

Towards Measuring Success of Enterprise Architecture Decisions: Survey among Practitioners and Outline of a Framework

Sandra Castro

Jürgen Jung

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Abstract

Enterprise Architecture Management is a well-established discipline fostering business-IT alignment and driving innovation in an organisation. It provides an extensive set of methods and tools for visualising and analysing an organisation using several perspectives. However, critical voices are increasing in recent years. A significant amount of initiatives for establishing Enterprise Architecture are not meeting expectations. Furthermore, Enterprise Architecture is often recognised as a burden to corporate stakeholders rather than providing benefits. Current research is aiming at providing a stronger focus on corporate needs while performing Enterprise Architecture work. There seems to be a shift towards collaborative and agile approaches. The paper at hand presents the results of a survey among Enterprise Architecture practitioners to understand the expected benefits from Enterprise Architecture. The results of the survey are used to develop a framework that supports measuring the success of Enterprise Architecture decisions. This framework does not only focus on specific Enterprise Architecture goals but also incorporates the impact of Enterprise Architecture Management on corporate objectives. A first version of such a framework has been specifically developed for a German logistics company. This specific framework will be the starting point for future research on a generic framework for determining EA benefits in a company.

Keywords: *enterprise architecture, business benefit, enterprise architecture management, EA goals, EA frameworks, expert interviews.*

1 Introduction

Enterprise Architecture Management (EAM) is a well-established discipline among practitioners and academics. Methods and tools have been developed in order to describe Enterprise Architecture (EA) and drive conscious decisions to improve an organisation [14]. These methods aim at aligning

business with IT, but also foster innovation within an organisation [27]. A plethora of publications is available on visualizing EA (cf. [21]) and frameworks allowing the implementation of EAM in an organisation. One of the most prominent framework is The Open Group Architecture Framework (TOGAF¹), defined and published as an open standard by The Open Group [1].

Despite a lot of success stories, there is an increase of criticism on how EAM is implemented in organisations. It seems that EAM is too focused on creating artefacts [22][21]. Those artefacts might create an abundance of documents related to an organisation's EA but are not really addressing the needs of the corporate stakeholders [44][6]. Consequently, EAM should rather enable people and organisations in order to achieve tangible benefits [25]. Sometimes, the role of a framework is overrated. Some studies show that applying an EA framework does not necessarily affect stakeholders' satisfaction positively [38].

Several studies have been conducted in the past in order to understand the benefits of applying EAM in a corporate environment. Some of them reveal specific drawbacks of current practices: Some corporate stakeholders are not satisfied with the way EA operates [43]. EA goals often do not match corporate objectives [24]. It seems that EA is established in parallel with existing management structures instead of following a holistic approach. Therefore, EAM does not seem to achieve strategic alignment [28]. Even worse, EA initiatives suffer from not showing measurable benefits [29]. Kurnia et al. published a more differentiating analysis on benefits and blockers in EA initiatives [23].

A more collaborative way of EAM is required in today's organisations [6]. Hence, a stronger focus on communication and collaboration with corporate stakeholders is necessary [5][44]. EAM should provide tangible benefits and contribute to corporate objectives [18]. The paper at hand presents research in progress on measuring the impact of decisions made by Enterprise Architects or supported by EA artefacts. The term *success* is interpreted as benefit or positive impact as a result from EAM. A survey has been conducted among architects and business stakeholders in European logistics companies to determine the typical kinds of benefits and potential measures of EA. This survey should not only reveal typical EA goals but also incorporate expectations from various stakeholders. The results from the survey are then used to develop a framework that supports measuring the impact of EAM.

The paper at hand is structured as follows: The subsequent section 2 summarises work related to determining the benefits from EA. The overview covers studies stating typical benefits as well as measuring the success of EA work. The ensuing section 3 presents the survey design and discusses its results. The survey results will then be the basis for future research.

¹TOGAF® is a registered trademark of The Open Group.

Section 4 provides an overview of a framework to measure decision quality made by EAM. This draft framework has been developed in collaboration with a German logistics company and will be subject to future research. The paper closes with a summary and an outlook on next steps in section 5.

