBLIC SECTOR

A. Electronic Government, E-Government

There is no universally accepted and stable definition of electronic government (e-government) and the progress in the possibilities of ICT use in governmental processes influences this vision. E-government is a concept of the use of ICT as a tool of achievement of better government, delivering services to citizens and supporting democratic opportunities. According [7] the task of e-government is governance, the job of regulating society, the transformation of governance processes resulting from the continual introduction into society of more advanced digital technologies.

At the end of the past century the first e-governmental applications were focused on development of public services on the Internet. The possibilities were mostly limited to end-user interface use. Later development was focused more on efficiency and quality of public services, on automation of administrative tasks, access to information via digital channels, use of electronic forms, electronic payment systems, e-registers, e-teaching and e-learning, e-libraries, and many specific applications (e-health etc.).

Technological progress and local objectives are subordinated to the policy and priorities in individual countries. Public managers coordinate local strategy with macro-strategy and supply (dominated by government) is coordinated with demand (from citizens). The strategies of e-government must bring benefit to different communities. Long-term and short-term consequences of e-government projects, supporting technological progression among different communities, must be taken into consideration.

B. Digital Divide

Multifunctional public applications provide to the citizens an advantage of better access to the public information and offer many services to them with highest quality. Access of citizens to information increases their possibility to influence policy outcomes in key areas. Public services strategy has to consider needs and expectations of each of citizens in population. One of the barriers in developing e-government could be digital divide, which is characterized as significant gap between specific segments of population in their opportunities to access to a technology. In contrast to majority of population, disability of a person, age category, gender inequalities, and differences based on style of life or socio-economic status can effectively deny some minority from the possibilities to access and use ICT.

The term "e-inclusion" is used in the Europe instead of "digital divide". This concept belongs to the i2010 plan [9] of society with growth, employment, and quality of life. According to this European strategy "the benefits of the information society can be enjoyed by everyone, including people who are disadvantaged to limited resources or education, age, gender, ethnicity, etc., [and by] people with disabilities as well as those living in less favored areas".

Theoretical considerations and different approaches to the digital divide are extended in [8] to the more rational "multi-perspective divide". This idea is supported in study [10] and works on assumption "that differential access and ability to use technologies are rooted within various factors. Therefore people will choose to use technologies differently for many reasons, but people also use technology differently because they are situated within various contexts or intersecting factors (age, gender, race, etc.)". The research [8] formulates recommendation to consider e-government and the digital divide as two complementary social phenomena. This aspect will work as decision support tool in digital divide questions (access to the Internet or education). Digital divide should be understood as the total sum of "demand-and-offer" gaps made on many variables. Instead of reduction a specific gap, decision should be more complex and based on many specificities of local area. These considerations can increase expected positive impact of e-government and its effectiveness in society.

C. Use and Accessibility of Technology

Successful systems with high accessibility of government services must be continually developed and improved. The use of many executive services is not voluntary, therefore users and their attitudes are important components influencing the effectiveness of investments into these services. Survey [11] from Australia and New Zealand (countries with easy access to publicly provided computers) surprisingly reports that the high proportion of respondents are reluctant to use some of the more sophisticated transactional e-government (financial transaction, paying for government services), less than half had even visited a government website, the majority of participants prefer to deal with the government through non-digital means (phone, mail), and e-government is not their preference as to budgetary expense. This result indirectly supports the idea of multi-perspective divide and proves the necessity to measure the opinion of citizens. Study [11] concludes that "respondents were generally skeptical that e-government gave to them greater access to policy decision making" and that "the wider benefits of e-participation and e-democracy still remain largely unrealized".

In each country some proportion of citizens either does not use or have no access to the Internet. Multi-channel government combines online delivery services (user-centric approach) with simultaneous delivery via other channels and this service benefits to all citizens [12]. Online channels use different devices (PC, mobile phone, tablet PC, Blackberry, PDA, iPod) for communication via web, SMS, VoIP, e-mails, interactive voice response. One-directional connections can be provided by local TV and radio broadcasting. Connections and governmental services can be provided by free public access points (public hotspot access) or by one-stop government

approach (more complex government services). Public computer centers or community technology centers (CTCs) are described [10] as increasingly common in United States, and supported by grants funding deployment of broadband infrastructure in underserved areas of US. Multi-purpose Community Telecentres (MCTs) offer several technologies and are funded by UNESCO in different countries. MCTs support communities to manage their development through access to appropriate facilities and services, resources, and training domains (education, business, health, local governance), <http://www.unesco.org>.

