

A BALANCED SCORECARD APPROACH TO MEASURE THE VALUE OF ENTERPRISE ARCHITECTURE

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Abstract

The value returned by Enterprise Architecture (EA) is increasingly under consideration by researchers and practitioners. They struggle to justify the EA investments made. Quantifying the Enterprise Architecture benefits has always been a challenge because measurements and real value delivered can not often be expressed in simple technical oriented metrics only.

In this paper we suggest a multi-perspective framework, based on the concept of Balanced Scorecard (BSC), for providing guidance about where to identify and quantify the value of EA from the perspective of management. A derived methodology is used to localize a few selected Key Performance Indicators (KPI's) for measuring the benefits of Enterprise Architecture that help practitioners to design and implement the suggested framework.

Keywords: Balanced Scorecard, Value, Enterprise Architecture, Framework, Governance, IT Architecture, Key Performance Indicators, Measurement Categories.

1 INTRODUCTION

The strategic importance of Enterprise Architecture (EA) is recognised by an increasing numbers of global companies around the world (Durst & Daum, 2007; Ross et al., 2006). Investments in Enterprise Architecture programmes foster the expectation of realising benefits from EA. But how can Enterprise Architecture help to improve the economic performance of the company?

Some of the challenges of today's enterprises are to make the right decisions regarding the companies' structure to achieve agility and performance (Vokurka & Flidner, 1998). EA plays an important role as an enabler to develop an appropriate structure. For an increasing number of companies, Enterprise Architecture is a mean to align corporate structures with their long term business strategies. But due to a rapidly changing environment both corporate structures and Enterprise Architecture have to evolve synchronized to support the implementation of the long term strategies. Therefore the challenge is to develop metrics suitable to govern the Enterprise Architecture effectively.

The objective of this research is to develop a framework and methodology that helps measuring and managing EA as a long term sustainable asset for the enterprise. For this purpose, architecture is understood in a resource-based view (RBV) (Prahalad & Hamel, 1990) as a strategic resource for comparative advantage that enables better management of enterprise's resources. The contribution is to develop a BSC based framework for providing a structure to allocate metrics for analysing the value of Enterprise Architecture in a holistic view. The derived and applied method to identify a few samples of KPI's is based on the Goal Question Metric (GQM) approach (van Solingen & Berghout, 1999). Both framework and method are part of a research project developing an Enterprise Architecture Governance methodology. The research methodology applied is design science research.

The main research question being addressed in this contribution is: How can the value of Enterprise Architecture be measured? To operationalise this goal the following questions are examined: (1) How

to design a holistic framework to allocate metrics for EA governance and (2) how to identify KPI's for measurement?

The paper is organized as follows. After presenting the conceptual foundations of EA and the underlying imperatives for EA governance in section 2, a short analysis of related work is provided in section 3. In section 4 the construction of a method for EA governance is discussed with first results regarding the measurement of the value of Enterprise Architecture (EA). The final section sums up the findings, reflects them regarding the research methodology and gives an outlook over the work remaining.

2 CONCEPTUAL FOUNDATIONS

The objective of this paper is to provide a framework and method that helps to measure the benefits of EA. In the following we first clarify the theoretical foundations of the framework.

2.1 Enterprise Architecture

The broad range of Enterprise Architecture definitions provided in EA literature shows both that the EA discipline is still in an early stage and that it has emerged mainly from business and IT perspectives (Winter & Fischer, 2006). Enterprise Architecture is the organizing logic for a firm's IT infrastructure and business process capabilities to address the firm's need for business process integration and standardization (Ross et al., 2006; Jonkers et al., 2006). In conjunction with IT architecture, EA is only the high-level logic for business processes and IT capabilities (Ross et al., 2006; Winter & Fischer, 2006). Based on a hierarchical, multi-level systems theory approach Winter and Fischer (2006) decompose EA into five architectural layers: Business architecture (goal systems, markets, products etc.), process architecture (e.g. processes and organizational structure), integration architecture (business view of information system structures), software architecture (e.g. software components and data structures), and infrastructure architecture (technologies and platforms used etc.). Whereas every single architecture can be decomposed to detailed views relevant for the stakeholders corresponding to the layers (e.g. detailed process structures for business, detailed application architectures for architects, detailed software architectures and data flows for developers), the Enterprise Architecture focuses on the aggregated artefacts and their relationships across all layers (Winter & Fischer, 2006). Because of these relationships EA can address business driven questions across these layers, e.g.: Which company products and services are affected if an application is outsourced? Which processes are affected if a system platform fails? Therefore Enterprise Architecture addresses strategic business issues and diminishes the gap between business and IT perspectives. EA often comprises principles, policies, and technology choices (Ross et al., 2006) which help to provide input and direction for the strategic planning process for the company. The main contributions of EA can be classified in five benefits (Ross et al., 2006):

