

# Enterprise Architecture Principles and their impact on the Management of IT Investments

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**Abstract:** The strategic role of IT and its significance throughout the organization increases complexity, variety, and the need of change. Hence IT management must deal with uncertainties derived from different, conflicting and ever changing demands. In this sense Enterprise Architecture is playing an increasingly important role in improving IT management practice. If contemporary organizations do not succeed in managing architectural issues, there is a clear risk that considerable resources will be invested without achieving desirable effects. This paper investigates how Enterprise Architecture Principles impact on the management of IT-investments in the context of large organizations. The purpose of the paper is to provide a deeper insight of the relationship between Enterprise Architecture and management of IT Investments throughout the elucidation of two significant types of principles: Delineation (differentiation) principles and Interoperability (integration) principles. Our conclusion is that the choice of architectural principles has an impact both on alignment between information systems and business demands and on the management of IT investments. This impact concerns at least four aspects: (1) The responsibility for IT investments (2) Time to value (3) Long term alignment, (4) Coordination of investments in information systems with changes in business processes.

**Keywords:** Enterprise architecture, information systems architecture, business architecture, architectural principles, business value, management of it investments

## 1. Introduction

During the last decades IT has received a more central role in transforming organizations in order to meet the challengers of the 21th century. IT strategic planning and management has gone from an emphasis on mastering the technology, developing information systems and controlling the costs of the IT department to seeing IT as an essential means to achieve business value, as well as to create new organizational forms with an increased ability to innovate, compete and cooperate. We can recognize three significant trends. Firstly, the use of IT is continuously influencing every area of social and business life. Secondly, IT investment issues that previously were a matter for the IT department, have now become issues of interest for the entire organization, not least the top management. Lastly, the management of IT investments from a strategic point of view has become more complex and more difficult. Although there are quite a few models and methods for evaluating IT investments, it is still difficult to achieve impact in the business. One of the most common reasons is that the larger the project the more complicated becomes IT management and especially to evaluate the business value. Another reason is that very often IT investments are considered as standalone investments rather than coordinated investments, i.e investments related to each other (Edwards and Lambert 2003), (Marchand and Peppard 2008). The strategic role of IT and its significance throughout the organization increases complexity, variety, and the need of change. Hence IT management must deal with uncertainties and with different, conflicting and ever changing demands. In this sense Enterprise Architecture is playing an increasingly important role in improving IT management practice.

This paper investigates how Enterprise Architecture impact on the management of IT-investments in the context of large organizations. Our thesis is that there is a significant impact of the Enterprise Architecture on the Management of IT investments. Further we argue that any kind of Enterprise Architecture principles is impacting the management of information systems and their interoperability differently. Thus, the purpose of this paper is to provide a deeper insight of the relationship between Enterprise Architecture and Management of IT Investments throughout the elucidation of two significant types of Principles: Differentiation Principles and Integration Principles. Two cases from Swedish industry are used to illustrate how these architectural principles impact management of IT-investments.

## 2. Research method

The research has been inspired by collaborative practice research (Mathiassen 2002) and its inside/outside perspectives. One author of this paper has been working several years with the case companies and provide “inside perspective”. The other two authors are full-time academic researcher and provide “outside perspective”, which allows for deeper assessment and reflection.

The research methodology is essentially interpretive case study (Walsham 1995, Klein and Myers 1999). We carried out data collection primarily through observations, semi-structured interviews, and workshops with CEO, CIO, Process Managers, Enterprise Architects, Project managers and Users. Observations and activities were recorded in a research diary. Research rigor is a question in any case study; typical critiques target the validity of generalisation or the lack of self-criticism. However, the main objective in these case studies is to increase the understanding of the relationship between Enterprise Architecture and Management of IT Investments.

