

# Service Oriented Architectures without Openness - a contradiction of terms. Reflection on the Norwegian situation

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## Abstract

*Interoperability of eGovernment services is high on the agenda of the European Union. A look at the situation in Norway in the domain of learning, education and training shows that development of services are hindered by a poor understanding of the need for open and transparent processes. This paper looks into the conversational frameworks that are needed to implement the European and national goals on service oriented architectures in the educational sector. The case of the UK Australian e-Framework for Education and Research is studied to understand more of the conceptual work that underpins this kind of activities.*

## 1. Introduction

The interoperability of eGovernment services, based on standards, open specifications and open interfaces, has become a crucial, crosscutting task, the European Commission states in a communication to the European Parliament [2]. The Commission observes that the growing number of players, the growing complexity of the relationships, and the related IT systems necessitate consistent architectures, common policies and standards as well as continuous and extensive coordination efforts between EU institutions and Member States.

The EU ministers are certain that the foundations are in place for a basic approach to European interoperability, i.e. the first version of the European Interoperability Framework (EIF) for pan-European eGovernment Services was published in 2004 [6]. This framework has been adapted by a number of European countries, also by Norway, which is not a member of the European Union.

The Ministry of Modernisation (now the Ministry of Government Administration and Reform) published in 2005 a report on "The use of Open Standards and Open Source in Government" [9], which draws heavily on the European Interoperability Framework. "The eNorway 2009 – the digital leap" plan (MOD 2005b) describes the official position on these issues. The

commitments are strong and the actions are put on a date line:

*"By 2006, all public sector agencies shall have incorporated how they are going to use open standards, service-oriented architecture and open source applications in the relevant planning documents."* [10]

The Ministry is now considering a Report to the Storting (a white paper) on how it is going to implement eGovernment strategies in Norway. When institutions are faced with acquiring new systems it is easy to ignore top down planning guidelines and keep on system development as before. Is this inertia grounded only in political disagreement, lack of knowledge and other issues outside reach of the ICT community? We do not think so. We will argue that we need to agree upon new concepts and a new framework for discussion to be able to support the new eGovernment strategies at an institutional level.

## 2. The Norwegian situation

The Norwegian debate on eGovernment is not focused on the interoperability needs of the educational sector. It seems to be more urgent to be able to hand in tax declarations and report change of residence address around the clock than having access to an on line learning environment. It is therefore not yet clear how the Ministry of Education and Research will ensure that service oriented architecture (SOA) and open standards will be implemented throughout this part of public government.

We got an indication when the Directorate for Education and Training put out to tender an Administrative System for Testing in February 2006. After a closed prequalification process the Directorate will present its specification to the chosen firm for development. No specifications or information about the system will be available for the general public or the ICT community. The rationale behind this way of handling system development is legal and competition reasons. A more transparent process may jeopardise progression and cause liabilities, the current thinking seems to be.

The picture is more complex than this example should imply. The Ministry published in 2005 a report titled “Culture for sharing” with the aim to cope with the confusing array of web portals targeting more or less the same audience<sup>1</sup>. The report addressed all the three dimensions of interoperability that are recommended for consideration setting-up eGovernment services [6]. For semantic interoperability a topic based common index should be established based on a joint ontology work. For organisational interoperability a three year coordinating project should ensure that the different web sites share and reuse content. For technical interoperability the report recommended the use of Topic Maps as the integrating technology.

It is still early days to judge if the recommendations for a culture for sharing will be put into practice. The project came up with one indicator that could be supervised from anywhere: an agreement to use a sub domain of every website with a common naming convention, like <http://backstage.mydomain.no><sup>2</sup>. This site should be used to build a developer community explaining which services the site is offering, e.g. RSS, web services, user interfaces towards other systems (APIs) etc. By going backstage for every website in the educational sector it would be easy to find who has a minimum commitment to a culture for sharing.

The Culture for Sharing initiative demonstrates a growing consciousness of the non-technical aspects of building a service oriented architecture for education and research. The very concept of “organisational interoperability” expands the frame of conversation about eGovernment services in the educational domain. However, we are not sure that this concept in itself has the potential to bring about the change that is needed to establish the educational services we need for e-learning and e-research.