- (1) Reducing IT costs by consolidating, standardizing and integrating corporate information systems.
- (2) Increase IT responsiveness by reusing mature components.
- (3) Reducing risk and fulfil regulation requirements by cleaning up existing information systems.
- (4) Increase value delivery by enhancing managerial satisfaction and helping decision making.
- (5) Enable strategic business goals via better operational excellence, more customer intimacy, greater product leadership or more strategic agility.

All these benefits can be realized by implementing an Enterprise Architecture programme. But analogous to the management of IT architectures (Hafner et al., 2004) the EA structure only is not sufficient to reach architectural goals in the long run. Governance principles are required to control architectural evolution and implementation.

2.2 Governance of Enterprise Architecture

Enterprise Architecture being directed to different stakeholders on different layers requires a strong governance to address the challenges of communicating the EA artefacts in a suitable way and integrating the different views consistently. In comparison with IT governance, EA governance encompasses decisions outside corporate IT as well. The alignment of business and IT perspectives is essential (Ross et al., 2006; Weill & Ross, 2004; Weill et al., 2002), requiring EA governance principles to be high-level coordination mechanisms. They ensure that Enterprise Architecture is aligned with corporate strategy, creates value by supporting the decision-making planning process, standardizes and integrates existing systems, establishes a business continuity management, supports the allocation of strategic resources effectively and therefore contributes to performance and efficiency in general. As a consequence assessing and communicating the value of resources allocated is one of the key issues of EA governance.

2.3 Enterprise Architecture as a source of sustainable advantages

The resource-based view (RBV) of the enterprise argues that firm-specific resources are determinants of competitive advantage and performance (Prahalad & Hamel, 1990). In order to gain a sustainable competitive advantage a firm has to determine which resources are valuable, imperfectly mobile and inimitable. As mentioned above, EA governance allocates and coordinates the use of IT resources in the context of enterprise. The strategic value of IT evolves as companies mature their Enterprise Architecture (Ross et al., 2006). For this reason, EA itself can be viewed as an asset and therefore be a source of competitive advantage. In detail, the mediation of IT resource is mainly a task for IT architecture which steers the application portfolio. This resource allocation can gain and maintain sustainable competitive advantages.

To measure the return on strategic allocation of IT resources we will use the RBV to identify KPI's to reap rewards from Enterprise Architecture.

3 RELATED WORK

An extensive literature review was done to identify existing approaches for measuring the value proposition of EA. Existing Enterprise Architecture frameworks, e.g. such as the Zachman Framework (Sowa & Zachmann, 1992; Zachman, 1987), the Open Group Architecture Framework (TOGAF) (The Open Group, 2003), the Federal Enterprise Architecture Framework (FEAF) (C.I.O. Council, 1999), the Systemic Enterprise Architecture Methodology (SEAM) (Wegmann, 2002) or the Enterprise Architecture Score Card (Schekkerman, 2004) do not offer a holistic governance framework with an integrative measurement methodology specific enough. Due to space limitations an extensive table with the literature compared cannot be provided but is available by the authors on demand.

The review of the related work shows that in both research and practice there still is a gap between the vision and the implementation of measurement techniques detailed enough to be usable.

4 TOWARDS A METHOD

The relevance of the intended methodology is obvious: Measurements techniques detailed enough to be useful enough do not exist yet. Only few companies are setting up the structures of an Enterprise Architecture and are in the beginnings of defining suitable management processes—including governance structures and according metrics. Therefore empirical approaches are not suitable to define a general metric. As a consequence a methodology is proposed to construct appropriate metrics for usage in Enterprise Architecture governance. A suitable research process has e.g. been proposed by (Rossi & Sein, 2003): (a) Identify a need, (b) build a methodology with respect to good design

research principles, usage of available good practices and the definition of measures of success. (c) Evaluate the methodology and (d) learn and theorize.