## 3. Enterprise architecture

Contemporary organizations invest more and more money in new information systems and in managing legacy systems. At the same time organizations are finding it more and more difficult to keep these information systems in alignment with business need. Furthermore, the role of information systems has changed during the last two decades, from automation of routine administrative tasks to a strategic and competitive weapon. In light of this development, a new field of research and practice has emerged and came to be known as Enterprise Architecture. One of the pioneers introducing the concept of architecture was John Zachman (Zachman 1987). His Enterprise Architecture Framework (Sowa and Zachman 1992) is probably one of the most referred both by practitioners and researchers. A number of Enterprise Architecture Framework has evolved since Zachman first introduced his framework. For example the Federal Enterprise Architecture Framework (CIO Council 2001) and the Open Group Architectural Framework (TOGAF 2007) to mention two well-known Frameworks. Enterprise Architecture is usually divided into different categories or domains or architecture types. For example Aerts et al. (2004) identify three domains in which architecture matters:

- The *business architecture* defines the business system in its environment.
- The *information systems architecture* (IS architecture) details the information system components of the business and their interaction.
- *ICT platform architecture* (or *IT architecture*) is the architecture of the generic resource layer that will be used as a platform for the construction and operation of the systems for the enterprise.

Enterprise Architecture Frameworks should give guidelines for the choice of architectural principles for information systems (CIO Council 2001). Architectural principles are statements that express how your enterprise needs to design and deploy information systems across the enterprise to connect, share and structure information. Such guidelines and principles should take into account at least two crucial aspects:

- How one should delineate (differentiate) information systems.
- How the different information systems should interoperate (integrate).

Differentiation and integration in complex organizations has been discussed in management research in many decades. For example Lawrence and Lorsch (1967) state that large organizations are being expected to cope with heterogeneous environments that have both highly dynamic and quite stable sectors. This continually increases the need for differentiation in organizations yet the requirements for integration to achieve a unified effort are at least as great as ever. In this paper we discuss differentiation and integration issues in terms principles for of how information systems can be delineated and how the information systems can interoperate (Magoulas and Pessi 1998). These two kinds of principles will be discussed further in the following sections.

### 3.1 Delineation of Information Systems

In order to handle heterogeneity and complexity in IT based information processing, delineation or differentiation of systems are crucial (Magoulas and Pessi 1998). Two basic delineation principles are discussed in this paper; One principle is based on different types of information models i.e. Information driven principle. The other principle is based on responsibilities in the enterprise i.e. Responsibility driven principle.

*The Information driven principle* is applied in several different architectural frameworks and is widely used (Magoulas and Pessi 1998, Alter 1996). Allen and Boynton (1991) called it “The high road alternative”. The information driven principle focus on information as basis for delineation of systems, for example, all product data should be gathered in one system, the “Product Data System”. The core IS activities of the business are centralized and core information systems are designed to be organizationally independent – that is, immune to restructuring in business. The information driven principle has as its starting point the premise that information is a central resource that must be controlled centrally.

*The Responsibility driven principle* (Magoulas and Pessi 1998) also referred to as “The low road alternative” (Allen and Boynton 1991) is based on the principle that the responsibility for an area of operations in the enterprise should comprise all resources (including information system) used to fulfil objectives and tasks specified for this area. Each information system should therefore support only one area of responsibility, and can then be developed for efficient support to users in that area. Necessary interaction and information exchange between different areas of responsibility in the organization and with external partners must however be considered. Systems must therefore interoperate using some of the principles listed below, otherwise this alternative leads up to stand alone systems. Accordingly, every system should respond to two tasks: to support local users and to support information exchange with other information systems in the enterprise. Similar areas of responsibility can use the same type of solution, but still each instance of information system can operate (and be changed internally) independent of other systems. Independence in development, operations and change is an important issue when delineation of information systems is based on responsibilities in the enterprise. The responsibility principle stresses rather high degree of autonomy, but also co-operation between information systems, where each information system is administered by the part of the enterprise that owns and uses that system.

### **3.2 Interoperability between Information Systems**

One of the major issues in designing and developing enterprise architecture is which degree of interoperability should there be between the various business units of the enterprise and how this should be reflected in the integration of their information systems (Clark and Jones 1999). Interoperability is usually defined as “the ability of two or more systems or components to exchange and use information” (IEEE 1990). Solotruk and Kristofic (1980) discuss three alternative principles for interoperability: Unification, Intersection and Interlinking.