2 Related Work

The current section at hand summarises related work concerning difficulties with determining EA benefits as well as approaches to measure EA success. A semi-structured literature review has been conducted. EA objectives and measures could be found as well as existing EA measurement frameworks.

2.1 EA Objectives and Measures

The review was focusing on identifying typical objectives as well as corresponding measures. A more extensive literature review has been conducted by Banaeianjahromi et al. The authors performed a mapping study with about 50 articles covering enterprise architecture and enterprise integration. Their results reveal that some of the main goals are the following: Complexity reduction, faster adaptability, a comprehensive enterprise view, improved change management, and increased interoperability and integration [4]. The results are well-justified but they seem to be too abstract for measurement. In fact, their work lacks specific key performance indicators (KPI) that support determining whether objectives have been met.

Another overview on the purpose of EA is provided by Op't Land et al. The authors categorize EAM goals in three relevant perspectives: *business stakeholder*, *IT* and *business and IT* [32]. While the first one is addressing stakeholder concerns from the business perspective, the second one has a strict IT focus. The third one then covers aspects of aligning business with IT. Whereas there are some examples for measurable EA goals (e.g. *reduction in delivery time and development cost*), there are still some rather generic goals. *Time* and *money* can be quantified easily. Measuring the achievement of *full and coherent overview and understanding of an enterprise* is not that trivial. Despite the reasonable separation of EAM goals, the examples stated by Op't Land et al. are not detailed enough to derive precise key figures.

According to Plessius et al. one of the main challenges in measuring EA success is the lack of a common standard [34]. The authors refer to a plethora of available literature on EA benefits and goals. This also hampers quantifying success so that it can serve as a measure to compare organisations.

Matthes et al. performed research on stakeholder concerns (cf. [7]) together with typical EA KPI [31]. The authors initially refer to existing KPI frameworks such as COBIT (Control Objectives for Information and Related

Technology) and ITIL (Information Technology Infrastructure Library). COBIT is a standard defining typical objectives for an IT organisation together with related KPIs [10]. ITIL is a collection of best practices for IT management [11]. It encompasses IT services and also defines measures to determine service quality. Both standards cover IT but no business-related objectives. Beside this, Matthes et al. also introduce EA KPI's beyond IT objectives. However, they are still rather IT-centric and require a mapping to business objectives. Langemeier, for example, points out that key figures should always be linked to goals of an enterprise. This requires the architect to define them [26].

There are also publications on EAM KPI available. Günther et al. focus on the problem of selecting the right key figures rather than on the challenge that there might be no appropriate key figures [15]. Remmenkampff demonstrates in his doctoral thesis how to build up a hierarchy of key figures [37]². The idea of a hierarchy of key figures will be integrated into the development of the measurement framework as future work.

Van der Raadt et al. examined the correlation between stakeholder satisfaction and EA effectiveness [43]. This sounds like a promising approach as this is what the business units of a company are focused on. The authors found that company goals are met well if only the goals of an individual stakeholder are taken into account. Their survey revealed among other things, that EA should increase the acceptance of change as one EA benefit. A corresponding key figure is not mentioned, however, it could be checked if projects are proceeded on time.

Foorthuis et al. found out that EA generates benefits indirectly rather than directly [13]. Additionally, their study showed that EA benefits for project work are not that high compared to benefits for the whole company. One of the main benefits is knowledge exchange. One measurement for knowledge exchange could be the presence of an active EA community. Another benefit is the reduction of complexity within a company. This could be measured by the number of implemented standard processes or models which improve insight into the company. In order to find processes which could be standardized, the number of high level overviews of the company could also be used as a key figure.

Etien et al. define four factors with corresponding metrics. The most interesting factor for the paper at hand, is the *intentional fit*. This factor is represented among others by the *support ratio*, which describes the degree of business activities supported by the system. And additionally, *goal satisfaction*, which states the meeting of business goals by the system. Corresponding metrics are *activity representation count* and *goal mapping count* [12]. The other three factors are mainly focusing on business cases being represented by technical data.

²The dissertation is only available in German.

