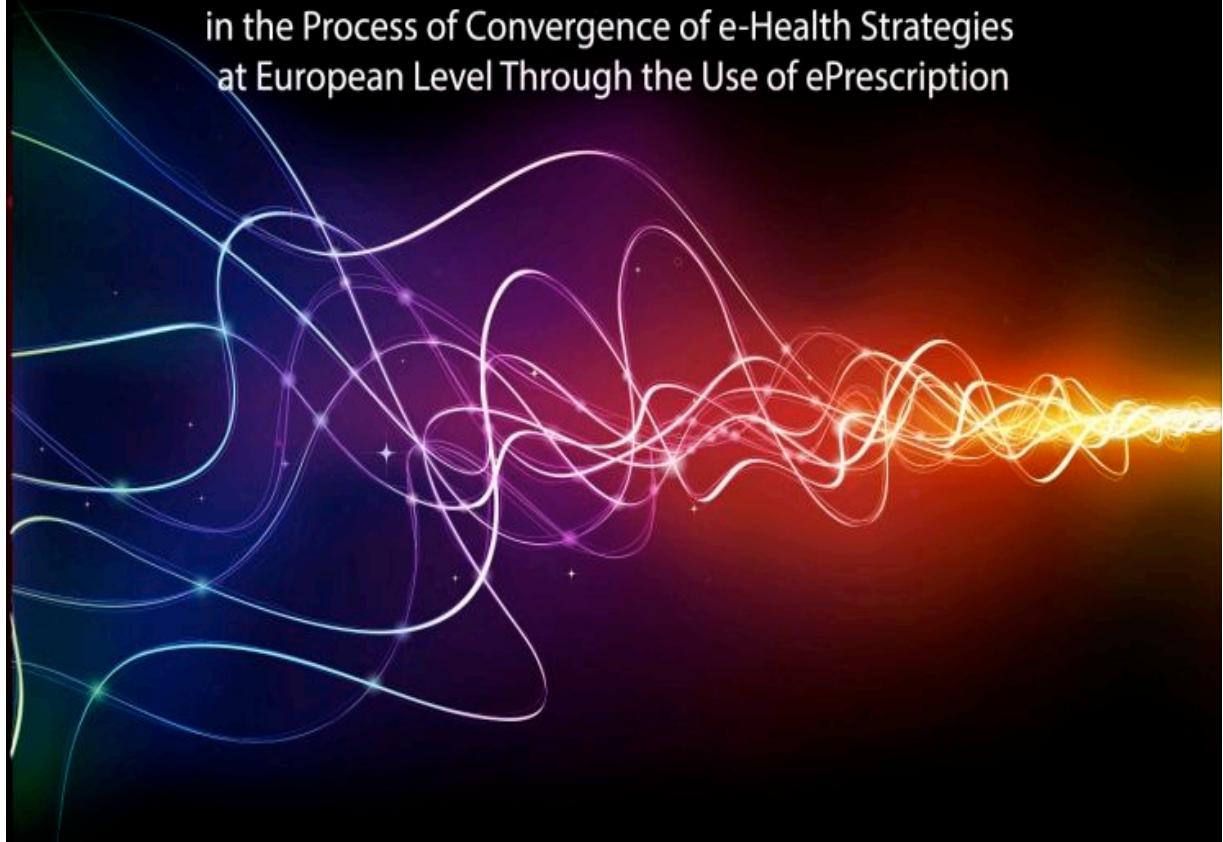




SAGAR Evaluation of Convergence

The Influence of epSOS I Design
in the Process of Convergence of e-Health Strategies
at European Level Through the Use of ePrescription



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... I dedicate the work on this thesis
to my first born child *Ruth Evelin*,
who helped me learn what perseverance is.

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Abbreviation list

eP	e-prescription
epSOS	Smart Open Services for European Patients
ICT	Information and communication technologies
IDE	Inter Operability Design
NEPC	National epSOS project coordinator
NICTIZ	National ICT Institute for Healthcare in the Netherlands
o.t. before epSOS	Own trajectory but not because non influence from epSOS I design, but because the country trajectory was set before epSOS project was in place.
CC	Competence Centre
PM	Policy members
PN	Participating Nations
PSB	Project Steering Board

Abstract

Introduction

The epSOS project is a pilot project, which began in 2008 with twelve participating nations (PN) united under the name of epSOS I; in 2011 eleven other countries joined the project. The evaluation of the epSOS I design highlights the consequences of implementing the epSOS project within national e-health strategies. Although convergence in e-health strategies is an incidental effect of epSOS, this thesis addresses the conceptual model of convergence in e-health strategies. The topic of this thesis is the evaluation of the degree of influence the epSOS I design has in the process of convergence in e-health strategies of the PN through the use of ePrescription (eP).

Conceptual framework

An unique conceptual framework has been designed in order to address the gap in knowledge on the topic of convergence in e-health strategies. An evaluation methodology and an instrument fitted for this particular evaluation has been developed. The proposed evaluation methodology is based on: (1) the scientific literature on the evaluation of e-health programs, (2) the particularities of the epSOS project, and (3) the consultation with experts in e-health area. The design of the evaluation integrated the use of a multi-perspective approach to provide a holistic framework for the evaluation of convergence in e-health strategies of the PN. The multi-method evaluation approach, integrates qualitative and quantitative research methods, as well as multiple research instruments in order to bring comprehensive results. Given that convergence is not a state per se, the multi-time perspective considered three different time-series: 2008, 2011, 2013; the joint of the three time-series determines the trend of the level of convergence. The multi-disciplinary approach considers different dimensions covering multiple indicators. The proposed evaluation methodology is named SAGAR evaluation.

Methods

A joint of methods have been used in order to determine the level of influence the epSOS I design has in the convergence of e-health strategies of the PN. An internet-base questionnaire has been developed as the main evaluation tool for epSOS I and epSOS II PN. A validation of the questionnaire was done through semi-structured telephone interviews with six key actors with thorough knowledge on the development of the epSOS project. The descriptive, attitude and predictive questions were coded based on a pre-determined matrix with five dimensions, from 'no influence from epSOS' to 'full convergence because of epSOS'. The results of the analysis are presented in graphs and charts for each dimension and time series apart.

Findings

The findings offered the degree of convergence at current moment for the SAGAR dimensions. The interoperability issues (Syntax and Semantics) as well as the technology design of the system (Architecture and Applications) proved convergence in 2011 due to the epSOS I design – to certain degrees. However, the Governance of e-health strategies and the Regulatory aspects confirmed the trends of the literature, and showed a low degree of convergence because of epSOS.

Considering the three time-series altogether, a broad image on the degree of convergence was determined. The overall image resulted from this evaluation shows clear trends toward alignment and convergence for epSOS I countries, while for epSOS II the trends are toward convergence and full convergence.

Conclusions

Convergence in e-health strategies remains a topic open for research in the different programs that aim interoperability and cross-border communication. The SAGAR evaluation framework represents a corner stone in the evaluation of convergence especially for the epSOS use cases, but also for other programs in the Western world. Since convergence is not a state per se, periodic re-evaluations would complete the image and define the trajectories of convergence in e-health systems of the evaluated countries.

1. Introduction

1.1. The epSOS project

Travelling from one country to another has become a normal trend in recent years. Travelling on vacation, for work or for other reasons is a key feature of modern lifestyles. Within the European Union (EU), the migration and mobility of individuals is promoted and facilitated by European legislation. In this cross-border movement the access to planned and unplanned necessary health care services becomes crucial. Access to medical services depends on the availability of a series factors such as: the availability to an individual's medical and pharmaceutical history; the information about treatments in use; the perception of the home-doctor for each patient. Each country has a unique health strategy, for handling the medical information which is why a level of cross-border communication, between medical professionals and institutions is necessary.

To address the need for cross-border communication in the medical field, EU developed the European Patients Smart Open Services (epSOS) project, in order to facilitate individual access to unplanned care. The epSOS project focuses on safety and efficiency in cross-border e-health strategies. However, a project of such a scale and with so many perspectives creates challenges in its development, implementation and evaluation.

The epSOS project is a pilot project, which began in 2008 with twelve countries united under the name of epSOS I. In 2011 eleven other countries joined the project. EpSOS II, which includes 23 participating nations (PN), is an extension of epSOS I with additional improvements. The list of the PN in epSOS project at the moment can be found in appendix 1. The main objective of epSOS project is “to develop a practical e-health framework and ICT infrastructure that will enable secure access to patient health information [...] between European healthcare systems” (epSOS 2008c).

The evaluation of the epSOS I design highlights the consequences of implementing the epSOS project within national e-health strategies. The interoperability design evaluation (IDE) is an epSOS project initiated in 2010 in order to directly evaluate the epSOS I design. The IDE considers three dimensions: scalability, extensibility and convergence (for details see epSOS 2011d). While IDE considers three aspects, the topic approached in this thesis considers only the convergence. This thesis addresses the conceptual model of convergence

in e-health strategies particularly through the use of one of the epSOS I use cases – the ePrescription.

1.2. The scope of this thesis

The topic of this master thesis was chosen once there was a clear understanding of the importance of convergence in the e-health strategies at national and international level. The scope of this thesis is on identifying the amount of influence the epSOS I design has on the national e-health strategies of the participating nations. The higher the degree of influence, the more aligned the countries are in e-health solutions. In the long term, alignment brings convergence in the national e-health solutions.

Even though convergence is not the main goal of the epSOS project, the need for convergence in e-health strategies is an intensely debated topic at international level. A clear cut concept of how to measure the degree of influence in e-health strategies of such a project is currently not available. This research aims to bridge this gap by providing a deeper insight into the ‘sandy’ concept of convergence in e-health strategies. In this way, this research adds to the existing knowledge on this topic. This thesis presents a conceptual understanding of the model and proposes the development of a unique instrument that can be used to measure the degree of influence the epSOS I design has on e-health strategies of the PN.

The particular infrastructure of each participating country has to be considered in detail in order to provide a successful evaluation of the implementation of epSOS in the EU context. Although the national context of each country is complex, convergence at local and national level would add to successful implementation of epSOS project.

1.3. Thesis road map

Following the introduction of the epSOS project and the declared relevance of this thesis, chapter 1 includes the introduction of the research questions and a series of assumptions. Since a clear definition of terms is essential in any evaluation, chapter 2 presents the definitions and explanations of the ‘key terms’. Chapter 3 reveals the conceptual framework. The first part contains the design of the evaluation of convergence and the structure of the theory based on the three multi-perspective approaches. The second part introduces the evaluation tools: the questionnaire – as the main evaluation tool; the interview – as a method of validation for the questionnaire; the research journal – as a tool through the long research

period; and the documents review – as the method of cross checking the data of the baseline in the evaluation. Chapter 4 tackles the evaluation methodology. Firstly, the data collection methodology is described and later the data analysis is presented. Chapter 5 carries out the analysis of the data and brings ahead the findings of the study. In chapter 6 the discussion and recommendation are carried out; strengths as well as limitations of the study are there presented. Chapter 7 offers the conclusions of the study while the last two chapters provide the references and bibliography.

1.4. *Research question*

The epSOS project, which is a program with a clear objective of providing better cross-border care in the case of unplanned care within EU countries, indirectly aligns the e-health strategies. The main research question of this thesis is: ‘To what extent does the epSOS I design influences the process of convergence in e-health strategies of the participating nations through the use of electronic prescription’.

In order to evaluate the influence that epSOS I design has in the process of alignment, and convergence of e-health strategies in participating countries, the following assumptions were made:

1. Participation in epSOS project provides alignment in e-health strategies on national solutions. Coming together toward the same direction would bring, over time, convergence in national solutions. (The epSOS design helps countries entering in the epSOS program adopt national e-health strategies in accordance with the e-health strategies of the other participating nations in epSOS). However, the convergence in national e-health strategies is an incidental effect of epSOS, since the main objective is to provide better cross-border care in the case of unplanned care within EU countries.
2. The participating nations in the epSOS II project, align better and quicker with the epSOS specifications than the participating countries in the epSOS I project. This is due to the fact that epSOS I countries constructed their e-health strategies before or at the same time as the introduction of the epSOS project. In contrast, the epSOS II PN adopted the e-health strategy - on their ‘green fields’ - in accordance with the epSOS I design.

3. Alignment in technical issues is much stronger than alignment on political issues (theoretical base). In the epSOS project, interoperability issues (Syntax and Semantics) as well as the technical design of the system (Architecture, Applications), could bring convergence to a certain degree. However, in regulatory/legal aspects and governance of e-health strategies, there is no convergence because of epSOS. In order to tackle this issue, the following sub-assumptions are made:
 - a. Syntax and Semantics is the first dimension that should go toward convergence, in order to allow interoperability in the cross-border care.
 - b. The Architecture of an information system (including the application of basic functionalities) at national level is influenced by epSOS specifications and brings convergence in certain aspects.
 - c. In the e-health Governance framework of the participating nations (including policy and regulations concerning data protection, role and authorization HCP, record management, patient empowerment, patient privacy), there is little prediction of alignment and convergence.
 - d. The implementation of epSOS Applications - in this case the eP use case - in the participating nations is better adopted in the epSOS II countries than in the epSOS I countries.
 - e. The Regulatory Framework of the participating countries is the last dimension where convergence is expected due to epSOS specifications. This is because epSOS does not propose any patterns. Consequently, the participating nations are converging in these dimensions due to other influences, such as the influence of other European requirements.

2. Defining key concepts

The use of information and communication technologies (ICTs) in health care is increasing worldwide in the last decades. The utilization of compatible e-health strategies is of paramount importance nowadays, and gets special attention. However, the evaluation of e-health strategies proves time and time again to be a complex, and challenging mission (Ammenwerth 2003b).

In creating a theoretical framework for the evaluation of convergence in e-health strategies, the concepts should be considered in detail, and at the same time, the broad image should not be forgotten. As the pieces in a puzzle, each “key concept” must be well defined and shaped in order to get a complete and clear framework.

Figure 1 shows the key terms used in the conceptualisation model of convergence. The upper part of the figure represents the flow from general to specific, while the lower part shows the interest of this thesis in explicit terms. Looking to the two parts as a mirror, convergence is one of the e-health strategies, and the evaluation means of convergence represented by the indicators are the evaluation strategies for e-health.

Based on the explored concepts, an unique evaluation framework is constructed. The scope of this thesis is to evaluate the level of convergence in e-health strategies of the participating nations. The results of this thesis reveal the amount of influence that the epSOS I design has on the e-health strategies of the participating nations in order to create alignment between the national solutions.

