

A Framework to Support Business-IT Alignment in Enterprise Architecture Decision Making

Niina Hämäläinen¹; Katja Liimatainen²

*¹Information Technology Research Institute, University of Jyväskylä,
niina.hamalainen@titu.jyu.fi*

*²Information Technology Research Institute, University of Jyväskylä,
katja.liimatainen@titu.jyu.fi*

Abstract

Business-IT alignment is one of the key concerns of general management and chief information officers. It is commonly recognized as an important instrument for realizing organizational effectiveness. Achieving business-IT alignment requires often change in the way managers regard IT and it demands co-operation between general and IT management. The challenge of aligning business- and IT-related concerns and requirements in architecture decision making situations is the focus of this study. As one possible solution, we present a framework of architecture decisions. This framework defines decision making aspects and business and architecture plans. Decisions are suggested to be compared against these plans at each aspect. In addition, long-term and short-term decisions at each decision making aspect are defined. This framework is meant to support creation of shared domain knowledge (especially long-term alignment) through the use of enterprise architecture plans in decision making situations. Furthermore, it can be used to support the alignment of business and IT through decision making and to assist in the evaluation of decisions. The framework was evaluated in a focus group interview by practitioners.

Keywords

Enterprise architecture, Decision making, Business-IT alignment, Framework

Acknowledgements

This paper is based on the work carried out in the AISA project (Quality Management of Enterprise and Software Architectures) and in co-operation with the FEAR-project (Finnish Enterprise Architecture Research). AISA-project is financed by the Finnish Funding Agency for Technology and Innovation (TEKES) and participating companies: OP Pohjola Bank Group, Elisa Oyj, IBM Finland, A-Ware Oy, S Group, and Tieturi. We wish to thank the participating companies for their co-operation. We also wish to thank the clients of FEAR project for funding: Ministry of Finance, BEA Systems Oy, IBM Finland Oy, Microsoft Oy, Oracle Finland Oy, SAP Finland Oy, SAS Institute Oy, SYSOPENDIGIA Oyj, and TietoEnator GMR Oy.

Introduction

Features of the current business environment are quarterly economy, organizational changes (e.g. mergers, acquisitions, structural changes, outsourcing), pressures for aligning the business and information technology (IT), cost-effectiveness, changes and improvements in technologies and practices (e.g. service-oriented architecture). The rapidly changing environment all organisations must operate creates a situation where an architecture approach such as an enterprise architecture (EA) is seen as an imperative to success (Ashmore et al., 2004). Architecture helps in achieving essential business objectives. Furthermore, a good architecture shows the relation of the architectural decisions to the business objectives of the enterprise (Lankhorst et al. 2005). EA is a hierarchical approach to aligning business and ICT (Langenberg & Wegmann, 2004). Business-IT alignment is commonly recognized as an important instrument for realizing organizational effectiveness (Lankhorst et al. 2005).

The need to make good decisions is a perpetual issue for all organizations. Management decision makers are especially concerned at profitability, growth, and increasing the market share. They participate in the strategy process and in defining the values of the company. Taking the management viewpoint affects the decisions and choices that the managers make. On the other hand, IT governance and development personnel are concerned about quality (e.g. security, performance), agility, cost-effectiveness and avoiding or reducing complexity in IT environments. Currently, company and business managers make also decisions relating IT governance and development. This means that the value of IT decisions or decision proposals must be demonstrated from the business perspective. However, especially far-sighted, long-term architectural decisions maybe difficult to justify in the quarterly minded business environment. This has led into decisions that are good from the management point of view but at the same time they, for example, might increase the complexity and costs of IT environment in the long-term. Because of that, fragmentation and silo-based solutions in IT environment may be increased. It is not explicit how to align business- and IT-related concerns and aims in decision making situations. Our paper studies this question from the viewpoint of architecture decision making.

This paper considers the problem of aligning business- and IT-related concerns and requirements in architecture decision making. As one possible solution, we present a framework of architecture decisions. This framework defines decision making aspects. Decisions are suggested to be compared against business and architecture plans at each aspect. In addition, long-term and short-term decisions at each decision making aspect are defined. This framework is meant to support creation of shared domain knowledge (especially long-term alignment) through the use of enterprise architecture plans in decision making situations. Furthermore, it can be used to support the alignment of business and IT through decision making and to assist in the evaluation of decisions. The framework was evaluated in a focus group interview by practitioners.