The first step was done with the literature review as sketched above. In the second step the design of the methodology has to reflect existing practice, design research principles (Niehaves et al., 2004), and the definition of measures of success. Existing practice is gathered in several steps: Focus groups with experienced enterprise architects of major companies are set up to unveil current practice in Enterprise Architecture measurement. As measurement can focus on different layers or across all layers all practices have to be analysed. Series of expert interviews as well as surveys are conducted in this step. The resulting method is comprised of reference procedure models, reference model instances (“lead elements”), a documentation model, a role model, and a meta model. Documentation and role models give additional advice how to apply the methodology regarding the documents types to be produced and the resources required to apply the method. The meta model specifies the conceptual data model of the results, thereby guaranteeing the consistency of the entire method.

For the reference procedure model, research is currently conducted to gather EA governance practices and to develop new approaches.

Regarding the metrics to be used, first results are available: We developed a framework for Enterprise Architecture performance and value measurement based on the Balanced Scorecard Approach to identify EA metrics. Then we applied the framework to define a few samples of EA KPI's in the context of two companies to prepare the first steps of the evaluation phase (third step).

4.1 BSC approach for EA

A balanced scorecard is a set of measures that gives top managers a fast but comprehensive view of the business (Kaplan & Norton, 1992). It extends the classical finance focused analysis of corporate performance measurement with three additional viewpoints. So a balance between financial and operational aspect is recommended, because relying upon one indicator only can be fatal. The Balanced Scorecard methodology links strategic goals and translates them into action. The use of this holistic measurement method can show that the resources are used in an efficient manner. We conceptualise EA value using a Balanced Scorecard (BSC), which allows for a multidimensional view of value not only from a financial perspective. To have such a holistic view over all EA value aspects, a framework is necessary.

4.2 Developing a balanced framework

A framework to systematically integrate all aspects of the BSC and the EA has been designed. A dashboard based on this scorecard can show real time information about every aspect of the Enterprise Architecture to facilitate better-informed decisions. To match the four perspectives of the genuine BSC with the EA terminology, three of four perspectives were renamed as follows:

- (1) Customer Perspective: Services
- (2) Internal Business Perspective: Processes
- (3) Innovation and Learning Perspective: Assets
- (4) Financial Perspective: Finance

In order to limit the scope for analysing the metrics, several classifications within a perspective have been made. As illustrated in figure 1 the inner frame addresses the four perspectives assets, services, processes and finance in the context of IT architecture. All resource allocations made by IT architecture are measured within this inner frame in one of the four perspectives. The next frame indicates the resource allocation in the same four perspectives but in the context of IT. The third frame measures the scope of enterprise and the last one in the context of cross-company.

