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METHODOLOGY OF E-HEALTH IMPLEMENTATION TO HEALTHCARE FACILITIES

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eHealth, health, health information systems, health information technology, telemedicine

Abstract

Currently, eHealth can contribute to improvements in the quality of patient care, the elimination of risks, work efficiency, financial savings and assisted living. Wider implementation of eHealth has not yet been successful in many healthcare facilities. The aim of this paper is, therefore, to design a methodology of eHealth implementation. Qualitative research, namely a case study, has been used to define prerequisites to the methodology. The study design and methodology are based on the MBI (Management of Business Informatics) model. The final structure of the methodology covers factors, scenarios and tasks of implementing eHealth solutions.

1. Introduction

Aging population (United Nations, 2015) and a growing number of patients with chronic diseases (World Health Organization, 2005) require healthcare facilities to implement new healthcare concepts using information systems / information and communication technologies (IS/ICT). Currently, one of the most trending concepts is assisted living supported by eHealth (Stephanie et al., 2011).

According to the Czech Statistical Office, 88% Czech-based physicians use the Internet in their offices, 56% have high-speed Internet, 29% have their own websites, and only 10% provide online ordering and consultation (ČSÚ, 2014). Unfortunately, many physicians, healthcare professionals and patients share negative attitudes to and prejudices against the use of new technologies (IS/ICT) in healthcare. Further expansion of eHealth is also impeded by the shortcomings in the definition of national strategies, the failures of big projects in the past, the lack of enthusiasm of medical staff and patients, and by too many organizations influencing the eHealth sector.

The main aim of this paper is to design a methodology for implementing eHealth or existing elements of eHealth to outpatient healthcare facilities (primary care, i.e., independent physicians' offices).

There are 24,542 outpatient healthcare facilities in the Czech Republic, including both state and private facilities, with the total of 55,379 employees (UZIS, 2012) providing care to patients from all over the Czech Republic. The following research methods have been used: first, eHealth implementation barriers and challenges were analyzed using existing literature; second,

a methodology of eHealth implementation was created based on a pilot case study and the MBI (Management of Business Informatics) model (MBI, 2015b). An outpatient healthcare facility (Feige et al., 2013) was selected for the case study. It is a typical Czech outpatient facility, which provides general medical services. As part of the case study, interviews with stakeholders (patients, managers and staff) were conducted. The average length of an interview was 40 minutes. The beginning of each interview was unstructured to get as much information and opinions about eHealth as possible, followed by a semi-structured part with questions about the implementation of eHealth. Other sources of information included national eHealth strategies (MZ ČR, 2016), internal notes, meeting minutes, annual reports and organization structure. The research is fully consistent with the definition of a case study as a qualitative research method within the exploratory and theory-building phase presented by (Myers, 2013) and (Yin, 2009).

2. eHealth and assisted living

eHealth entails the implementation of information systems and information and communication technologies (IS/ICT), processes and services to all levels of patient care. G. Eysenbach defines eHealth as *“an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology.”* (Eysenbach, 2001)

Assisted living aiming *“to extend the time which elderly people can live independently in their preferred environment using ICT technologies for personal healthcare”* (Memon et al., 2014) is closely connected to eHealth. Assisted living offers many possibilities for the application of eHealth (Hanke et al., 2011), using its tools, standards, network protocols, and middleware technologies (Memon et al., 2014). The growing trend of personal monitoring and assisted living (Kumari et al., 2017), (Milenković et al., 2006) stimulates eHealth implementation into healthcare facilities and their processes.

3. Current situation of eHealth implementation

The benefits of eHealth have been studied and proven by several studies (Ilminen, 2003) and (Kunstová et al., 2013). Unfortunately, the implementation of eHealth and its elements has not yet been successful in many countries of the European Union (EU) (e.g., the Czech Republic, Slovakia and Poland). (Potančok, 2015a) Figure 1 shows the eHealth implementation rate of the EU 27+3 (n=1753), the Czech Republic (n=20) and Sweden (n=26). The Czech Republic is where the case study has been carried out; Sweden has been selected as the leading country in eHealth implementation to demonstrate the difference in the rate of eHealth implementation within the EU.

The findings of the case study confirm which psychological aspects and barriers related to eHealth implementation (Potančok, 2015a) should be considered when planning eHealth projects. In the interviews carried out as part of the case study, doctors often mentioned problems with previous projects and concerns about negative impacts on their core processes. The following psychological aspects and barriers have been confirmed as the most important: fear and concern, distrust, motivation, expectations, core work vs new work, misunderstanding. As such, they need to be taken into consideration when creating a methodology for eHealth implementation and are the reason a methodology for eHealth implementation to healthcare facilities is needed.