This article is organized as follows. In the second chapter, concepts related to business-IT alignment, enterprise architecture and decision making are described. The third chapter explains the research method. The fourth chapter presents the framework for architecture decisions and reports the empirical evaluation of the framework. The last chapter summarises and discusses the results.

Previous Research

There are several areas of research that are related to our work. We do a short overview of the key literature in the areas of business-IT alignment, enterprise architecture and decision making. We also describe the use of architecture plans in decision making situations.

Business-IT alignment

Business-IT alignment has consistently been reported as one of the key concerns of general management and chief information officers (see for example Reich & Benbasat, 2000). There is also some evidence that Business-IT alignment has beneficial effects (Henderson & Venkatraman, 1993, Reich & Benbasat, 1996, Chan et al., 1997, Avison et al., 2004, Gregor et al., 2007) and it is commonly recognized as an important instrument for realizing organizational effectiveness (Lankhorst et al. 2005). Although, business-IT alignment is a desired and beneficial state it is not always achieved, since it often entails a radical change in the way general managers regard IT (Henderson & Venkatraman, 1993). Alignment requires an intense communication process whereby organizations strategic goals and IT goals are shared with organizational members (Reich & Benbasat, 2000). This requires co-operation between the business and the IT department and it is uppermost important to consider the business and IT objectives together (Avison et al., 2004).

Alignment allows organizations to apply information systems and information technology to the business delivery tasks and operational activities (Gregor, Hart & Martin, 2007). Reich and Benbasat (1996) define alignment as: *"the degree to which the IT mission, objectives, and plans support and are supported by the business mission, objectives, and plans"*. Aligning the relationships between the business and IT infrastructure makes it possible to take advantage of IT opportunities and capabilities. Alignment can be beneficial at least in three ways: maximises return on IT investment, helps to achieve competitive advantage through IS, and provides direction and flexibility in reaction to new opportunities (Avison et al., 2004).

We use the alignment model of Reich and Benbasat (1996, 2000) as a basis for our study. They distinguish intellectual and social dimension of alignment. We focus on the latter. According to Reich and Benbasat (1996) social dimension of business-IT alignment is: *"The state in which business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans"*. They identify two aspects of social alignment: short-term and long-term. Short-term alignment refers to shared understanding of short-term goals and long-term alignment is having a shared understanding of IT vision. Reich and Benbasat (2000) state that the shared domain knowledge between business and IT management influences long-term alignment. They define shared domain knowledge as: *"The ability of IT and business executives, at a deep level, to understand and be able to participate in the others' key processes and to respect each other's unique contribution and challenges"* We suggest that using enterprise architecture plans in decision making situations is one method that can support the development of shared domain knowledge within an organization.

Organization's enterprise architecture can enable the alignment of business strategy and information technology (Gregor, Hart & Martin, 2007). For example, EA can help alignment by drawing viewpoints of general and IT management together under a common

organizational framework. This integrates the two managerial viewpoints and makes them more visible. EA can also be used to define and describe the current and future state of the organization's business and IT. (Gregor et al., 2007) Next we examine the concept enterprise architecture in a more detailed manner.

Enterprise architecture

Enterprise architecture capabilities are typically developed to be used as an instrument in managing an organization's daily operations and future development (Lankhorst et al., 2005). Enterprise architecting is seen as "*a planning, governance, and innovation function that enables an organization to progress toward its vision of its future state*" (Leganza, 2007). Usually enterprise architecture deliverables are closely aligned to the strategic enterprise plan of the organization (Subramanian et al., 2006). Enterprise architecture is an adopted means for coping with companies' ever-increasing complexity and for ensuring that companies appropriately use and optimize their technical resources (Shah & Kourdi, 2007).

Definition for EA is presented by Lankhorst et al. (2005, 3): "*enterprise architecture is a coherent whole of principles, methods and models that are used in the design and realisation of an enterprise's organisational structure, business processes, information systems, and infrastructure.*" An enterprise architecture explains how all the information technology elements in an organization – systems, processes, organizations', and people – work together as a whole (Morganwalp & Sage, 2004). EA commonly has four viewpoints: business architecture, information architecture, application architecture and technology architecture. These viewpoints are promoted in many widely used frameworks such as E2AF (2005) FEA (2002), and TOGAF (2003). Implementation of an enterprise architecture offers, for example, a way forward in integrating independent ICT silos across inter-organizational units.

