Organisational Barriers to Interoperability

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Abstract: The growth of internet access as well as the development of national strategies for e-Government, have had a remarkable impact on the information society. This progress has brought about a broad range of new issues and challenges, among these, those of interoperability of systems and services. One area, in which barriers are common, yet not fully understood, is organisational interoperability. In this paper we present results from empirical research exploring such obstacles in Norwegian public administration and government agencies. The findings are based on semi-structured interviews, and organised in ten categories of barriers to organisational interoperability. The results presented in this paper are aimed at deepening the understanding of organisational interoperability in e-Government. The identification of barriers is a first step for finding solutions to achieve interoperability goals.

1. Introduction

The e-Society strategies (e.g., the i2010, [1]), the growth of internet access in general, and the development of e-Government in particular have a remarkable impact on the development of the information society. Clearly, the strategies bear fruit, and new electronic services to citizens and businesses keep evolving. Governments all over the world are offering a rapidly increasing number of on-line services to businesses and citizens. This development has brought about a broad range of new issues and challenges, among these, those of interoperability of systems and services.

There are several models which describe levels of interoperability and interactivity of electronic services. The maturity models as presented by Wauters et al. [2], Gottschalk et al. [3], and the model in the Norwegian white paper [4], are composed of a zero-level and several consequent levels of interaction, or service and content availability on-line (Figure 1). Many European and other governments are reaching the first stages of interoperability while many strive for reaching the more mature levels. According to the upper levels of sophistication, several suppliers of information and basic services need to collaborate in order to deliver the required services. This requirement challenges the involved organisations many different ways. One of the persistent challenges is the stove-piped structure that has emerged as a consequence of specialisation between ministries and government agencies in many European countries [5]. In 2007, the Norwegian Ministry of Government Administration and Reform, responsible of coordination of the use of ICTs and measures to make government more efficient and service-oriented, organised a working group with key ICT-personnel from all major public organisations to give recommendations about a common ICT-architecture for the public sector. One of the conclusions from the working group was that the stove-piped managerial structure in the public sector is a serious obstacle for collaboration and communication within the public sector [6].

Several sophistication levels of collaboration are shown in Figure 1. In order to achieve full interoperability, organisations have to reach the upper levels of the ladder. For all levels, there are policy issues which concern objectives (e.g., efficiency, effectiveness and efficacy), and strategies at governmental and intergovernmental levels. Below this, there are concrete interoperability issues of technical, semantic and organisational character. First,

there is the very basic level of technical interoperability which includes such topic areas as physical connections, common protocols, definitions of data elements and interfaces, and documentation of system functionality. Semantic interoperability begins to exist when we move from presenting information and exchanging it between computer programmes, to combining it with other information, processing it and using it in a meaningful manner in a given context. Second, the organisations have to be both able and enabled to collaborate. This is where organisational interoperability enters the scene. In order to reach the sophistication level of full interoperability, a number of obstacles have to be removed. One area, in which barriers are common, yet not fully understood, is organisational interoperability. This paper is aimed at deepening the understanding of organisational interoperability in e-Government. The identification of barriers is a first step for finding solutions to achieve such interoperability. In the remainder of this paper we present results from empirical research exploring such obstacles.
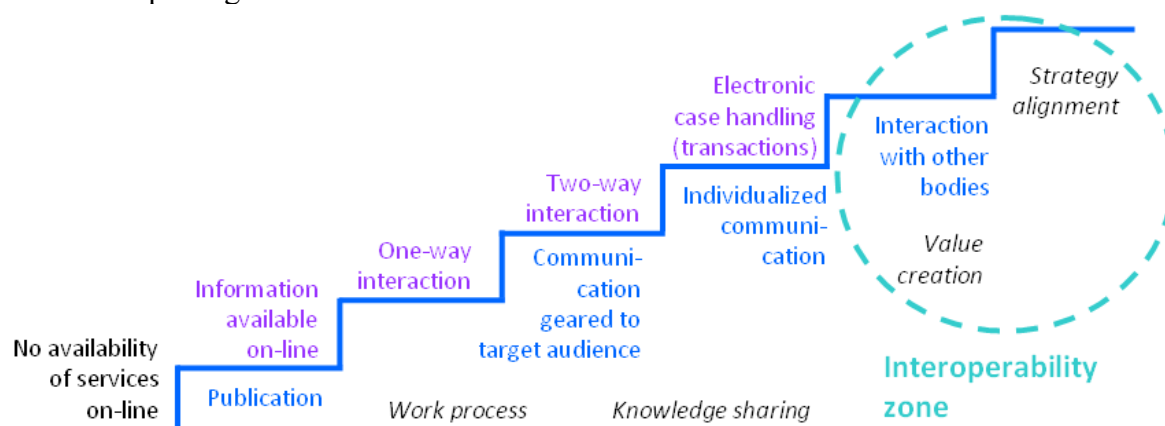