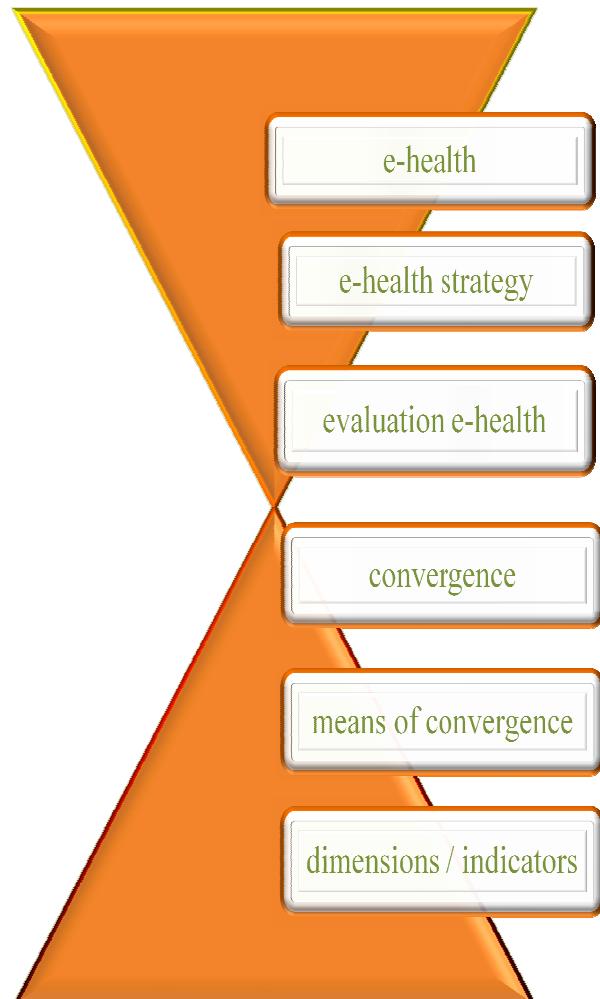


Figure 1 Flow of concept terms

For understanding the concepts met in the evaluation framework of convergence in e-health strategies, in what follows, the key terms are explained.

2.1. E-health

E-health, term first used around 1999, is one of the “e-” words that in a short time become a buzzword. One of the first definition recognized for this term was given by Eysenbach: “e-health is 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” (Eysenbach 2001). In this sense, it can be observed that the content of modern technological devices in medicine is not only connected with health issues or societal problems, but also with economics, marketing and trading.

At the time when “e-” of e-health was only connected to Electronic devices, Eysenbach came with a broader sense of that the e-health should be connected to. Different terms such as Efficiency, Effectiveness, Evidence-based, Empowerment, Encouragement, Education, Enabling, Extending, Ethics, Equity, Easy-to-use, Entertaining, Exciting all become part of the “e-” of e-health (Eysenbach 2001). Even though this is an innovative concept, this is only a heuristic approach since the development in the field of e-health is continuously, roughly changing and incorporating new terminologies (Oh 2005).

At a later stage in the development of the e-health concept, Eysenbach claims that “E-health refers to health services and information delivered or enhanced through the Internet or Internet related technologies. In a broader sense, [...] improved health care worldwide is possible by using information and communication technology” (Eysenbach 2001). Because increased meaning of the “e-” domain in general and e-health in particular, it is hard to imagine the health sector without the “e-” in front.

In the last decade, e-health has developed extensively and came to meet many of the societal needs. Nowadays, a service sector without an ICT system could not benefit from the boosting innovation and efficiency. World Health Organization define e-health as: “leveraging of the ICT to connect providers, patients and governments; to educate and inform healthcare professionals, managers and consumers; to stimulate innovation in care delivery and health systems management; to improve in care delivery and health system management; and to improve health care system” (WHO 2003). Subsequently, the term focuses on the one hand on the technical development, and on the other hand on the human and organizational development (Yusof 2008b).

Considering the connection of epSOS project on the e-health timeline, it could clearly be said that the epSOS project is the main European Electronic Health (e-health) Interoperability Project (epSOS 2008a). Running for more than five years, the project is co-funded by the European Commission and partners.

2.2. E-health strategy

Many countries that encounter the e-health concept, aim to develop a holistic e-health strategy. However, not all countries succeeded to clearly design a sound e-health strategy. Among the countries that did a step upfront in the clarification of their e-health strategy are: Denmark, England, Estonia, Finland, France, Norway, Scotland, Slovakia and Sweden (European commission 2009). However, most of the other countries still miss it.

The national e-health strategy should contain issues on the infrastructure, implementation and policy aspects (Wen 2005). Even though in infrastructure and implementation of e-health strategies countries are more aligned, this is not the case in policy issues. An explanation is that e-health legislation does not have a clear determined framework and in each country it takes a different roadmap. In some countries it is part of the national health policy, in others there is a e-government policy. However, in the last years more EU countries are in the process of creating and enacting a funded e-health policy (expressing the patient rights, data protection, etc.). At the present moment, the common ground for data protection of the EU countries is Article 8 of the EU Data Protection Directive (see appendix 2). In order to be able to align and further converge, strategies should have a common base.

The epSOS project, which “aims to design, build and evaluate service infrastructures that demonstrate cross-border interoperability between electronic health record systems in Europe” (epSOS 2008a) brings along different consequences. One of the incidental effects - which is the main theme of this thesis - is the degree of convergence in e-health strategy of the participating nations.

2.3. Evaluation in e-health

A comprehensive evaluation of the e-health strategies represents one of the most challenging aspects of health informatics (Ammenwerth 2003a). Many studies were done on the topic “how to do a successful evaluation of ICT systems” (Klecun 2005); nevertheless, one golden evaluation framework is not available because perspectives that are crucial for one evaluation are not valid for another.

A systematic review was carried out by means of computerized literature search. The following data sources were accessed: PubMed, Elsevier, BMJ, Sage-journals, Palgrave-journals, Jstor, Routledge, Cambridge University Press, Science direct, European Observatory on Health Systems and Policies, The Royal Society of Medicine Press, Open Clinical, and Inderscience. A number of ten articles were selected, and categorised in a literature review matrix (see appendix 3).

From the different perspectives, Symons (1991) proposes the traditional evaluation approach where the focus is on the context (who and why is evaluating), the content (what) and the process (how to evaluate). Later, more nonconformist approaches were considered in the evaluation of information and communication technologies (ICT), like the use of triangulation (Ammenwerth 2003a). While the term based on the work of Denzin (1970) was initially used in navigation (for determining the position of the ship), in evaluation of ICT applications Ammenwerth (2003) presents the benefits of using the integration of different methods and approaches in order to offer a holistic evaluation framework. The evaluations should incorporate factors such as: (1) the different sources of data and observations; (2) the multiple points of view; (3) the use of varied methods; (4) the exploit of diverse theories in investigating similar phenomenon (Ammenwerth 2003a). The use of multi-perspective approach is also persistently proposed in the evaluation of e-health programs (Shaw 2002; Stoop 2003; Yusof 2008; Clarke 2008; Marthandan 2010). A mix of the specific considerations bring to light specific characteristics such as: (1) the complexity of the projects, (2) the different interests of the stakeholders, (3) the types of research methodologies, (4) the multiple dimensions involved, and (5) the different phases in the implementation.

Since the desired evaluation of convergence in e-health strategies through the epSOS project could not follow any of the existing proposed outlines, this master thesis brings in a new evaluation methodology for e-health strategies. Aside from the guidance received from the literature, knowledge of the particularities of the epSOS project offered important guidance. In this regard, information from the multiple epSOS expert meetings and former reports were accessed. In addition, particular attention was given to the clear determination of the objective of this evaluation.

2.4. Convergence

Starting from the eighties and continuing in the nineties, the term ‘convergence’ becomes one of the buzz-words in IT, internet, telecom, media or electronics industries. However, the more popular the concept becomes, and the more it enters in all the specific areas, the less attention there is for a clear-cut definition (Lind 2004). Basically the term convergence would be defined as “a situation in which people or things gradually become the same or very similar” (Macmillan 2012).

In the previous century, the term convergence was linked with alignment. The latest was defined as “the tendency of societies to grow more alike, to develop similarities in structures, processes and performances” (Kerr 1983). Nowadays, the term convergence is used in different settings. Starting from technological, economical, political or communicational convergence, the coming to a similar unit is a modern trend. In 1997 the European Commission gathered in a Green Paper under the umbrella of ‘convergence’ four main levels. These are: (1) convergence in the level of technology and network platforms, (2) convergence in the level of industry alliances and mergers, (3) convergence in services and markets, and (4) convergence in the level of policy and regulations (Lind 2004). Convergence in different aspects, aims towards a stable, peaceful, prosperous physical location where people, goods, services, and capital move among Member States as freely as within one country (European Union n.d.).

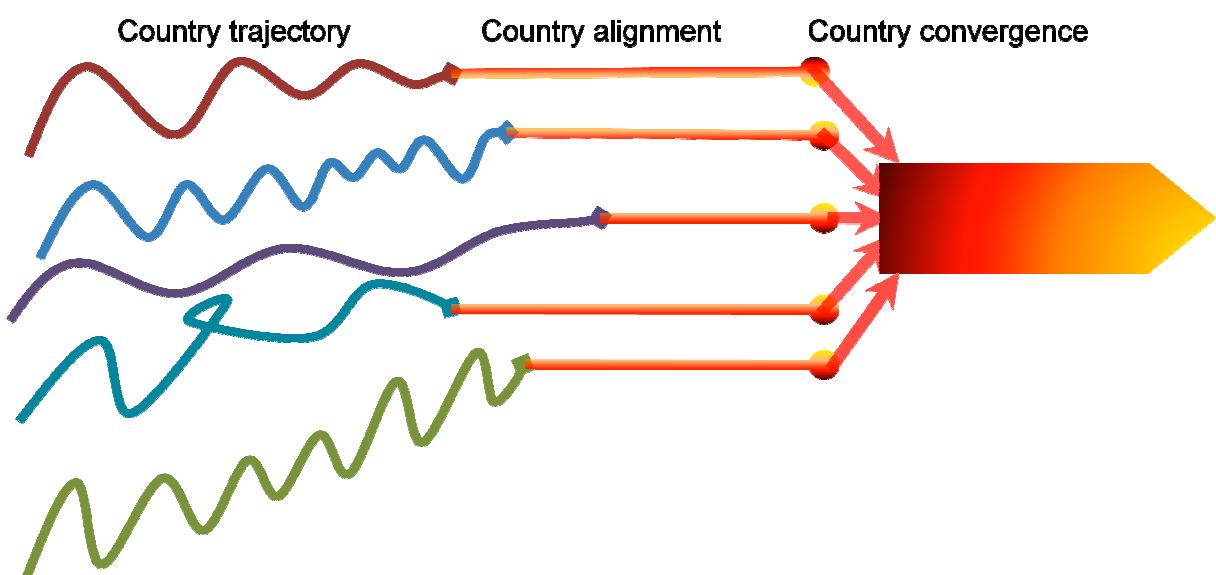


Figure 2 Country circumstances in e-health over time

Though all the benefits that convergence leads to, a good understanding of the concept is essential in order to create benefits, since many times different aspects and diverse understandings are present. In this thesis, alignment represents the second phase in the direction of convergence. The concept of differentiating the path of the countries in circumstances over time is depicted in figure 2. When each country has its own e-health strategy after becoming part of epSOS, countries indirectly could align their strategies, and smoothly converge in national solutions. The trend toward convergence would bring interoperability in the e-health system, which would result in “more possibilities to collaborate and less interoperability problems between the countries”(epSOS 2011d).

2.5. *Means of convergence*

The epSOS project is funded by the European Commission that intends “to develop a practical e-health framework and ICT infrastructure that will enable secure access to patient health information” (epSOS 2010a). Given the fact that epSOS is a pilot project, in 2008 epSOS I phase was initiated containing a number of 12 countries. In 2010, epSOS II started, building on the epSOS I design but with a larger number of participating countries and supporting new use cases. Now there are 23 countries involved in epSOS project from within and outside the European Union.

Next to the initial objective of epSOS, there are numerous side effects. The Interoperability Design Evaluation (IDE), which is an evaluation of the epSOS I design, considers these characteristics that do not result from the pilot evaluations but bring great consequences (see epSOS 2011d). The assessed focus points in IDE are: scalability, extensibility and convergence (figure 3).

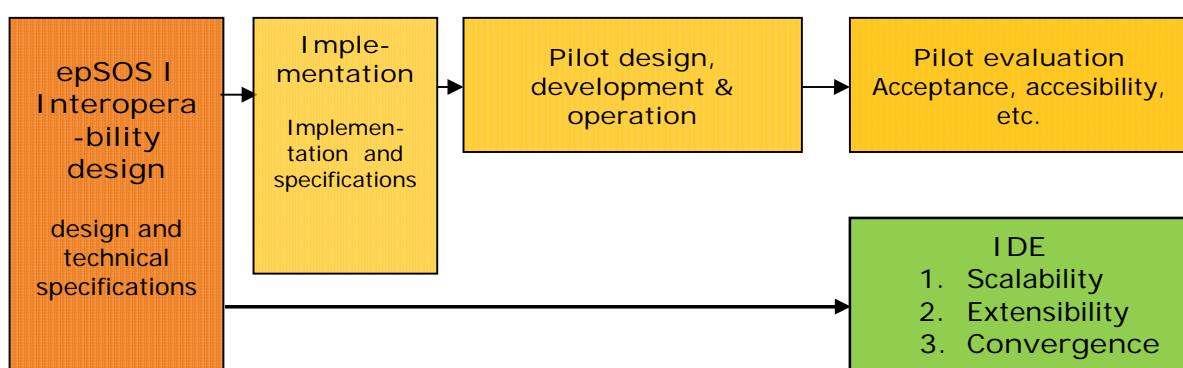


Figure 3 Schematic overview of the overall evaluation of epSOS I

2.6. Indicators

Identifying a comprehensive set of dimensions and indicators is based on a number of characteristics such as: significance, sensitivity, measurability, precision, practicability and comparability. In evaluating the degree of influence that epSOS I design has on the PN a set of dimensions were identified and analysed. The dimensions were derived from the convergence categories (see figure 4) into dimensions and further divided in indicators. The base of the identified dimensions and indicators are: (1) the expert sessions, (2) literature studies and (3) in depth personalization of the epSOS project.

