

Norsk konferanse for organisasjoners bruk av informasjonsteknologi

# NOKOBIT 2011

Universitetet i Tromsø 21. – 23. november 2011

## NOKOBIT-styret og redaksjonskomité

Terje Fallmyr  
Bendik Bygstad  
Jørgen Fog  
Laurence Habib  
Jon Iden  
John Krogstie  
Laila J. Matberg

Universitetet i Nordland (redaktør, styreleder)  
Norges Informasjonsteknologiske Høgskole  
Departementenes servicesenter  
Høgskolen i Oslo  
Norges Handelshøgskole  
Norges teknisk–naturvitenskapelige universitet  
Høgskolen i Nesna

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Laila J. Matberg	Høgskolen i Nesna

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ISSN 1892-0748

ISBN 978-82-519-2845-8

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## FORORD

Velkommen til NOKOBIT 2011!

NOKOBIT 2011 arrangeres av Universitetet i Tromsø, mens prosessen rundt det faglige programmet ble ledet fra Universitetet i Nordland. Dette er det 18. NOKOBIT siden starten i 1993, og det er 12. gang at NOKOBIT arrangeres sammen med NIK – og fra 2008 også sammen med NISK.

I år har vi mottatt 27 bidrag, og det er 20 bidrag som skal presenteres. Alle bidrag har vært gjennom en grundig fagfellevurdering (blind review) av tre uavhengige reviewere. I god NOKOBIT-tradisjon vil hver presentasjon ha en diskutant som er grundig forberedt, og bidragsytere må også fortelle hvordan de har forholdt seg til kommentarene fra reviewerne.

Jeg vil gjerne takke alle reviewerne for konstruktive tilbakemeldinger. Uten deres innsats hadde det ikke blitt noen konferanse. Jeg vil også takke styret i NOKOBIT for et utmerket samarbeid.

Til slutt vil jeg takke den lokale arrangementskomiteen, og spesielt Lars Ailo Bongo. Det har gått veldig fint å samarbeide over distanse.

Vi gleder oss til en god konferanse!

Terje Fallmyr

Handelshøgskolen i Bodø, Universitetet i Nordland  
Redaktør og styreleder for NOKOBIT 2011

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# ENTERPRISE ARCHITECTURE TO ENHANCE ORGANIZATIONAL AGILITY? AN EXPLORATORY STUDY

Terje Fallmyr  
Bodø Graduate School of Business  
University of Nordland  
terje.fallmyr@uin.no

Bendik Bygstad  
Norwegian School of IT  
bendik.bygstad@nith.no

## Abstract

*Contemporary organisations experience an increasing pressure to change. This requires organisational agility, i.e. the ability to sense and respond continuously to changes in the environment. To support this unprecedented challenge, Enterprise Architecture has been proposed as an architectural and organisational foundation. This is a rather grand promise. In this exploratory study we discuss the usefulness of the approach, building on the framework of Ross et.al. Our research question is, to what degree can medium sized organisations use EA to build organisational agility?*

*Our empirical evidence is a case study with four medium sized Norwegian organisations. We find that the adoption of EA principles is contingent and pragmatic, and that maturity levels are generally low. We find reasonable support for the assumption that EA is actually increasing organisational agility, in particular the capability to respond to external changes.*

## 1. INTRODUCTION

Organizations of all kinds experience an increased pressure to change - for example by introducing new products and services, to increase efficiency, and to engage in changing networks in a globalising world. Some business researchers have suggested that this development requires that *organisational agility* is included in a business strategy (Doz and Kosonen 2008). Organizational agility is described as the ability to sense and respond continuously to changes in the environment (Haeckel 1999; Overbye et al. 2006). In practice, this means that organizations need to develop their capability to manage change both in organisation and technology.

It is relatively obvious that ICT plays a key role in this development, although the role is ambiguous. On the one hand, ICT is a powerful enabler of organisational agility (McAfee and Brynjolfsson, 2008) by providing the technology and systems in order to integrate business processes across organisations, and to support innovation of new products and services. On the other hand, ICT is also often a hinder and a bottleneck to change, because of large installed bases of legacy systems, silo-oriented solutions and lack of competence. Moreover, the business and IT people have a long history of not understanding each other. Often, the top management is generally aware of the importance of IT, but has a rather unclear picture of exactly how IT contributes to value creation and competitive edge in the business (Mathiassen and Pries-Heje 2006).

