A comprehensive EA benefit realization model – An exploratory study

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Abstract

Enterprise architecture (EA) management has become an intensively discussed approach to manage enterprise transformations. While there is a strong interest in EA frameworks and EA modeling, a lack of knowledge remains about the theoretical foundation of EA benefits. In this paper, we identify EA success factors and EA benefits through a literature review, and integrate these findings with the DeLone & McLean IS success model to propose a theoretical model explaining the realization of EA benefits. In addition, we conducted semi-structured interviews with EA experts for a preliminary validation and further exploration of the model. We see this model as a first step to gain insights in and start a discussion on the theory of EA benefit realization. In future research, we plan to empirically validate the proposed model.

I. Introduction

Enterprise architecture management (EAM) has become an intensively discussed approach in both industry and academia to manage enterprise transformations [1]. The core of EAM is to understand, engineer, and manage the organization's architecture by providing a holistic, high-level view of the organization's business processes and IT systems, as well as their relationships [e.g. 2, 3]. Thereby, EAM translates the broader goals and principles of an organization's strategy into concrete processes and systems enabling the organization to realize their goals. Hence, EAM bridges business strategy formulation and the actual implementation of this strategy in processes and IT systems and should play a pivotal role in governing an organization's continuous improvement process [4, 5]. For this purpose, EAM constitutes on the one hand the interface between business strategy and implementation and on the other hand supports solution architecting of implementation projects [1].

While there is a strong academic and practical interest in enterprise architecture (EA) frameworks and EA modeling [5], there is a notable insecurity about the cost benefit ratio of EA [1, 6]. The benefits emanating from EA have not been extensively researched and currently there are only few studies addressing benefits explicitly [e.g. 1, 6, 7]. Most reported EA research only mentions or explains EA benefits superficially in passing. In addition to this lack of a theoretical basis, the few published empirical studies focus on selected characteristics of EAM and its benefits only, such as, for instance, IT-focused EA standards and their resulting benefits [2], the IT-focused impact of EAM on IT flexibility and IT efficiency [8], and EA techniques stimulating compliance and their benefits [9]. However, both academia [1] and practice [10] are increasingly interested in a more comprehensive model that comprises and explains business- and IT-centric EA benefits as well as the factors that yield these EA benefits. This need for a comprehensive theoretical model exists for at least two main reasons. First, establishing the theoretical foundations of EA benefits provides insights into the contribution of EA to organizational goals and allows one to position the discipline better [11], especially in comparison to other instruments such as project portfolio management or business process management [12]. Second, understanding the mechanisms of EA and its success factors enables the establishment of a business case and associated metrics showing the full benefits of EA to justify the associated investments [7, 13].

In our research, we attempt to address this lack of an overarching established theory for the realization of EA benefits and define the following two research questions: (1) what are success factors required to realize organizational benefits from EA? And (2) how do these success factors translate into realized EA benefits?

To answer these questions, in this paper we develop a comprehensive model for EA benefit realization. In building our model, we draw upon the DeLone and McLean IS success model (DMSM) and discuss our extension of the model in the domain of EA [14, 15]. Building on an extensive literature review, this extension of the DMSM considers existing research in the area of EA as well as related IS and management theories. In addition, we conducted semi-structured interviews with EA experts for a preliminary validation and

further exploration. We see the resulting model as a first step towards a theory of EA benefit realization. In future research, we plan to empirically validate the proposed model.

We proceed as follows. In the following section, we introduce the DMSM and related EA research. Then, we describe how we conducted our literature review and interviews. Then, in the section 'Theory development' we present our extended EA benefits realization model. Finally, we conclude this paper and outline our agenda for further research.

II. Existing research

In the following, we introduce the DMSM, which we argue later in this paper is an appropriate foundation to develop our EA benefit realization model and discuss existing applications of the DMSM to the domain of EA. Other relevant literature, such as EA benefit literature, which has been identified in our literature review, will be discussed later on, along with the introduction of our model.