Figure 1. *Above the ladder, sophistication stage model of Wauters et al. [2]. Below the ladder, service stages described in the Norwegian white paper [4]. In italics, four maturity stages by Gottschalk et al. [3]. The interoperability zone illustrates the stage at which full interoperability within all the different areas of interoperability are reached.*

Definitions of Organisational Interoperability

According to Finetti [7] organisational interoperability deals with modelling organisational processes, aligning information architectures with organisational goals, and helping these processes to cooperate. IDABC [8] characterizes organisational interoperability as follows: "This aspect of interoperability is concerned with defining business goals, modelling business processes and bringing about the collaboration of administrations that wish to exchange information and may have different internal structures and processes, and it aims at addressing the requirements of the user community by making services available, easily identifiable, accessible and user-oriented." Later, IDABC has divided the interoperability model into several layers, of which the organisational and legal levels together address issues of organisational interoperability (Figure 2). The latter is said to concern a "broad set of elements of interaction, including business processes, business interfaces … seamless integration of business processes and the exchange of information that they manage between the organisations. Organisational interoperability occurs when actors agree on the why and the when of exchanging information, on common rules to ensure it occurs safely, … draw up plans to do all these things, and carry them out" [9]. The ATHENA-project has identified 31 interoperability issues. These are classified according to business management, process management, knowledge management, information management, service management and data management [10]. A large number of the 31 issues go under the general heading of organisational interoperability.
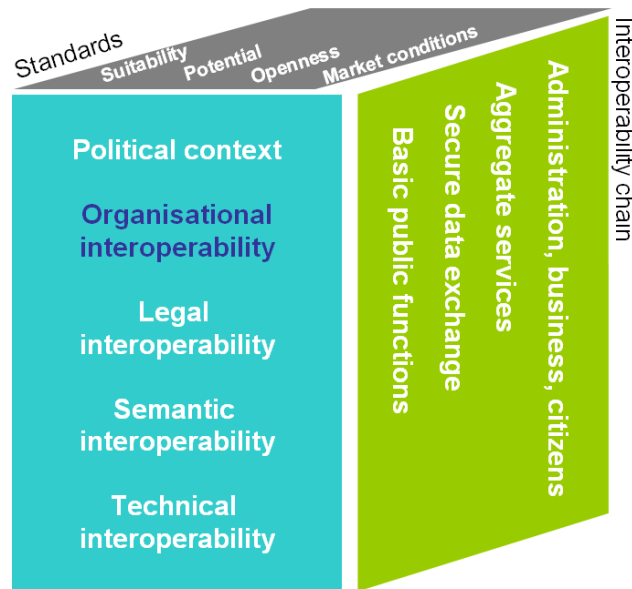
Figure 2. Organisational interoperability in the context of the three dimensions and underlying issues of interoperability, by EIF 2.0 [9].

Known Obstacles to Organisational Interoperability

Organisational interoperability can be seen as an important enabler of all interoperability, semantic as well as technical. Common goals and practical agreements have to be in place before any collaboration can take place. Organisational interoperability issues are therefore gaining increasing interest. There are several publications that discuss barriers to organisational interoperability in general, and why it does not happen to the extent that is intended and desired in particular.

Eynon et al. [11] have identified seven barriers to e-Government: "1. Leadership failures, which result in slow and patchy progress to e-Government, 2. Financial inhibitors limiting the flow of investment to e-Government innovation, 3. Digital divides and choices, where inequalities lead to differences in motivations and competences that constrain and fragment e-Government take-up and fail to address particular user needs, 4. Poor coordination across jurisdictional, administrative and geographic boundaries that holds back e-Government networking benefits, 5. Workplace and organisational inflexibility impairing adaptability to new networked forms of information sharing and service provision, 6. Lack of trust heightening fears about inadequate security and privacy safeguards in electronic networks, and 7. Poor technical design leading to incompatibilities between ICT-systems or e-Government services that are difficult to use. "