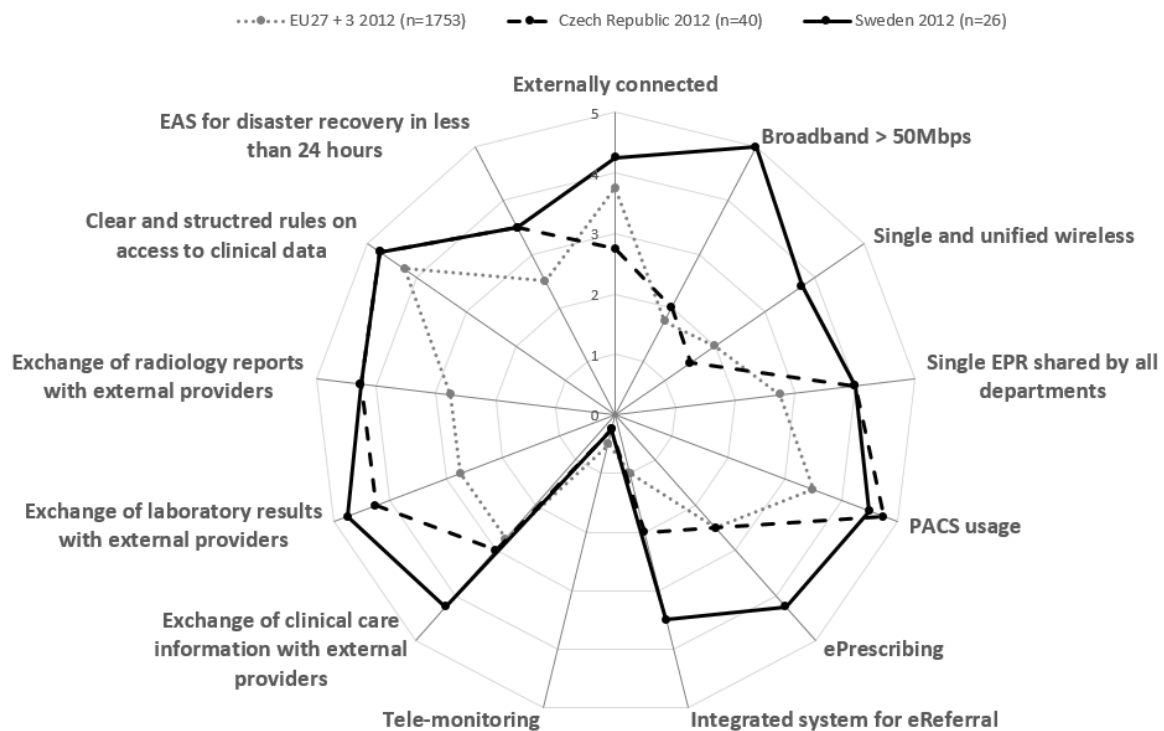


Figure 1: eHealth profiles, data source (Sabes-Figuera, 2013)

4. Methodology of eHealth implementation

eHealth requires a precise and comprehensive methodology of implementation to healthcare facilities. The right methodology of eHealth implementation can tackle psychological aspects and barriers related to eHealth implementation (e.g., fear and concern, misunderstanding, etc.). Although, many methodologies for the implementation of IS/ICT are used in the commercial (manufacturing) sector (Voříšek et al., 2008), (MBI, 2015b), there is no comprehensive methodology for the healthcare sector.

It is necessary to design a suitable methodology which will take into account the specifics of the healthcare environment. (Potančok, 2015b) Some of the existing general methodologies can be used and extended to healthcare. The MBI (Management of Business Informatics) model (MBI, 2015b) has been chosen for the initial implementation of eHealth elements to outpatient healthcare facilities. The MBI model is a flexible business informatics management methodology, which includes best practice guidelines for specific industries; healthcare can be one of them considering the characteristics of the model. The MBI model consists of the following components (Voříšek et al., 2015):

- Factors

Factors have a significant impact on the way a particular task is performed. The most important factors include: organization size, industry sector (where the organization operates) and organization type (i.e., a private company or a public institution). Consider, for example, how the following task, the preparation of a tender for the supply of IT services, would be carried out by different organization types: in the case of a public institution it would be completely different than in the case of a private company, because public institutions need to comply with specific legislation.

- Scenarios

Scenarios are typical issues that need to be addressed by an organization. For example, if an organization wants to reduce its IT costs, the MBI model identifies relevant tasks, documents and metrics and gives recommendations to achieve the desired cost reduction.

- Tasks

Tasks are key MBI components, basic business informatics management units. A task describes how to proceed in solving a management problem.