A. The DeLone and McLean IS success model

The DMSM provides a comprehensive framework to measure the "ultimate" dependent variable in IS research: the success of information systems. It was first suggested by DeLone et al. in 1992 and updated in 2003 after ten years of empirical and theoretical research by various authors [14, 15]. The updated model derived from these two theories consists of six dimensions, depicted in Figure 1, that determine the success of an information system: *Information quality* measures the output that is created by an information system. Typical characteristics of this dimension are accuracy, completeness, consistency, relevance, and timeliness. *System quality* measures the information processing system and typically characteristics of this dimension are data quality, ease-of-use, flexibility, functionality, importance, integration, portability, and reliability. *Service quality* measures the support of the IS function for the end user of the system. *Use and intention to use* measures the actual usage of the IS and is typically analyzed with the characteristics dependency, frequency of use, number of accesses, time of use, and usage pattern. *User satisfaction* measures how satisfied the user is with using the information, the system, and related services. And finally the *net benefits* measure the outcomes which are typically characterized by job performance, decision-making performance, and quality of work environment [14, 15].

The DMSM has been validated in various domains such as business process modeling [16], e-commerce [17], or knowledge management [18], to name a few, suggesting the widespread acceptance of the model [19]. Furthermore, Urbach et al. and Petter et al. reveal in their literature reviews that the DMSM has been empirically validated widely [19, 20]. However, the DMSM is also criticized in literature, with criticism addressing three main points: Firstly, the DMSM is criticized to be a mixture of a process and a variance model [21]. Combining process and causal explanations in one model is not possible, as a variance model describes what independent factors influence to what degree the dependent factors if all other conditions are equal, while a process model describes which series of events causes a certain outcome. Such series of events cannot be analyzed in a variance model. Furthermore, Seddon criticizes the ambiguous meaning of the use construct. To Seddon's discussion, it can have three different meanings: Use can be a proxy for the benefits of IS, the dependent variable for future IS use, or an event in a process that leads to impact. However he concludes that the first meaning can only be the right one in the context of a variance model [21]. And finally, the third main criticism is the underrepresentation of cultural and people aspects in the model. For instance, the role of external players as well as other cultural aspects that have an effect on IS success are not considered [22].

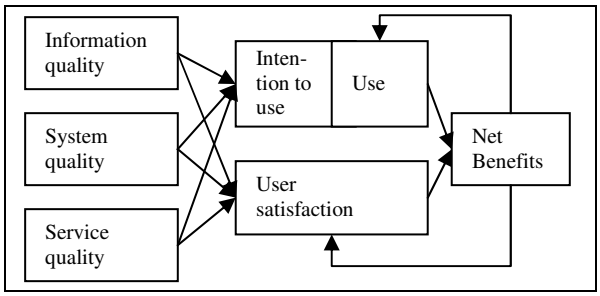

Figure 1. Updated Delone & McLean IS Success Model [15]

B. Approaches to apply the DMSM to EA

In fact, to our best knowledge two available publications suggest adopting the DMSM to the domain of EA considering different aspects of an EA.

Kluge et al. argue that the involvement of both business and IT stakeholders in EA is required to encourage a comprehensive usage of EA and hence to derive the full benefits from EA. Based on two case studies, they identify that EA typically lacks an involvement of relevant stakeholders which is impedimental to realize the full benefits of EA. This brings them to the conclusion that the DMSM should be adjusted to an EA Value Realization Model aiming at a greater overall EA acceptance. The authors reason that the DMSM is suitable as it was originally designed to capture the process of value realization in the IS domain and has been extended in further research to other domains as well. Consequently, they derive based on their findings from two case studies and the DMSM the adjusted EA

Value Realization Model that contains service quality and use as two catalysts enabling the overall success of EA. This model however focuses on the effects of EA presentation and different governance strategies on the overall success of EA. Other constructs that might influence the overall success of EA as well are not considered in this research. Furthermore, the study reports on their preliminary findings from two case studies and a further validation has not been published [23].