Bachoo represents EA value in different maturity levels. Some values are complexity reduction, cost savings, revenue increase and process and decision improvement. Possible metrics were summarized in financial, customer, process and compliance metrics. [2]

2.2 EA Measurement Frameworks

After having created an overview on EA benefits and corresponding challenges in finding appropriate key figures, the next step is to identify any frameworks or methods available to face these challenges. One framework could be found from Plessius et al., which is called the Enterprise Architecture Value Framework (EAVF) and which is shown in figure 1 [33, 35, 34].

	BSC	Finance and Accountability	Customer and Partnerships	Internal Processes	Learning and Growth
Activity Classes					
EA Development					
EA Implementation					
EA Exploitation					

Figure 1: EAVF by Plessius et al. (source: [34])

According to Plessius, the value of EA can be categorized in benefits and costs. Moreover, these benefits and costs can be assigned to certain phases, so-called EA activities, as well as to perspectives, which are corresponding EA goals. The four perspectives in figure 1, i.e. *Finance and Accountability*, *Customer and Partnerships*, *Internal Processes* and *Learning and Growth* are based on Kaplan and Norton’s Balanced Scorecard (BSC) [19]. EA activities, i.e. *EA Development*, *EA Implementation* and *EA Exploitation* are derived from TOGAF version 9.1. Within the EAVF cells, benefits and costs can be assigned to EA goals as well as to specific EA activities.

TOGAF also incorporates some EA benefits, for instance more effective and efficient business processes [1]. However, there is no advice on how these EA benefits could be made measurable. Further references to existing frameworks can be found in [40]. However, measurement is not covered explicitly. According to Bakar et al., existing frameworks are too complicated to be easily implemented [3]. Another challenge to implement EA are business functions not being flexible enough and the IT structure not being well organized. In essence, the core challenges seem to be a lack of communication and collaboration [5].

Maturity models are used to assess a company’s development. Although there is an abundance of maturity models, selecting and integrating the right models remains difficult. This is why the Capability Maturity Model Integration (CMMI) Framework was developed by the Software Engineering Institute (SEI). The CMMI consists of various maturity best practice models.

It defines which goals and practices are to be fulfilled in order to reach a certain quality level [1], [42].

As most key figures found in literature are general ones, Matthes et al. created a catalog of 52 KPIs. These KPIs are based on COBIT 4.0 and are supposed to be more specific. In addition and as a basis for the KPI catalog, Matthes et al. defined 10 desirable EA goals. These are for instance *ensure compliance*, *foster innovation* and *improve project execution*. [31]

As regards benefits management, business managers need to identify business benefits and transform them into business value. In addition, Teixeira et al. state that it is essential for business stakeholders to say whether a certain initiative and the respective investment was profitable. Therefore, they created a benefits management framework based on value creation [41]. This framework is not specific for EAM but addresses management in general.

Most research papers focus on IT metrics rather than on business metrics [12], [31], [17]. Desirable business key figures would focus on a company's stakeholders and would, therefore, include e.g. stakeholder benefits. These benefits could be an overview for the chief operations officer (COO) on processes and systems representing these processes. Another example would be information on digitalization degree for top management, stating which business capabilities are mapped to IT.

Bakar et al. concluded that theoretical EA knowledge stated by EA experts can be implemented in practice [3]. There are various approaches to implement EA. These approaches need to be tested in practice in order to be of valuable use. Bakar et al. identified 27 factors influencing EA in an organisation, having strategic planning and a business driven approach on top. More business key figures are stakeholder support and benefit, which are ranked on 7th and 9th place of influencing factors and should, therefore, also be taken into account.

3 Survey

The overview on related work in section 2 reveals that further research is required on the determination of specific benefits and related measures. Therefore, a survey has been conducted as a part of the research concerning the conceptualisation of a measurement framework for EA success. This framework is still a work-in-progress, but basic ideas are shown in the subsequent section 4. The current section will introduce the survey design and summarise its results.

3.1 Survey Design

The survey has been designed as an online questionnaire, consisting of 16 questions. Thirty-eight EA experts from various companies took part in

the survey. These companies cover different industrial sectors: automobile manufacturer, asset management, management consulting, transport and logistics, telecommunications provider, freight forwarder, trade and service, financial service provider, consulting and insurance. It should be noted that most participants were from the logistics sector and, furthermore, located in Germany.