In the expert meetings a series of four actors (from three different epSOS PN, and with different roles in the development of the epSOS project) came up with dimensions and indicators that give information about the level of convergence in e-health strategies. This list of indicators was discussed in several meetings and categories were attributed to all of the dimensions. The list was enhanced with dimensions and indicators resulted from the literature research that proved suitable to the goal of epSOS evaluation of convergence.

The latest list of dimensions and indicators was brought up, and discussed again in the expert sessions. This final version serves as the base of the theoretical background and also as the guide in the construction of the evaluation tools.

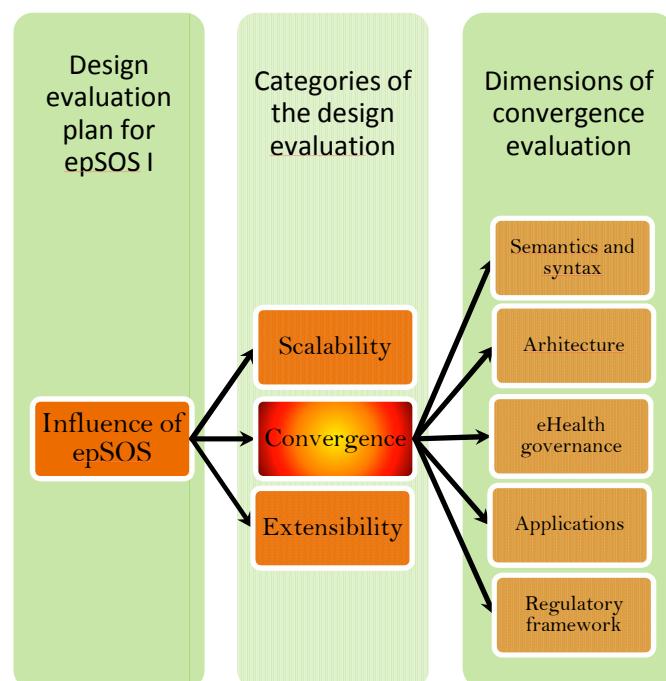


Figure 4 Evaluation dimensions

3. Conceptual framework

The evaluation of epSOS I design has a two-folded reasoning: (1) to determine the impact of the epSOS project in the process of alignment in e-health strategies; (2) to bring improvement to the epSOS II design. However, the second reason is out of the aim of this thesis. The aim of this study is on the one hand to highlight the conceptual model of convergence – based on a unique theoretical framework, and on the other hand to develop and implement an appropriate instrument in order to bring accurate results.

Even though the conceptual model of convergence was developed for both epSOS I use-cases, this thesis focuses on the ePrescription, defined in epSOS glossary as “a medicinal prescription, i.e. a set of data like drug ID, drug name, strength, form, dosage and/or indication(s), provided in electronic format” (epSOS 2008b). Consequently, this evaluation examines the degree of influence epSOS I design has in the process of convergence in e-health strategies of the PNs through the use of eP. In what follows the conceptual framework is presented.

3.1. Evaluation design

The design of an evaluation framework is a challenging attempt, especially in e-health where literature proposes so different perspectives (Ammenwerth 2003; Dansky 2006; Pagliari 2007; Buccoliero 2008; Catwell 2009; Marthandan 2010). The evaluation of convergence in epSOS PN, based on the epSOS I design follows a step-wise approach. The data triangulation particularly designed for the evaluation of convergence in e-health strategies due to epSOS I design considers: the multi-method approach (Stoop 2003; Yusof 2008a), the multi-disciplinary approach (Shaw 2002; Yusof 2008b) and the multi-time perspective (Inkeles 1991; Yusof 2008). These three dimensions represent the scaffold of the multi-perspective framework in the evaluation of convergence.

3.1.1. Multi-method approach

As Yusof (2008a) said: “Evaluation is complex; it is easy to measure many things but not necessarily the right ones”. To obtain holistic results, in this study multiple research methods were used.

On the one hand, the qualitative method investigated the why and how of the decision making, not just what, where, when. On the other hand, the quantitative method offered

information about who, what and why. Qualitative methods were used in order to create the main research instrument – the questionnaire. At the same time, the instrument was validated through several qualitative methods – the interviews. The answers of the initial time series (2008) were cross-checked with data resulted from documents review. Small but focused samples were altogether used in order to get inclusive information. The different instruments used in this study are presented in chapter 3.2.

3.1.2. Multi-time perspective

Convergence is not a state a per se, but it implies a continuous process of alignment in goals, strategies and actions. In this sense, Inkeles (1991) defined convergence as the “moving from different positions toward some common point. To know that countries are alike tells us nothing about convergence. There must be movement over time toward some identified common point”. In this sense, the evaluation of convergence in e-health strategies due to epSOS I design followed a longitudinal framework.

In 2008 epSOS I project started with twelve countries ‘on board’. In 2011, eleven other countries joined the project (epSOS II). New countries are welcomed to join in the future also. At present time, 23 PN are involved in epSOS project and these are the countries to be considered in the evaluation of convergence (see appendix 1).

In epSOS evaluation of convergence, three different time series are considered: the initial moment, the current moment and the prognosis for the future. Figure 5 gives a schematic overview of the timeline considered in the evaluation of convergence. Consequently, in order to create the baseline, epSOS I countries were asked about their situation in 2008 (before entering in epSOS). The second time sequence considered for both epSOS I and epSOS II countries was 2011; this time sequence offered the situation in the moment of the evaluation. The last time series considered was 2013, a prognosis in order to find out at what extent do the PNs expect to experience convergence in e-health strategies.

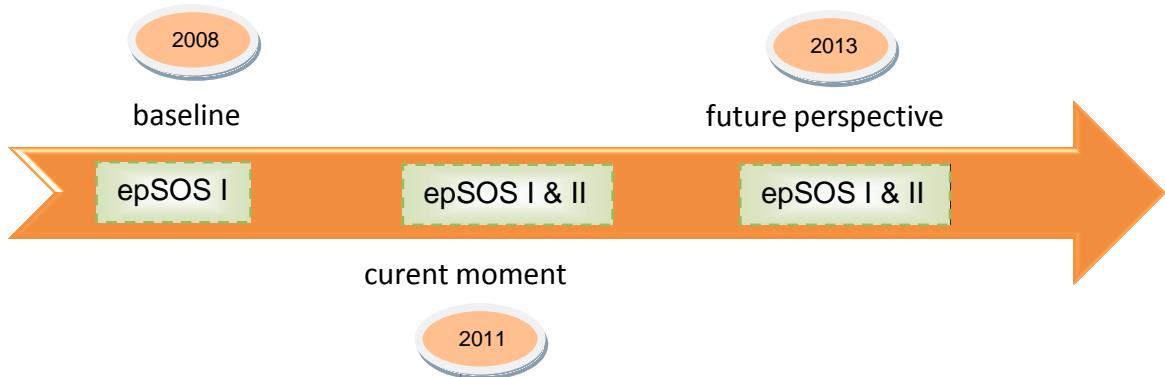


Figure 5 Timeline evaluation convergence

In order to create a strong fundament for the baseline and to minimize the bias of hindsight information, empirical research was combined with documents review (see section 3.2.4.). Also information of the “current time” was balanced with data from parallel studies. For the “future perspective” sequence, it the data from empirical research resulted from the questionnaire was used.

3.1.3. *Multi-disciplinary approach*

The focus of this thesis is on the evaluation of the convergence in e-health strategies. However, this could not be measured without considering the different dimensions. A series of indicators were detected, based on the (1) literature study, (2) discussions with experts in e-health and (3) particular characteristics of epSOS design. A complete analysis contains not only traditional technical categories, but also political, inter-operational and organizational aspects (Yusof 2008b). The evaluation of the identified set of dimensions and indicators is offered to the extent that the epSOS project served the ambitions of the initial goals.

3.1.3.1. *Dimensions*

A series of dimensions were selected as the result of literature studies, expert meetings followed by numerous discussions. These were: e-health Governance framework, Syntax & Semantics, Architecture, Applications, Regulatory issues. The five dimensions for evaluating convergence in the epSOS design brought answers to a set of crucial questions: Semantics – ‘What information is talked about?'; Syntax – ‘How is the information structured?'; Applications – ‘In what context is this information used?'; Architecture – ‘What is the design of the information system?'; Governance framework – ‘How is the system used?'; and Regulatory framework – ‘what laws and regulations should be applied?'. A description of the

five dimensions can be found in appendix 4. For simplicity, they were called “SAGAR Evaluation Framework”. Figure 6 illustrates the dimensions framework with each of the five categories in the three different time series.

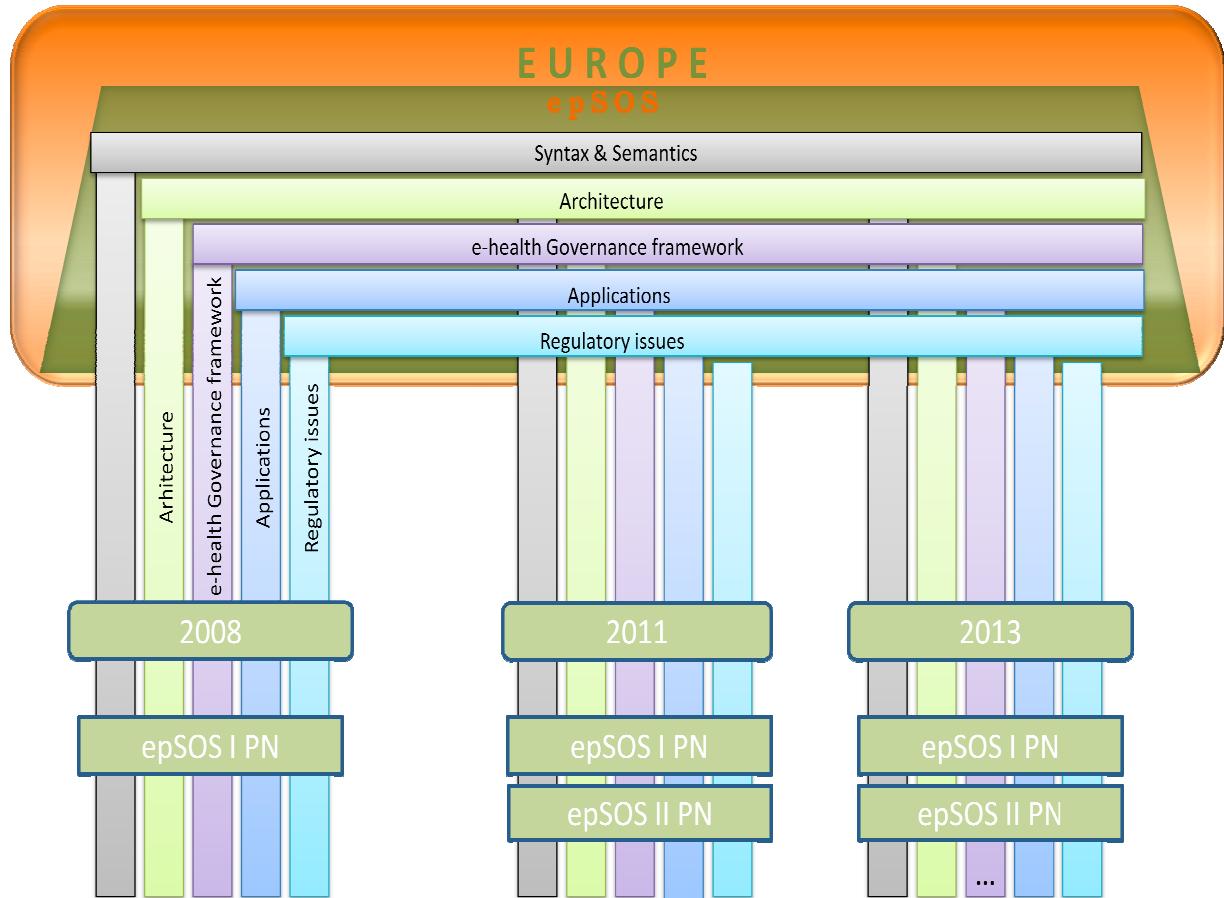


Figure 6 Dimensions of convergence

Each identified dimension is recognised as an important share of the whole convergence “ring” (see figure 7). Under each dimension there are included multiple indicators (presented in next session) which all influenced the different aspects of convergence.

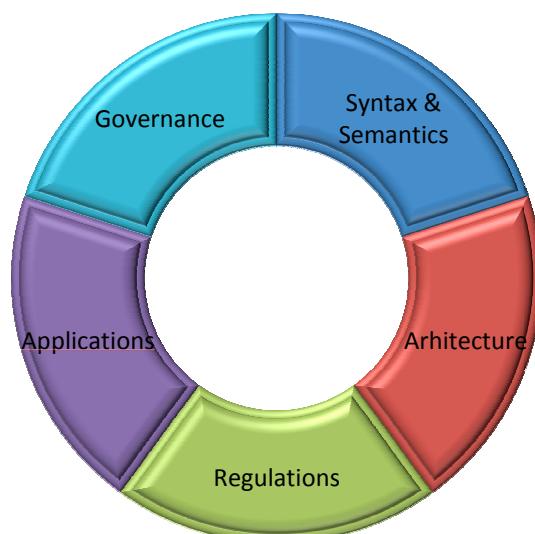


Figure 7 Convergence ring

3.1.3.2. Indicators

Identified as important sources of information to be analysed, an indicator was defined as “an unit of information that measures a specific aspect or condition that exist in the area of study” (Abrams 2003). Each of the SAGAR dimensions include several attitude indicators used to measure convergence. The indicators cover general and specific attitudes towards the perceived impact of epSOS on national e-health strategies. Table 1 gives a systematic overview of the dimensions and indicators that were used during the convergence evaluation.

Dimensions	Indicator
Background	Actors involvement in epSOS stakeholder involvement architectural level cooperation
Syntax & Semantics	use of standards development of standards datasets
Architecture	infrastructure security/privacy
e-health governance framework	governance framework data protection codes of practice roles/authorization HCP records management patient empowerment information security liability patient privacy
Applications	use cases processes basic services communication national information systems
Regulatory framework	legal framework ePrescription dispensing ePrescription Patient Summary

Table 1 Dimensions and indicators for evaluation of convergence

3.1.3.3. Involved actors

Considering the importance of the different actors (Yusof 2008; Marthandan 2010), the evaluation of convergence in e-health strategies through the epSOS I design considers multiple stakeholders. Different actors involved in the project were questioned on their perspectives on the same topic.