What options are there for handling this challenge? The past ten years have seen an increasing interest for ICT architectures not only as a technical arrangement, but also in a strategic context, because organisational agility requires the ability to change components and links relatively fast. In practice, this is impossible with traditional large, vertically integrated “silo” systems, and the ICT industry has proposed solutions such as Enterprise Application Integration (EAI), Service Oriented Architecture (SOA), and Enterprise Architecture (EA). While EAI and SOA are mainly technical solutions, EA represents a full framework that integrates ICT capabilities with strategic and organisational issues. Therefore, EA is perceived as a promising approach to support organisational agility, while also providing the necessary framework for developing a stable and manageable ICT architecture. Ross et al. (2006) put it this way: “*EA provides a long-term view of a company's processes, systems and technologies so that individual projects can build capabilities – not just fulfil immediate needs*”.



This may seem too good to be true. The ambition of EA is not only to provide organisational agility and ICT architecture, but also to bridge the long-time gap between the business people and the IT people by providing a shared and integrated framework (Ross et al. 2006). Researchers have learned to be wary of such grand promises, because of many previous disappointments. However, we believe that cynicism is no adequate response to the EA initiative, because a) the framework is a bold concept and b) many companies and organisations are currently supporting and deploying it. The success of the TOGAF initiative (Open Group 2009) is one indication of this.

There are certainly sceptics (Brown 2004, Hjort-Madsen and Pries-Heje 2009). EA is considered difficult to manage. Getting good results are risk prone, and EA is therefore not necessarily popular among business stakeholders. Much of the EA literature is normative rather than empirical; it tells us how we should use EA, not how it is actually used. From a research view it is important to investigate EA with a practice lens; i.e. how organisations are actually using the EA frameworks, and to which degree they are benefitting from it. It is also important to investigate whether the typical medium sized Norwegian organisation can use the approach, in particular as a step-wise improvement approach. For example, many organisations – especially SMEs – may actually not use real EA frameworks; rather they may be only using some of the ideas and apply them practically in order to improve their business processes.

Our research question, then is, to what degree can medium sized organisations use EA to build organisational agility?

The rest of the article is structured as follows. First we review the research on EA literature, and discuss in more detail the framework of Ross et al. Then we present our research method and our cases. We finally discuss our findings, and conclude in the last section.

## 2. RESEARCH REVIEW

In this section we briefly present and discuss the EA research and also discuss some concerns and limitations. Then we describe in more detail the Ross et al. framework (2006) “Enterprise Architecture as Strategy”.

### 2.1 Enterprise Architecture

Zachman is generally credited for introducing EA in 1987. In an article in IBM Systems Journal he wrote that “with increasing size and complexity of the implementation of information systems, it is necessary to use some logical construct (or architecture) for defining and controlling the interfaces and the integration of all of the components of the system” (Zachman 1987). Zachman’s point of departure was that it is immensely complex to manage a large organization. The key to managing this complexity is classification, and the Zachman framework is a classification system to describe the knowledge about the enterprise and the services, as illustrated in figure 1.

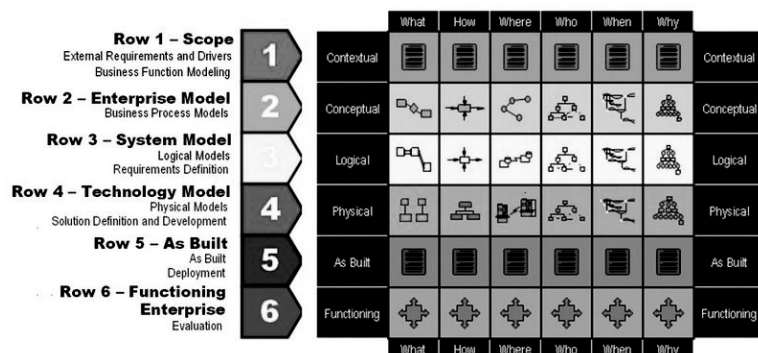


Figure 1: Zachman’s framework (Wikipedia)

Zachman was concerned with information systems. The field of EA comes from the IT domain and has been associated with it. Armour et al. (1999) defines EA as a holistic view of the enterprise's IT resources. According to them, EA is the set of processes, tools and structures necessary to implement an enterprise-wide coherent and consistent IT architecture for supporting the enterprise's business operations.

Over the years, enterprise architecture has grown to encompass more than enterprise-wide IT architecture, and is now increasingly concerned with the architecture of the enterprise (Fehskens 2008, Greefhorst and Proper 2011).