Beckers [12] has identified seven interoperability problems, five of which address organisational interoperability. These are: "1. Administrative interoperability, containing conflicting, exclusive or overlapping jurisdictions and accountability, 2. Legal interoperability, meaning different legal regimes with conflicting rights and obligations, e.g. in relation to privacy and safety regulations, 3. Operational interoperability, i.e. different working processes and information processing, routines and procedures, and 5. Cultural interoperability, addressing conflicting organisational norms and values, communication patterns, and grown practices." Scholl et al. [13] have reviewed a large body of literature and identified nine categories of constraints with regard to e-Government integration and interoperability. These are: Constitutional/legal, jurisdictional constraints, collaborative, organisational, informational constraints, managerial, cost, and technological and performance constraints.

There are, of course, also good examples of interoperability initiatives: Many EU mem-

ber states have launched interoperability efforts, as shown in Table 1 below [14].

Table 1:

Belgium	http://www.belgif.be
Denmark	http://standarder.oio.dk/my-home-your-home/view?set_language=en
Estonia	http://www.riso.ee/en/information-policy/interoperability
France	http://synergies.modernisation.gouv.fr/rubrique.php?id_rubrique=1
Germany	http://www.kbst.bund.de/cln_012/nn_837392/SharedDocs/Meldungen/2006/saga0.html
Ireland	http://www.reach.ie/technology/interoperability.html
Italy	http://www.cnipa.gov.it/site/_files/Opuscolo%2013II.pdf
Malta	http://ictpolicies.gov.mt/docs/cimu_t_0001_2002.pdf
Netherlands	http://www.e-overheid.nl/data/files/architectuur/E-government_in_the_Netherlands.pdf
Spain	http://www.csi.map.es/csi/pg5c10.htm
Sweden	http://www.verva.se/shs and http://www.verva.se/framework

As far as Norway is concerned, there is all reason to mention the five in Table 2.

Table 2:

Altinn ("All-In").Internet portal for public reporting for citizens and businesses).	http://www.altinn.no/en
NUCAS: The Norwegian Universities and Colleges Admission Service.	http://info.samordnaopptak.no/english
Digital Norway. Collaboration that enables access to geo-information data and services owned by producers at national, regional and local level.	http://www.gim-international.com/issues/articles/id816-Digital_Norway.html
ByggSøk: Governmentally owned service for applications for buildings, building licences and city engineering cases.	http://www.byggsok.no
Norsk Helsenett ("Norwegian Health Network") provides professional e-Services to the health care sector.	http://www.norsk-helsenett.no

According to our understanding, these represent the best practice, where systems and services are based on fully transparent interoperability between several service providers. However, there should be more. Thus, our research question is: "Why isn't there?" Below, we refer to research work that has contributed to an understanding of this lack. In Chapter 2, we will complement this picture by presenting our findings. We regard exploration of barriers to organisational interoperability as a key issue in the enterprise of approaching sophisticated e-Government. In the remainder of this paper, we report from our field studies related to still remaining obstacles to organisational interoperability.

2. Barriers to Organisational Interoperability – the Norwegian Case

2.1 Method

In September-December 2008, 15 semi-structured interviews were carried out in the Semicolon-project sites and other relevant organisations [15]. The main goal of Semicolon is to develop and test ICT-based methods, tools and metrics to obtain faster and cheaper semantic and organizational interoperability both with and within the public sector. The interviewees were recruited among middle to upper management and senior advisers with professions or careers close to but not necessarily within the ICT-departments of the organisa-

tions. The interviews were targeted to inform the Semicolon-project, as well as to provide information about experienced and practical barriers to organisational interoperability. Open-ended questions were used, the wording of which was identical for all interviewees. Each interview lasted from one to 1½ hours. The main themes were:

1. *"How would you describe organisational interoperability?"*

2. *"What promotes organisational interoperability in general?"*

3. *"What retards organisational interoperability in general?"*

4. *"Do you have any examples of best practice within organisational interoperability?"*

5. *"What kind of measures or initiatives would boost organisational interoperability?"*

The interview material is highly qualitative. The interviews were transcribed into structured schemes, expressing the main statements made by the informants. In the next chapter, these statements are presented in ten categories of findings. No weak indications are included in the findings. To be included in the findings, at least one third of the informants must have explicitly pointed at a particular barrier. Approximately one third of the barriers were mentioned by majority of informants. For anonymity reasons, no citations will be provided.