Enterprise architecture management is a continuous and iterative process identifying company's business strategy needs and controlling and improving the existing and planned IT support for an organization (Ernst et al., 2006). The enterprise architecture work not only thus considers the information technology (IT) of the enterprise, but also business processes, business goals, strategies, etc. are considered in order to build a holistic and integrated view on the enterprise (Ernst et al., 2006). Thus EA management is the discipline of managing the whole enterprise architecture and the artifacts building the enterprise architecture.

Organisations' drivers for and expectations of benefits of an enterprise architecture vary. Both business- and IT-related benefits are expected to be achieved. In addition, the expected benefits are different depending on viewpoint. For example, the benefits expected by general management and IT governance management (e.g. CIO) vary. IFEAD (2005) has investigated why enterprise architecture is important for companies. Expected benefits of EA approach are that EA delivers insight and overview of business and IT, it is helpful in mergers and acquisitions. EA supports out-/insourcing and systems development as well as manages IT portfolio and delivers roadmaps for change. In addition, EA is expected to assist in decision making, managing complexity, and in business, as well as, IT budget prioritization. More precisely, business-related benefits are, among others (Shah & Kourdi, 2007):

- reduction in impact of staff turnover: capture knowledge from employees and consultants and provide business solutions from third party organizations consistently so they can conform to the current models,

– First published in the proceedings of the EBRF 2007 conference "Research Forum to Understand Business in Knowledge Society", September 25-27, Jyväskylä, Finland –

- faster adaptability: facilitate knowledge acquisition necessary for changing systems and adopting new components,
- operating procedures improvement: understand and model business processes, review and reengineer processes,
- decision making: represent enterprise layers and components modularly to let the organization make business decisions in the context of a whole instead of a stand-alone part.

IT-related benefits are among others (Shah & Kourdi, 2007):

- complexity management: facilitate the scoping and coordination of programs and information systems projects, manage complexity and describe the interdependencies in a usable manner,
- technical resource oversight: identify and remove redundancy,
- knowledge management: manage and share knowledge modularly so it can be visualized across different levels
- IT visibility: IT resources and systems are more aligned to business strategies and are better placed for responsiveness.

Decision making

A large amount of literature and studies exist on decision making practices and processes (e.g. Drucker et al, 2001, Welch, 2001, Gray, 2006, Bhushan & Rai, 2004, Cook et al., 2007, Qudrat-Ullah et al., 2007, and Shapira, 2002). In addition, there are some scientific journals in the field of decision making such as 'Journal of behavioral decision making', 'Judgement and decision making' and 'Information Sciences for Decision Making'.

Commonly, decision making seems to be understood as a cognitive process leading to the selection of a course of action among variations. Every decision making process produces a final choice, which can be action or an opinion. Decision making consists of a group of phases. A general model of basic phases of decision making is presented in the next figure.

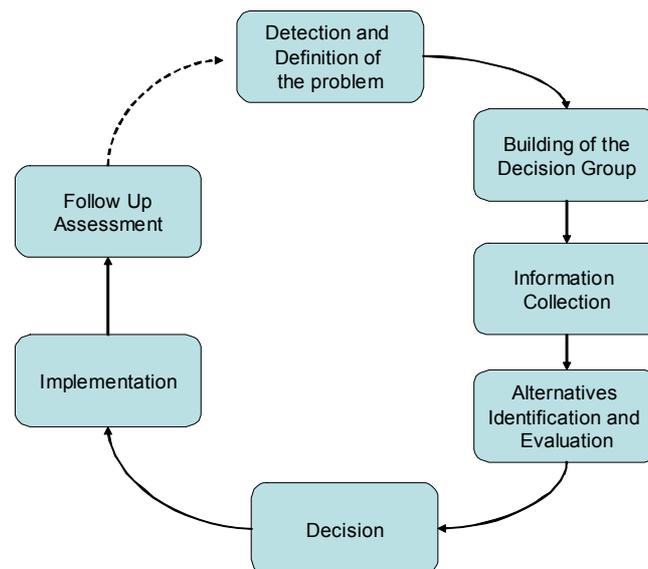


Figure 1. A general decision process model (Power, 2002).

Decision making processes and practices in companies relate among others to the strategic management, portfolio management (e.g. IT project portfolio and application portfolio management), and project management.