Niemi et al. [24] pick up the main shortcomings of Kluge et al.'s EA Value Realization Model and suggest a model that considers further constructs relevant to the success of EA. They propose to consider four different viewpoints when evaluating the seven dimensions of the DMSM: The *process viewpoint* considers the EA planning, development and management processes. The *products viewpoint* comprises the results of the EA processes, i.e. the models and principles. The *outcome viewpoint* assesses the results of the implementation of EA products, i.e. the systems developed. And finally, the *impacts viewpoint* considers the benefits from EA that arise directly or indirectly from EA processes or products. The authors illustrate the suggested theoretical application of the DMSM by using a case study that has been published in [25] earlier but do not further validate their suggested approach either in later publications. However, the main limitation of this research is in our view the definition of the different viewpoints. On the one hand, the definition contains redundancies and white spots. For example the impact viewpoint has for five out of seven dimensions no direct equivalent. On the other hand, the viewpoints are not integrated to an overall perspective and it is not clear how the different viewpoints relate to each other to gain a consistent and integrated theory for the EA benefits [24].

In conclusion, current research has suggested to apply the DMSM to explain selected characteristics of EA but no comprehensive model for the realization of EA benefits has been researched as yet.

III. Research approach

In the following section, we describe our approach to the literature review first and then detail how we used the insights from the literature review to derive our EA benefit realization model and start a first verification. We also discuss our approach for a preliminary validation and exploration of our model.

A. Literature review

To build a theoretical foundation for the application of the DMSM to the domain of EA, we conducted a comprehensive literature review of papers describing EA success factors as well as EA benefits. In our review, we followed the structured approach as suggested in [26]. First, we identified scientific publications by searching relevant scientific databases (ACM Digital Library, AIS Electronic Library, EBSCOhost Business Source Premier, IEEE Xplore, ScienceDirect, and SpringerLink) as well as by searching the domain-specific outlets Journal of EA and the Trends in EA Research workshops series. Because EA is a comprehensive discipline and related to various other IS topics [27], we focused our review by excluding literature from boundary disciplines such as business-IT alignment or software architecture development.

We used the key word "enterprise architecture" to query the databases. This search yielded 868 publications. To identify further publications from IS top publications that might be missed by the first step, we screened the table of contents and abstracts of the eight AIS senior scholars' basket journals [28]. This search yielded to additional 4 publications. Having identified 872 publications, we excluded 190 redundant publications. Further 82 were no peer-reviewed publications and hence excluded, following the suggestions in [29]. The remaining 600 publications were further screened by evaluating title and abstract regarding their fit to our research scope. This step led to an exclusion of 453 publications as they address topics different to the scope of this study, such as how to define a meta models for EA, or discussions of definition of EA. The remaining 147 publications were analyzed in detail to extract EA success factors and EA benefits. These could be found in 48 publications that are used as a foundation for this research.

B. Theory development

Studying the identified 48 publications, we extracted all concepts mentioned explicitly or implicitly as EA success factors. With this approach, we identified 211 potential EA success factor items, such as "completeness of the as-is architecture documentation improves EA efficiency". We used the qualitative data analysis tool NVivo 9 to code and cluster the success factors. In this tool, we assigned tags, in NVivo terms 'nodes', as units of meaning to the each identified item. Therefore, we modeled the DMSM in the tool by creating a folder for each of the 6 dimensions. To analyze the 211 EA success factor items, we coded them as follows:

- When a new success factor emerged, a new node was created and assigned to the appropriate dimension of the DMSM.
- Further success factors generally supporting a certain earlier identified factor were assigned to these nodes.

Two researchers coded the identified success factors subsequently. The first researcher coded the success factors including the initial topic structure. Then, the other researcher re-coded the success factors against the

created structure. With this approach, we could identify only few discrepancies. To resolve these discrepancies, we discussed and recoded the topics, thereby reaching iteratively consensus in our coding.

C. Preliminary validation and exploration

As a first step towards a validation of the model, especially in terms of completeness, we conducted five semi-structured interviews with EA experts. These interviewed EA experts covered both EA experts from enterprises on a senior manager level (mostly "Head of Enterprise Architecture" or equivalent) as well as experienced consultants to complement the experiences from the enterprises. These interviewees were identified through a judgmental procedure using factors such as years of experience in EA, reputation in the EA community and position in the organization. We compiled a list of experts based on these factors by searching the German professional community platform XING as well as personal contacts. Based on these criteria, we developed a list of 54 EA experts and contacted the experts individually. A face-to-face interview was then set up with five of these experts who were willing to participate. Among these participating experts, we did not identify any systematic omissions or bias in the responses in terms of associated industry, EA maturity, or positioning within the organization.