On the one hand there were the policy makers (PM). They provided information about the national situation of the member states in epSOS project. In general, these persons are the

national PSB members (Project Steering Board). They are familiar with the country's e-health strategy and the related policies and have the role of steering and supervising the national strategies. Usually the respondents could be members of the ministry (second or third hierarchical level). On the other hand there were the Competence Centres (CC). The CCs are the so called "technical knowledge", and handle the 'national contact point' development.

3.2. Evaluation tools

"Unlike in physics, the study of social systems will always be prone to subjective measurements and interpretations" (epSOS 2011a). In order to come up with the most reliable and balanced outcome a combination of qualitative and quantitative strategies was used. The evaluation of convergence in e-health strategies of epSOS PN used qualitative methods for the design of a quantitative instrument - the questionnaire. All research instruments used in the evaluation are: questionnaire, interviews, journals and documents review. The construction and use of all the instruments is explained in what follows.

3.2.1. Web- based questionnaire

The principal tool used for the evaluation of convergence for the 23 epSOS PN was the internet based questionnaire. It consists of descriptive, attitude and predictive questions. The use of the internet-based questionnaire (see appendix 8) offers the benefits of the classic paper questionnaire, and some additional advantages. The use of the online questionnaire permits the respondent (agent in charge with getting the answers at national level) to constantly check the completeness of the answers. Other advantages of the online questionnaire are: (1) multiple persons can get access but only with the unique code from the person responsible for the questionnaire, (2) answers to the questions can be given any time from any computer connected to the internet, (3) ulterior changes in the answers are possible.

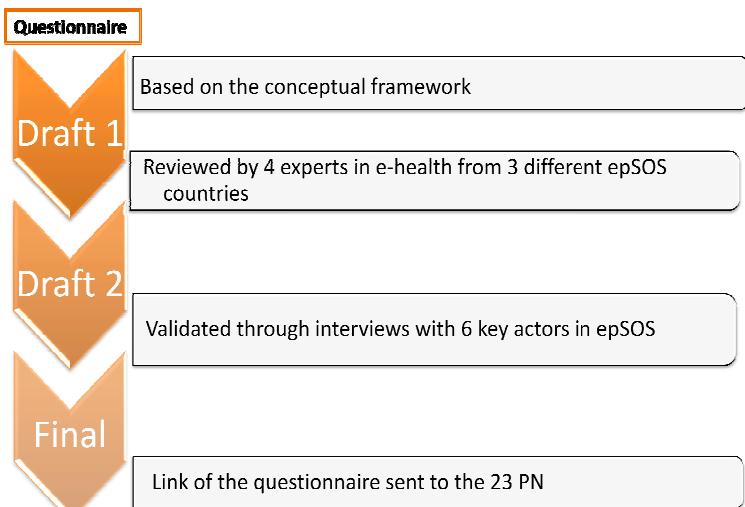


Figure 8 Stages in questionnaire construction

The design of the questionnaire followed several steps (see figure 8). Firstly, a draft of the questionnaire was created considering the characteristics of the theoretical framework. The multi-method approach brought up different types of questions (closed ended questions for the majority of the questions; open ended questions in order to give the respondents the possibility to develop a complex answer to the questions and present their opinion without restrictions). Based on the multi-time perspectives, three different time series were considered in the questions of the survey (2008, 2011, and 2013). Based on the multi-dimension approach, the five SAGAR dimensions were considered. At the same time, the questionnaire includes contingency questions (addressing specific respondent groups).

Secondly, the resulted questionnaire draft was discussed in expert meetings with Michiel Sprenger – the national epSOS project coordinator for the Netherland; Alexander Mense – the national epSOS project coordinator for the Netherland; and Mie Hjorth Matthiesen – national board of e-Health, Danish epSOS coordinator.

Thirdly, the resulted questionnaire was checked through a validation round. The questionnaire in .xlsx format was sent to a series of key actors *a priori* in order to test the correctness of the questions. Also a telephone interview followed with the same six key actors. The feedback received from the validation round was used for the latest version of the questionnaire.

The final version of the questionnaires includes 103 questions and contains question on all epSOS I use cases: Patient Summary, ePrescription, eDispense. On request, the questionnaire can be provided in .pdf format or it can be accessed online (see appendix 6).

3.2.2. Semi-structured interview

There is a well known saying in academic research: “The way you ask the questions determines the answers” (Serpa 2000). In order to search for balanced results in the SAGAR evaluation, a telephone interview was conducted. This semi-structured telephone interview served as the tool in the validation of the questionnaire.

The validation round tested the level of understanding the respondents have on specific questions of the questionnaire. Next to the clarity of the questions, the interest was in finding (1) how long data collection can be expected to take, (2) how difficult are the items to be filled in, (3) which questions need editing. The interview considered also questions about the

methodology behind the evaluation of convergence, and the content and format of the questionnaire.

The target for the semi-structured interview were six key actors with thorough knowledge on the development of the epSOS project. The respondents which were identified represent four countries that are part of epSOS from the beginning and they play an important role at national level, as well as in the management of epSOS program. The six persons addressed were: Alain Périé from ASIP Santé, France; Montse Moharra and Carlos Gallegro from the Catalan Agency for Health Information, Assessment and Quality, Spain; Roberto Zuffada and Marcello Melgara from Lombardia Informatica, Italy; and Jeremy Thorp from the NHS committee for health care programs, England.

The interviews were about one hour long each, and their transcription is available on request. The analysis of the interviews (see appendix 5) provided feedback for improving the quality of the questionnaire. The main changes consisted in re-editing of the response scale and bring clarity in some of the questions. These changes improved the chance of receiving the necessary results out of the study.

3.2.3. Research journal

Although initially it would seem a non-academic method, the research journal proved a particularly useful tool, especially in analyzing trends and patterns (Rabinowitz n.d.). Part of the qualitative research methodology, the journal could record the experiences over time. In the evaluation of convergence in e-health strategies through epSOS I design, the process of data collection and analysis was tremendous sustained by the use of an elaborated journal. Updated regularly, the journal provided - in moments of delay or stray - the opportunity to review perspectives on different issues from the beginning of the project to any of the later moments.

3.2.4. Documents review

Besides the field study, which gathered opinion statements, an elaborated document study was performed in order to reveal what is already known and how the situation differs per time period. In this review, previous epSOS reports were considered, as well as some other European country reports. From the used documents are: (1) epSOS documents: D1.1.1. – “Analysis and comparison of national solutions. Report on opportunities and constraints of

participating member states architectures”, May 27th 2009; D1.4.2. “Country status outline and template specification”, February 2nd, 2012; (2) European Commission Information Society reports such as: “eHealth in Action. Good Practice in European Countries”, “eHealth priorities and strategies in European countries”; (3) Empicrica – Gesellschaft fur Komunications und Technologieforschung mbH: “European countries on their journey towards national e-health infrastructures – evidence of progress and recommendations for cooperative actions” “eHealth Benchmarking”.

4. Methods

4.1. Data collection methods

Data collection was performed with the use of the evaluation tools presented earlier. The step-wise approach to data collection followed productively combined the information from literature study, questionnaires and documents review.

The questionnaire provided qualitative as well as quantitative information. Each dimension and indicator was researched through a set of questions: a closed-question: pre-coded list of answers, as well as an open-question which lets room for elaboration through verbatim. The closed-ended questions were an obligatory field (in order to be able to successfully submit the questionnaire), while the elaboration on the open-ended questions was recommended, but optional. The open ended questions offered the advantage that respondents could refer to similar issues or problems, and patterns were identified (Rabinowitz n.d.). The vast majority of the close ended questions offered the respondent the possibility to choose an answer from the matrix set of answers. The response scale has five possible answers:

For creating the baseline:

No, we have not been influenced, because we do not have this (yet).

No, we have not been influenced, because we already made our design which has not been changed (because of the epSOS project).

Yes, we have been influenced, as we have looked at epSOS for inspiration.

Yes, we have been influenced, as some parts of our design have been checked for/on compliancy.

Yes, we have been influenced, as our entire national design has been checked for/on compliancy.

Do not know/out of my competence.

For determining the prospected degree of influence of epSOS I design in the participating nation in the year the 2013:

No, we will not be influenced, because we have not planned to do this (yet).

No, we will not be influenced, because we already made our design and there are no plans to change it (because of the epSOS project).

Yes, we will be influenced, as we will look at epSOS for inspiration.

Yes, we will be influenced, as some parts of our design will be checked for/on compliancy.

Yes, we will be influenced, as our entire national design will be checked for/on compliancy.

Do not know/out of my competence.

Given that convergence is not a state per se, the questionnaires sent out in 2011 covered information about the current situation, the past and future. The retrospective data could offer biases; in this sense, the baseline information from the questionnaire was cross-checked with data from documents review. Previous reports were used in order to enhance the initial information received and to provide a valid base (see section 3.2.4).

The prospective data required in the questionnaires offered a rounded evaluation by determining the degree of convergence in e-health strategies of the PN in the third time series. However, the data for 2013 is recommended to be compared with the data received in further studies.

In the process of data gathering different actor groups were addressed: Competence Centre (CC), and Policy Maker (PM). The questionnaire included specific questions regarding the competences of each group and also some other for both groups. In this way, there were provided differing insights and viewpoints on the same topic. Specifically, the CCs were questioned for the technical questions, while the PMs were inquired about the factual and/or applicative questions.

4.2. Data analysis methods

The use of different instruments in data collection provided different types of data. In this way the traditional research methods were not sufficient to elaborate both qualitative and quantitative information (Dansky 2006). The quantitative and qualitative data sets were linked into one data set that categorises each of the evaluated dimension. The analyse of data continue the same framework as the methodology proposed. There were analysed the five SAGAR dimensions based on the three time series.

As Sandelowski (2000) proposed in the case of multi-method evaluations “techniques are tied neither to paradigms nor to methods, combinations at the technique level permit innovative uses of a range of techniques for a variety of purposes”. Since the target of the study were the 23 PN, the data resulted from the questionnaire could not benefit fully from the use of statistical measurements. In the analysis of convergence in e-health strategies due to epSOS I design, a tiny guidance came from Spiggle (1994) research strategies.

The first phase toward for an inclusive data analysis started from the moment of sending the questionnaire link together with the introduction and the instruction sheet (see appendix 6, 7 and 8 respectively) to the person in charge for contacting the national agents of the 23 epSOS PN. The National epSOS Project Manager (NEPC) and Project Steering Board members (PSB members) received the responsibility to complete the questionnaire themselves, or to send the link to the entities in charge of giving complete and adequate answers, valid at national level in due time. Also, several follow-up email reminders with the link to the survey were sent out. An extension of the deadline was decided due to a low response rate. In addition, numerous reminders specific for the countries that did not answer the questionnaire, were done not only via e-mail but also in the official meetings of the national epSOS project coordinators. In the end, there were four months available for the responders to fill in the questionnaire, and the response rate reached the level of 50 percents.

In the next phase, the responses to the questionnaire were imported from Formdesk (the software used for the online questionnaire) into one Microsoft Office Excel sheet. Then, the data was scrutinized based on the degree of completeness, clarity and consistency. Anomalies and inconsistencies were clarified and resolved.

After the validation of information, data was sorted out into three categories as follows:

- epSOS I countries apart from epSOS II countries;
- epSOS I PM apart from epSOS I CC; epSOS II PM apart from epSOS II CC;
- epSOS I PM in 2008, in 2011 and 2013; epSOS I CC in 2008, in 2011 and 2013; epSOS II PM in 2011 and 2013; epSOS II CC in 2011 and 2013.

In this way, there resulted 12 different excel sheets with the information from the questionnaires. The excel sheets could be provided and explained on request.

After the split of data, the focus was set up on coding the information. The answer matrix of the vast majority of questions was coded in a five step approach (see table 2). The answers form the open questions, and the information extracted from the documents review were coded in order to follow the same answer matrix, implicitly the same code scale. The first two answers from the coded scale show no influence toward convergence in e-health strategies from the epSOS I design; this non-influence could have two reasons: on the one hand, the specifications were not in place in the PN or, on the other hand, the existence a priori of the

standards. The last three answers in the scale show influence from epSOS and were grouped as: convergence to certain degree.

Response	Code
No, we have not been/will not be influenced, because we do not have this (yet).	Own trajectory without epSOS
No, we have not been/ will not be influenced, because we already made our design which has not been/will not be changed (because of epSOS).	Own trajectory before epSOS
Yes, we have been/will be influenced, as we have looked/will look at epSOS for inspiration.	Alignment
Yes, we have been/will be influenced, as some parts of our design have been/will be checked for/on compliancy.	Convergence
Yes, we have been/will be influenced, as our entire national design has been/will be checked for/on compliancy.	Full convergence

Table 2 Code scale to responses to closed-questions

The next step after coding the information was the categorisation. The information resulted from the questionnaire about the situation before entering in epSOS (2008 for epSOS I PN) was cross-checked with the information from the documents review.

The next steps were the comparison and dimensionalisation. Frequencies were calculated for each of the indicators and the level of convergence of each dimension was calculated in percentages. Each of the five SAGAR dimensions was analysed apart, and specific patterns and trends were identified – within a particular year and between years. Some of the dimensions were particularly for PM and some for the CC, but some for both of them. Then, the dimensions were compared within themselves. Contingency tables were done in order to summarise the information and to determine the degree of convergence in e-health strategies of the epSOS I and epSOS II PN (see appendix 10 and 11). In this way, the degree of significance of each of the dimensions could be identified.

Since epSOS is a program with a volunteer membership, the analysis does not put in light any of the particular countries. The analysis is restricted to the comparison of epSOS I and epSOS II PN. However, considering that epSOS I PN joined the epSOS project in 2008 and epSOS II PN in 2010, the correlations within these two groups could be done only for two time series: the current time and the future perspective.

The last steps in the procedure of analysis were the integration and interpretation. The trends over time - for the three moments determined - show the patterns in the direction of the evaluation. In this way, the degree of convergence could be measured in 2008, 2011 and 2013. Integrated data in a complex matrix offered the possibility to decide whether there is a

trend toward convergence or not. In the next section, the information is presented in a graphical way, per dimension and per time sequence.