2.2 Findings

Below, the main findings from the interviews are presented. The collected material is large, and therefore we have chosen to systematise the findings in categories that several or many informants identified as barriers to organisational interoperability:

1. Low Competency: Organisational interoperability is based on a good understanding of business processes, and models of these. In many public organisations and government agencies, modelling of business processes has not taken place, and changes occur on an ad-hoc basis. In order to integrate the business processes of two or more organisations, models of these processes are required. Models, in turn, are based on a detailed knowledge of real tasks, procedures and routines. These have to be analysed and put into a frame of formal descriptions. Poor knowledge of business processes represents a true obstacle to organisational interoperability. Equally poor is the ICT suppliers' knowledge of the business processes of the customer. Thus, their systems and solutions do not correspond to interoperability requirements. The third instance of poor competency often occurs at the operative level of organisations. Digital illiteracy and resistance against new applications of ICTs reduce the potential that interoperability through uses of modern ICTs could offer.

2. Lack of "Measurables": The informants indicated clearly that instruments for measuring organisational interoperability are missing. This lack of proper instruments has a negative impact on both planning, execution and evaluation of organisational interoperability. In the planning or re-engineering of business processes, the description of organisational interoperability goals suffers both from the high level of abstraction and the difficulty to quantify the level of ambition. Performance indicators for organisational interoperability are clearly missed. In this connection, economic indicators that describe the effects of successful interoperability are also called for.

3. Economic Restrictions: Many informants pointed at the fundamental lack of allowances for interoperability measures. In Norway, governmental departments and agencies operate according to a strict fiscal sector principle. Each department takes care of its own business, and collaboration in general and interoperability issues in particular are typically not part of this enterprise. Further, the letters of allocation from the government to the sector departments usually do not instruct the departments or the governmental agencies to spend money on interoperability actions. Actions for interoperability are therefore often seen as additional tasks which generate overhead and eat up possible surplus.

4. Absence of National Joint Efforts: According to the informants, one of the most important drivers toward broad organisational interoperability is the existence of large-scasle ICT-projects which involve several influential organisations. Currently, too few such projects are active, thus constituting a hindrance for organisational interoperability. Quite many informants mentioned Altinn ("All-In", cf. Chapter 2.1) as an excellent example of interoperability-enhancing projects, and they complained about the absence of similar efforts for the time being.

5. Project Archipelago: In contrast to the large projects described above, the informants point to the myriad of small, uncoordinated projects and project initiatives as a major barrier to interoperability on all levels (both technical, semantic and organisational). The explanation to this is three-fold: First, many small ICT-development projects are continuously being initiated without anchorage points in overall strategies for cross sector development. Second, even if local projects could contain openings for interoperability, such projects seldom find a counterpart in other organisations, simply because the other organisations already have given priority to something else. Third, there is no catalogue or database which gives an overview of current and past projects small and large, for continuity and possible reuse of existing results.

6. Disharmony in Legislation: Legislation with all laws, provisions of Acts, rules and regulations is a huge complex. Consequently, new laws or amendments to an Act bring about uncertainties with respect to the total body of laws and the total area of impact. Are there unintended consequences of the new law or amendment to other areas of jurisdiction, or does the new law, rule or regulation even prevent reasonable collaboration, such as provision of information from one public body to another? Or, which public body is legally responsible for services or information provided by a conglomerate of public bodies with distinct areas of legislation? Indeed, our informants regard the legislative framework as an important area of severe obstacles to organisational interoperability. Double reporting of information to public registers is a frequent example of poor interoperability. Furthermore, the law may directly prohibit merging information from different sources for security or privacy reasons. Against this background of examples, it is reasonable to assert that disharmony in legislation hampers organisational interoperability in a severe manner.

7. Anaemic Arenas: Organisational interoperability requires collaborative arenas at the management level of participating organisations. There has to exist arenas where the top management meets regularly to work out strategies, enter mutual agreements etc. According to our informants, some arenas do exist, but these have a tendency to turn into enervated meeting places. Vital arenas have an "expiration date".

8. Invisible Best Practice: In connection with organisational interoperability, complexities are connected to both formal agreements and practical approaches. Our informants communicate unambiguously the need for good examples in general, and showcases of best practice within particular domains, be it tools for process modelling, management of organisational alignment, or ICT-literacy. The fact that there is a shortage of best practice constitutes an obstacle to the advancement of organisational interoperability.