There are many definitions of EA none of which is precise or has gained wide acceptance. Moreover, starting with Zachmann's initial contribution, a number of frameworks have been introduced, among them the Open Group's TOGAF, which has now reached version 9 (Open Group 2009).

It may seem useful to approach EA from its intended purpose. The Open Group (2009) defines the purpose of EA *"to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy"*.

According to Ross et al. (2006), the ambition of EA is – briefly stated - to manage the complexity of organizational and technological change, at both strategic and tactical levels. Some essential features with EA are to link strategy to business processes and technology, provide an extended view of ICT based services and required infrastructure, and support technology driven change.

## **2.2 Concerns and limitations**

Although EA has been met with enthusiasm in the IT industry, there are also concerns and limitations.

First, there are concerns about EA as a new *IT bureaucracy* producing mountains of technically oriented documentation, which is very difficult to handle and keep consistent with the evolving enterprise. EA is not necessarily popular among business stakeholders, as it represents a very different approach and "language" compared to what is taught in business schools and used by business managers.

Second, one may question whether the EA approach is really used strategically. The IT industry aims at selling software solutions, and the software product focus may lead to a limited use of EA (Armour et al. 1999). Management should recognise that EA not necessarily pays off immediately, but is a strategic concept (Kaisler et al. 2005).

Third, EA is very structure and system oriented, and is not a complete approach to organizational change. Many issues, such as leadership, culture and sense making are not addressed in the EA frameworks.

## **3. ENTERPRISE ARCHITECTURE AS STRATEGY: THE ROSS ET. AL. FRAMEWORK**

There are two reasons for choosing this framework. First, it is business oriented and offers an original approach containing a few, clear steps. Second, it is clearly grounded in the concept of business agility, which is seen as a strategic necessity.

### **3.1 The framework**

Ross et al. (2006) define EA as "the organizing logic for business processes and IT-infrastructure reflecting the integration and standardization requirements of the company's operating model". Furthermore: "EA provides a long-term view of a company's processes, systems and technologies so that individual projects can build capabilities – not just fulfil immediate needs".

The business orientation is rooted in the increasing strategic demands for both company agility and for better execution while addressing the "IT problem", mainly exemplified by lagging behind, being

complex and ad hoc, not building capabilities but an increasing “rat’s nest” of solutions. The Ross et. al. approach suggests that companies must select their core operations, digitize them and execute them well on a suitable IT platform. Then, core routine activities can be executed with high reliability and high efficiency. This frees management from time-consuming problem solving on lower value activities.

The digitized core is called *the operating model* and is used as a platform for growth and innovation. The operating model defines some important relationships between the company strategy and the properties of the technological platform. The relationships are the degree of reliance on shared data between business units and the required degree of company-wide business process standardization. There are four general types of operating models, as shown in the table below. The two dimensions are *business process integration* (high and low) and *business process standardization* (high and low). Thus, diversification is low on both, while unification is high on both.

Business process integration	High	<b>Coordination</b> <ul style="list-style-type: none"> <li>Shared customers, products and suppliers</li> <li>Impact on other business unit transactions</li> <li>Operationally unique business units or functions</li> <li>Autonomous business management</li> <li>Business unit control over business process design</li> <li>Shared customer/supplier/product data</li> <li>Consensus processes for designing IT infrastructure services; IT applications decisions made in business units</li> </ul>	<b>Unification</b> <ul style="list-style-type: none"> <li>Customers and suppliers may be local or global</li> <li>Globally integrated business processes often with support of enterprise systems</li> <li>Business units with similar or overlapping operations</li> <li>Centralized management often applying functional/process/business unit matrices</li> <li>High-level process owners design standardized processes</li> <li>Centrally mandated databases</li> <li>IT decisions made centrally</li> </ul>
	Low	<b>Diversification</b> <ul style="list-style-type: none"> <li>Few, if any, shared customers or suppliers</li> <li>Independent transactions</li> <li>Operationally unique business units</li> <li>Autonomous business management</li> <li>Business unit control over business process design</li> <li>Few data standards across business units</li> <li>Most IT decisions made within business units</li> </ul>	<b>Replication</b> <ul style="list-style-type: none"> <li>Few, if any, shared customers</li> <li>Independent transactions aggregated at at high level</li> <li>Operationally similar business units</li> <li>Autonomous business unit leaders with limited discretion over processes</li> <li>Centralized (of federal) control over business process design</li> <li>Standardized data definitions but data locally owned with some aggregation at corporate level</li> <li>Centrally mandated IT services</li> </ul>
		Low	High
		Business process standardization	

Table 1: Four types of operating models (source: Ross, Weill, Robertson: *Enterprise Architecture as strategy*, 2006)

As seen in table 1, each operating model presents different opportunities and challenges for growth. New strategies and innovations may be delivered fast and reliably as long as they can be implemented within the current operating model. If the operating model must be changed however, things may become more difficult. It is for instance very costly to establish shared data across all departments in a company that has relied on a diversified (distributed) data model. In the same way, it is costly to implement standard work practice (standardized business processes) across an entire enterprise. Both of these changes carry large costs and risks, not only technologically, but also, and not least, in terms of organizational change.