The online survey has been conducted for a duration of two weeks in May 2020. Focusing on logistics companies, 72 practitioners have been asked to participate in the survey. Potential candidates have been contacted via professional networks from employees of a large German logistics company as well as academic relationships of the Frankfurt University of Applied Sciences. All practitioners contacted worked or still work in the EA discipline. In the end, 38 practitioners actually took part and shared their knowledge this way. The survey consists of 16 questions including multiple choice and free text questions, which have been analyzed. Almost all practitioners declared their interest in survey results.

3.2 Survey Results

This section provides an overview on survey results. In addition to the 16 questions, complementary ones are marked by letters "a" or "b". Questions having information associated with each other are grouped accordingly.

Question 1, 2 & 3 - Professional Background

Most of the participants' professions are enterprise architect, application architect and data architect. Additional professions are project manager or business analysts. The experience of all participants in their respective profession was between 0 and 25 years (*Question 2*). All but one participant were currently involved in architectural decisions (*Question 3*).

Question 4 - Goal Assessment

Answers of this question shows how the participants assess if a certain goal is professionally or privately achieved or not. Most of the participants mentioned "requirements" to be defined beforehand and which are subject to a certain "measurability" in order to be able to evaluate the "result" and make statements on the "benefit". Interestingly, the assessment by several "involved parties" also seemed to be important. Consequently, the goal should not only be achieved from a personal point of view. It was mentioned once that not all goals could be measured. For some participants the achievement of goals is rather intuitive, and therefore, subjective.

Question 5 - Proof of Decision Implementation

The following scenario of an architecture decision is provided: Google Cloud is chosen to be the standard cloud environment for all applications. The

participants were asked how they would check the implementation of this architecture decision. It was noted that a success measurement is not feasible unless the goals behind the decision are known. An excerpt of answers is shown below:

- List potential applications and count the actually migrated applications.
- Use corresponding milestones in roadmap and define necessary follow-up steps.
- Define KPI together with target value and measure against it.
- Involve responsible application administrators.
- Definition and follow-up of architectural principles.
- Verification through business case and user survey.

Question 6 - Key Figures

This question requires information on hard and soft key figures to measure the implementation of professional goals. Thirty-Four out of 38 participants stated a lack of an established KPI system for architecture decision assessment within their company. One participant mentioned that above all, data delivery is also challenging as long as it depends on a colleague's motivation.

Question 7 to 10a - Information on Specific Key Figures

In detail, *Question 7* asks for the interval in which potentially named key figures should be measured. *Question 8* deals with the data required for creating named key figures. *Question 9* should give information on where the requested data is located, e.g. in which database. *Question 10a* asks for specific corporate goals, e.g. flexibility, security or error tolerance of applications, and how to measure these goals. Unfortunately, there were almost no precise key figures mentioned by the participants, consequently, answers of questions 7 to 10 were quite general. For this reason, these answers are not mentioned at this point but were taken into account to create a KPI catalog as a basis for the designed framework.

Question 10b - Documentation Template

This question asks if architecture decisions are documented by means of a template. The reason for this question was to find out whether there is some kind of process behind making an architecture decision or whether architecture decisions are rather a side product. All participants documented their architecture decisions. Approximately 54 % of the participants use a template for documentation purposes. Around 23 % work without any templates. The rest of the participants, i.e. another 23 %, work sometimes with

and sometimes without templates.

Question 11 - Value of Documented Architecture Decisions

This question is about the value of documented architecture decisions and how to measure this value. Thirty-Three out of 38 participants gave an answer on this question. Some participants mentioned that they do not document architecture decisions, respectively, they do not measure architecture decision values. According to some participants, if an architecture decision is based on an architecture principle, they only document the purpose of this principle. One reason for not documenting the value of architecture decisions was the exposure of a decision having no or at least not the expected value, which could lead to blaming the responsible persons. Other participants mentioned some soft key figures to assess the value of architecture decisions. Among others, these soft key figures were "feedback" of teams involved and "quality" or acceptance of the decision. Most participants agreed that measuring value requires some key figures. However, none of them defined such key figures.

Question 12a - Documentation Aspects

This question shows some aspects which were reasonable to document. All aspects were given as examples beforehand and the participants chose whether one aspect seemed reasonable for them or not. The result is shown in figure 2.