Decision making challenges relate especially to information based on which decisions are made and process of decision making. The essential challenges are (Ullman, 2006):

- The information may be uncertain.
- There exist different interpretations of the information that exist and different things are important.
- There exist no a good decision making strategy and it is not clear what to do next reach a decision.
- In addition, the risks associated with each alternative are not understood.
- In addition, it must manage alternative and criteria evolution and it must get buy-in on any decision it is made.

Decision making is especially a reasoning process which can be rational or irrational, can be based on explicit assumptions or tacit assumptions. Architecture descriptions and plans and information included in them can be used in reasoning. The focus of this study is the use of architecture plans in the following decision making phases: detection and definition of the problem, information collection and alternatives identification and evaluation (see Figure 1).

Architectures plans and decision making in organisations

Literature and guidelines have been published relating architecture decisions (e.g. Clements, 1995, Jansen & Bosch, 2005) and decision making (e.g. Asundi et al. 2001, Cullen & Hoppermann, 2006, Johnson et al., 2004, Linstone, 1999, Meszaros, 1995, Pulkkinen, 2006, and Jansen & Bosch, 2005). Some studies have also tackled how to relate architecture planning to companies' other decision making processes (Ekstedt, 2004 and Johnson et al., 2004).

Plans can be used to support decision making. Decisions can be made about these and/or these can be source information for the decision making. Decision making can be about the selection of a plan. Executing a plan usually requires many actions, but may not require any new decisions (Krantz & Kunreuther, 2007). Sometimes, a plan leaves open a choice of subplans at some critical juncture, and in that case, there is an additional decision that has to be made (Krantz & Kunreuther, 2007).

Architecture descriptions and plans that are produced and used to support the decision making are e.g. baseline architecture descriptions, target architecture plans, architectural roadmaps, transition plans, architecture vision and system architecture plans. The baseline architecture encompasses the different layers and existing enterprise components (Shah & Kourdi, 2007). This description serves as a starting point for identifying relationships between different components as well as gaps that should be filled to improve organizational performance (Shah & Kourdi, 2007). The target architecture plan specifies the new enterprise architecture components and strategic initiatives that should perform to bridge the existing gaps and ensure the competitive advantage (Shah & Kourdi, 2007). Architectural roadmaps represents the baseline architecture's intermediary alternatives while mitigating the risks and analyzing existing gaps during the shift to the target architecture (Shah & Kourdi, 2007). Roadmaps

highlight the architectural milestones performed prior to reaching the target architecture (Shah & Kourdi, 2007). Transition plans document the activities undertaken during the shift from the baseline to the target architecture (Shah & Kourdi, 2007). These are specifications of the baseline (as-is) and target (to-be) architecture views in terms of managing the architectural transition’s feasibility. Such plans could include risk assessment, gap analysis, and resources supporting transition. Architecture principles are goals, constraints and guidelines for any information system developed in an organization (Subramanian et al., 2006). Architecture vision describes the ideal or the desired state of the organization. Information system/software architecture plans describe structures of an information system.

Next we apply the literature in construction of a framework to support business-IT alignment in enterprise architecture decision making. Avison et al. (2004) have done a somewhat similar study. They applied their strategic alignment model to an EA framework. In comparison to our study, their framework is aimed at investigating and interrelating different strategies of general and information management. Our framework concentrates more on the decision making situations where enterprise architecture plans are used.

Research Method

Aim of this research was to develop a framework 1) to support creation of shared domain knowledge (especially long-term alignment) through the use of enterprise architecture plans in decision making situations, 2) to help the alignment of business and IT related concerns and requirements in decision making, and 3) to support the evaluation of decisions suitability for the plans and requirements of business and IT.

In the development of the framework, the following research phases were carried out:

- 1) Gathering information about decision making, business-IT alignment and enterprise architecture planning.
- 2) Construction of the framework based on the literature.
- 3) Evaluation of the framework in a focus group interview.
- 4) Development of the framework based on results of the focus group interview.

The companies and interviewees are described in the table 1.

<i>Companies</i>	<i>Number of personnel (year 2005)</i>	<i>Number of interviewees</i>	<i>Viewpoints of interviewees</i>
Banking, finance and insurance company	11 974	2	enterprise architecture
Telecommunication company	4989	1	enterprise architecture
Business & IT consulting and development organization	a part of a large international company with 329 373 employees in total	2	enterprise architecture, software architecture

Table 1. Interviewees in the focus group interview.