So, in order to build an operating model, companies must decide on the importance of shared data, which will support business process integration but will force a common understanding of data across business units. The companies must also decide on the level of business process standardization, which may create efficiencies of scale between units but will limit customized customer service.

At the same time, IT should be kept clean from ad hoc solutions, or solutions with a limited fit with the architecture. Instead, while building the technological platform, emphasis should be focused on building capabilities with regard to the chosen operating model, as this makes a platform for business agility. A clear operating model and the implemented capabilities make up very valuable inputs to new strategic initiatives. Initiatives need not start from scratch, but may rather build new capabilities on top of the existing platform.

The operating model is quite general and may be implemented by applying a framework for Enterprise Architecture. An EA framework such as TOGAF (Open Group 2009) represents a structured approach to binding the operating model, business goals and business architecture to the technological platform. This is expressed in the information systems and technology architectures of TOGAF. EA frameworks may thus provide more detail and structure than the operating model and may serve as a guide to build a strong foundation for execution.

Implementing EA is challenging and takes time. The Ross et. al. approach to building capabilities is divided into four different stages of maturity:

1. *Business silos architecture*: companies maximize individual business unit needs or functional needs.
2. *Standardized technology*: efficient IT through technology standardization and often increased centralization of technology management.
3. *Optimized core architecture*: companywide data and process standardization as appropriate for operating model.
4. *Business modularity*: companies manage and reuse loosely coupled IT-enabled business process components to preserve global standards while enabling local differences

### 3.2 How does the framework support agility?

Following Haeckel (1999) and Overbye (2006) we defined organisational agility as the capability to sense and to respond to changes in the environment.

How can EA be useful for *sensing* changes? Sensing may reveal symptoms, and analysis may explain what are the real problems that cause the symptoms. EA advocates customer focus as a precursor to process orientation, well-developed business architecture with measurements (e.g. balanced scorecard) and management follow-up. EA (e.g. TOGAF) promotes for instance stakeholder analysis that may also be useful for developing systematic awareness of changing conditions in the external environment.

These could all be important for early detection and be considered part of good general management practice and also good EA practice. EA also promotes problem analysis, both when developing a model of the current situation (as-is) and analysing possible future situations, as well as the gap to be bridged in order to get there – both in terms of new or changed deliverables (products/services) and internal capabilities.

How can EA be useful for *responding to* changes? Ross et al describe the operating model as a foundation for agility. The main reason is that it provides the necessary resources in order to respond to short and long-term challenges. Responding to short-term challenges includes for example to handle variations in customer demands, automate routine processes, to manage emergency situations and to conduct continuous improvement of services. The information systems constitute the key resource for these tasks, and the operating model provides the plan for necessary integration and communication between these systems. Responding to long-term challenges includes for example product and process innovation, and to link into the value chains of vendors and customers. Again, the operating model provides a foundation for business process innovation and redesign, and for designing the key features of new strategy.

So, in principle, EA seems well suited as a tool for increased organisational agility. We will now describe how we investigated the matter in a local Norwegian context.

## 4. METHOD

The general approach was a case study (Gerring 2007), conducted in Northern Norway. Ross et al. contend that business agility depends on a foundation for execution. Building on previous research (Overbye et al. 2006) we investigate two dimensions of organisational agility; the ability to *sense changes* in the environment and the ability to *respond* to such changes. In the context of EA we should therefore assess a) to which degree will EA help the organisation to sense changes in the environment

and b) to which degree will EA help the organisation to respond quickly to changes in the environment.

#### 4.1 Case Selection

We present a case study with four cases. The cases represent fairly common organisations, but they are also different in many respects. They vary in size from 35 to 500 employees and operate with regional, national or global scope. Both public and private enterprises are represented.