*Unification principle.* Unification is defined as the process of producing a common structure for two or more information systems. A unification strategy creates a unified information space. One kind of unification means that two or more integration entities are merged into one entity (one common system principle). Another kind of unification is standardization of two or more systems with regard to their inner structure, functions and content. In this case, the systems don’t merge into one physical system; rather there are many systems which are replicas of each other (replication principle). The latter situation covers physically distinct systems that conceptually are treated as one system. Unification is about the full integration into one common system or the standardization of information systems with respect to their inner structure, function and content. Unification as strategy leads to a very high intensity of interoperability or integration. Accordingly, a change in one system must necessarily lead to changes in all other systems. Very often economic and efficiency reasons are the driving force behind unification as strategy. One purpose of unification strategy may be to improve the simplicity, rationality and costs of information management. Another purpose may be to equally treat social events (e.g. pensions, insurances, memberships and so forth).

*Intersection principle.* The objective of intersection principle is to improve the availability and quality of information and the efforts of information management through the elimination of redundancies. Accordingly, the intersection principle (or overlapping) takes place when the structure of each of the participating systems has one or more elements whose properties are identical (or sufficiently similar) or one of the participating systems has elements which can be used in some of the other systems. Intersection strives to eliminate duplicates. The intersection principle creates a shared information space, which can be exemplified by a situation where the participating information systems share some of their constituent parts, i.e. the conceptual base, the information base, or the rule base. In this sense, the participating information systems can be coordinated either (1) by keeping the previously redundant part in one system and allowing the other systems to access to that part, or (2) by unifying

the redundant local parts into one shared and common part (like a common database). Thus, a shared information environment might be seen as the result of a coordinating process aiming either to eliminate the overlapping parts of the participating systems or the globalization of some of their parts. The shared parts become a common property because any kind of change in those parts may have effects on all of the participating systems. Locally, the right to alter the system is limited to unshared parts only. In this sense the effects of integration might be described in terms of expectations for better quality and availability of information services, as well as, in terms of an acceptance of a limited freedom of alteration.

*Interlinking principle* represents a different concept for systems interoperability. Interaction between different systems is carried out through the exchange of messages which are based on business demands. A significant feature of interlinking is that interoperability takes place without substantial interference with the inner structure of the participating systems and without substantial limitation of their independence. Only information exchange is federated in the interaction agreement, which means that the inner structure in each system can be specified and developed quite independent of the inner structure in all other systems in the enterprise. Each system has to produce specified messages according to interaction agreements, either as a planned task or on request, and has to handle incoming specified messages. Interlinking implies a change from access or sharing thinking to messaging. Interaction is bridged through the defined messages based on business relations. It is not a question of understanding data in other systems; it is a question of understanding what information is to be transferred between the systems. The different data structures are local and connected to the messages through mapping mechanisms, which must be developed and maintained for each system. If the inner structure in one system is changed, then the mapping mechanism may need to be changed in that particular system in order to maintain proper interaction, but there will be no change in any other system as long as the interaction agreement stands. In the long perspective interlinking creates the possibility to replace a system without any changes in interoperability, as long as the new system fulfills interaction agreement. This has a major impact in that it reduces migration problems and facilitates the sustainability of complex structures of systems

### 3.3 The extrinsic and intrinsic value of Enterprise Architecture

The impact of Enterprise Architecture on the management of IT investments can be discussed in terms of two significant dimensions that together expresses the essence of management in general and IT management in particular. The first dimension deals with the principle of stakeholders expectations i.e. “doing the right thing” and can be understood in terms of the extrinsic value of the enterprise architecture. The second dimension concerns the principle of knowhow of architecting, i.e. “doing things right”, and can be understood in terms of the intrinsic value of the enterprise architecture. In this paper we focus mainly on the intrinsic value, although below both dimensions are presented. Thus architectural excellence is the situation that both dimensions are continuously aligned in a harmonious way (Hoffman 1988). All these areas denote one and the same thing, namely, that enterprise architecture make sense, also in the context of management of IT investments.

*The extrinsic value of enterprise architecture.* The impact of the Enterprise Architecture on the management of IT investments can be demonstrated and judged in terms its extrinsic values, i.e. various forms of performance improvements. Accordingly, the management of investments in existing or future IT assets can be understood in three areas of performance (CIO Council 2001)

- Resource related performance, , i.e. savings, quality, reliability, availability etc. of IT assets in general and infrastructural assets in particular (Inputs)
- Process and activity performance, (Outputs) such as in business efficiency, business effectiveness, business attractiveness, etc. (FEAPMO 2003)
- Strategic performance (Outcomes) such as stakeholders’ satisfaction, social responsibility, ethical behaviour, social symmetry etc.

