

Enterprise Architecture Benefits: Perceptions from Literature and Practice

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Abstract

Enterprise Architecture (EA) is considered a means for acquiring a multitude of benefits in organizations by most academic literature and practitioners alike. However, academic research has almost omitted the domain of EA benefits and value realization, and thus more research on the subject is needed. This paper describes a study which aims to chart the benefits of EA by a comprehensive literature review and a focus group interview of practitioners. As a result, a categorization of the EA benefits is composed and analyzed.

1. Introduction

Enterprise Architecture (EA) includes all the models needed in managing and developing an organization, and takes a holistic view of its business processes, information systems and technological infrastructure [see e.g. 1-3]. It has become one of the major interests of both business and academia. It is claimed to provide a vehicle for aligning and integrating strategy, people, business and technology, and enabling an agile enterprise – continually evolving within the ever-changing environment [see e.g. 4, 5].

However, investments need to be made in organizational, cultural and technical infrastructure to support the EA program [see e.g. 2] and be justified by demonstrating the positive effects of EA to key stakeholders [see e.g. 5]. Still, presenting the benefits of EA is difficult since measuring its effects comprehensively is demanding and the architecture itself is constantly changing [5]. Academic research has almost omitted the subject of EA benefit and value realization, focusing instead mostly on EA frameworks [see e.g. 6-8], and EA development methods and tools [see e.g. 9-11]. Recently, a few contributions have been made in the domain of EA evaluation [see e.g. 5, 12-16]. However, the evaluation and measurement – and even the definition of – the benefits and value of EA seem so far to have escaped the attention of academic research.

Nevertheless, the need for defining the potential benefits of EA is evident – it might even be the prerequisite for the selection of objectives for an EA program, measuring the realized benefits and value of EA, and thus providing a rationale for key stakeholder support and investments in EA [see e.g. 17]. Therefore, this study aims to chart the benefits of EA and EA work (EA planning, development and management) by an extensive literature review and a focus group interview of practitioners.

This paper is organized as follows. In the next section, the research method is described. In Section 3, the literature on EA benefits is discussed. In Section 4, the benefits of EA are categorized and in Section 5, the categorization is analyzed. Section 6 includes a discussion of the study's contribution and agenda for further research. Finally, Section 7 concludes the paper.

2. Research Method

To identify the benefits of EA, the following steps were conducted.

1. *Literature review.* Literature on EA and architectures in general was charted for references of benefits using both academic and general search engines on the Internet, using keywords such as benefit, objective, value and evaluation with terms enterprise architecture and architecture. Moreover, additional literature was found by studying the references sections of the found papers. Literature by both academia and practitioners was included in the review for a more diverse view of benefits. Academic journal articles and conference papers, magazine articles, books, research reports by institutions, industry white papers, published government documents and electronic sources were reviewed, and the found EA benefits listed. Subsequently, closely related benefits were combined for a more compact list of benefits by the discretion of the author. Based on reviewing the literature, a preliminary list of 27 EA benefits was composed.

2. *Focus group interview on the literature review results.* A focus group interview [see e.g. 18] of seven practitioners from five Finnish or international organizations, either information and communication technology (ICT) users or service providers, was organized in August 2006. The organizations were either independent companies, or divisions, subsidiaries or other parts of domestic or global enterprises. Furthermore, they represented different industries and employed from 14 to several thousand people. All of the organizations were conducting EA work and thus employed specialists who could contribute to the study. Each organization provided one or two persons to the interview. In four of the organizations, the interviewees had an EA-level viewpoint of the enterprise, and in one, they were more focused on the system architecture level. The objectives of the interview were 1) to review the literature review results, and 2) to collect additional, experience-based information. The interview was carried out in a group, because group influence was thought to stimulate the discussion. However, confidential information may thus have remained undisclosed. The interview was moderated by one researcher, while the other two took notes. In

addition to the notes taken, the interview was also audio-recorded.

3. *Composing a categorization of the EA benefits.* The results from the literature review and the focus group interview were analyzed and combined into a categorization of the EA benefits.

3. Literature on EA Benefits

Even though the number of academic research papers exclusive on the benefits of EA is very low, a greater number of studies mention several EA benefits or objectives. Generally, the benefits are not the main topic of the papers. On the contrary, they are typically briefly disclosed in the introduction section. Journal articles (7) and industry white papers (8) seem to dominate the area, added with a number of conference papers (5) and government documents (4), such as EA evaluation frameworks and reports. Moreover, a few research reports (3) by various institutions, books (2), magazine articles (2) and electronic sources (1) exist.