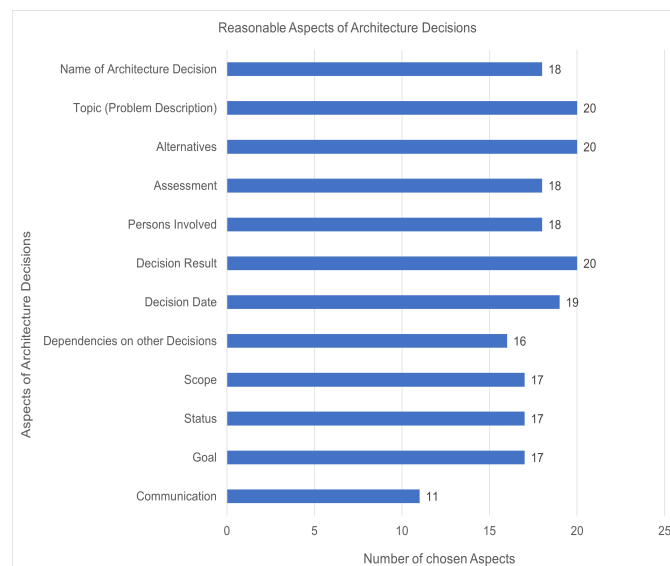


Figure 2: Most given aspects of architecture decisions are seen as reasonable

Besides the aspect "Communication", it can be seen that all other aspects are rated more or less equally. "Communication" was seen as reasonable by

only a good half of all participants. It is assumed that it was not clear to all participants what is meant by "Communication". "Communication" referred to the group of people affected by the respective architecture decision and who should, therefore, be informed on any status change. Moreover, the aspects "Topic" and "Goal" were seen as redundant. "Topic" is the answer to the question "What is this architecture decision about in short?", whereas "Goal" answers the question "Which problem should be solved with this architecture decision?". This difference seemed not to be clear to all participants. On top of the list and seen as the most reasonable aspects were "Topic", "Alternatives" and "Decision Result".

Question 12b - Benefits of Architecture Decision

This question should demonstrate the benefit of documented architecture decisions. The top four benefits were "Traceability", "Communication", "Transparency" and "Clarity". These named aspects can also be seen as examples for value of EA as a whole. This is also demonstrated by another survey of Carr et al. [8].

Question 13a - Additional Documentation Aspects

This question is an extension of question 12a, here asking what additional aspects should be reasonably documented concerning architectural decisions. The answers were given as follows:

- Consideration of alternatives and reasons for not choosing specific alternatives.
- Presentation of cost alternatives.
- Priority and criticality.
- Cost-Benefit-Analysis.
- Consciously accepted disadvantages.
- Which sources were taken into account?
- Short description of result.
- Person responsible for architecture decision.
- Life cycle including revisions after a certain time.
- Any architectural debts that may arise.
- Is it a mandatory requirement or a recommendation? And what happens, if it is not compliant with the architecture decision?
- Evaluation criteria.

The above-mentioned list emphasizes one of the main EA problems: Several of the additional aspects are already captured in the named aspects of question 12a. However, as there was no given definition, the participants could not know what is meant by all aspects of question 12a. So the participants felt there were still some aspects missing. There was no common vocabulary on the given aspects.

Question 13b - Personal Recognition of Benefits

This question deals with the possibility of personally recognizing the benefits of architecture decisions within the company. The participants mentioned that besides traceability and transparency, one benefit is the improvement of weighing up all advantages and disadvantages. This weighing up process increases the quality of architecture decisions. In addition, architecture decisions form a good basis for a common future vision and a common vocabulary.

Question 14 - Customer Benefits of Architecture Decisions

In *Question 14* the participants were asked whether they see a direct or indirect benefit of architecture decisions for the end customer or product. The participants claimed that there is no need for entering the same data multiple times in different systems. This leads to faster implementation of the requirements and improves maintenance. Another benefit is the work in progress (WIP) limit, which restricts the number of tasks within different (project) phases. Through an adequate WIP limit, which could be determined by an architecture decision, the focus is on the right tasks.

Question 15 - Benefits of EAM

Question 15 shows how participants rate benefits of Enterprise Architecture Management (EAM). The result can be seen in figure 3.