*The intrinsic value of enterprise architecture.* The impact of the Enterprise Architecture on the management of IT investments can also be demonstrated and judged in terms its intrinsic values, i.e. the architectural goodness provided by the principles of certain school of thought or certain architectural framework. For instance, the larger, heterogeneous, and dynamic the business and its environment are, the more crucial are the issues of information systems delineation and interoperability. Hence, business agility, manageable complexity and comprehensibility may be seen

as arguments for the choice of relevant architectural principles (Simon 1962), (Ackoff 1967, 1980), (Emery 1969, 1975), (Galbraith 1973,1977), (Hewitt 1986), (Sanchez 2000, 2003), (Ulrich 1980). Unfortunately, very few existing Enterprise Architecture Frameworks give clear guidance about how to architect and manage these critical issues. In the two cases below, the intrinsic value of enterprise architecture will be demonstrated with reference to four areas of architectural interest. These are:

- Responsibility for investments in Information Systems (Ross et.al. 2006)
- Time to value (Sessions 2006), (Hamilton 2003)
- Managing the coordination of IT investments (Ross et.al. 2006), (USAID 2008), (Ross 2004)
- Managing the effects of long term alignment (Hugoson et al 2008). (Aert et al. 2004), (USAID 2008)

Enterprise Architecture is an expression of an operational alignment between short terms business requirements and information systems assets that have been organized in a particular way as a response to the nature of business environment. In the same sense, Enterprise Architecture expresses a strategic alignment (or misalignment) between the business architecture, information systems architecture and IT architecture. Therefore the Enterprise Architecture Frameworks should give guidelines for how to manage short terms operational alignment and long terms strategic alignment.

#### 4. Management of IT investments - two cases

In order to demonstrate how Enterprise Architectural Principles may have impact on management of IT investments, we use two cases from Swedish industry. The first case is a Chemical Company and the second case is a Company in the Pump industry. These two cases illustrate how different architectural principles have been applied in these companies. In the section thereafter we discuss how the applied architectural principles has have impact on management of IT investments.

##### 4.1 Case 1: The Chemical Company

The first case is a Chemical Company with a Headquarter, a global Sales organization and a number of Business Units in different countries. Each Business Unit produces and delivers specified chemical products to a worldwide sales organization. As main architectural principles, the Chemical Company has chosen the information driven principle for systems delineation and a combination of unification and intersection for systems interoperability. In the company common information was analyzed and defined, and the strive was to create a central systems, where different subsystems access and update this common information. Subsystems for different tasks in the enterprise may use additional local information, but the main part was unified information, centrally defined. The company invested in an ERP system, proposed by a vendor. This ERP system had a kernel containing all central information on products, customers, sales, warehouses, deliveries, invoicing, accounting, etc. When the system was 'rolled out' into different Business Units some local information could be added.

Figure 1 shows the business processes and information systems in the company.