They were not selected because they are sophisticated practitioners of Enterprise Architecture, which may indeed be hard to find. Rather, they represent ordinary organisations that over the past years have handled their issues in how to organise themselves and use ICT for organisational improvement. The companies are presented in brief in the first three rows of table 2 below.

#### 4.2 Data Collection and Analysis

The information about the companies was gathered, from publicly available material, student projects, and semi-structured interviews with representatives from management; one or more of CEO, CTO, and CIO. Two of the companies (A and C) were interviewed face-to-face and two by phone.

The cases were analysed in two steps. First, each case was analysed, aiming to understand how the organisation was approaching the EA concept, and which opportunities key informants had identified. We also analysed their operating models and assessed their EA maturity level, and also their processes and lateral coordination. In order to assess to what degree EA has increased their organisational agility, we tried to find evidence for sensing and responding capability.

Second, we conducted a between case analysis, focusing on comparing the key issues described above. Where strong similarities were identified, findings were relatively clear. When differences were seen, we tried to understand them in the light of different contexts.

### 5. CASE ANALYSIS

In this section we describe the results of the case analysis. They are summarised in table 2 below.

	<b>A:Telecom service on optical fiber</b>	<b>B:Administrative agency</b>	<b>C: High-tech maritime equipm.</b>	<b>D Energy supplier</b>
Size (empl.)	35	500	400	105
Scope	Regional	National	Global	Regional
Sites	3	2	12	5
Organisation base	Products and departments	Products and departments	Products and departments	Matrix
Operating model	Approaching unification	Coordination	Largely diversified	Unification
Enterprise processes	Few formally defined	Few formally defined	Some common. Defined in quality management system.	All described in detail, in quality management system.
Lateral coordination	Mostly personal and informal	Few crosscutting processes	Mostly personal and informal	Formal. Each process has owner
Enterprise data	Each department have their systems and data	Some common data. Most local to units	Some common administrative and project data.	Administrative data is common. Separate prof. systems
EA-maturity level	Mostly level 1. Developing some level 2	Some level 1. Approaching level 2	Largely level 1. Developing towards level 2	Level 3
IT builds enterprise capabilities?	IT tries. Centralised IT decisions	IT tries hard to plan long term. IT decisions by team	IT is enterprise level function. Centralised IT decisions	Yes
Approach to EA	Bottom-up No detailed strategy	Bottom-up and middle-out. IT active	Bottom-up. No detailed strategy.	Top-down, but very inclusive to

	IT very active Management supports	Management is partner, but not driver	IT dept very active from start. Mngment is active	employees
Current EA initiatives	None, strategy is being made	None, just beginning	Build on core systems.	Everything is done in light of EA
Sensing capability	Leadership is alert, but sensing is not particularly described	Sensing is not particularly developed	Leadership is alert, but sensing capability is not described.	Well developed. Stable business. Laws and regulations change
Responding capability	Responding based on unification model	Sufficient, complexity is a problem	Improving, some internal resistance	Very good

*Table 2: Summary of case analysis*

### 5.1 Case A

This company provides telecom services on optical fiber. The services include Internet access to private homes and businesses, TV, phone, etc. It has a regional market scope, with 35 employees on 3 geographical sites. The organisation base is the services it offers and departments.

The current operating model does not quite fit any of the four quadrants listed in Table 1. According to the company, the goal is unification even though it is not attained yet. Recently, when a company in a neighbour town was acquired and integrated, a “rip and replace” method was used, meaning that all systems, processes and data were integrated into those of the overtaking company. The processes and systems that are present at each location are standardised, but the systems do not communicate well. There are some legacy systems both on the technical side (operation support systems) and on the commercial side.

A few processes are defined, but they are not formally documented. Processes have no end-to-end ownership. Rather, ownership changes between departments as its “point of control” passes between departments. The lateral coordination is mostly personal and informal. These are both known sources of process problems, resulting in some dissatisfied customers. The company is aware of their process problems, and is eager to improve customer satisfaction as well as process effectiveness and efficiency. According to the CEO, the situation is improving.

The EA maturity level is considered to be mostly level 1 (silos) since each department has their own systems and data. We might also say that the company is approaching level 2 in some areas. There is standardised technology in the various functions and the IT decisions are centralised, but the silos still dominate. The IT (or technical) department is aiming to establish a standardised IT platform, and tries to build capabilities for enterprise level, and does not focus on short-term solutions. Top management (CEO) is involved in this process and supports it, but it is run by the CIO/CTO.