No participant answered with "There are no benefits at all.". Approximately 6 % think that there are some benefits for sure, but that they cannot think of any right now. The rest, approximately 94 %, see miscellaneous benefits of EAM. These mentioned benefits could be categorized well in the three main tasks of EAM according to Wierda [44]. Thus, the first main task of EAM is chaos prevention, the second task is the alignment of business IT landscape on corporate goals, and the third is to achieve benefits for a company through use of IT. For chaos prevention the participants mentioned a desired holistic overview of processes and applications, traceability, a common and communicable vision and the definition of governance in order to reach the target state. With reference to the second task, participants mentioned the alignment of business and IT as another benefit. As regards the third main task, flexibility and sustainability are mentioned positively: This way, companies are able to quickly react to changes. Apart from that, EAM narrows down technical variety, which leads to a better overview.

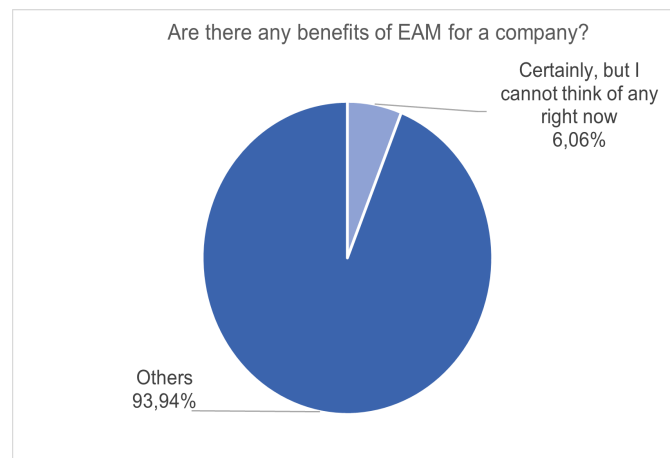


Figure 3: Almost all participants see benefits of Enterprise Architecture Management

Question 16 - Architecture Value Framework

Question 16 should give information on the interest in an architecture value framework. The average interest among the participants was approximately 65 %. As an example of stated reasons for not being interested in such a framework were a general skepticism towards key figures, especially, if those key figures were used to measure success of architecture decisions. Another reason for lacking interest was a hierarchy on corporate success, which has business success on top, project success below and architecture success at the bottom. According to this hierarchy, the framework interest was rated badly. The last reason was that it seemed doubtful that such a framework can be implemented. One participant added that architecture decisions are mainly oriented on corporate success in the short run. If the success of this architecture decision will be measured, it would make this inadequate base for decision-making transparent.

Finally, all answers within the survey gave valuable insights of how EA practitioners deal with measuring success of EA and how they rate the meaning of EAM for companies. However, there were almost no precise key figures stated. This leads to the conclusion that measuring EA's success is no deep seated approach in various industry sectors. However, through the survey results, a method to derive respective key figures could be created. Furthermore, it should be noted that the questions relate to the current situation of the participants and less to a future vision the participants may favor. Therefore, the results depict no evaluation on whether this situation is satisfactory or needs to be improved.

3.3 Discussion

The intention of the survey was to find adequate key figures for the EA discipline. EA experts from several German companies stated that almost no practicable key figure is known or used. One possibility to identify such key figures would be to involve further stakeholders. Preferably those who are directly affected by results of these key figures. This proved one of the main challenges within the EA discipline: The lack of communication and collaboration as revealed in [5]. Many practitioners would like to work based on key figures but almost no one uses or knows how to use such figures to prove the value of EA. Measuring EA's success is not trivial, as checking whether a goal is reached or not is subjective and, therefore, not always measurable in an established way. In EA context, soft key figures seem to be defined easily compared to hard key figures. This demonstrated again the collaboration part, as soft key figures depend on the opinion of human beings.

Especially the topics of decisions ("What is the decision about?") and their results ("What was the outcome of discussion?") are relevant. Alternatives also seem to be significant ("Which other decisions could have been taken?" and "Reasons for not taking these alternatives"). However, there is some potential for finger-pointing if architecture decisions are documented and evaluated. Though, this should definitely not be the intention of measuring EA's effects. Regarding the documentation aspect, it can be seen that experts can always think of more and more aspects to be followed and handled by EAM. The challenge is to focus on essential points in order to not get bogged down.