5. **Findings**

The collected data through the questionnaire had a rather low response rate of around 50 percent, despite the dogged determination. Multiple requests were done in order to increase the response rate, particularly on the countries that did not react to the survey deadline (see appendix 9). A summary of the response rates per different groups is offered in figure 9. Per total, epSOS I PN had a higher response rate compared with epSOS II countries, and in the same time the PM offered a higher response rate in comparison with the CC. Nevertheless, the received answers were handled with care in order to determine the degree of convergence in e-health strategies of the PN in epSOS, due to epSOS I design.

epSOS I (in total 12 countries)			epSOS II (in total 11 countries)
Policy Makers		Policy Makers	
7 completed	58%	5 completed	45%
4 not answered at all		3 not answered at all	
1 partially filled in		3 partially filled in	
Competence Centre		Competence Centre	
6 completed	50%	5 completed	45%
2 not answered at all		4 not answered at all	
4 partially filled in		2 partially filled in	

Figure 9 Response rate summary

In what follows the findings of the survey are presented for the eP use case. In the first part the outcome of the use of multi-method approach is brought up. Secondly, results of the multi-dimension approach are presented with the five SAGAR dimensions. In the third part the multi-time perspective illustrates the trends of convergence over time.

5.1. **Multi-method approach**

In evaluating e-health strategies, the multi-method approach proved the highest benefits. The use of both qualitative and quantitative indicators provided valuable information. In this thesis, the qualitative methods were used in order to create a quantitative instrument of analysis that was validated through other qualitative methods. The quantitative data was drawn from questionnaires, literature study and documents review while qualitative data resulted from the research journal, the telephone interviews and the open questions of the questionnaire. The use of the multi-method approach results in a holistic data collection for

the analyse of convergence in e-health strategies in the participating nations through the epSOS I design.

5.2. Multi-dimension approach

The multi-dimension approach is the second crucial aspect considered in this evaluation. The outcome of the analysis are presented in the next pages. In order to determine the level of influence of each of the five dimensions, the results illustrate the situation for 2011.

5.2.1. Syntax and Semantics

Interoperability proved to be one of the key factors in establishing cross-border exchange of electronic medical data. In order to determine the level of convergence in Syntax and Semantics questions regarding the use and development of different standards were asked especially to the Competence Centres.

Results show that epSOS I PN were not influenced in choosing their national e-health standards by epSOS specifications, and that they must have decided their national strategies before or at the same time with the introduction of epSOS. However, there can be observed 21 percents of these epSOS I PN that point toward alignment and convergence regarding the use and development of standards.

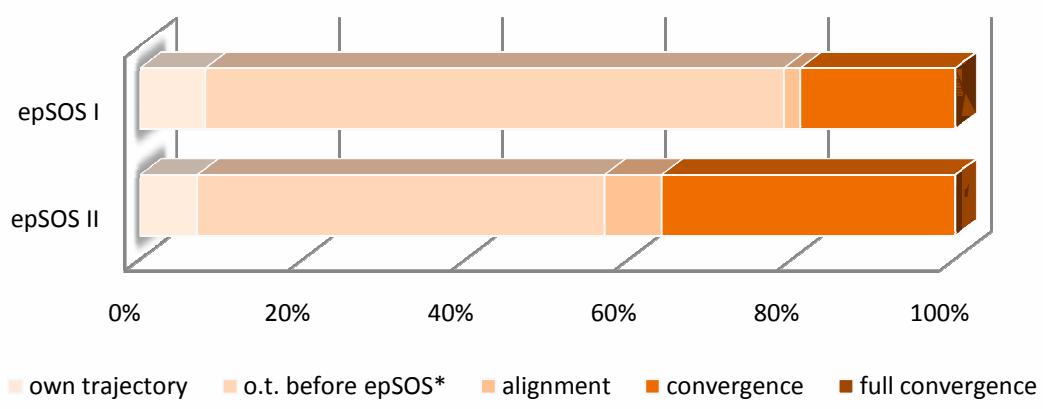


Figure 10 Syntax and Semantics

The epSOS II PN got inspired by epSOS at a slightly higher degree in choosing standards. From figure 10 could be seen that the percentage of alignment and convergence for epSOS II

countries reached the level of 45 percents. This appears to be explained by the effort done in semantic interoperability through epSOS MVC (epSOS Master Value Sets Catalogue).

The standards used in epSOS influenced the epSOS II PN in choosing their standards more than the epSOS I PN. One of the standards with the greatest influence for all PN appeared to be SNOMED: “epSOS definitely enhanced the extension of SNOMED use in national HIS” (Questionnaire, Estonia – epSOS II). In conclusion, using this standard, epSOS I and epSOS II PN got the highest level of convergence in e-health strategies due to the epSOS I design.

5.2.2. *Architecture*

Another significant dimension analysed in the process of convergence in national e-health strategies was Architecture. The architecture of information systems considered aspects such as: infrastructure, communication, security and privacy.

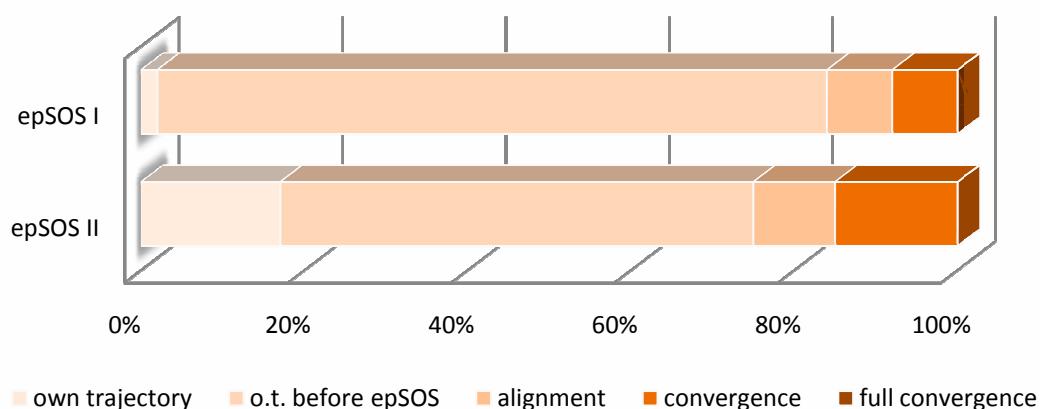


Figure 11 Architecture

The degree of convergence in architectural aspects of e-health strategies had appeared to be mainly based on something else than the influence of epSOS I design. On the one side, the epSOS I PN revealed around 20% alignment and convergence due to epSOS I design. On the other side, the epSOS II countries showed a slightly higher degree of going toward convergence, around a quarter of the total number of answers (see figure 11). The low level of influence from epSOS was mainly expressed in infrastructure and security/privacy issues. However, communication issues (especially the data transport standards) hailed a high degree of alignment of 50 percents in epSOS II PN.

In the *Architecture* dimension as a whole, it became apparent that epSOS I PN set the components of their national information system before epSOS project was in place, while

the countries that just entered in the project adopted the architectural issues promoted by epSOS with great expectations on their “green e-health field”.

5.2.3. *e-health Governance Framework*

Different aspects of legality were considered in this study despite the proved lack of convergence showed in literature studies. The indicators included in the measurement of the level of convergence in e-health systems due to epSOS project were: data protection policies, roles / authorization HCP, records management, information security and liability, etc.

The empirical data resulted from this study made apparent a low degree of convergence in governmental issues (a legitimate trend predicted in former studies). In epSOS I PN, the balance of influence heavily leaned toward no influence from epSOS I design, while only 8% of the answers could show alignment and/or convergence. As declared by epSOS I respondents, their national governance framework was decided upfront, “independently from epSOS, according to roles and responsibilities of different actors” (Questionnaire, Italy - epSOS I, 2011).

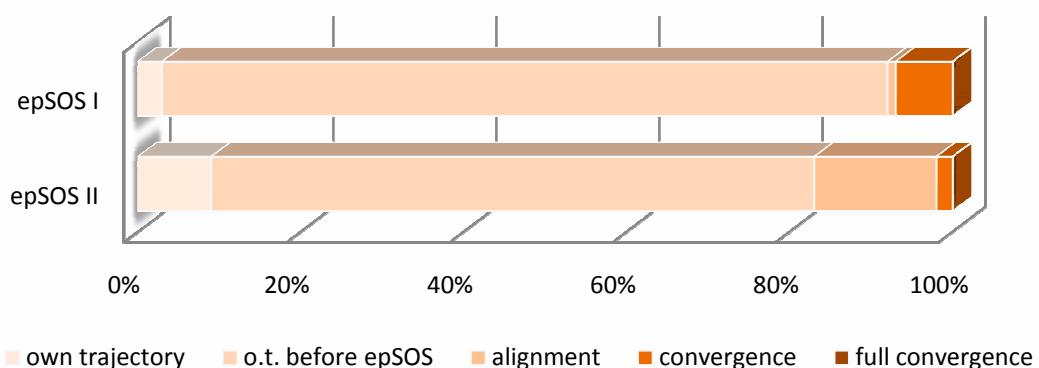


Figure 12 e-health Governance framework

Similarly, the epSOS II PN proved a low degree of influence from epSOS I design, with 17% alignment and/or convergence while the rest of 83% confirmed non influence from epSOS (see figure 12). In setting the governance framework PN declared that most of the decisions would be taken without influence from epSOS I design, but based on the national characteristics. As a result, – at this moment but also in the future – there proved little chances of alignment and convergence and no sign of full convergence due to epSOS I design.

5.2.4. Application

The degree of influence the PN receive from the ePrescription use case described in the epSOS specifications was studied in the Application dimension.

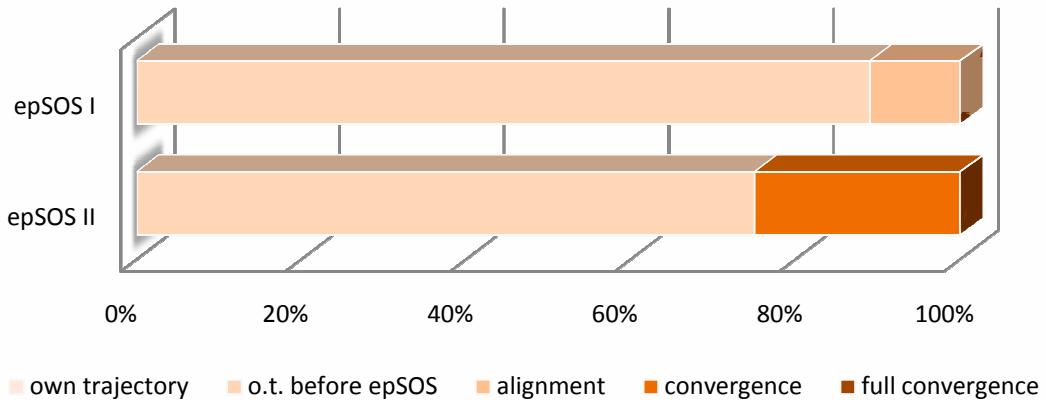


Figure 13 Application

It also became apparent that the level of influence that both epSOS I and epSOS II PN attested in the application dimension is rather low (see figure 13). When the epSOS I PN had no level of convergence, and only 11% of alignment, the epSOS II PN claimed 25% influence from epSOS toward convergence in eP application. In both groups of countries the CC were more reticent than the PM in declaring influence from epSOS I design. The justification for the small degree of influence from epSOS I design was explained by the low number of countries piloting on eP use case. However, it was observed that epSOS II countries prove to be more interested (than epSOS I PN) in piloting the eP use case for their national use cases in the future.

5.2.5. Regulatory framework

The Regulatory framework aims to determine the impact of epSOS I design in the process of convergence in legal aspects. Similarly to the other dimensions, the regulatory framework revealed low level of convergence. More exactly there proved to be no direction toward convergence. As seen in figure 14, both epSOS I and epSOS II countries declared 0% alignment and/or convergence due to epSOS I design.

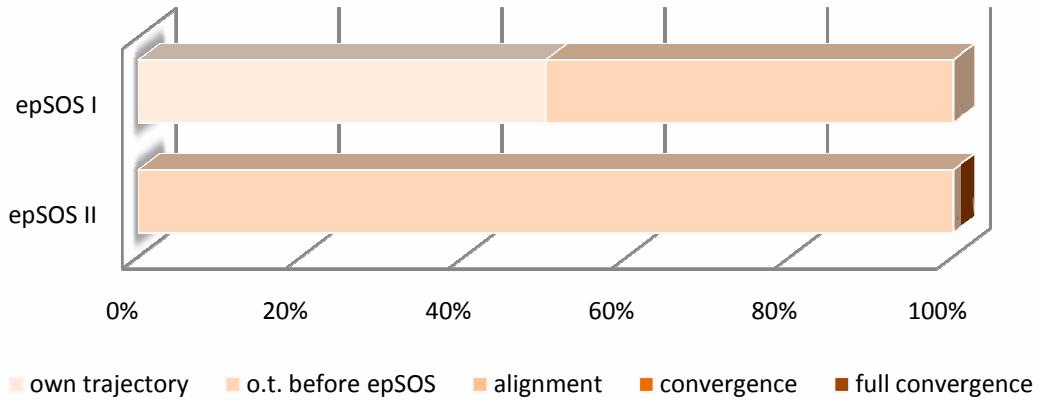


Figure 14 Regulatory framework

The most plausible explanations for this lack of convergence in this dimensions were that: maybe epSOS I design does not specify enough information in regard with this dimension, or maybe this domain is still a work in progress, or that the European Legislation has more influence on national laws and regulations than projects like epSOS.

In conclusion, the present findings offered the degree of convergence at current moment for the SAGAR dimensions. The interoperability issues (Syntax and Semantics) as well as the technology design of the system (Architecture and Applications) proved convergence in 2011 due to the epSOS I design – to certain degrees. However, the Governance of e-health strategies and the Regulatory aspects confirmed the trends of the literature, and showed a low degree of convergence because of epSOS. Appendix 10 includes the degree of influence epSOS I design has on the level of convergence for each of the five dimensions into a complex matrix. Nevertheless, an interpretation of the dimensions and indicators without the multiple time series cannot offer a complete image on the degree of influence that epSOS I design has on the PN through the eP.