Based on the MBI model, its structure, and the above described situation in eHealth, the following methodology structure has been designed:

- Factors – F015/Healthcare; F901XHE/The national plan for eHealth; F902XHE/Outpatient healthcare facilities
- Scenario – S901XHE/An outpatient healthcare facility needs to implement eHealth
- Tasks – U551A/eHealth implementation feasibility study; U552A/eHealth implementation analysis and design; U553A/eHealth implementation; U554A/eHealth implementation into operation & migration

In accordance with the aim of the paper, the conducted research focused specifically on scenarios and tasks. The factors of healthcare, eHealth and healthcare facilities are integral to the environment and as such have already been described in detail in (Milosevic et al., 2016), (MBI, 2015a) and (Potančok, 2015b).

4.1. Scenario – S901XHE/An outpatient healthcare facility needs to implement eHealth

The scenario consists of the following phases: familiarization, readiness, planning and implementation, and deriving the benefits. Figure 2 shows topics and questions for each of the phases as well as the relationship between time and the level of change.

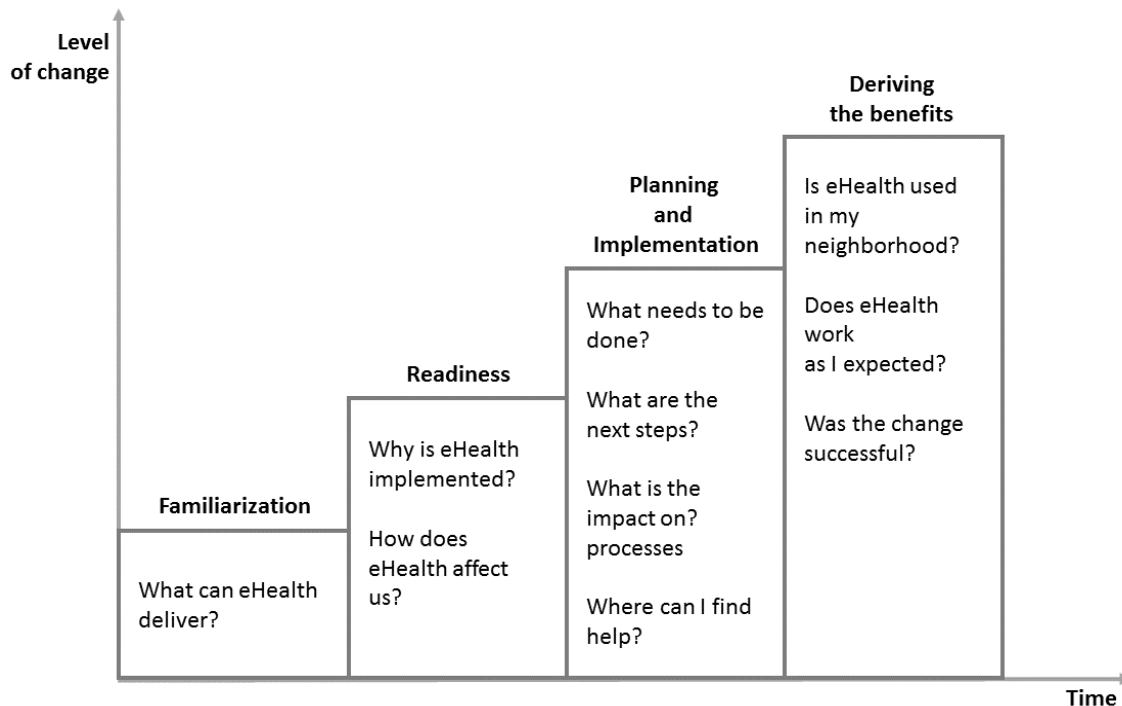


Figure 2: Topics and questions during eHealth implementation

4.2. Task collection – TG550XHE/eHealth implementation project

The collection of eHealth implementation project tasks includes application and implementation tasks reflecting the specifics of the healthcare (healthcare facilities) environment. This task collection directly expands on the project management task collection (TG401/Project management) and is indirectly influenced by the portfolio management task collection (TG103/Portfolio management). The tasks of eHealth implementation project draw on the common solution project tasks (TG410/Solution project).

eHealth projects are managed by project managers (R103/Project manager) together with CIO (R101/CIO), portfolio managers (R111/Portfolio manager), and IS/ICT development managers (R104/IS/ICT development manager).

The project team (according to the project specifications) consists of business and training services professionals (RG200/Business and training services professionals), analysts and system analysts (RG300/Analysts and system analysts), developers (RG400/Developers), database designers and administrators (RG500/Database designers and administrators), and system administrators (RG600/System administrators). The project team needs to cooperate with users, which include methodists, key users (RQ032/Methodist, key user), business process owners (RQ033/Business process owners), and business requirements owners (RQ034/Business requirements owner).