### 3. In search of conversational concepts to build learning services

The 2005 JISC CETIS conference on the e-Framework for Education and Research<sup>3</sup> was an eye opener on the conceptual, social and cultural aspects of building new technologies. Bill Olivier gave a presentation on “why reference models”, reference models being the theme of last years' meeting [11].

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<sup>1</sup> Report only in Norwegian at [http://odin.dep.no/kd/norsk/dok/andre\\_dok/rapporter/045071-220020/dok-bn.html](http://odin.dep.no/kd/norsk/dok/andre_dok/rapporter/045071-220020/dok-bn.html)

<sup>2</sup> See <http://backstage.bbc.co.uk/> for an example.

<sup>3</sup> <http://www.e-framework.org/>

Olivier started by pointing out that lack of user involvement is the number one reason for project failure in software development. The traditional waterfall model of software development (with the stages requirements, analysis, design, implement & test, and roll out) does not work unless the requirements are perfectly known. And they seldom are in the domain of learning, education and training! There are alternatives to the waterfall models, e.g. certain agile approaches. However, they still aim at plastic wrapped software for a single organisation. Most software methodologies assume development is for a single organisation, Olivier observed. Packaged software is for a large number of users. However, schools and higher education are somewhere between these, and consequently there is a need for new methodologies and approaches.

Olivier listed a number of reasons why it is so difficult to specify requirements:

- Introducing new software changes practices & processes
- It's hard to co-design software and new ways of working
- Users don't know what is feasible
- Technologists don't understand the practices
- It's even hard to identify where to apply development

Olivier concluded: “A dialogue is needed between users & technologists!” And he introduced the concept of Reference Models as a kind of boundary objects<sup>4</sup> for this dialogue [13].

Reference models bridges the world of users and their work with the underlying technical services and their associated specifications. It is therefore a human context that needs to be made clear with stakeholders, purposes, processes and practices. And there is a machine context with applications and services, and specifications that integrate them.

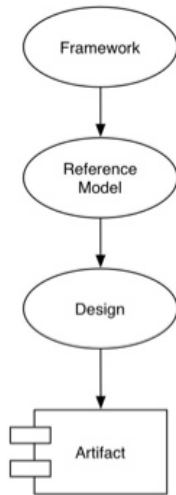
Reference models are part of a bigger conceptual framework. What are their relations to specifications and standards, to service oriented frameworks, to services and other concepts that are now coming into vogue? Again, let us follow the traces of the e-Framework partners.

In July 2004 DEST (Australia), JISC-CETIS (UK) and Industry Canada presented a paper on “Service-Oriented Frameworks: Modelling the infrastructure for the next generation of e-learning systems” [14]. The paper aimed at providing a common set of concepts

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<sup>4</sup> Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. [11]

and terms that could be used in conversations about e-learning infrastructure, and to present a case for developing and maintaining service-oriented e-learning technical frameworks. Basically the authors proposed four concepts to facilitate the conversation, see figure 1.



**Figure 1 of a simple relationship model [14]**

To start in the soft end, framework provides a vocabulary and grammar and it is left to individual organisations to write the stories. According to Wilson et al. “a framework creates a broad vocabulary that is used to model recurring concepts and integration environments. (...) A Reference Model is a selection of Services defined in one or more Frameworks. (...) A Design specifies an Artifact, such as a piece of software, and is a collection of specific technologies applied to either a Reference Model or the Framework. (...) An Artifact is a realisation of a Design.”

You might derive multiple Reference Models from a single Framework, and a Reference Model might be derived from multiple Frameworks.

At first glance this model might seem a little too abstract to spark heated discussions about different directions of technology development for learning, education and training. The primary objective of the model is not to provide the language for the conversation, but to point out the conditions for having such a conversation at all. And then you need a language. This is not as self-evident as it may sound.