While the literature focuses on listing a multitude of benefits, it does not clearly define and describe them. Furthermore, there does not seem to be an established model for classifying the benefits in the EA context, despite some categorizations have been proposed [see e.g. 5, 19, 20]. Moreover, the literature does not generally differentiate between benefits at different levels of abstraction; particularly, between abstract, high-level benefits such as integration or agility of an enterprise [see e.g. 4, 21], and more concrete, lower-level benefits such as shortened cycle times or cost savings [see e.g. 5, 19]. Additionally, it does not commonly distinguish between the benefits, the characteristics of EA, and the areas of EA work from which the benefits could be gained. For example, standardization and integration activities may lead to cost savings [see e.g. 22], and all of these are mentioned as EA benefits [see e.g. 14, 23]. Furthermore, the causes, effects and other relationships between various EA benefits, EA characteristics and EA work activities are not clearly defined in the literature.

In addition to the deficiencies mentioned above, the literature does not normally provide academic research results of any kind to quantify the argued benefits or value of EA, with the exceptions of a few case studies [see e.g. 17, 24] and survey-based studies [see e.g. 19, 25, 26]. Even these provide mainly qualitative information of the gained benefits. While this kind of EA research is arguably carried out in the industry, the majority of the results do not become published.

4. Categorization of the EA Benefits

This section presents a categorization of the EA benefits identified in the literature review and the

focus group interview. First, the benefits and their representative sources are listed on Table 1. Second, the benefits are categorized according to a Information Systems (IS) benefit classification model [27]. The seven most cited benefits and the benefit categorization are analyzed in the next section.

The focus group generally agreed with the preliminary list of EA benefits, and considered several of them especially important in their work. These benefits are listed on Table 1 as a reference number 45. Considering the challenges mentioned in the previous section, a sufficient magnitude of benefits was preserved to represent as much of the whole range of identified benefits as possible. However, a number of closely related benefits were combined to maintain clarity.

As can be seen from Table 1, the range of benefits is extensive and without proper categorization, it is difficult to comprehend. For this reason, a IS benefit classification model [27] was selected and applied to the domain of EA. The basis for selecting this model was its clarity, applicability and suitability: it is reasonable to categorize the EA benefits on the basis of their measurability and the potential to attribute them to EA or EA work.

The horizontal axis of the model distinguishes between quantifiable and non-quantifiable benefits, and the vertical axis between benefits that can be accounted to EA or EA work, and those that significantly depend on other organizational or environmental factors as well. In the model, the benefits are categorized into the following categories:

Hard benefits can be objectively quantified (e.g. in monetary terms, time or other numeric values) and attributed to EA or EA work. They could be related to possible cost and cycle time reduction and economies of scale. Moreover, they could include increased standardization attained by utilizing the standards defined in EA, increased reuse of architectural models, descriptions and documentation, and increased interoperability between systems constructed according to EA. Hence, they can potentially be attributed to EA.

Intangible benefits cannot be easily quantified, but they can be attributed to EA or EA work. These benefits can be realized, particularly, from the development and usage of architectural models and descriptions, leading to better insight of the enterprise and thus supporting e.g. decision making.

Indirect benefits can be measured in quantifiable terms, but cannot be attributed to EA or EA work. They are related, especially, to an enterprise's better position in the market, improved management and customer orientation, and more efficient business processes – factors that can be quantified by various metrics but only partially attributed to EA.