5.3. *Multi-time perspective*

The third crucial aspect considered in the evaluation of an e-health project is the multi-time perspective. In what follows, a comparison of the indicators is provided together with the timeline presented earlier in this paper: the initial moment - 2008, the current moment of the evaluation - 2011, and the prognosis for the 2013. For epSOS I PN all three time series are considered, while for the epSOS II countries (that joined the project in the second phase) only the last two time series could be measured.

Because convergence is an ongoing process, the evaluation of each time-interval proved valuable especially for measuring the impact of a program over time. An contingency table offers the complete image of the evaluation (see appendix 11).

The graphical representation that follows depicts the status of each of the three time series based on four main variables. The X axis represents the steps from own trajectory toward full convergence. The Y axis provides the result on each of the five SAGAR evaluated dimensions. The colour of the bubble distinguishes the epSOS I PN represented by the green colour circles from epSOS II PN pictured by the orange colour circles. Observing the size of the bubble, the interpretation is that the larger the size of the bubble, the higher the percentage of answer in that area.

5.3.1. The past perspective

The epSOS project started in 2008 with a number of 12 countries, with great ambitions and perspectives. In this survey, the respondents were asked about their situation in 2008. The information was cross-checked and enhanced with the data from previous reports. The general trend showed that the epSOS I countries did not undergo a high degree of influence from the epSOS I design (see figure 15). Even though there was revealed a certain level of alignment in the e-health strategies of the participating countries due to epSOS I design, the only dimension that confirmed convergence and full convergence was Architecture. This denotes the importance that epSOS offered from the beginning to the architecture of the national e-health infrastructure of the PN. However, with regard to the Regulatory framework it was observed that the epSOS I design had a low influence ever since. An explanation remained the fact that in legal and political aspects each country prefers an own trajectory.

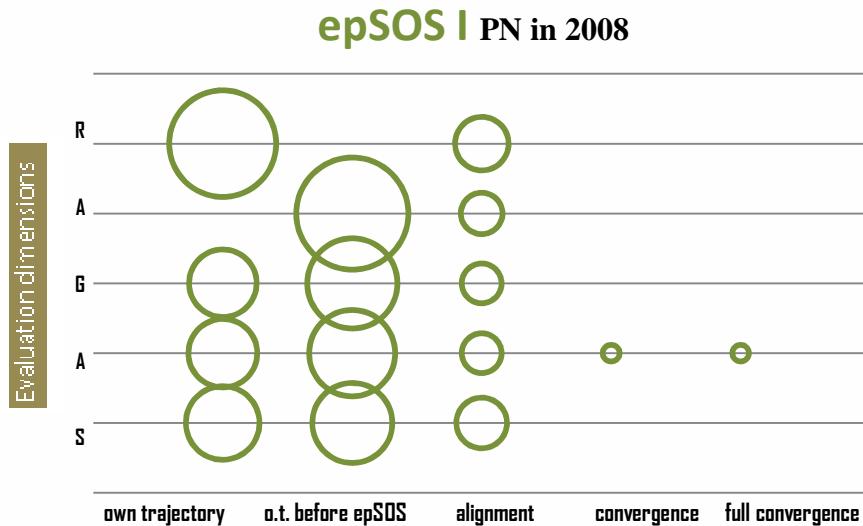


Figure 15 The epSOS I PN at the beginning of epSOS project

5.3.2. *The current situation*

The questions regarding the current situation presents the PN in the year 2011, when the survey took place. The results provided the bridge between the data from the beginning of the project and the prognosis for future. In this way, the trends toward convergence were identified. For the year 2011, the epSOS I and epSOS II PN were investigated. Both groups of countries answered to four of the five dimensions that there was no influence from epSOS I design in setting their national infrastructure (see figure 16). These countries set their trajectory before being part of epSOS or independently from epSOS. However, several inconsistencies could be observed when compared with the data regarding the initial moment. In Regulatory Framework there appeared 20% alignment due to the epSOS I design, while in 2011 there is declared no influence from epSOS. Slight differences in the same directions could be observed also for the Governance framework and the Applications. An explanation for this contradictions could consist in the fact that the answers from 2008 supported a certain degree of alignment or convergence but not particularly due to the influence of epSOS I design, but possibly due to other programs. For epSOS II PN, Syntax and Semantics offered the highest degree of influence from epSOS I design. Altogether, the influence that epSOS I design proved to have on the PN's e-health strategies differs per dimension, based on each countries list of priorities.

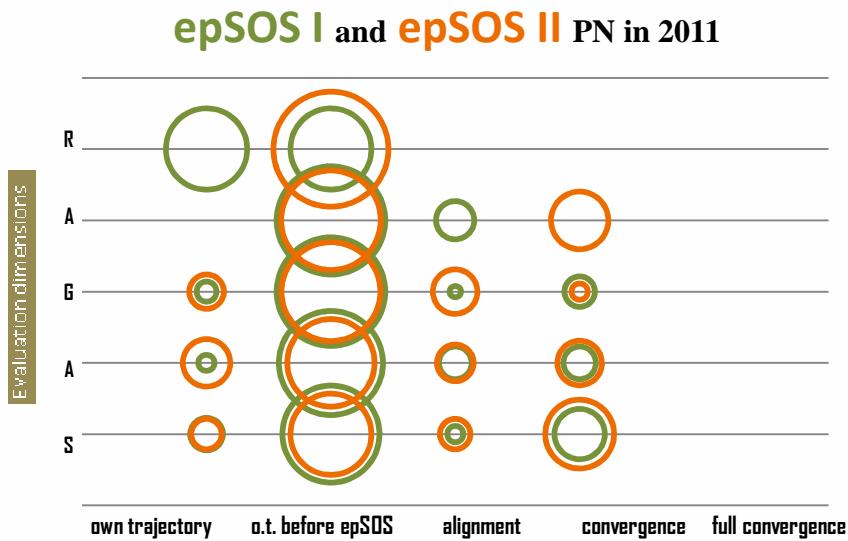


Figure 16 The epSOS I and epSOS II PN at current time

5.3.3. *The future perspective*

In order to complete the framework, a series of questions were asked regarding the future perspective on the degree of influence that epSOS I design has on the e-health strategies of the PN. Generally, the results showed that the SAGAR dimensions are expected to bring convergence in the e-health strategies of the PN till the year 2013. The graphical representation of the results can be observed in figure 17.

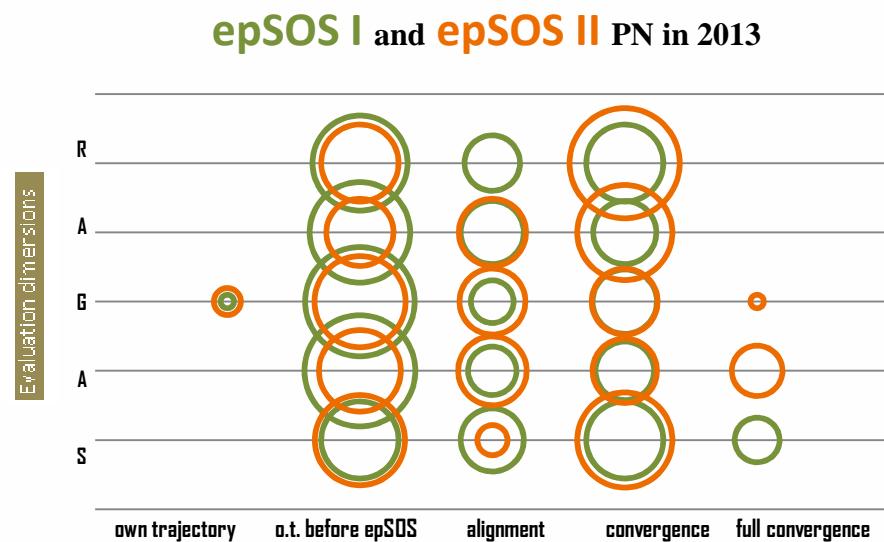


Figure 17 The epSOS I and epSOS II PN – future perspective

On the one hand, the epSOS I PN revealed - in most of the dimensions - that their national trajectories were decided before being part of epSOS. However, in Syntax and Semantics was

observed a high wish to align, converge and even fully converge. Also in Regulatory and Application issues there is expected a high level of convergence.

On the other hand, the epSOS II PN proved a higher expectancy of convergence than epSOS I countries, especially in Application, Regulatory framework, Architecture and Syntax and Semantics. Interesting to observe in the epSOS II PN is that the Regulatory framework with 0% alignment and convergence in 2011, prognosed around 67% convergence in 2013. Also optimistic prognosis were for the e-health Governance framework, where is expected alignment, convergence and even full convergence for epSOS II countries in 2013 at a value of 49 percent.

Considering the three time-series altogether, a broad image on the degree of convergence was be determined. However, “convergence is an ongoing activity” (Questionnaire, Italy, epSOS I) which continues to flourish. The overall image resulted from this evaluation shows clear trends toward alignment and convergence for epSOS I countries, while for epSOS II the trends are toward convergence and full convergence.

6. Discussion

6.1. Summary of findings

By adopting a multi-method approach, multi-time perspective and the multi-disciplinary approach, the evaluation of epSOS I design helps to determine the influence towards alignment and convergence in e-health strategies of the epSOS PN through the use of eP. As a whole, both epSOS I and epSOS II PN, show different levels of convergence over the years, with optimistic perspectives for the future. The dimensions considered in the evaluation of convergence could be categorized based on their degree of convergence from the highest to the lowest level (see figure 18). In the cross-border exchange of data, the Semantics and Syntax (in other words ‘what information is required’ and ‘how to structure it’) show the highest level of convergence (42%) due to epSOS I design. Subsequently, the Applications and Architecture show a convergence of 36% and 32.5% respectively. These two dimensions explain the degree of convergence in the context of ‘the used information’ and ‘the proper design’ of the information system. The last two dimensions in the trend toward convergence are the Regulatory framework and the e-Health Governance framework with 28% respectively 25%. They are consistent with the existing literature trends, and show the lowest level of convergence. As Radaelli (2005) said, ideas and techniques travel with a higher speed than the legislative and regulatory issues with political implication, which makes the level of convergence in the last two dimensions the lowest.



Figure 18 Degree of convergence per dimensions over the years

6.2. Literature considerations

The initial objective of this master thesis has been to evaluate the degree of convergence in e-health strategies of the PN due to epSOS I design. Although it was beyond the scope of this thesis to supplement the existing literature, the gap in knowledge on this topic was addressed and a meticulous methodology of evaluating convergence in e-health structures was developed. The development of the evaluation framework focused on several characteristics. The first milestone to be set in any evaluation is the used research method. Ammenwerth (2003b) proposes a clear distinction between: (1) the objectivistic tradition (quantitative method) in the case of research questions which can be “measured, explained and predicted”, and (2) the subjectivistic tradition (qualitative method) for the cyclic approaches “with a steady revision and reformulation of theories, based on any new data”. At the same time, Stoop (2003) suggests that “the best way to answer the evaluation questions and interpret results and consequences is to integrate qualitative and quantitative research methods”. In the SAGAR evaluation, the multi-method approach was used in order to bring comprehensive results (qualitative instruments were used in order to create a quantitative evaluation instrument).

The timing of the evaluation was also of benefit for the evaluation of the degree of influence epSOS I design has on the PN. Marthandan (2010) and Hyppönen (2007) relate that evaluations usually take place before, at the same time, or after implementation of an e-health system. Since convergence is not a state per se, the SAGAR evaluation considered three different timing series: (1) the moment of starting the epSOS project – 2008, (2) the current situation – 2011, and (3) the future perspective – 2013.

Another common dimension considered in the evaluation of emerging technologies by both Shaw (2002) and Clarke (2008) is the multi-disciplinary approach. Both authors review a number of articles, but none of them provides a holistic evaluation methodology or a general list of dimensions. Hyppönen (2007) applies the multi-disciplinary perspective in the evaluation of national medical e-prescription system pilot in Finland based on three domains: activity system, actor network and development life-cycle. Yusof (2008) proposes the HOT direction for the evaluation frameworks: the consideration of human, organizational and technological factors. Stoop (2003) proposes six different dimensions: technical, professional, organizational, economic, ethical and legal. In the SAGAR evaluation framework, five different dimensions were researched, based on two different angles. From one angle the

technical factors were considered, which contain the interoperability issues (Syntax and Semantics) as well as the technical design of the system (Architecture, Applications). From the other angle the political factors were considered, which encompass the Governance and Regulatory aspects of e-health strategies. Furthermore, multiple perspectives were balanced through the answers of different actors involved in the study.

Aside from the multi-method, multi-time perspective and the multi-disciplinary approaches, the access to previous reports enhanced the information of the evaluation, especially at the baseline level. In addition, valuable information on the special characteristics of epSOS project and the proper structure of the theoretical framework was obtained from discussions with experts in e-health and members of epSOS project.

As a whole, this study diminishes the shortage in the available literature on the evaluation of e-health systems, by proposing a complex methodology, which sheds light on the unexplored dimension of convergence. In order to determine the degree of convergence in e-health strategies of the PN through the epSOS I design, an evaluation methodology and an evaluation tool were developed and applied for both epSOS I and epSOS II countries.

6.3. Recommendations

The difficulty of facilitating a comprehensive cross-border exchange of information is not the problem only for the epSOS project. On a large scale, the problem of interoperability in e-health strategies covered through the SAGAR evaluation, is a challenge faced by nations worldwide. Since “information has become a core element of health care” (Kuhn 2007) numerous initiatives were taken with regard to the communication and transfer of medical data, and especially with regard to the exchange of patient information. In the United States, multiple regional health information organizations tried, for several decades, to develop a safe and efficient information exchange of medical data (Yasnoff 2004). Similar attempts are also noticeable in Canada (Mercer 2001). However, the integration of these health information systems toward a National Health Information Infrastructure remains, at a large scale, a challenge (Kuhn 2006, Marchibroda 2007). Consequently, the different initiatives to date in the Western world could benefit from the SAGAR evaluation framework, in order to evaluate the degree of convergence in different strategies of the health information exchanges.

Nevertheless, the evaluation framework proposed in this thesis was specifically developed for the evaluation of convergence in e-health strategies, through epSOS I design. The results highlight the degree of influence epSOS I design through the use of eP has on the e-health strategies of the participating nations. One possible focus for future research would be an attempt to apply this evaluation framework at a local level. Countries such as Italy, the Netherlands or Greece have a decentralized health system where the mobility of people can hardly be linked to the mobility of health data. A challenge would be to use the SAGAR dimensions in order to determine the degree of convergence in e-health strategies at a national level for the epSOS PN.