Interviewees in the focus group were practitioners from three different companies. They were managers and specialists of the management of enterprise and software architectures in their organizations. The participants were interviewed as one group in order for group members to influence each other by responding to ideas and comments of others (Krueger & Casey, 2000). The use of group interview did have an impact, bringing out new aspects. However, it is possible that the interviewees did not discuss some aspects due to confidentiality reasons. The interview was tape-recorded and notes were written during the interview session. Based on the data, the framework was improved. This framework is presented in the next chapter.

A Framework for Architecture Decisions

In this chapter, we present a framework of architecture decisions. This framework consists of decision making aspects and plans/information. Decisions are suggested to be compared and evaluated against business- and IT-related information and plans. These are introduced in Table 2. The chosen decision making aspects are identified to be relevant from enterprise architecture planning point of view.

Decision Making Aspects	Plans / information against to which decisions to be made on this aspect are suggested to be compared
EA Planning: <ul style="list-style-type: none"> • Target architecture and transition plan development • Architecture visioning • Road mapping • Development of architecture principles 	<ul style="list-style-type: none"> - Company strategy - Business environment changes - Business trends and forecasts - ...
Portfolio planning: <ul style="list-style-type: none"> • Project portfolio • Application portfolio 	<ul style="list-style-type: none"> - Business plans, drivers and needs - Long-term enterprise architecture plans: target architecture plans, road maps, transition plans, architecture vision - ...
Project / solution design	<ul style="list-style-type: none"> - Business requirements for the project - Architecture principles and guidelines defined for any information system developed in the organization (e.g. Goals, constraints, and guidelines) - (Long-term architecture plans) - ...

Table 2. Decision making aspects relevant from architecture planning point of view.

Table 3 presents the framework developed for architecture decisions. In addition this framework describes the difference between long- and short- term architecture decisions.

Traditionally, long- and short-term architecture decisions have been frequently used concepts by practitioners in architecture planning (especially by IT governance and system developers).

Decision Making Aspects	Short-term architecture decision	Long-term architecture decision
EA planning	Suitable for <u>near-term</u> strategy, near-term business environment change and near-term business trends and forecasts	Suitable for <u>long-term</u> strategy, business environment change and business trends and forecasts
Portfolio planning	Suitable for current business plans, drivers and needs BUT <u>Does not support</u> long-term enterprise architecture plans	Suitable for current business plans, drivers and needs AND Supports long-term enterprise architecture plans
Project – solution design	Suitable for the defined business requirements for project BUT - <u>Non-compliant</u> with architecture principles and - Does not support and realize the long-term enterprise architecture plans.	Suitable for defined business requirements for project AND - Compliant with architecture principles and - Supports and realize long-term enterprise architecture plans.

Table 3. A framework for architecture decisions.

The framework was evaluated by practitioners from a group of companies in a focus group interview. The framework was developed based on comments. Examples of comments and observations are presented in the following.

The decision making aspects were accepted by practitioners. These aspects were thus seen as a suitable approach from practice point of view. In addition, it was seen that short- and long-term architecture decision may be a good decision. For example, a comment was presented in the focus group interview: “*Sometimes a short-term decision may be needed to be done when there is no time to define and plan a long-term decision.*” In addition, in some cases, it may not be clearly known which of decisions are long-term and which short-term. For example, information related to business environment change may be uncertain. Uncertainty of information, against to which decisions are evaluated, affects to the reliability of evaluation results. Therefore, the decision that is expected to be long-term may turn out short-term decision and vice versa. As an interviewee stated: “*Future shows if the decision is long- or*

short-term." Sometimes it may be needed to make an exception to the accepted architecture plans and principles. These exceptions should be recognized and explained. Several needs for making exceptions, for example to architecture principles, may be a sign of a need to change architecture principles.

Practitioners were also asked to mention examples of short- and long-term decisions. An example of short-term decision is the choice of other technology than it is regarded as a long-term technology choice. Reasons for this may be a lack of resources or skills for the long-term technology and immaturity of long-term technology. Another example is the use of point-to-point solution in integration solutions when longer-term integration technology solution is not wanted or is not able to be introduced yet. In addition, as a short-term decision from the architecture point of view is seen the focusing projects only serving business needs heedless of what kind architecture these projects build. Projects developed thus new services and products without looking after whole architecture they build. Long-term decisions are for example technology infrastructure projects that focus on the building the basis infrastructure according to the enterprise architecture plans and consolidation projects.