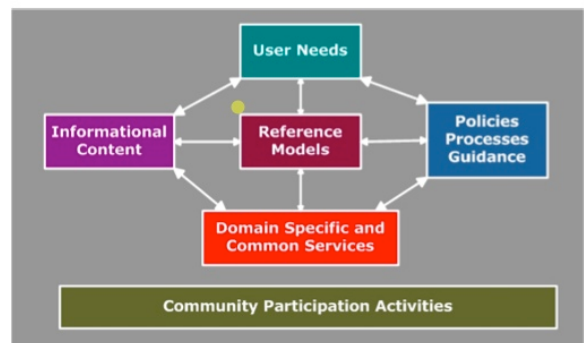
Technologies very often present themselves as “black boxes” – they “just work” and make the political, social, cultural and other filtering of knowledge opaque [4]. You almost need some kind of “reverse engineering” to tease out the values and interests that are inscribed into the designs of technology [7], [8], [3]. This is to some extent due to

the fact that we lack a common vocabulary to carry the conversation across different communities, e.g. educational users and technologists.

Going back to the definition of a framework Wilson et al. states that a framework is equivalent to the concept of a pattern in the software community [14]. They cite Brad Appleton who says

*“The goal of patterns [Frameworks] within the software community is to create a body of literature to help software developers resolve recurring problems encountered throughout all of software development. Patterns [Frameworks] help create a shared language for communicating insight and experience about these problems and their solutions. Formally codifying these solutions and their relationships lets us successfully capture the body of knowledge which defines our understanding of good architectures that meet the needs of their users. The primary focus is not so much on technology as it is on creating a culture to document and support sound ...design.” [1]*

From our point of view the need for “creating a culture” is the crux here. This understanding was strengthened during the aforementioned JISC CETIS conference on Reference Models. By focusing on Reference Models and Services as the key concepts of the e-Framework [12] it is made clear that this is a community effort where the development process is intertwined with Governance and Stewardship processes. Figure 2 explains how the parts of the e-Framework fit together:



**Figure 2. Diagram of how the different parts of the e-Framework fit together [12]**

#### 4. Implementation of Service Oriented Architectures – a multi-layered process

Service Oriented Architectures are true examples of disruptive technologies. As such one should not expect too much from goal setting exercises like the ones that come from the EU Commission and the Norwegian Ministry of Government Administration and Reform.

Institutions resist change, and they will find all kinds of excuses to carry on their software development processes as before.

The UK led e-Framework endeavour is an example of applying a domain approach to meet the goals set in the eGovernment strategies of the European Union. The work is carried out almost without reference to these pan European visions. The situation in Norway is quite contrary, we have European visions and national goals but very little domain activities (this holds for the educational sector and to some extent for the cultural sector; the situation in health and trade is slightly better). A central principle in the eNorway strategy is that the different public sectors take full responsibility for their own ICT and service development – and they control their own pace.

It is obvious that the coordinating authorities should extend their support toolbox to speed up the adoption of service oriented architectures. We would think that the conceptual framework developed as a cooperative effort by UK and Australian experts might be a source of inspiration. However, if we have the Norwegian situation in mind, we would need more than a conceptual understanding of a Service Oriented Framework.

The e-Framework presupposes that there is a community of developers that could be mobilised to build the framework through an open conversation coordinated by JISC, DEST<sup>5</sup> and eventually other national authorities. There are no such coordinating and funding agencies in Norway. The community of developers is less organised, and do not have a clear vision as to which services that are needed in learning, education and training. We would therefore need more incitements to get the SOA process to roll.

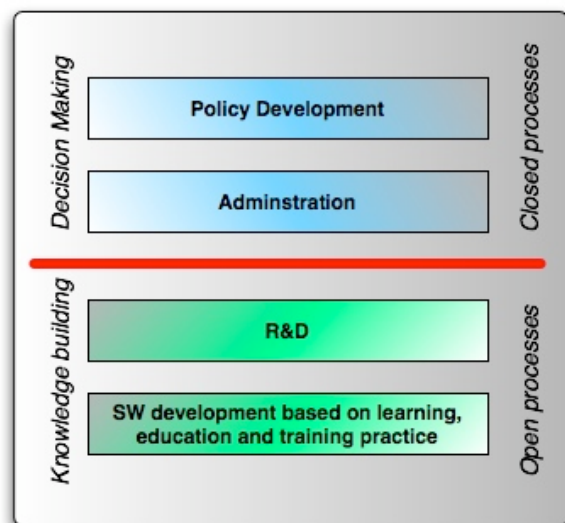
Openness is a key concept in SOA development (open as in Open Source, Open Standards, Open User Interfaces etc.) However, these days government institutions are more and more run according to a private corporations ethos with tight control on information, no exposure of business processes etc. It is therefore a need to (re)define a layered business model of public sector software development within a SOA<sup>6</sup>.