With regard to the epSOS project, the degree of convergence evidence from data in this study could be used in several ways. The SAGAR evaluation framework can be (and has already been) applied to other epSOS I use-cases: Patient Summary and eDispense. It is highly recommended to complete the analysis of the Patient Summary use-case, since the level of convergence in e-health strategies of the participating nations due to epSOS I design could only be inclusive when the results of both use-cases are laying aside.

Considering the characteristics of the epSOS II programme, the SAGAR evaluation framework could be suitable for other use-cases such as: Integrated European Healthcare Insurance Card, patient access to data, etc. For a fruitful determination of the use-case with the highest influence in the level of convergence in e-health strategies of the PN, a comparison between different use-cases could be done.

Since convergence is not a state per se, this study considered three moments in time: 2008, 2011 and 2013. The recommendations for future study is to re-evaluate the SAGAR dimensions on epSOS use-cases at regular times in order to set the degree of influence of epSOS I design toward convergence in e-health strategies at a large scale. Also an evaluation in 2013 could compare the results of this study on the prognosis of convergence with the reality. Future evaluations should consider the timing of the project, since scheduling the evaluation period proper at the right time could increase the response rate. In this thesis the clinical pilots were running in the same time with the IDE and this could contributed to the low response rate in the survey.

6.4. Strengths

One of the strengths of the current study is the use of the triangulation technique of research. The current evaluation framework corroborates a multitude of factors: data triangulation – access multiple data sources in order to understand the phenomenon; timing triangulation – use of three moments in time to investigate the level of convergence; and theory triangulation – multiple theories and perspectives used in order to interpret and explain the data.

Another strength is the reliability of information. Ample literature researches and document reviews were performed prior to the study and in the process of developing the study. The information received from the respondents is cross-checked with data from previous studies. Reliability of the information is also strengthened by the fact that the NEPCs addressed the persons in charge of offering the most complete responses to the questionnaire.

In addition, the data collection was performed using scrupulous techniques – both qualitative and quantitative in order to provide comprehensive results. The validity of the study is ensured by the manner in which it was carried out, using the questionnaire and the interview techniques as methods of improving the principal research tool.

The final advantage is the periodic peer reviews. The discussions of the methods and the results with experts in the domain of e-health, provides this piece of work with a strong foundation. The meetings with non-experts (uninitiated persons) in e-health provide a clear and succinct topic for everyone.

6.5. Limitations

The first limitation of this study is the low response rate (around 50%), which meant data could not be extrapolated. The epSOS project includes 23 participating nations and the NEPCs were asked to approach the ‘best fitting persons’ in order to answer the questionnaires. However, the response rate remained low. This may be explained by the fact that (1) some countries do not have CC, and (2) other countries are officially part of epSOS but invisible in the project process (e.g. Greece, Belgium, Hungary, Portugal). Another limitation of this study is the fact that one or two persons are asked to offer answers which represent an entire country. The fact that one respondent represents a country offers a limited scope and breadth of to the required information.

In addition, there are biases in data collection. Firstly, the respondents were asked in the questionnaire (in 2011) about the situation from 2008. In this way, the data could suffer some inconsistency. However, this bias was diminished by cross-checking the responses with information from document reviews. Secondly, there is some variation in responses over time, such as reported alignment in 2008 while in 2011 or 2013 there is no sign of alignment, convergence or full convergence. This discrepancies could be eliminated through reconsideration of certain aspects. Also follow-up responses could be required for the aspects where the respondents are thought to have given ‘politically correct answers’.

Furthermore, a limitation of the study is the fact that the evaluation for epSOS II PN has only two points in time. This cannot give a clear trend, as the three moments in time considered in the evaluation of epSOS I countries. In this regard, it is recommend that another evaluation at a later date be performed.

One final limitation worth mentioning is the timing of the project. The design of the evaluation, the data collection and the analysis took place at wide time intervals. The data collection was longer than initially proposed. One benefit of this is that it can allow for a higher response rate. Nevertheless, the downside is that it increases the risk of inconsistencies in the responses. Any delay between data collection and interpretation enhances the risk of bias in the final results.

7. Conclusions

There are two main outcomes of this research. Firstly, the gap in the literature was addressed and enhanced with regard to the unexplored domain evaluation of convergence in e-health strategies. Secondly, a unique methodology and instrument fitted for the evaluation of convergence in e-health strategies was proposed and applied.

The development of the SAGAR evaluation framework was based on: (1) the scientific literature on the evaluation of e-health programs, (2) the particularities of the epSOS project, and (3) the consultations with experts in this domain. In addition to this, were the results of the survey, which mirror the answer to the initial research question: ‘to what extent does the epSOS I design influenced the process of convergence in e-health strategies of the participating nations through the use of eP?’

Even though alignment and convergence are not the main objectives of epSOS, there is evidence of a certain degree of influence in the e-health strategies of the PN through the use of eP specifications from the epSOS I design. On the pre-determined answer scale from “country own trajectory” to “alignment”, “convergence” and “full convergence” the epSOS I countries showed clear trends of alignment and convergence. For epSOS II PN, the trends were toward convergence and full convergence. Based on these findings, the second assumption is addressed: the epSOS II countries tend to align better and quicker with epSOS specifications than epSOS I PN. This proved a legitimate trend, since countries with a ‘green field’ adopt new technologies easier, than countries that set their own trajectories (like epSOS I PN), before being part or in the same time with the development of the project.

Furthermore, the degree of convergence in e-health strategies of the PN highlighted the influence of each of the dimensions evaluated. In this way the SAGAR dimensions were categorized from the highest to the lowest, based on their influence. Syntax and Semantics proved to be the most significant dimension that proves convergence, in order to allow interoperability in the cross-border care. The next dimension was Application where convergence appeared to be present (specifically in the case of the eP), more for epSOS II PN than epSOS I PN. The Architecture of an information system at national level followed, but there did not appear to be a clear trend with respect to convergence. Consistent with the existing literature, the Regulatory framework and the e-health Governance framework showed the lowest level of convergence. The explanation for the lack of convergence in this dimensions appeared to be the influence of other sources, such as: the European requirements

or the focus on the PNs own national characteristics. In conclusion, interoperability issues such as Syntax and Semantics, as well as the technology design of the system (Applications and Architecture), showed converge to certain degrees due to epSOS I design.

Convergence in e-health strategies remains a topic open for research in the different programs that aim interoperability and cross-border communication. The SAGAR evaluation framework represents a corner stone in the evaluation of convergence especially for the epSOS use cases, but also for other programs in the Western world. Since convergence is not a state per se, periodic re-evaluations would complete the image and define the trajectories of convergence in e-health systems of the evaluated countries.

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Appendix

Appendix 1 Participating countries in epSOS I

epSOS I	epSOS II
Austria	Belgium
Czech Republic	Estonia
Denmark	Finland
France	Hungary
Germany	Malta
Greece	Norway
Italy	Poland
Netherlands	Portugal
Slovakia	Slovenia
Spain	Switzerland
Sweden	Turkey
United Kingdom	

Appendix 2 Commune ground for data protection of the EU countries

Article 8 The processing of special categories of data:

1. “Member States shall prohibit the processing of personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, trade-union membership, and the processing of data concerning health or sex life.
2. Paragraph 1 shall not apply where:
 - (a) the data subject has given his explicit consent to the processing of those data, except where the laws of the Member State provide that the prohibition referred to in paragraph 1 may not be lifted by the data subject's giving his consent; or
 - (b) processing is necessary for the purposes of carrying out the obligations and specific rights of the controller in the field of employment law in so far as it is authorized by national law providing for adequate safeguards; or

- (c) processing is necessary to protect the vital interests of the data subject or of another person where the data subject is physically or legally incapable of giving his consent; or
- (d) processing is carried out in the course of its legitimate activities with appropriate guarantees by a foundation, association or any other non-profit-seeking body with a political, philosophical, religious or trade-union aim and on condition that the processing relates solely to the members of the body or to persons who have regular contact with it in connection with its purposes and that the data are not disclosed to a third party without the consent of the data subjects; or
- (e) the processing relates to data which are manifestly made public by the data subject or is necessary for the establishment, exercise or defence of legal claims.

3. Paragraph 1 shall not apply where processing of the data is required for the purposes of preventive medicine, medical diagnosis, the provision of care or treatment or the management of health-care services, and where those data are processed by a health professional subject under national law or rules established by national competent bodies to the obligation of professional secrecy or by another person also subject to an equivalent obligation of secrecy.

4. Subject to the provision of suitable safeguards, Member States may, for reasons of substantial public interest, lay down exemptions in addition to those laid down in paragraph 2 either by national law or by decision of the supervisory authority.

5. Processing of data relating to offences, criminal convictions or security measures may be carried out only under the control of official authority, or if suitable specific safeguards are provided under national law, subject to derogations which may be granted by the Member State under national provisions providing suitable specific safeguards. However, a complete register of criminal convictions may be kept only under the control of official authority.

Member States may provide that data relating to administrative sanctions or judgements in civil cases shall also be processed under the control of official authority.

6. Derogations from paragraph I provided for in paragraphs 4 and 5 shall be notified to the Commission

7. Member States shall determine the conditions under which a national identification number or any other identifier of general application may be processed”.

Appendix 3 Literature study – evaluation categories

Author	Evaluation categories identified			
Review of Ela Klecun [...] 2005	Critical	Socio-technical	Social-constructivism	Hermeneutic
Ela Klecun [...] 2005	Social	Political		Historical
Review Elske Ammenwerth et al. [] 2003	The objectivistic tradition	The subjectivistic tradition		We should also include the human side into evaluation since it was for long neglected
Elske Ammenwerth et al. [] 2003	Use of the triangulation method including: sources of data, observers, methods, and/or theories in investigations of the same phenomenon.			
Review Ammenwerth [] 2003 b	Evaluation studies can be formative or summative	Various phase models for evaluation studies: Holle et al. proposes four phases: (technical pilot study, feasibility study, controlled effectiveness study, cost-effectiveness study), while VATAM [8] is oriented on a eight-phase life cycle of information technology (conception, design, development, integration, early use, exploitation, routine use, end of life cycle). Some more approaches are presented for example in Brender [11].		Problems from health care evaluation can also be found in other evaluation fields
Ammenwerth [] 2003 b	They define three main problem areas:	the complexity of the evaluation object	the complexity of an evaluation project	the motivation for evaluation
Stoop AP et al. [] 2003.	why to evaluate (what will be done)	what to evaluate (the domain: technical, professional, organizational, economic, ethical and legal)	when to evaluate (the moment in time: pre-implementation, during implementation and post-implementation)	how to evaluate (which method to use)

	who (which stakeholders' perspective is going to be evaluated)	why (objective of evaluation)	what (aspects or focus of evaluation)		when (which phase in the system development life cycle)	how (methods of evaluation)		
Review Yusof et al. [] 2008								
Yusof et al. [] 2008	Human factors			organizational factors		technological factors		
Yusof et al. [] 2008b	A new framework for HIS evaluation incorporating comprehensive dimensions and measures of HIS and provides a technological, human and organizational fit.							
Review Clarke [] 2008	In the systematic review of literature on the technical evaluation of telemedicine systems 112 articles were considered. However, none of the papers described a systematic approach to full characterization of the entire end-to-end system.							
Clarke [] 2008	The paper demonstrates how a multidisciplinary approach is essential when evaluating new and emerging technologies, particularly when such systems are implemented in real service as opposed to a research setting.							
Review Shaw [] 2002	A number of articles were reviewed, but none of the provide a comprehensive framework for evaluation							
Shaw [] 2002	Clinical	Human & Organizational	Educational	Administrative	Technical	Social		
Hyppönen et al. [] 2007	multidisciplinary framework and its use in the evaluation of a national medical e-prescription system pilot in Finland.	activity system (each of the stakeholders could be analysed as institutional activity systems)	actor network (development of a technological system from the viewpoint of the network of actors constructing the system)	development life-cycle (pre- and post-implementation situations)				
Review Marthandan et al [] 2010	evaluation scope	evaluation timing	unit of analysis	level of analysis	different perspectives	different dimensions	different measures	underpinning theoretical frameworks

Appendix 4 Description dimensions

Syntax and Semantics

“The full benefits of e-health services and tools will not reach patients unless a high level of interoperability is integrated at the heart of their design and deployment. Healthcare providers need to co-operate extensively with each other, and with their suppliers, to ensure that their services are well connected”¹. Interoperability is one of the key factors in establishing super-regional and cross-border exchange of electronic medical data. Therefore, the current level of interoperability and the planned future steps are one of the most important indicators for e-Health convergence in Europe and even in a country or region.

Architecture

The architecture of an information system can be defined as the conceptual model that describes the structure (components), their interrelationships and behaviour, and principles and guidelines governing their design and evolution over time, which help with guiding the implementation of the information system. This category of indicators focuses on the convergence of architectural decisions in epSOS on the architecture of the national/regional e-health infrastructures in the PNs.

E-health Governance framework

A clear governmental and regulatory framework within- and between-countries are among most challenging aspects of e-health. Even though several countries started to clearly design the governmental and legal framework of e-health, (e.g. Denmark, England, Estonia, Finland, France, Norway, Scotland, Slovakia and Sweden²), most of the EU countries still miss it. Because e-health policy can be part of the national health policy, or the e-government policy, e-health legislation in most of the countries takes different roadmaps. However, based on the literature studies (**Bennett** 1991; **Godet** 2002) there is no possibility of convergence in this dimension.

¹ http://ec.europa.eu/information_society/activities/health/policy/interoperability/index_en.htm

² Karl A. Stroetmann, et al. “European countries on their journey towards national eHealth infrastructures - Final European progress report” eHealth Strategies Report, January 2011.

In order to enable a sustainable implementation and use of e-health application at international level, issues such as:

- data protection
- codes of practice
- roles/authorization HCP
- records management
- patient empowerment
- information security
- liability
- patient privacy

However, most countries do not experience a coherent strategy for developing a governmental e-health framework specifically designed to address these aspects. Developing a universal governmental framework is impossible in theory due to all the different political contexts (**Radaelli 2005**). In most countries, the use of e-health is currently regulated only by “the general legal framework, in particular by laws on patient rights and data protection in general, and by regulations on professional conduct”³. In this way, the focus is on understanding how each of these factors influenced the convergence of the participating nations.