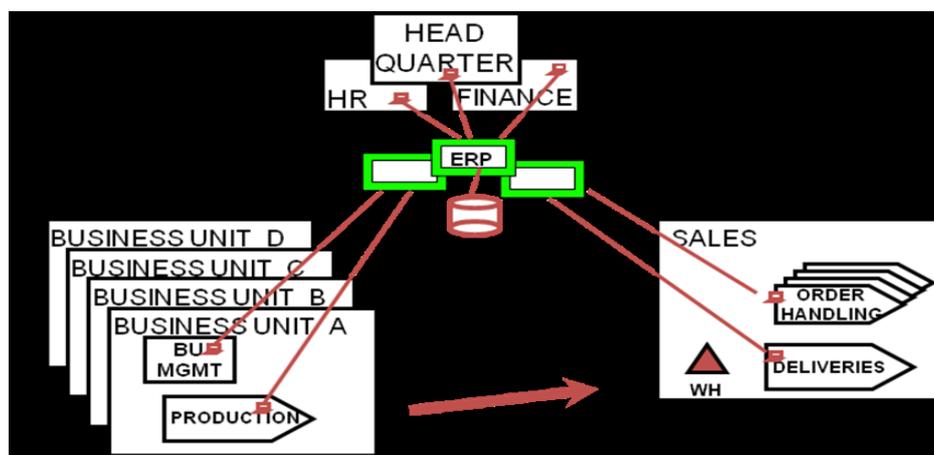


Figure 1: Business Processes and Information Systems in the Chemical Company

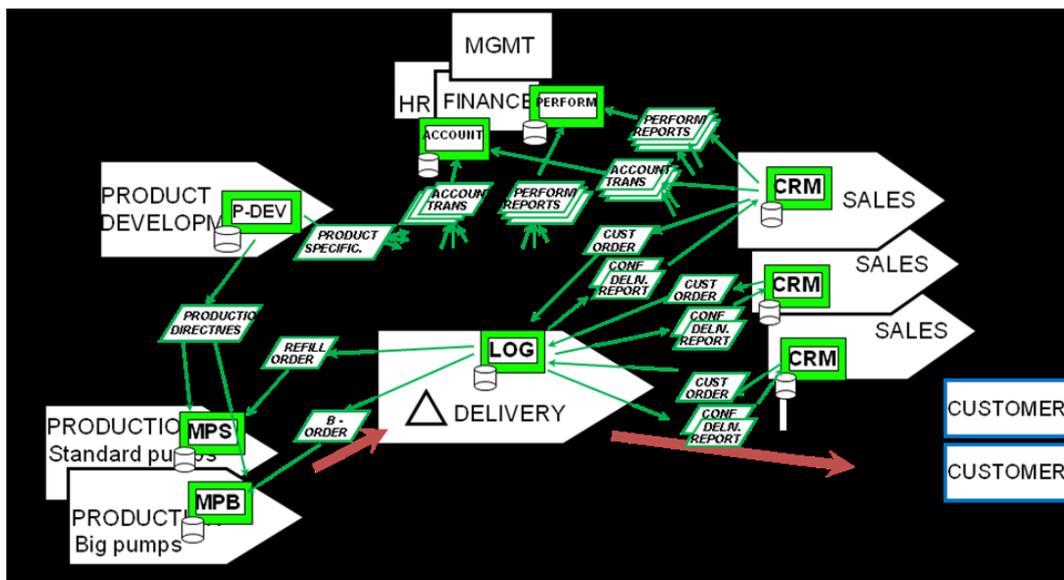
The architectural principles used in the Chemical Company lead to an IT investment that must be centrally estimated and evaluated. The development, implementation and operation of the ERP

systems must be seen as a central infrastructural cost which is handled by the IT department (even if different parts of the organization are charged using some kind of key for cost distribution)

The manager of the Swedish Business Unit proposed a local system, more adapted to the Swedish type of production and deliveries, but this was denied, even if the proposed local system was some millions SEK cheaper than the estimated distributed cost for the central system. The Managing Director for the Swedish Business Unit just stated that the central system will not be profitable in Sweden, and it will limit the possibility to make efficient use of the IT support, but the answer from the central IT manager was that the central system will give corporate benefits when implemented all over the organization. The roll out of the system was controlled by the central IT department.

## 4.2 Case 2: The Pump Company

The second case is a Swedish Pump Company with the mission to construct, produce and sell pumps on the European market. In a number of countries sales companies are established, with local responsibility for the SALES process to support customers in each country. The DELIVERY process to fulfill customer orders is centralized and handles logistics, including warehousing and transports to all customers. There are two PRODUCTION processes that are somewhat different; one produces small pumps for sales from stock, the other produces big pumps to customers' orders. Product specifications and specifications for production of all pumps are given by the central PRODUCT DEVELOPMENT process. As main architectural principles, the Pump Company chose the responsibility driven principle for systems delineation and the interlinking principle for systems interoperability. Information systems were delineated according to responsibilities for different business processes.



**Figure 2:** Business Processes and Information Systems in the Pump Company

The SALES processes were supported by a CRM system. As the SALES process can be implemented in different ways in different countries, each country can have its own instance of the CRM system. This gives freedom of action for step by step development, and for future insertion of new systems to support structural changes (new, or new type of SALES processes), without major changes in existing systems. A central information system, the LOG-system was delineated to support the central DELIVERY process. Two different systems (MPS-S and MPS-B) for material and production planning were delineated, as the two PRODUCTION processes are different. If new production plants will be established, each plant will have a separate system. Outsourcing of (part of) the production will therefore not cause changes in remaining systems. For the PRODUCT DEVELOPMENT process a certain system P-DEV was delineated. Central systems ACCOUNT and PERFORM support central management.