<sup>5</sup> DEST is the Australian Department of Education, Science and Training.

<sup>6</sup> An example will illustrate the problem we are grappling with. In 2004 seven work groups under the Norwegian Digital Library Programme were commissioned to come up with recommendations for a comprehensive framework for a digital library in one year. The groups delivered their reports in time, but they were not published at once. During the twelve months of 2005 the professional conversation in the library community was put on hold, waiting for the recommendations to be processed within the formal authorities. 95 percent of the content of the reports was of strict academic nature and might have stimulated a necessary professional conversation. [5]

The IDABC interoperability model does not give guidance to how authorities and institutions should organise their work processes. Semantic, organisational and technical interoperability presupposes to a large extent open processes between systems. However, once you put a governmental institution into the equation you will experience that these kinds of systems have a mixture of open and closed processes.

In figure 3 we have identified four distinct layers that fall into two categories. In one way it is Academia meeting Government, which is in fact the case when Ministries of Education are commissioning software for learning, education and training. The problem arises when the red line between the decision-making and administrative processes is crossed and “the light is dimmed” for necessary knowledge processes.



**Figure 3. Process layers within governmental institutions.**

We have given examples of projects where knowledge-building activities have been dealt with from a decision making logic where control of information has been the leitmotif. For a country with scarce access to experts and a weak professional discourse one year's halt in a field as agile as ICT and learning technologies could be devastating.

With Service Oriented Architectures being a new software paradigm we could foresee that a small country like Norway could be set back if we are not able to discern between the different types of processes. This is because much of the software development has been left to the market, managed by the vendors alone or in a closed relationship between public authorities and a small number of software and consultancy companies. It is not possible to put SOA

out for tender as such. Someone has to do some orchestration to come up with the right factorisation of the services that should be developed. And those orchestra rehearsals have to be done in public as a knowledge building exercise, for the developing community to be able to pick up the right tones and subdue the false ones.

## 5. Conclusion

If the EU policies on open standards, service oriented architectures and open source shall have any impact on the development of technologies for learning, education and training the Ministries of Education have to rethink the way they handle their knowledge building and decision making processes.

Up till now we (to a large extent the vendors) have built individual systems, e.g. Student Management Systems, Learning Management Systems, Test Administration Systems etc. When these systems start to crackle into services the Ministries suddenly are faced with the need to some orchestration. Some of the services are vital to society (e.g. security, privacy, data protection, exam systems etc.) and cannot just be left to "the market" to develop without an open and common architecture.

A common architecture for learning, education and training must be built upon up to date knowledge through research and development activities in close connection with communities of practice throughout the educational sector. These knowledge-building processes could collide with the public management culture of educational authorities with the result of open processes being closed for some periods.

To follow up EU and national goals on SOA the government bodies should be very careful to define which processes should be open and which should be closed when they for instance commission reports, put out bids for tender etc. One paragraph with recommendations in a full report to the Ministry on a technical issue is enough to keep it from the public eye for months. Instead the Ministry should ask for a public technical report and a separate letter of recommendation, to be able to contribute to a knowledge building processes.

To lift the administrative veil from knowledge processes is not enough to harness a service oriented architecture. The UK Australian e-Framework exercise to forge adequate concepts to grasp the essence of the bricked wall<sup>7</sup> they are building is worth a study for

Ministries not participating in this effort. What should be noted is that several of the concepts (e.g. Framework, Reference Model, Design etc.) have a dual nature. They are precise technical concepts that are used in formal models, often expressed in UML diagrams. On the other side, they are soft concepts that are meant to bridge the user community and the technical community by facilitating the professional conversation between stakeholders. The very fact that communication and dialogue is built into these concepts that are essential to understand what service oriented architectures are, makes it even more important to facilitate development of such services as open processes. Closed SOA development is a contradiction of terms.

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<sup>7</sup> The collection of domain services and common services in the e-Framework is often referred to as "the Wall", see [http://www.eiframework.org/learning\\_domain\\_services](http://www.eiframework.org/learning_domain_services) and [http://www.eiframework.org/common\\_services](http://www.eiframework.org/common_services))

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