There are also expected benefits of EAM. For instance, EAM makes (or at least should make) processes more efficient which leads, among other things, to lower costs which could then lead to lower prices for consumers. In most cases, making architecture decisions has an established process behind it. Most of the answers given in the survey confirm the results from the literature review by Foorthuis et al. [13], the identified alignment metrics by Etien et al. [12] as well as Bachoo [2]. Van der Raadt et al. also identified the questioning of stakeholders as a valuable approach [43].

The conclusion that business-IT alignment seems to be one of the most valuable EA benefits could not only be proved within the scope of the survey but also by various literature, e.g. [39] and [4]. Furthermore, Schmidt et al. name business-IT alignment not only as the greatest EA benefit within a company, their survey even proves a relation between EAM benefits and a high degree of business-IT alignment [39]. Luftman et al. go one step further and design a model for measuring business-IT alignment [30]. They identify six dimensions and corresponding activities supporting business-IT alignment. The activities focus on the dimensions *communication*, *value analytics*, *IT governance*, *partnering*, *dynamic IT scope* and *skills development*

[30]. The dimensions could be used as sub goals in order to reach the high level goal business-IT alignment.

4 Outline of a Framework

A future objective of the research at hand is the design of a framework for assessing EAM benefits. Such a framework should make the value-add of EAM more explicit instead of just giving vague impressions. First steps towards this framework have been conducted already with one partner company by developing a specific framework for their respective strategic objectives. This framework is based on survey results as well as on literature regarding goals and existing key figures of EA. Together with the framework, a 65 key figures catalog had to be developed. Almost one third of these key figures has been validated together with enterprise architects. The rest of the key figures catalog needs to be validated in further research. To begin with, in order to clarify the method behind the framework, the model in figure 4 has been established.

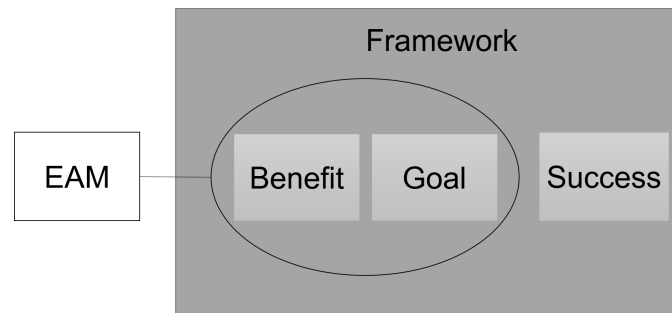


Figure 4: The model shows relationships between benefit, goal, success and EAM

To measure EAM success, one needs to commit to specific EA activities, e.g. making an architecture decision. These EA activities need to be mapped to EA goals, which are or at least should be equivalent to corporate goals. Because of the mapping of EA activities to EA goals one is able to say whether an activity led to a certain goal and, therefore, was a good activity, or whether an activity did not support any EA goal. The latter is an example for a bad EA activity. If a goal was reached by means of an EA activity, a statement on EA success can be made. If the goal is reached because of an EA activity, EAM was successful. If an EA activity does not support any goal, this specific activity needs to be rethought as EAM is not successful at this point. For measuring the success of EA activities, corporate goals need to be measurable with adequate key figures. Consequently, what is needed to use the designed framework are goals first and, secondly, respective key figures for measuring these goals.

Once corporate goals are decided on, respective key figures need to be defined. How to derive key figures from corporate goals is depicted in figure 5.