The information systems should interoperate through exchange of computerized messages, based on the Interlinking principle. *Customers Orders*, as a result from the SALES process are to be sent from CRM to LOG. These messages contain all information necessary for order fulfillment. *Confirmation*

and *Delivery Reports* should be sent back. LOG sends *Refill Order* to MPS –S and *B-Order* to MPS-B. The system P-DEV supplies all CRM-systems with *Product Specification* and MPS-systems with *Production Directives*. Directive information for *Accounting* and for *Performance* surveillance is to be sent to the ACCOUNT and PERFORM systems, according to specifications from central management.

In the Pump Company information systems were implemented step by step. The strategic structure of systems was used for coordination of different development projects. Standardized software packages were used and a central license contract was signed with a software house. It was centrally controlled by the Chief Administration Officer (CAO) that every proposed system interacts with other systems according to the strategic structure, but features in each system (based on the software package) were selected locally. The IT manager was responsible for the IT infrastructure, including Message Handling System to support systems interaction, and the investment for this (which represents a minor part of the total investment) was handled centrally. Managing Director in Italy was eager to start implementation of the new SALES process, and step 1 was to specify and develop a CRM system for Italy. Vendor proposed a solution with a common database for all SALES processes, but CAO just stated that he controls the structure, and as there are no common customers between different SALES processes, the system for Italy should be quite independent from other CRM systems. Each CRM system must send *Customer Orders* to the central system and receive *Confirmation* and *Delivery* messages. The CRM system must also interact with central systems for accounting and for performance control, as specified in the strategic structure. The system CRM-IT was implemented within six months, closely coordinated with changes in the Italian SALES process. The infrastructure was financed centrally, but both direct IT-investment in the CRM system and IT related investments in the SALES process were financed locally, which gave incentives for an efficient local system. Only features that have a business value were chosen in the CRM package.

On demand from the Managing Director in The Netherlands, step 2 was to specify and implement a CRM system for the Dutch SALES process. The vendor proposed an extension of the Italian system, but again the CAO gave clear directives that an independent CRM-NL should be developed. The same specification should be used for systems interaction, but the Dutch system may from the software package pick some other features, more suitable for the Dutch SALES process. The long term ability to use different versions and even install systems from other origin is to be maintained. MD in The Netherlands was responsible for investments in CRM-NL, for changes in the Dutch SALES process and for the ability to reach business value from the investments.

Gradually other CRM systems were inserted in the structure in parallel with business process development. Implementations of the P-DEV systems started early. When changes in the new DELIVERY process were specified, the system LOG was implemented in parallel with the new logistics. The two systems for the PRODUCTION processes were developed in parallel with the LOG system in order to fully replace the old system. The business value from investments in each project could be evaluated separately, and the time to value (TTV) for each IT investment was short as the implementation time for each project was rather short.

## **5. The impact of architectural principles on management of IT-investments**

The cases demonstrate that the choice of architectural principles has an impact on management of IT investments. The cases also show partly that different principles have different impact on management of IT investments. Below the most significant differences will be described.

### **5.1 Responsibility for IT investments**

The Pump Company:

- Support local business oriented responsibility for IT investments in different parts of the organization.
- Central responsibility for infrastructural investments only (IT manager).
- Implementation of ISs is done step-by-step under control of process management and coordinated by a strategic structure of information exchange.

The Chemical Company:

- IT investments are mainly centrally estimated, evaluated and decided.

- The development, implementation and operation of systems are handled by the central IT department.
- Local managers are generally not allowed to make decisions on IT-investments.

In the Pump Company the chosen delineation principle supports local, management oriented responsibility for IT investments in different parts of the organization, with a central responsibility only for infrastructural investments. In the Chemical Company almost all IT investments are seen as a central responsibility

## **5.2 Time to Value**

The Pump Company:

- The chosen architectural principles support a step by step development.
- The implementation time for each system is rather short.
- The business value from each local investment can be reached within a short period of time.

The Chemical Company:

- The chosen architectural principles implies a “Big bang” implementation.
- The impact from the investment cannot be reached until the total system is fully implemented.
- Changes in different processes after that the system is implemented may have some impact on time to value.