The general approach to “EA” is a mix between bottom-up and middle-out. The IT department builds capabilities based on general overview – not a full strategy, and has been very active in this process all the time. They have competent people with long experience from the telecom industry and know the complexity they are facing. Still, short-term solutions are made in order to keep up a functioning production system, and preliminary solutions are also integrated into the production system.

At present, there is no current full EA initiative. The IT department is working to build capabilities guided by general directions and experience. The CEO stated that he has delayed further work on company strategy and further development of new IT support until CIO/CTO issues a report that recommends the future development. In that sense the CEO gives possibilities for development in direction of EA.

When it comes to sensing capability, the leadership is alert as in any competing company, even though there are no specific described procedures for sensing that is connected to EA. Today, their product and market is well defined, but that may change quickly. Responding will be based on the unification model. A large part of product base also relies on third party software. Change in this software may force changes in local software, but request for change in the third party system is a slow process.

## 5.2. Case B

Case B is a national administrative agency with 500 employees in two geographical sites. They provide fundamental services to both public and private enterprises, and private persons too. Departments and services are the basis for the organisation. The operating model is close to coordination. The CIO would like to move to unification.

The company has started on the route to standardise the processes underlying the different services. This requires an extensive change of the information systems since the process models (including support for laws and government regulations) are coded into the support systems, which need to work continuously since customers also use them. There are no big crosscutting processes as they largely stay within each service (which also define departments), but this will be an issue in the future when increased process standardisation enables employees to work on different processes – maybe at the same time.

Today, one important principle for data management is to store only one copy of shared data. This, according to the CIO, creates some challenges regarding maintenance of systems. They have started the process of making a common data model for the different processes behind the services. Future architectures will be based on components and service orientation.

EA maturity is largely level one (silos) although work is going on to move to level 2. The company is very aware of their total dependency on their IT systems, both for internal purposes and for their services. In fact, their purpose is to provide electronic services instead of the old paper based services. IT is aware of the necessity of building capabilities, and this has been the policy all the time. Over the years, short time change requests from the government or introduction of new services have made the systems rather messy. Focus has always been on keeping their services running, since they are fundamental to many public services. What was once a good architecture can now be described as a nest of patches and “tape and glue”. This is obviously a challenge for change, for instance for introducing new standard processes that involves several systems.

The CIO says that the approach to these challenges is use of “common sense” in the light of the demands for continuously running services, not “EA proper”, particularly not a heavy top-down approach. Lately however, the company has discussed some possibilities of EA with external consultants. The IT department reports that it has barely started with EA. They think in terms of SOA and they are well aware of the business needs. IT and top management communicates well. The general approach to handling these issues is bottom-up and middle-out. We find that the top management is a good partner, but is no driver in the EA-related development.

The company has focus on cleaning up its internal systems and develop a more modular architecture, among others in order to improve its ability to respond fast to change requests. Today, short-term change requests tend to slow down the internal cleaning processes and leave, as a side effect, more patches. A team where process owners (unit leaders) are represented normally makes decisions concerning new IT developments.

## 5.3. Case C

Case C is a producer of high-tech maritime equipment in the global market. It has 400 employees at 12 sites around the world. The company is a corporation with semi-autonomous companies, all working in the maritime area but with no common customers. The corporation fits a diversified operating model.

Some common processes are described, especially for the Norwegian companies, mainly due to demands from public authorities but also customers regarding quality management and quality systems transparency. Process descriptions are available on a web-based system, and are supported by the quality management system (QMS) and production management system (which is an ERP system).

The lateral coordination is mostly personal and informal. Each customer order represents a large project, and the project leader has the responsibility for all necessary coordination. The projects are in effect processes that cut across several departments, and the project leader is process owner. The new

QMS and ERP systems mean that project resource planning and inventory control is much better, leading to substantial cost and timesavings in the projects. Common administrative data have been specified for the Norwegian companies. Some common project data, especially within Norway also exist, but otherwise data are largely diversified and distributed.

The EA maturity level is largely 1 (silos). This is due to heritage of old systems, acquisitions and a diversified operating model. At enterprise level there is development towards level 2, among others with the standardised production management system (ERP). In the last years IT has developed into a critical enterprise level function. The enterprise is completely dependent on the QMS and ERP systems. They have in practice become the platform for future development. All IT investments and developments are considered in the light of this platform. The quality management system is also used for standardization of processes.

The enterprise has not formally adopted any specific approach to EA, but several processes are modelled, and the IT department is very active in building capabilities for the enterprise. IT decisions are centralised, with corporate top management and unit leaders closely involved.