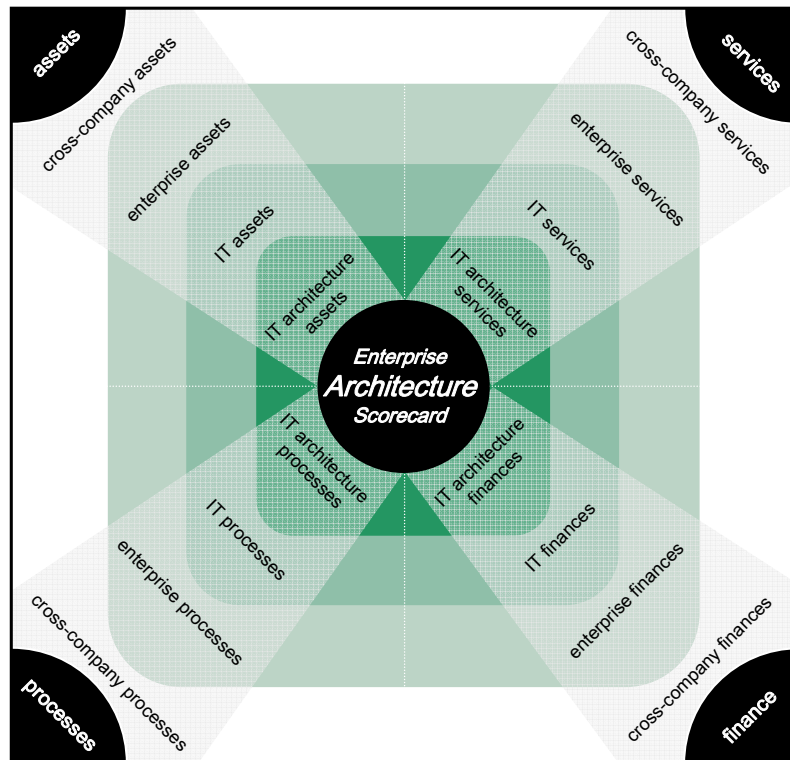


Figure 1. Enterprise Architecture Scorecard Framework.

When we started to identify metrics in the framework, we found that they often are linked together from the inner frame to the outer and vice versa. E.g. if we define to measure the quality of the architecture documentation as an IT architecture asset, the degree of IT integration as an IT asset directly depends on this.

We conducted several workshops and experts interviews with practitioners resulting in the identification of hundreds of architecture relevant metrics. They have been consolidated and aggregated to enforce a holistic view of the whole framework according to the EA scope.

4.3 Identifying critical measurement categories for EA

The identification of the relevant indicators to measure EA performance has to be done for any corporation individually. To fill out the four perspectives of the framework developed above, a generic process based on the GQM approach can be applied. In short GQM is about defining specific goals, asking concrete questions, defining metrics and collecting measurement data to answer questions and draw conclusions on whether the goals were reached or not (Dyba et al., 2004). The activities typically consist of the following steps (Ebert et al., 2005):

1. Plan: Develop an EA strategy and metrics for EA service levels.
2. Manage: Define business goals for EA and determine how to achieve them.
3. Monitor: Analyse metrics with the developed framework.
4. Adjust: alter strategy, goals, and metrics.

It is important to identify measurements directly linked to the corporate strategy for measuring the value of Enterprise Architecture.

4.4 Examples for measurement categories and evaluation

The suggested method and the developed framework are currently adopted in two major Swiss insurance and banking companies. For both of them we have defined an EA strategy with key metrics for measuring the value of EA. Two of this metrics can be described as follows:

(1) Agility: Agility is important to the survival of companies in competitive markets. There are many types of agility, but one indicator of agility is a company's percentage of revenue generated from new products (Ross et al., 2006). Digitising core business processes makes individual processes less flexible while making a company more agile (Ross et al., 2006).

(2) Standardization: Create operating efficiencies by using standardized technology platforms and standardized business processes. The result of standardization, a reduction in variability, can be dramatic increases in throughput and efficiency (Ross et al., 2006).

The according indicators have been developed within the framework structure described as above. In both cases the framework is developed within a programme to establish an EA governance structure.

5 SUMMARY AND OUTLOOK

The objective of this paper is to present a comprehensive measurement framework to assess the value contribution of the Enterprise Architecture. For this purpose, conceptual foundations and theoretical backgrounds have been discussed first. Existing approaches are not very detailed regarding metrics and are neither theoretically well-founded nor derived from existing practices transparently. The still infantine discussion of Enterprise Architecture lacks management and governance issues. To address the EA governance issue, a multi-perspective framework based on the BSC approach was developed. It is a framework to measure the performance of Enterprise Architecture from a business perspective. Furthermore a method based on the GQM approach was introduced to implement the framework regarding the measurement categories. Finally, a few selected KPI's have been shown to illustrate the applicability of the framework elaborated.

To complete the third step of the design science research approach chosen success measures have to be defined in order to evaluate the laboratory or field implementations. Both will be done in two companies in the insurance and banking industry in Switzerland until mid 2007. Initial results are promising. Furthermore the procedure model has to become more elaborated and is to be complemented by activity and role specifications.

Both framework and embracing method for EA governance complement other research activities within the Business Engineering Framework (Österle & Winter, 2003) in order to constitute a Enterprise Architecture Management Methodology. This and complementing research activities are planned to be concluded by mid 2007. After this the fourth phase, "learn and theorize", within the research cycle sketched above can start to generalize findings and to confirm or reject the original assumptions. Up to then current and upcoming findings can give both academics and practitioners interested in the topic an overview of the current state in EA governance and EA metrics. Furthermore it is an application of the research process proposed by (Rossi & Sein, 2003), resulting finally not only in better theories on EA governance and EA metrics, but providing feedback to ongoing discussions in method engineering and research processes in design science as well.