Conclusions

This study focuses on how to carry out and improve business-IT alignment using enterprise architecture plans in decision making situations. In addition, this study aims to increase the understanding of short- and long- term decisions as well as the difference between them. Our framework for architecture decisions supports the creation of shared domain knowledge. This comes through the use of enterprise architecture plans in decision making situations. Communication between general and IT management in decision making situations increases the level of understanding about others' viewpoint and work processes. Enterprise architecture advances the creation of shared domain knowledge by giving general and IT managers a common language and tools for co-operation. Use of the framework for architecture decisions increases particularly long-term alignment between business and IT.

This study contributes both to the practice and research. The results of this study help to understand and align the requirements and objectives of the business and IT in decision making. In addition, this study increases the understanding of long- and short-term architecture decisions as well as the difference between them. From practitioners' point of view, the developed framework is suggested to be applied in the enterprise architecture decision making and especially to support the communication between general and IT management. This study contributes to the research on enterprise architecture decision making. Especially, results of this study focus on how to carry out and improve business-IT alignment in the enterprise architecture –related decision making. Research on this area is lacking.

There are some limitations in our study. The focus group interview was done from the viewpoint of enterprise and software architects. It would be beneficial to have another focus group where the participants would be business and IT decision makers. This would give more knowledge about decision making from the architecture plans' users viewpoint. After this the framework should be evaluated and developed further if necessary. There is a need for empirical studies on how organizations use enterprise architecture plans in decision making.

Based on the results, we suggest that both business- and IT-related concerns should be taken better into account in decision making, although, these concerns may be conflicting. Architecture plans are suggested to be used to support communication between general and IT management in decision making situations.

References

- Ashmore, P., Henson, J., Chancellor, J. & Nelson, M. 2004. Is Your Enterprise Architecture All It Can Be? Lessons From the Front-Line. Business Process Trends, May 2004.
- Asundi, J., Kazman, R. & Klein, M. 2001. Using Economic Considerations to Choose Among Architecture Design Alternatives. The Software Engineering Institute, Carnegie Mellon University, Technical Report CMU/SEI-2001-TR-035.
- Avison, D., Jones, J., Powell, P. & Wilson, D. 2004. Using and validating the strategic alignment model. The Journal of Strategic Information Systems, Vol. 13, No. 3, 223-246.
- Bhushan, N. & Rai, K. 2004. Strategic decision making: Applying the analytic hierarchy process. Springer.
- Chan, Y.E., Huff, S. L. Barclay, D.W. & Copeland, D.G. 1997. Business strategic orientation, information systems strategic orientation, strategic alignment. Information Systems Research, Vol. 8, No. 2, 125-150.
- Clements, P.C. 1995. Understanding Architectural Influences and Decisions in Large-System Projects. Presented at First International Workshop on Architectures for Software Systems, Seattle.
- Cook, M., Noyes, J. & Masakowski, Y. 2007. Decision-making in complex environments. Ashgate Publishing.
- Cullen, A. & Hoppermann, J. 2006. Requirements For Long-Term Architecture. Forrester Research.
- Drucker, P.F., Hammond, J., Keeney, R., Raiffa, H. & Hayashi, A.M. 2001. Harvard Business Review on Decision Making. HBS Press Book.
- E2AF. 2005. Extended EnterpriseArchitecture Framework (E2AF). Institute For Enterprise Architecture Developments (IFEAD). Version 1.4, <<http://www.enterprise-architecture.info/Images/E2AF/E2AF%20A0%20New%20Poster%2003-2005%20version%201.4.pdf>>, 20.2.2007.
- Ekstedt, M. 2004. Enterprise Architecture for IT Management. A CIO Decision Making Perspective on the Electric Power Industry. In Industrial Information and Control Systems. Stockholm: KTH, Royal Institute of Technology.
- Ernst, A.M., Lankes, J., Schweda, C.M. & Wittenburg, A. 2006. Tool support for enterprise architecture management - strengths and weaknesses. Proceedings of the 10th IEEE Enterprise Distributed Object Computing Conference (EDOC'06).
- FEA. 2002. Federal Enterprise Architecture (FEA). Office of Management and Budget (OMB), <<http://www.whitehouse.gov/omb/egov/a-1-fea.html>>, 20.2.2007.
- Gray, P. 2006. Manager's Guide to Making Decisions about Information Systems. John Wiley & Sons, Inc.