The CEO is clear about that the approach to EA is bottom-up. It is based on a general overview, not a detailed strategy. The reason for this is that they need the power from their current production to drive further development. Their EA approach is therefore evolutionary rather than revolutionary. The top management decision team must see short and medium term business benefits of EA. They build competence in the organisation step by step, and they build IT solutions step by step. Now, they are at a stage where they fully recognise that the ERP and QMS systems are of crucial importance for the enterprise. They also recognise that these systems are vital parts of the platform for further development. For them, no IT decisions are made unless the relevance to the company-wide strategy is clear.

For company C, the enterprise IT strategy is still not formulated and therefore not communicated. The new platform, especially the production management system (ERP) was implemented as a simple replacement of an older system. This had very little consequences for the users. According to the CEO, it would not have been possible to get a decision to implement this system if the consequences for the users had been too comprehensive. This indicates quite clearly that a large top-down process is not possible for this company, and that in this case EA needs to be introduced in smaller steps – picking the low-hanging fruits first.

They have found that they cannot pursue a top-down approach or reorganise substantially because of a complex stakeholder situation; many of the owners work in various leading positions in the companies of the corporation. But they have established a platform for growth with a couple of central IT systems and centralisation of IT decisions. In addition, they have a very active and competent CIO. They report on somewhat increased agility, although some uncertainty remains due to resistance in the organisation towards the new systems. The CEO, however, is confident that they are on the right path to increased agility.

#### **5.4. Case D**

Case D is a regional energy producer and supplier with 105 employees in five geographical locations. There are 8 companies in the group.

This is the only of the four cases that has implemented many of the ideas of EA. Enterprise processes cover all eight companies and are described in detail and continuously maintained. The company has developed a matrix-structured organisation based on the processes in one of the dimensions and resource management is the other dimension. Process descriptions are available in the quality management system and an on-going project will make them available on web for all employees. The planned introduction of hand-held devices for mobile field workers will make all this information available to all employees wherever they are located.

They have adopted an operating model that we believe is approaching unification. This means that all processes are standardised and all enterprise data is shared. Some systems for special professions keep their own data, and all systems do not communicate well yet. The transformation from a standard



department-based organisation started with a project that focused on developing a quality management system. In 2003 the new CEO (who is still in this position) discovered to his surprise that the company did not have any descriptions of procedures for handling dangerous equipment or riskful work procedures, or for securing delivery to customers according to plans or expectations. As a remark, even today, only about 15 out of 125 companies in this business are ISO certified.

While working on the quality management project, the combination of increased customer focus and the process descriptions provided strong arguments that they should change the organisation completely. With the CEO as primary sponsor, they decided to reorganise according to the needs of the business processes. The company has later made some minor adaptations to the model, but is true to the matrix organisation.

All processes have their process owner. Process owners make up the top management level together with the resource managers who distribute resources to processes based on an overall view. The main resource distribution is done annually as part of the budget process, but reallocation is done dynamically based on need. We consider that the company has EA maturity level three (optimized core architecture). Data and processes are standardised across the whole enterprise, as appropriate for operating model. IT is concerned with building capabilities as well as ensuring that as much data as possible should be made available to all. Process owners and CIO prepare decisions about IT to CEO, and decisions are made as a team.

This company seems very satisfied with their way of organising. Besides their use in the quality management system, process models are also used for management purposes and to communicate between levels of the organisation. One part of the communication is that employees at all levels understand the company and can contribute to modelling and improving processes. The CEO states that process models contribute to a common understanding that supports better balancing of workload and flow. The CEO claims to be able to prove that they produce more “power for each ’krone” than similar companies. He also remarks that they have very few internal complaints or resistance about change; they change all the time. He has also noticed that even field workers have become more customer oriented and have started to plan and improve their work in a more proactive way.

The fact that the CEO has been a proponent for this development all the time must be considered a major success criterion. Also, it seems that at the right moment they had the competence to take the right decisions. Being an energy provider, they probably also have had the financial resources for this kind of big change. The CEO says that spending one man-year early on modelling was a necessary investment. Once the first version of the models was made they could use them to communicate and plan the coming change.

Another important factor is that management has spent much time and resources on changing attitude and culture. The fixed hierarchies that we find in most organisations are gone and employees must be prepared to take on different roles in different processes. Only a few persons are leaders all the time. The new organisation also requires a new office building with different properties than the current building, e.g. containing more team rooms instead of ordinary offices.