Applications

The e-health Action Plan set the objective to “focus on deploying eHealth systems, setting targets for interoperability and the use of electronic health records”. Such systems are a prominent element in virtually all national strategies and roadmaps. But usually they are not well defined, often (implicitly) referring only to a patient summary or basic electronic patient record. EHR-like systems were implemented or were under development in many healthcare provider organisations, and in various regional healthcare systems. They cover patient data from within own organisational or regional boundaries. However, in larger European countries there exist hardly any at the national level.

The European epSOS project undertaken by 23 countries pursues a more limited approach. It pilots interoperable cross-border services for the exchange of basic patient summary data and electronic prescriptions only – not a complete EHR. For supporting these applications, some basic functionalities are needed such as patient identification, indexes, and consent services, which are also subject of this dimension as national/regional equivalents could have been influenced by the epSOS specifications.

³ Ibidem.

Regulatory framework

Lately it is researching that “what happens locally has global impact, and what happens globally has a local impact” (Mars 2010). In this regard, the regulatory framework focuses, next to the governmental framework considered above, on a global e-health policy of the participating nations that includes the entire legal and political aspects specific for each country.

In fulfilling this goal, there should be considered both the within- and between-countries perspective: “what happens locally has global impact, and what happens globally has a local impact”⁴.

However, convergence in regulatory issues is no easy to determine. Considering the regulatory aspects, the interest here is to determine how the use cases of epSOS I (ePrescription and Patient summary) influenced the convergence in legal aspects.

9.1.

⁴ Mars M. and Scott R, “Global E-health Policy: a Work in Progress”, *Health Affairs* 29, No. 2 (2010): 239-245.

Appendix 5 Interview matrix

<i>Respondent</i> <i>Question</i>	<i>Alain Périé</i>	<i>Montse Moharra Carlos Gallegro</i>	<i>Roberto Zuffada Marcello Melgara</i>	<i>Jeremy Thorp</i>
Status				
Function	-France ASIP Santé	-Spain -Catalan Agency for Health Information, Assessment and Quality (CAHIAQ) -Tic Salut	-Italy Lombardia Informatica s.p.a	-NHS committee for health care program -particular interest in what will turn in England on patient summary and ePrescription
Involvement	-from July 2008 -project manager for the implementation of the epSOS project and the epSOS pilot operation in France -risk manager for the WHOLE project	-2010 - we are in the epSOS evaluation for the project implementation	-2008 R: member of the PSB LPG group for the legal aspects of the project; initial audit analysis. -task leader of the K.T. 2.2.2, - involved in dissemination and communication aspects and for the organizational aspects of the piloting phase -administrative and financial aspects of this project. M: NEPC for Lombardia packet leader of 3.9 3.10 -in epSOS I implementation and testing -in 3.b implementation of epSOS II. -!working in all the W.P. of epSOS.	-2008 -NEPC -chair of the PSB -quality manager for epSOS
Methodology				
Multi-method				
-qualitative	After getting back the questionnaires, decide if a short interview for	Do the questionnaire now, and come with the interview in 1 year. And then do another evaluation	An interview is necessary to double-check. An interview is clear and understood	-ask again so that you verify the data

-quantitative	clarification is needed and in which cases. questionnaire is very complete	in 2013 Interviews all the time gives you more information than a questionnaire.	let the people explain their opinion, ok not only fill in a box	ok
Multi-dimensions				
epSOS I	baseline 2008	NOT agree to use W.P. 1.1[...]because of that time we did not knew much, standards were not done(appear only in 2009 and some countries already used some standards at that time); it was too early in the project - by asking the countries their situation in 2008 you can get the best answers	Use the information that fits your needs. You can also use W.P 1.1 (they do not know anything about it bec. they joined last year)and also 1.4.5 -if you have doubts about using some data or not, the best way is to ask people now about their situation before entering to epSOS and now and future. -if you ask now about the situation in 2008 the info MIGHT be biased – <i>“historical information”</i> ok	-! Do not rely on any data within W.P. 1.1 because all the information in W.P. 1.1 was averaged according to political decisions, and not to technical reality [if you use that as a baseline you will get polluted measurement] - ask now again the situation in 2008, and compare with the info from 1.4.2
epSOS II	moment 2011 baseline 2011	Yes, you need a baseline	-make questions now and then that could be compared -ask the same people (now and then)	Ok
	moment 2013	Is a good idea		Ok
Multi-disciplinary				
-categories -indicators	I have no idea on that, because I am not an expert in evaluation	All the categories and indicators are listed. -there is no single person to answer all these questions, that is why we think it is good to ask different people.	Ok in the regulatory framework what is missing is the <i>concept of certificate and certification authority</i> . That is really the bottom line for starting testing and piloting (is not our interest)	In governance framework the health care professional aspects should be more emphasise on the usability data: the way that the information is recorded how we train HCP, both in action stage and record data
Questions Questionnaire				
Clarity	-comments in excel sheet	Yes	yes	lot of repetition

Rephrase quest	-comments in excel sheet	-	-comments in excel sheet	- comments in excel sheet
Time spent	about 1 or 2 hours	1 hour	1 hour in total	2 hours
Length	It is ok	Was ok	ok	-no complains about that
Divide per use case	Yes, very good idea (but do not split all the questions)	Yes, good idea (we have spited it in the evaluation of the services)	It is not necessary to split the questions by the use cases in the case of Italy, but maybe for other countries yes.	Yes, good idea -for example HCP have more concerns about the eP, than PS
Extra comments				
	- send the questionnaire to the NEPC; let the NEPCs decide who will fill in the questionnaire -only 9 countries plan to participate in the pilot operation – so convergence could be only for these countries not for the 11	bring some protocol studies, some documents, some background doc. to be send before these questionnaire. There you explain why this questionnaire is being sent, what do you intend to collect with these questions? Which are the people answering these questions? What are your needs? And how are you going to analyze that, and everything like this. All these things are usually in a protocol type document.	-clarify the concept of baseline -define the concept of application (bec. I do not see why u use this term)	- although I would not necessary say that epSOS has influenced directly what we have done in the UK, in fact a lot of the changes in the standards that we use are the same for the UK and for epSOS -thr question is "Are we in the UK able to build on the top of what we already have to link with epSOS and the use in other countries?" - "do you as a country participating in epSOS actually feel the convergence?"

Appendix 6 Introduction questionnaire

At the beginning!

Thank you for making time to fill in this questionnaire. The estimated time for answering all the questions is around 1 hour. We expect the answers to reflect the reality at the national level in your country.

When you do not know the answers to some questions please find the person in charge with answering them in your country.

You can save the partially filled in questionnaire and come to it at a later stage or let another person answer some of the questions by giving him/her the username and password.

Generic information about the questionnaire:

1. What do we expect to get from this study?

We are going to measure the influence of epSOS I specifications on the e-health design of the participating nations

2. How to use the questionnaire?

For the closed questions give one single answer that provides the most appropriate answer from the scale of answers offered.

For the open questions, where there is place for you to elaborate, we are looking for getting the information on how the situation in each specific country was before entering in epSOS and what do they foresee for the 2013.

3. How is this questionnaire organized?

This questionnaire is organized in five parts. These are: Background, Syntax and Semantics, Architecture, e-health Governance framework, Applications, Regulatory framework. These study categories are driven out from literature study and experts opinion for measuring the degree of convergence and at the beginning of each part, there is a short description at the beginning of each part on what we intend with those questions. The final results of the study intend to show to what degree did epSOS specifications influence the national e-health design, and will be part of the W.P. 1.2

4. What are our needs?

In 2 weeks to get the answers valid at a national level for all the participating nations in epSOS (deadline is 31 October 2011)

At the end!

Thank you for taking time to fill in this questionnaire. Please send this questionnaire back to your NEPC which will send it to us ASAP.

Appendix 7 Questionnaire Instruction Sheet NEPC and PSB

Introduction

The Interoperability Design Evaluation will evaluate the epSOS I design directly, for aspects that cannot be learned from evaluation of the pilots, namely scalability, extensibility and convergence.

- *Scalability* -To find out how new nations or regions experience the epSOS design when implementing pilots for the original use cases of epSOS I.
- *Extensibility*- To find out how all epSOS II designers experience the epSOS I design when expanding the use cases or creating new use cases.
- *Convergence* - To find out what the amount of influence is that the epSOS I design has on the e-health strategies in the participating nations of epSOS II in order to create alignment between the national solutions.

For this WP1.2 has chosen to collect this information by means of a questionnaire. This questionnaire has to be completed by preferably all the Participating Nations or where applicable by regions of the Participating Nation.

The different questionnaires need to be answered by different roles/from different perspectives. In the instructions below is described what roles/perspectives we are looking for and a short instruction for the recipients of the questionnaires how to fill it in.

Deadline

As epSOS II is already underway, several changes are already proposed to improve the epSOS I specifications and the first results of epSOS II might already been influencing national e-health strategies, together with limited resources to analyse the results, we ask you kindly to make sure that the filled in questionnaires will be returned within 3 weeks.

Instruction for distribution of the questionnaires

Scalability

[...]

Extensibility

[...]

Convergence

Here is measured the extent to which epSOS has influence on national e-health strategies. In each of the participating nations we ask that the questionnaire is answered by two persons with different role:

- *National Project Manager (National Institution dealing with e-health)*

In general, these are persons are members of the PSB. They are familiar with the country's e-health strategy and the related policies, and are responsible to define parts of them. Usually, the respondents could be members of the ministry (second or third hierarchical level) or a policy maker. If they are unable to answer the questions, they should know who to address in their own country/ministry.

- *Competence centre, one or more per country*

WP1.2 has distinguished three groups of competence centres, that if available in your country, all are invited to fill in the questionnaire.

- competence centres which are epSOS beneficiaries;
- competence centres which the countries have hired to handle NCP development/operation;
- competence centres that are not part of the epSOS project. In some countries there are explicit “e-Health Competence Centres” that are involved in building regional e-health infrastructures.

Instruction for the recipient of the questionnaire

The expected time for answering all these questions is around one hour. We expect the answers to reflect the reality at the national level in your country. We are looking for getting the information on how the situation in each specific country was before entering in epSOS (in 2008/2011) and what do they foresee for the 2013.

This questionnaire is organized in five categories. These are: some basic background information, ‘Syntax and Semantics’, ‘Architecture’, ‘e-health Governance framework’, ‘Applications’ and ‘Regulatory framework’. In the on-line questionnaire a short description of what we intend with those categories is provided.

Partially filled in questionnaires can be saved and completed at another time. This can also be used to let another person answer some of the questions by giving him/her the username and password.

For the closed questions give one single answer that provides the most appropriate answer from the scale of answers offered. A free text field is also available to elaborate on your answer (please do).

Thank you in advance for filling in the questionnaire before our deadline. If you have any questions on this instruction sheet of the on-line questionnaire itself, please contact us. You can find our contact information below and in the on-line questionnaire.

Work Package 1.2 Interoperability Design Evaluation; WP12@nictiz.nl

Appendix 8 Link to the questionnaire

http://www.formdesk.com/nictiz/questionnaire_epSOS_interoperability_design_evaluation_convergence

Appendix 9 Responses per country

Responses Convergence questionnaire
07-11-2011

epSOS I

Role Country	Austria (got an extension)	Czech Republic	Denmark	France	Germany	Greece	Italy	Netherlands	Slovakia	Spain	Sweden	UK
Policy Maker		Red			Red	Red	Green			Green	Red	Green
Competence Centre	Green	Green			Yellow	Red	Yellow		Green	Red	Yellow	Green

epSOS II

Role Country	Belgium	Estonia	Finland (got an extension)	Hungary	Malta	Norway	Poland	Portugal	Slovenia	Switzerland	Turkey
Policy Maker	Red	Green	Green	Red	Yellow	Green	Yellow	Red	Green	Green	Yellow
Competence Centre	Red	Green	Yellow	Red	Red	Red	Yellow	Red	Green	Green	Green



Completed



Partial completed



No activity

Appendix 10 Trend matrix per dimensions

epSOS I*															
	2008					2011					2013				
	S	A	G	App	R	S	A	G	App	R	S	A	G	App	R
	38	33	32	0	80	8	2	3	0	50	0	0	1	0	0
	own trajectory														
	own trajectory – before epSOS	45	52	57	88	0	71	82	89	89	50	33	68	66	56
	alignment	18	11	11	12	20	2	8	1	11	0	22	13	10	22
	convergence	0	2	0	0	0	19	8	7	0	0	33	19	23	22
	full convergence	0	2	0	0	0	0	0	0	0	0	11	0	0	0

epSOS II*											
	2011					2013					
	S	A	G	App	R	S	A	G	App	R	
	7	17	9	0	0	0	0	4	0	0	
	own trajectory										
	own trajectory – before epSOS	50	58	74	75	100	45	37	46	25	33
	alignment	7	10	15	0	0	5	26	24	25	0
	convergence	36	15	2	25	0	50	23	24	50	67
	full convergence	0	0	0	0	0	0	14	1	0	0

*All results are presented in percents

Appendix 11 Contingency table epSOS I & EpSOS II

Frequency distribution of convergence for epSOS I & EpSOS II for all dimensions in the three time series*:

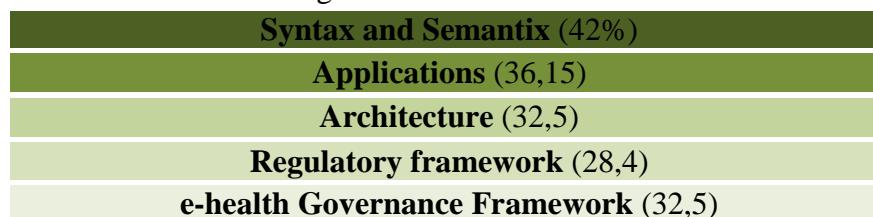
	2008	2011		2013	
	epSOS I	epSOS I	epSOS II	epSOS I	epSOS II
S	18	21	43	66	55
A	15	16	25	32	63
G	11	8	17	33	49
A	12	11	25	44	75
R	20	0	0	50	67

Appendix 12 Degree of convergence per dimensions over years

Total degree of convergence per years and dimensions*:

	S	A	G	A	R
epSOS I	35	21	17,(3)	22,(3)	23,(3)
epSOS II	49	44	33	50	33,5
epSOS I & epSOS II	42	32,5	25,15	36,15	28,4

Order of dimensions from highest to lowest in the level of convergence*



*All results are presented in percents