9. The People Factor: When organisational interoperability is in focus, we have to take a look at the people who work in these organisations, i.e., the people factor, which has individual and collective dimensions. According to our informants' experiences, many initiatives to practical collaboration fail because of negative attitudes and non-collaborative working practices. There are people who simply do not cope well in collaborative work situations. There are leaders, who do not promote collaboration, and leaders who are afraid of loss of position if collaborations should lead to more rational work organisation, and even leaders who practice authoritative leadership. There are trade unions that do not promote collaboration because of potential rationalisation and loss of jobs. This hindrance to organi-

sational interoperability is considered as sensitive and difficult to counteract.

10. Ubiquitous Heterogeneity: Many of the informants express the view that a number of inherent differences hamper organisational interoperability. This starts with unequal levels of competency in general, and digital illiteracy in particular, continues through differences in strategic thinking and foresight, organisational cultures, phases in development processes and available technologies, and ends in dissimilarities in available resources. One illustration of such obstacles to interoperability comes from the municipalities, counties and public enterprises under municipal or county ownership. In Norway, there are ca. 430 municipalities, varying from tiny rural communities to large urban centres. The scales of economy are totally different, and consequently the fiscal priorities initiatives for innovation vary greatly. The practical possibilities of different municipalities to participate in the development of common ICT-solutions (and thus interoperability) are totally different. Another illustration is the different modes of operation in governmental sector departments. Our informants assert that some departments promote and finance collaboration and interoperability initiatives in an excellent manner, while others seldom enter the mode of collaboration. So, there is a serious deficit of partnership due to unequal preconditions.

3. Recommendations

The list above communicates a need for a number of different approaches to better organisational interoperability. Barriers may be turned into opportunities by applying appropriate corrective measures. Eynon et al. [11] propose four organisational, technical and legal key solutions to the barriers to e-Government that they identified. With reference to our findings, we suggest three additional measures to enable organisational interoperability:

As presented in Section 2.2, one of our main findings was barriers that originate from low or lacking competency within a number of different areas. In order to create or enable interoperable work and business processes, these have to be analysed and modelled. Until now, this exercise has typically been performed by ICT-specialists. From a competency point of view, it seems appropriate to suggest *a broader involvement in modelling exercises*. For example, involving case handlers in the modelling enterprise, important knowledge will be brought along, and understanding of the business processes will increase. This can be approached by use of methods that suit non-experts. As an illustration, modelling methods that resemble paper-prototyping in a system development context can be introduced in combination with the necessary formal methods (Figure 3).

Another area within which we suggest measures to battle barriers to organisational interoperability is *performance indicators*. The development of proper instruments for planning, execution and evaluation of organisational interoperability can be approached by development of interoperability indicators as part of well-established planning tools and measurement techniques such as Total Quality Management, Balanced Score Card or Key Performance Indicators. Modification and refinement of these should result in a tailor-made interoperability barometer including both quantitative and qualitative variables that describe the progress made over time. Also for this development, a broad involvement of personnel may bring along important knowledge and thus increase the precision of the instrument.

The third recommendation that we regard as appropriate is the development of a *knowledge base* containing information about previous and current e-Government projects, as well as best interoperability practices within e-Government, may it be formal agreements, practical achievements, examples of uses of tools and techniques, or the like. Such an initiative should be feasible for most organisations to contribute to, and for the largest ones to pull forward.
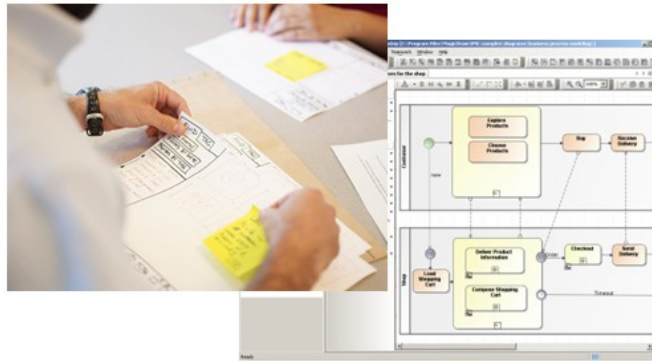
Figure 3. *Paper-based, informal methods used in combination with formal modelling techniques and languages.*

The Semicolon-project which the work reported in this paper is part of, will in 2010 go into detail on the identified barriers (Section 2.2). This will be done by quantitative measurements of the barriers that were reported in this paper, and define a point of departure for a barometer of organisational interoperability barometer. An on-line survey will be designed for this purpose and carried out. Further recommendations will result from this study.

Acknowledgements

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