Table 1: the identified benefits of EA

Benefit	1	3	4	5	8	12	13	14	17	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	45	
Evolutionary EA development & governance				X																						X					X			
Provides a holistic view of the enterprise	X	X	X	X			X			X	X		X	X	X				X		X				X	X		X	X		X	X	X	
Improved alignment to business strategy				X			X	X		X			X	X							X	X				X	X				X	X		
Improved alignment with partners	X			X			X			X	X		X		X											X		X	X					
Improved asset management				X			X								X	X										X	X							
Improved business processes									X	X							X			X											X			
Improved business-IT alignment			X	X			X	X	X	X		X	X		X	X	X	X	X	X	X					X	X			X		X	X	
Improved change management	X	X				X	X				X				X	X	X	X	X	X	X	X	X	X	X	X						X	X	
Improved communication		X		X			X		X	X		X	X					X	X	X						X						X	X	
Improved customer orientation	X				X	X	X	X					X									X								X				
Improved decision making	X	X		X								X		X		X			X	X						X								
Improved innovation	X			X	X		X	X	X								X				X					X				X				
Improved management of IT investments	X			X			X					X	X	X	X	X	X	X	X		X								X	X		X		
Improved risk management				X	X		X		X	X		X	X	X					X	X	X				X	X		X			X	X		
Improved staff management									X		X	X	X																X	X	X		X	
Improved strategic agility	X		X	X			X	X	X	X	X									X							X							
Increased economies of scale																				X									X	X				
Increased efficiency				X	X							X	X	X		X						X	X											
Increased interoperability and integration			X		X	X	X	X		X	X	X	X	X						X	X	X	X	X										
Increased market value							X						X												X									
Increased quality					X								X							X	X	X							X	X		X		
Increased reusability				X	X	X	X		X		X	X	X								X					X	X				X	X		
Increased stability	X																															X	X	
Increased standardization					X	X	X					X	X	X						X	X	X					X						X	
Reduced complexity				X		X					X	X	X	X		X	X	X	X	X		X			X								X	
Reduced costs				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Shortened cycle times				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Strategic benefits are positive effects that are realized in the long run and are typically affected by a multitude of factors. Therefore, they generally cannot be objectively quantified or completely attributed to EA or EA work. These benefits may include, for example, increased stability of an enterprise in an environment of constant change, better strategic agility, and improved alignment with business strategy.

The benefits of EA were categorized into the model by using the author's discretion (see Figure 1). For this reason, the categorization is merely meant to be suggestive of the potential types of the EA benefits. Because of this rather subjective nature of the categorization, the relative positions of the benefits

inside the categories were not specified. Therefore, the order of benefits inside the categories is horizontally alphabetical.

5. Analysis of the Categorization

In this section, the seven most cited EA benefits are selected for discussion and analysis. Subsequently, the categorization of the benefits is analyzed.

The most cited benefits from the literature and the focus group interview include 1) *reduced costs*, 2) *providing a holistic view of the enterprise*, 3) *improved business-IT alignment*, 4) *improved change management*, 5) *improved risk management*, 6) *improved interoperability and integration*, and 7)

shortened cycle times. From these, *reduced costs* seem to be related to a great number of other benefits: the costs could be lowered by reducing duplication and overlapping in technologies and processes, reusing components, integrating systems, increasing standardization, and rationalizing procurement [see e.g. 5, 14, 22, 23]. *Shortened cycle times* also seem to be related, at least, to reuse and standardization [see e.g. 14, 22]. Realizing these benefits, on the other hand, can lead to increased efficiency [see e.g. 22].

Improved alignment between business and IT seem to be a vaguer concept, but is stated to be contributed at least by defining a common business vision by EA [see e.g. 14, 42] and performing governance over projects for EA compliance [see e.g. 31]. *Integration and interoperability* seem also to be related to alignment, and thus could be improved by increasing collaboration between organizational functions with the aid of integrated IT systems [see e.g. 4]. *Change management*, on the other hand, could be improved by documenting the current state, the target state, and transition plans to

EA [see e.g. 31, 42]. Moreover, EA documents could also be used for the improvement of *risk management*, by e.g. providing a description of the current state for preparing an enterprise for unplanned changes [see e.g. 14], defining common standards, guidelines and principles that the IT organization can use for decision making, and providing information to projects for assuring EA compliance [see e.g. 31]. Finally, most of the benefits seem to be contributed by a *holistic view of the enterprise* that a high-quality EA can provide.

Recent EA surveys [25, 26] from the industry, as well as the focus group interview results, also indicate that *change management*, *reduced IT costs* and *alignment between business and IT* are among the most important EA-related concerns for practitioners. Moreover, providing a *holistic view of the enterprise* seems to be a self-evident benefit of EA in literature. However, *managing the complexity of IT assets* is considered equally important in the surveys and was also one of the concerns of the focus group, but was not among the top-10 most cited EA benefits in this study.