4.2.1. Task – U551A/eHealth implementation feasibility study

The aim of this task is to develop an overall concept of the implementation of eHealth to an outpatient healthcare facility. The initial task is to clearly describe the final product. It is necessary to define the vision and scope of and approach to the eHealth project. The critical success factors of the task include:

- *Support from the healthcare facility management/owners* – Implementation of eHealth or its elements must comply with the visions and goals of the facility. The ability to accept changes is also important.
- *Complete and explicit definition of the scope and subject of the feasibility study* – The healthcare facility needs to know/define the functionality and cost of the expected eHealth solution.
- *Active participation of business process owners* – eHealth implementation is likely to affect or change a considerable portion of internal processes. It is, therefore, necessary for the team to work together with the healthcare professionals that know the processes and activities. Ideally, individual process owners / employees who can influence and change processes should also be the key users in each area.
- *Active participation of key users* – The users of the future applications need to be involved in the development as key users (healthcare professionals, staff of healthcare facilities, patients). They must be technically proficient, have thorough knowledge of the processes and be able to redefine and re-configure them. Their participation in the project, expertise and utilization is one of the key factors determining successful implementation.
- *Presenting the changes to users/patients/society* – In healthcare we often see resistance to change within organizations and from the general public. As a result, it is necessary to explain planned changes clearly and well in advance and provide reasons why eHealth should be implemented.
- *Restrained planning* – Cost and schedule planning is often underestimated. It is also necessary to include reserves. Estimations should be done by a specialist, preferably based

on data from previous projects. The return of investment in eHealth projects has not yet been determined. eHealth projects are also associated with high initial expenses.

- *Supplier and product selection* – It is necessary to choose a product which meets the needs of the healthcare facility (see the above-mentioned critical success factors) and a reliable supplier that has enough experience with similar healthcare facilities. In the Czech Republic, the ehealth.vse.cz portal (eHealth, 2017) can be used in this phase, as it lists both healthcare facilities and organizations dealing with eHealth.
- *Legislation* – The current legal framework is fragmented, lacks clarity and does not support eHealth applications, especially mobile applications collecting health data.

4.2.2. Task – U552A/eHealth implementation analysis and design

The aim of this task is to define the desired eHealth functionality and the level of customization according to the needs of the healthcare facility (see task U551A/eHealth implementation feasibility study above). The tasks' critical success factors are:

- Greater interoperability of eHealth services
 - Introduction (inclusion) of standards and certification
 - Changes to organizational structure
 - Resolving legal issues
- Support for research, development, innovation and competitiveness in eHealth
- Adoption and promotion of wider adoption of eHealth
 - Skills and digital literacy in the health sector
 - Measuring added value

4.2.3. Task – U553A/eHealth implementation

The aim of the task is to take concrete steps to ensure eHealth operation, i.e., software installation and process changes. Prior to the actual implementation it is necessary to carry out an initial study confirming the benefits of the project and approving its implementation, as well as to carry out an analysis of the system itself and design it. The task's critical success factors are:

- A strategic and clearly defined process of implementation and leadership
- Determination of critical factors such as laws and regulations, and funding
- An analysis of stakeholders
- Having all key activities planned prior to the actual implementation
- User system training

4.2.4. Task – U554A/eHealth implementation into operation & migration

The aim of the task is to fully prepare the eHealth solution and its elements for everyday operation. Based on the project specifications and documentation of migration, handover procedures are carried out and the required functionality and operational characteristics of applications (such as response time, reliability, etc.) are confirmed. An acceptance protocol formally concludes the project and since then its further development and adjustments comes under change management. The task's critical success factors are:

- Migration strategy – It is necessary to determine the basic migration concept (immediate transition to the new application, or parallel operation of the old and new applications) by assessing the requirements and costs of the alternatives against their potential risks.
- Specification of the extent of participation and co-operation of the external supplier, especially regarding data migration
- Original system data documentation for data migration
- Change management

The proposed methodology includes IS/ICT organizations operating in the eHealth environment, elements of eHealth, activities carried out before and during implementation, changes in internal regulations (including IS/ICT strategies and sourcing strategies) and IS/ICT installation processes, training, user involvement, etc. The subject of the methodology is the implementation of existing elements of eHealth; this methodology is not intended to help create new elements or eHealth national concepts.

5. Conclusion

The aim of this paper has been to design a methodology of the implementation of eHealth or eHealth elements to outpatient healthcare facilities, where it can enable and support assisted living services.

A structure of the eHealth implementation methodology has been designed. The methodology is specific to the healthcare environment and the scenario when an outpatient healthcare facility needs to implement eHealth; it includes tasks describing how to proceed in eHealth implementation.

The applicability of the results is twofold. First, project designers and promoters can use the methodology when preparing new projects; the results can also be used by IS/ICT professionals when designing new eHealth elements. Second, the results can be used in further research. It is necessary to expand the case study by seeking more detailed opinions of patients and citizens.

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