In the Pump Company it is shown that the chosen architectural principles support a step by step development, as the interlinking principle gives a high degree of independence between different systems. The implementation time for each system is rather short, which means that the business value from each local investment can be reached within a short period of time. In the Chemical Company the impact from the investment cannot be reached until the total system is fully implemented. There is also a risk that changes in different business processes are not completed in time, which will still more increase time from investment to value.

## **5.3 Coordination of investments in information systems and changes in business processes**

The Pump Company:

- Local managers coordinate changes in business processes with development, implementation and change of local systems.
- Coordination is driven by the ambition to “make use” of the system in the business process.
- Central management coordinates structural changes in the business architecture with respect to the information systems architecture.

The Chemical Company:

- The central responsibility of the IT-department makes it easier to coordinate and control IT-investment on a corporate level.
- Focus on efficient implementation of the information system, also covering education in how to handle the system.
- Changes (and investments) in the business processes are however not seen as part of the implementation

In the Pump Company it is shown how the local Managing Director coordinates changes in the sales process with development and implementation of the local CRM system. This is not only a question of timing; it is also a question of management of IT investments in the business process, necessary to make use of the information system. This improves the possibility to evaluate the business value and to follow the outcome in a systems lifetime perspective. The freedom of action to invest only in features that really can give business value is strengthened by the decentralized financing principle used in the company. In the Chemical Company the roll-out principle supports efficient implementation of the information system, including education in how to handle the system. Changes (and investments) in the business processes are however not seen as part of the implementation. In

addition it may be very difficult to state the outcome of corporate benefits used in central cost/benefit analysis.

#### **5.4 Long term alignment**

The Pump Company:

- When a part of the enterprise in the pump company is changed, independence between systems allows replacement of corresponding system(s) without major changes in other systems.
- Long term changes in the information systems architecture, can be carried out gradually, step by step in parallel with changes in the business architecture.

The Chemical Company:

- Changes that are IS/IT driven can be handled according to a long term plan
- But if large changes in business occur, change or replacement of systems is more oriented to a new big bang investment.

The architectural principles in the two cases show different long term perspectives. When a part of the enterprise structure in the Pump Company is changed, independence between systems allows replacement of corresponding system(s) without major changes in other systems. Changes in the information systems architecture, and in a long term perspective replacement of the architecture, can be carried out gradually, step by step in parallel with changes in the business architecture. For each step IT investments can be related to possible business value. The information systems architecture can be kept aligned with the business architecture. In the Chemical Company system replacement is more oriented to a new big bang investment.

### **6. Summary and conclusion**

The strategic role of IT and its significance throughout the organization increases complexity, variety, and the need of change. Hence IT management must deal with uncertainties and with different, conflicting and ever changing demands. In this sense Enterprise Architecture is playing an increasingly important role in improving IT management practice. Architecture matters, and therefore Enterprise Architecture Frameworks are more and more critical for the creation of attractive information environments. If large organizations do not succeed in managing architectural issues, there is a clear risk that considerable resources and efforts will be invested without achieving desirable effects. In this paper we have discussed two crucial aspects in the context of management of IT-investments: (1) the choice of principles for delineation of information systems, (2) the choice of interoperability principles. Cases from Swedish Industry have been used to demonstrate how these principles may impact the management of IT investments. Our findings indicate that the principles have an impact on at least four aspects:

- The responsibility for IT investments
- Time to value
- Coordination of investments in information systems with changes in business processes.
- Long term alignment

The study has demonstrated that the enterprise architecture makes sense because it is able to hold a strong alignment between the capabilities of information systems architecture and the ever changing demands of the business architecture. Furthermore, the capability of the enterprise architecture is grounded on the strong agreement between the enterprise architecture and with the right choice of principle of delineation, and principle of interoperation. Finally the impacts of the mentioned principles on the management of IT investments can be given in both extrinsic, respectively intrinsic terms. In the first case various kinds of performance requisites. In the second case, the intrinsic character of the enterprise architecture is given in terms of issues satisfied by the goodness of the architecture.

In summary, our thesis is based on two logical arguments, namely, (1) the enterprise architecture always agrees with the chosen architectural principles, and (2) the architectural principles have an impact on the management of IT investments. Therefore, Enterprise Architecture Frameworks should give guidelines for the choice of principles for systems delineation and interoperation. Unfortunately, existing Enterprise Architecture Frameworks give none or unclear guidance about the above issues.

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