<i>Attributable to EA</i>	Weakly	Indirect	Strategic
		Improved alignment with partners Improved customer orientation Improved risk management Increased market value Improved asset management Improved innovation Improved staff management Increased quality Improved business processes Improved management of IT investments Increased efficiency Reduced complexity	Improved alignment to business strategy Improved change management Improved strategic agility Improved business-IT alignment Improved communication Increased stability
	Strongly	Hard	Intangible
		Increased economies of scale Increased reusability Reduced costs Increased interoperability and integration Increased standardization Shortened cycle times	Evolutionary EA development & governance Provides a holistic view of the enterprise Improved decision making
		Quantifiable	Non-Quantifiable
		<i>Measurable</i>	

Fig 1. The EA benefits categorized according to the Giaglis et al. model

According to the categorization, the challenge of evaluating and measuring the benefits seems to be that most of the benefits are indirect or strategic – even if they can be clearly quantified, they are difficult to address to EA or EA work. Moreover, the relatively large amount of strategic benefits impedes the evaluation as well. Consequently, in the initial stages of EA maturity, applicable evaluation criteria and metrics for hard benefits could be developed for showing “quick wins”. In higher maturity levels however, metrics for other types of benefits should be developed as well to quantify the value of EA more comprehensively. Even the indirect and strategic benefits might include elements which could be evaluated and addressed to EA.

6. Discussion

This section includes a discussion of this study’s contribution to research and practitioners, limitations of the study, and agenda for further research.

Contributions to Research

This study contributes to research in several ways. Firstly, it provides researchers with a perception of what benefits can be received from EA and EA work. Secondly, it provides one potential categorization for the benefits. Thirdly, the categorization can be used as a basis in determining what kind of evaluation criteria and metrics could be used in measuring the realization of the benefits.

Contributions to Practice

Practitioners may use the results of this study to select a certain set of benefits to act as objectives of their EA programs. Moreover, the research provides practitioners with a variety of potential EA benefits for rationalizing EA work initiation. Practitioners may also find the categorization useful in developing metrics for quantifying the benefits in later stages of EA work.

Although the benefits of EA could be used by practitioners to define a set of EA objectives to be pursued, the focus group advised that conducting EA work by merely aiming at the selected objectives could result in a failure, because factors external to the objectives (e.g. business environment changes and undisclosed business goals) may also have a considerable effect on EA work. Moreover, the interview showed that in enterprises initiating EA work, the risk of failure is greater and the benefits acquired cannot be clearly addressed to EA because of the less established position and influence of the EA program in the enterprise.

Limitations of the Research

There are a few limitations in this study, which could impede generalizing the results. Firstly, EA benefits are organization-specific at least to some extent. There could be differences between enterprises depending on e.g. the geographical area, the enterprise type, the industry, the EA maturity,

the size of enterprise and the EA program, and the market situation and position. Naturally, the selection of EA objectives and thus the direction of the EA program also have an effect on the benefits received. Secondly, the categorization of the EA benefits is based only on the author’s discretion. Thirdly, the study is primarily based on the extensive literature review, supplemented only by a small amount of empirical data (the focus group interview). However, the literature review already provides a valuable contribution, which is strengthened by the validation and practical viewpoint of the focus group, and clarified by the categorization of the benefits.

Agenda for Further Research

This study provides a number of important themes for further research. Firstly, the benefits itself should be unambiguously and consistently defined, and their categorization empirically validated. Secondly, a valid and consistent model should be constructed to illuminate the relationships between EA benefits, EA characteristics and EA work activities on different levels of abstraction. Thirdly, metrics and evaluation criteria should be charted and developed for measuring the realization of the benefits. Fourthly, the benefits should be empirically quantified by applying these metrics and criteria to provide a rationale for adopting an EA approach or making further investments in EA. In the near future, we aim at identifying metrics and evaluation criteria for assessing EA value and the realization of the benefits.

7. Conclusion

In this paper, the benefits of EA were charted by an extensive literature review, supplemented by a focus group interview of practitioners. Subsequently, the benefits were categorized according to a IS benefit classification model [27]. Furthermore, seven of the most cited benefits and the categorization were analyzed.

It is worth noting that EA should be communicated effectively to realize the benefits [see e.g. 22]. Even then, EA does not guarantee long-term value because a multitude of factors affects the realization of benefits [see e.g. 43, 44]. Moreover, distinguishing the contribution of EA from all the potential factors affecting the realization of the benefits is a significant challenge. Naturally, the benefits identified in this study are only suggestive of what kind of value an EA could provide to an enterprise. Nevertheless, the results can be used by practitioners to build a business case for EA. On the other hand, enterprise decision-makers should note an opposite argument: EA should be seen as an asset, not an expense, and that the expenses are actually realized by not investing in EA [see e.g. 22, 42].

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