D. Attitudes Towards E-Government

A feedback about opinion and expectations from citizens must be based on representative samples. An analysis of e-government acceptance and determinants of user's satisfaction is one of challenges in quantification the quality of relationships between government and citizens. Framework for measuring of user's acceptance and prediction of user satisfaction is presented in [12]. The research was carried out in Northern part of Belgium in 2006. User's acceptance and satisfaction concerning electronic public services were measured by respondent's judgment. Perceived importance of individual indicators was evaluated on Lickert scale 0 – 10. Indicators with the highest importance ordered in descending order according average score values were reported: reduce the administrative burden, reliability, usability, cost effective, ease of use, security, content readability, privacy/personal information protection, courtesy, content quality, transparency, responsiveness, and accessibility. Average perceived values of these indicators varied from 8.79 to 8.20 and approaching maximum score 10. The respondents perceive all of these indicators important. This information is necessary in the case of redesigning or restructuring services.

The most important indicators are clustered into three groups: (1) Access to the service (easily findable by search robot, one-window application, more "about" information as necessary, minimal skills required). (2) Use of the service (information comprehensible, reliable and up-to-date, system technically stable, safety and privacy of data be guaranteed, kind help desk person, personal contact possible if necessary). (3) Impact of the service (reducing the administrative).

E. ICT and productivity

Progress in ICT generates new demands and expenditure. Profit from ICT investments frequently is not measurable by money, although information sector contributes significantly to economy. Indirect evaluation of profit from information technology through the quality of public services is based on data from governmental statistical offices. Many statistical indicators are defined, collected, analyzed and published in unified form and the numbers are comparable among states or among local areas in the country. Analysts track and evaluate information from different resources with the aim to support decision alternatives with quantitative information.

ICT is used for two primary purposes: for improving the productivity and efficiency of work processes and for advance in decision-making capabilities. Organizations invest time, capital, and personnel to gain advantages from ICT progress and expect profit from these expenses. But the high level of

investment to ICT did not usually meet expectations [13]. This statement given in 1995 was explained as the "productivity paradox" two years later [14]. High investment into ICT brought only slight improvement in productivity of knowledge workers. Management should fit technology to people. The strategy of measurement information management enablers and IT enablers (IM/IT) enablers allows analyze and detect weakness in the strategy and information delivery .

F. E-Government in Czech Republic

The broader development of e-government in Czech Republic (CR) started in the period 2006 – 2009 with data mailboxes, e-signature, and as the network of contact point centers (Czech POINT). Development of public administration registers followed and still is working with problems. The main difficulties follow from limited possibility to communicate between registers and to share data between registers. Incompatibility of software and low level of interoperability between registers are other difficulties.

The accessibility and usability of e-government and quantitative comparison of CR with other European countries is summarized here. Study [15] compares fundamental IM/IT enablers: Electronic identification (eID), Single Sign On (SSO), ePayment, and Electronic Safe (eSafe) [15]. Nine key enablers: eID, SSO, Authentic Sources, eSafe, Secure and Formal Delivery (eDelivery), Open Specifications, Architecture Guidelines, Catalogues of Horizontal Enablers and Electronic Payment (ePayment) are focused and European countries are compared. Out of the 9 enablers, 4 were accepted as available in the CR (SSO, Authentic Sources, Open Specifications, and ePayment). CR stands on the sixth position in EU as to eProcurement visibility with 96 % scores. Business start-up portals are valued as user-centric with high degree of integration and tailor-made information provision and automation.

As to full online availability, the CR with 74 % ranks on 21st out of 32 countries and is below average 82 %. The sophistication of Public services reaches 85 % (of which 95 % for Business services and 78 % for Citizen services) the value is below EU average.

The CR's score in eServices is 43 % on Usability and 34 % on User satisfaction monitoring, (both values are below EU averages 79 % and 80 % respectively). EService Usability refers to: Transparency of service delivery (rated 30 %, EU 52 %), Multi-channel services (rated 28 %, EU 88 %), Privacy and data protection (rated 61 %, EU 90 %), and Easy of use of services (rated 78 %, EU average 90 %).

IV. CONCLUSIONS

Challenges for education and research follow from conditions of usability and highest quality of e-governmental services: (1) Importance of detection what are specific skills and knowledge the users and civil servants need, to be able use e-government services and resources effectively. (2) Methodology is necessary related to the measurement of quality of service delivery and user's satisfaction. This can help to restructure services and design ICT model effectively. (3) Knowledge management tools, based on the analysis of processes, services and interoperability, can support the

usability of public information resources. (4) Education IT experts who understand the domain public services. (5) Risks analysis and critical factors of unsuccessful implementations (case studies) should be studied, analyzed, and published.

This article focuses on interdependency between ICT development and users in the network society. Development of ICT and its economic, social, and personal consequences are studied. The e-government idea is based on effectiveness of services due to use of advantages of the Internet and networks. Successful e-government is considered in a broader perspective as the result of ability to fit ICT solution with governmental needs and satisfaction of users.

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