Case D also reports that the full documentation of processes makes it very easy for them to document to authorities and also implement new regulations. The CEO states that when a request for change is decided, they know exactly where to start, and can easily estimate what is involved. Complete process models also make it easy for employees at all levels to participate in modelling and planning.

They report very clearly on increased agility. They also report on improved communication and participation from employees from all groups. This company has an extremely dedicated CEO and sufficient financial resources, as well as human resources, to pursue their path of development. In total, company D says it is easier to stay compliant. Thus, they are confident that their way of doing business promotes company agility. Since this way of organising implies much of EA thinking, we believe it supports a claim that EA promotes company agility. In this case, no specific EA framework has been used. The company used consultants in the beginning to learn modelling. After that they have used their own competence and “common sense”.

## 6. DISCUSSION

Our approach has been to try to analyse the effects of EA on company agility from a practical point of view, because great frameworks and proposed solutions are of little use and value if they are not accepted and implemented. Summing-up our cases the key findings are as follows.

First, we find that all organisations approach “EA thinking” in pragmatic and practical ways, consistent with earlier research on IT methods (Avison and Fitzgerald 2003). None of them has followed a specific EA methodology or framework. Most of them enter process thinking through projects concerning quality systems. Three of the organisations approach EA in a bottom-up style. One reason could be that nobody has “sold” them top-down EA, but they are very clear that on the one hand they see the necessity of this process, but on the other also realise that they have to follow their own path.

Second, the EA maturity levels are generally low. Only one of the companies took the full consequences of their approach and findings, and decided to reorganise completely. The company (case D) that took the full consequences followed a path from a quality systems project into a full-scale top-down process including a complete reorganisation. However, all companies seem to appreciate some of the central propositions of the approach described in Ross et al. (2006), and have all started on the job to determine their operating model in terms of the need for common processes and shared data.

Third, there are some indications that EA increases their organisational agility, but the picture is mixed. All companies report that their ability to respond to external changes has increased. We believe that this is a significant finding. However, only one company (case D) has increased its sensing capabilities. The other companies in the study have found that documented process models and higher maturity is useful. With higher maturity we mean a particular focus on standardised processes, shared data, and centralised IT decisions. Their work seems to provide a good tool for communication between top management and IT. Senior management supports the work in all companies, but the extent to which top management is able to drive the work seems to be very important.

We conclude that medium sized organisations indeed can use EA to build organisational agility under certain conditions. Companies with sufficient human and financial resources, and with top management commitment, may succeed, and profit from a top-down approach. From our cases, it seems that SMEs with small margins and high dependency on continuous production to drive development will choose an evolutionary approach. The same evolutionary path is followed by the quite big public company in case B, although for different reasons. All companies seem to have followed the path described by Ross et al. (2006), in establishing an operating model and investing in enterprise IT capabilities. They have done so without any particular guidance from outside. This might indicate that this is a natural path into EA.

As this is an exploratory study we see that many questions remain. First, it should be acknowledged that the relationship between EA and agility is a contested one, depending on how EA is framed. Proponents of EA claim that the holistic and integrated character of EA enables the organisation to sense and respond, because it documents the inner workings of the organisation, and helps to identify which “levers” to draw (Ross et al, 2006). Sceptics, on the other hand, may challenge the whole approach by asking why more bureaucracy (as is evidently also a feature of EA) should lead to agility. We believe that this is an empirical issue that can only be solved by more real-life studies, not by constructing frameworks. In particular, there is a need to study in more detail *how* the various elements of EA enable agility, and in which contexts the approach is effective.

## 7. CONCLUSION

This paper reported from an exploratory study on Enterprise Architecture, which has been proposed as an architectural and organisational foundation for organisational agility. Our research question was, *to what degree can medium sized organisations use EA to build organisational agility?*

Based on a case study with four organisations in Northern Norway we find that the adoption of EA principles is contingent and pragmatic, and that maturity levels are generally low. We find reasonable evidence for the assumption that EA is actually increasing organisational agility, in particular the capability to respond to external changes.

In relation to the grand promises of EA, as expressed in the literature, there is no evidence in our material that these are satisfied in Norwegian medium sized organisations. This does not, in our opinion, indicate that the EA approach is useless. On the contrary, our main conclusion is that the EA approach can give companies an analytic and communicative tool to build organisational agility. An EA approach also seems to promote building of a technological platform that is required for execution in a competitive world.

There are certainly limitations to our findings, in this exploratory study. More evidence on how this approach could be adopted should be explored further.

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