References

- C.I.O. Council (1999) Federal Enterprise Architecture Framework Version 1.1.
<http://www.cio.gov/archive/fedarch1.pdf>
- Durst, M. and Daum, M. (2007) Erfolgsfaktoren serviceorientierter Architekturen. *HMD – Praxis der Wirtschaftsinformatik* 42 (253), pp 18-27.

- Dyba, T., Dingsoyr, T. and Brede Moe, N. (2004) *Process Improvement in Practice – A Handbook for IT Companies*. Kluwer Academic Publishers, Boston.
- Ebert, C., Dumke, R., Bundschuh, M. and Schmietendorf, A. (2005) *Best Practices in Software Measurement – How to use metrics to improve project and process performance*. Springer, Berlin et al.
- Hafner, M., Schelp, J. and Winter, R. (2004) Architekturmanagement als Basis effizienter und effektiver Produktion von IT-Services. *HMD – Praxis der Wirtschaftsinformatik* 41 (237), pp 54-66.
- Jonkers, H., Lankhorst, M. M., Doest, H. W. L., Arbab, F., Bosma, H. and Wieringa, R. J. (2006) Enterprise architecture: Management tool and blueprint for the organisation. *Information Systems Frontiers* 8 (enterprise architecture), pp 63-66.
- Kaplan, R. S. and Norton, D. P. (1992) The Balanced Scorecard – Measures that Drive Performance. *Harvard Business Review* 70 (1), pp 71-79.
- Niehaves, B., Ribbert, M., Dreiling, A. and Holten, R. (2004) Conceptual Modeling – An Epistemological Foundation. In *Proceedings of the Tenth Americas Conference on Information Systems (AMCIS 2004)* (Romano, N. C., Ed), pp 4232-4242, Association for Information Systems, Atlanta, Georgia, USA.
- Österle, H. and Winter, R. (Eds.) (2003) *Business Engineering*. 2. ed. Springer, Berlin et al.
- Prahalad, C. K. and Hamel, G. (1990) The Core Competence of the Corporation. *Harvard Business Review* 68 (3), pp 79-91.
- Ross, J. W., Weill, P. and Robertson, D. C. (2006) *Enterprise Architecture as Strategy – Creating a Foundation for Business Execution*. Harvard Business School Press, Boston, MA.
- Rossi, M. and Sein, M. K. (2003) Design Research Workshop: A Proactive Research Approach.
- Schekkerman, J. (2004) Enterprise Architecture Scorecard, Version 2.1. <http://www.enterprise-architecture.info/Images/Architecture%20Score%20Card/Enterprise%20Architecture%20Score%20Card.PDF>
- Sowa, J. F. and Zachmann, J. A. (1992) Extending and formalizing the framework for information systems architecture. *IBM Systems Journal* 31 (3), pp 590-616.
- The Open Group (2003) *TOGAF (The Open Group Architecture Framework) Version 8.1 "Enterprise Edition"*. San Francisco, CA.
- Van Solingen, R. and Berghout, E. (1999) *The Goal/Question/Metric Method*. McGraw Hill, London.
- Vokurka, R. J. and Fliedner, G. (1998) The journey toward agility. *Industrial Management & Data Systems* 98 (4), pp 165-171.
- Wegmann, A. (2002) *The Systemic Enterprise Architecture Methodology (SEAM) – Business and IT Alignment for Competiveness*. École Polytechnique Fédérale de Lausanne, Lausanne.
- Weill, P. and Ross, J. (2004) *IT Governance - How Top Performers Manage IT*. Harvard Business School Press, Boston.
- Weill, P., Subramani, M. and Broadbent, M. (2002) IT Infrastructure for Strategic Agility.
- Winter, R. and Fischer, R. (2006) Essential Layers, Artifacts, and Dependencies of Enterprise Architecture. In *EDOC Workshop on Trends in Enterprise Architecture Research (TEAR 2006), October 17 2006, Hong Kong* (Society, I. C., Ed), IEEE Computer Society Press, Los Alamitos, CA, USA.
- Zachman, J. A. (1987) A Framework for Information Systems Architecture. *IBM Systems Journal* 26 (3), pp 276-292.