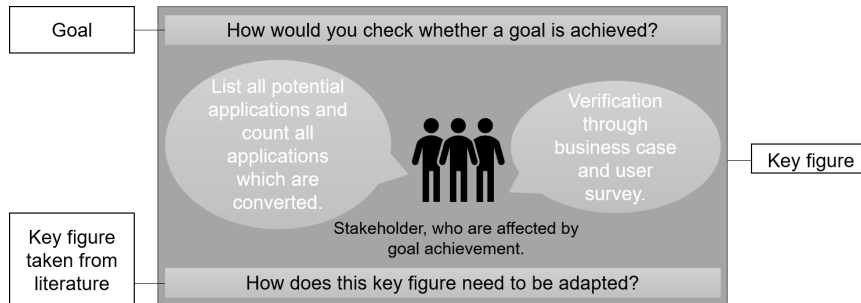


Figure 5: Deriving key figures from goals

To anticipate the answer straight away, the message is: Ask your stakeholder, which key figure they need and check whether these key figures can be mapped to corporate goals. In detail this means: list corporate goals together with adequate key figures you may have already found in literature. Prepared like this, ask your stakeholder how they would check whether these goals are achieved. If you have already found key figures in literature or elsewhere, ask your stakeholder how these key figures would need to be adapted so that statements on goal achievement are possible. Probably, it would be not feasible or at least very time-consuming to ask all stakeholders. Consequently, you should focus on stakeholders who are affected by the achievement of the goal. You will most probably get the best answers from them. Referring to the listed goals, answers from stakeholders might be "List all potential applications and count all applications which are converted." or "Verification through business case and user survey.". Of course, not all answers will lead to key figures directly. However, you will get some valuable hints on how the key figure needs to be created to be of use.

This approach is also mentioned in [16, p. 286], where Humble et al. describe that once the goals to be measured are defined, key figures have to be derived. In this way it could be checked whether the organization moves toward a certain goal or not. Furthermore, Rennenkampff demands that key figures must be informative, quantifiable and simple [37, p. 69]. In addition, key figures need to be formulated as precisely as possible [37, p. 182]. On the other hand, all data required for key figures should not need to be gathered with an unreasonably high effort [37, p. 182].

For validation purposes, the action research method has been decided. This method offers the opportunity to get deeper insights in participants' knowledge, as the researcher himself is part of the interview [20]. As the literature recommends to develop frameworks together with the affected stakeholders [36], the designed framework was presented in front of 19 participants. These participants came from Deutsche Bahn AG and were also part

of the conducted survey. Professional background of Deutsche Bahn participants are Enterprise Architect, Senior Information Security Enterprise Architect, Application, Domain, Data and System Architect, IT Consultant and CIO. The participants were asked about aspects such as benefits, challenges, and desirable additional content of the framework. Results are summarized in figure 6.

Aspect	Participant's Feedback
Benefits	<ul style="list-style-type: none"> • Alignment on corporate strategy possible because of goal and activity mapping. • Flexible scope and customizability. • Framework could be used as basis for dashboard. • Framework could be easily visualized by tools, e.g. Excel™.
Challenges	<ul style="list-style-type: none"> • Definition of respective KPIs requested. • Before KPIs have a benefit such as comparability, these should be defined more clearly. The difficulty is not to formulate metrics too generic, but also not too specifically. • More practical examples are essential.
Additional Content	<ul style="list-style-type: none"> • Link to respective architecture decision in addition to the corporate goals. • Maybe add a good visualization, e.g. a dashboard.

Figure 6: Benefits and challenges of the framework as well as additional content

The models and methods presented in this section as well as the basic concept were validated and documented within the scope of a master's thesis [9]³.

5 Summary and Further Research

The topic of the paper at hand is of relevance because many experts engage in it. It is without controversy that there are EA benefits. What is debatable on the other hand, is how to measure these benefits. The paper at hand which

³This master's thesis is not publicly available due to company secrets.

is based on a master's thesis ties in with the measurement of benefits. In this way, some helpful key figures could be identified. Most notably are key figures focusing on other aspects than IT. These key figures are: Stakeholder assessment, change management, number of problems not being (previously) identified by EA, number of user requests, customer focus, reusability, time to market, audit results, compliance, trends, quality defects, risk reduction (prevent asset losses) and focus on requirements.

In their study on EAM's relevance in future, Carr et al. mentioned some kind of EA reform, which among other things includes the development of a business understandable framework [8]. Our framework could be seen as a first step towards this approach, as it has evolved only by experts' feedback and adequate literature. The framework itself was successfully tested on one real world example in Germany. Of course, in order to be a representative result, the framework needs to be tested on far more practical examples, maybe even outside Germany. This could be a good possibility for future research.

Acknowledgement

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