- Gregor, S., Hart, D. & Martin, N. 2007. Enterprise architectures: enablers of business strategy and IS/IT alignment in government, *Information Technology & People*, Vol. 20, No. 2, 96-120.
- Henderson, J.C. & Venkatraman, N. 1993. Strategic alignment: leveraging information technology for transforming organizations. *IBM Systems Journal*, Vol. 32, No. 1, 472-484.
- Jansen, A. & Bosch, J. 2005. Software Architecture as a Set of Architectural Design Decisions. *Proceedings of the 5th Working IEEE/IFIP Conference on Software Architecture, WICSA 2005*.
- IFEAD, 2005. Trends in Enterprise Architecture 2005 - How are Organizations Progressing? Web-form Based Survey 2005.
- Johnson, P., Ekstedt M., Silva E. & Plazaola L. 2004. Using Enterprise Architecture for CIO Decision Making: On the Importance of Theory. In *Proceedings of the 2nd Annual Conference on the Systems Engineering Research (CSER)*.
- Krantz D. & Kunreuther, H. 2007. Goals and plans in decision making, *Judgment and Decision Making*, Vol. 2, No 3, 137-168.
- Krueger, R.A. & Casey, M.A. 2000. Focus groups. A practical guide for applied research (3rd Edition ed.). Sage Publications, Inc.
- Langenberg, K. & Wegmann, A. 2004. Enterprise Architecture: What Aspects is Current Research Targeting? EPFL Technical Report IC/2004/77, <http://ic2.epfl.ch/publications/documents/IC_TECH_REPORT_200477.pdf>, 2.4.2007.
- Lankhorst, M. et al. 2005. Enterprise Architecture at Work –Modeling, Communication, and Analysis. Berlin Heidelberg, Springer-Verlag.
- Leganza, G. 2007. Topic overview: Enterprise architecture. Forrester Research.
- Linstone, H.A. 1999. Decision Making for Technology Executives: Using Multiple Perspectives to Improve Performance. Artech House, Incorporated.
- Meszaros, G. 1995. Patterns for Decision Making in Architectural Design: Workshop Summary. Presented at Conference on Object Oriented Programming Systems Languages and Applications, Austin, Texas, United States.
- Morganwalp, J.M. & Sage, A.P. 2004. Enterprise Architecture Measures of Effectiveness. *International Journal of Technology, Policy and Management*, Vol. 4, No. 1, 81-94.
- Power, D.J. 2002. Decision support systems: Concepts and resources for managers. Quorum Books.
- Pulkkinen, M. 2006. Systemic Management of Architectural Decisions in Enterprise Architecture Planning. Four Dimensions and Three Abstraction Levels. In *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS '06)*. Kauai, Hawaii: IEEE Computer Society.
- Quadrat-Ullah, H., Spector, J.M., & Davidsen, P.I. 2007. Complex decision making: Theory and practice. Springer.
- Reich, B.H. & Benbasat, I. 1996, Measuring the linkage between business and information technology objectives, *MIS Quarterly*, Vol. 20, No.1, 55-81.
- Reich, B.H. & Benbasat, I. 2000, Factors that influence the social dimension of alignment between business and information technology objectives, *MIS Quarterly*, Vol. 24 No.1, 81-113.
- Shah, H. & Kourdi, M.E. 2007. Frameworks for enterprise architecture. *IT Pro*, September / October 2007, 36-41.
- Shapira, Z. 2002. Organizational decision making. Cambridge University Press.

– First published in the proceedings of the EBRF 2007 conference "Research Forum to Understand Business in Knowledge Society", September 25-27, Jyväskylä, Finland –

- Subramanian, N., Chung, L. & Song, Y-T. 2006. An nfr-based framework for establishing traceability between enterprise architectures and system architectures. Proceedings of the The Seventh ACIS International Conference on Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing (SNPD'06).
- TOGAF. 2003. The Open Group Architecture Framework. Version 8.1, Enterprise Edition, <<http://www.opengroup.org/togaf>>, 20.2.2007.
- Ullman, D.G. 2006. Making Robust Decisions: Decision Management For Technical, Business, & Service Teams. Trafford Publishing.
- Welch, D.A. 2001. Decisions, Decisions: The Art of Effective Decision Making. Prometheus Books.