Section 1.	**Demographics** What are your enterprise's demographics? What is your personal experience with EA?
Section 2.	**EA benefits** What organizational benefits yields EA?
Section 3.	**EA success factors** What are success factors required to realize organizational benefits from EA?
Section 4.	**Sub-factors of EA benefit realization model** What sub-factors influence the dimensions of the EA benefit realization model?

Table 1. Guiding questions per interview section

In each interview, which took approx. 90 to 120 minutes each, we first asked open questions about the experts experience with EA benefits and EA success factors and then discussed the expert's experience with EA success factors along the dimensions of our model derived from literature. Table 1 describes the interview structure.

Following these interviews, we coded the results from the interviews in the same manner as we coded our findings from the literature review. With this approach we were able to conduct a preliminary validation and further exploration of our model based on the insights from the expert interviews.

IV. Theory development

Building on the insights from the literature review, we present in the following section our EA benefits realization model. First, we generally introduce our adjusted DMSM and then we detail each dimensions by outlining identified EA success factors and EA benefits. Thereby, we denote in italic each success factor with a capital letter for the associated dimension (e.g. *P*), a number for the success factor or benefit (e.g. *P1*), and a lower letter for the sub-dimension or sub-benefit (e.g. *P1a*).

A. The EA benefit realization model

We extended the DMSM to the domain of EA in this research by using a holistic view on EA success factors that lead to EA benefits based on our literature review. According to our characterization of EA in Section 1, EA is a capability to manage transformations. It builds on EA methods, tools, and frameworks [30] as well as people conducting the related EA activities which is identical to the definition of information systems: An information system is *"any combination of information technology and people's activities using that technology to support operations, management, and decision-making"* [31]. Consequently, we argue that EA can be interpreted as a particular type of an (information) system itself. Furthermore, our perspective on EA is that of a more comprehensive capability rather than a simple documentation, and in turn justifies the interpretation of EA as a system in terms of an organizational function.

Although the DMSM was originally developed for information systems, especially the application of the model to areas such as process modeling or knowledge management shows the broader applicability of the model to other domains as discussed in Section 2. This is mainly because the model is based on the generic communication and information influence theories which indicates that the model can be used to evaluate the success of any process [24]. Using the DMSM as a variance model [32] in this research, our suggested EA success factors are interpreted as the independent factors that result in EA benefits as the dependent factor. To apply the dimensions of the DMSM to the domain of EA, we interpret, the DMSM dimension in the EA benefit realization model as follows:

EA product quality is adapted from the dimension information quality in the original model. Originally this dimension describes the output of the information system. Similarly in the context of EA, this dimension is concerned with the output of the EA function, namely the EA products. The EA products are the artifacts that store the information required for EA and the related decision making. The second dimension of the EA benefit realization model, in the original model the system quality, is adjusted to the *EA function setup quality*. In line with the actual system in the DMSM, the EA function setup provides the required infrastructure for EAM and hence determines the formal condi-

tions under which EAM is executed. And finally, the *EA service delivery quality* replaces the original dimension of service quality. This dimension is concerned with the quality of the EA services provided to EA stakeholder to enact the EA. The other remaining four dimensions, use, intention to use, satisfaction, and net benefits remain in their original definition intact.

In addition to these adjustments of the DMSM, we introduce a further dimension *EA cultural aspects* motivated by the criticism of the DMSM that cultural and people aspects are underrepresented [21, 22] and reflecting the importance of this factor identified through our literature review. In oppose to the EA function setup quality that is concerned with the formal conditions, this dimensions is about the informal, i.e. "softer", conditions in which EA is operated. Bean [33] and Magalhaes et al. [34] argue that these cultural and social aspects are a fundamental element of EA that is often not part of EA or neglected. Therefore, we see a need to represent these aspects in the additional dimension *EA cultural aspects,* which is further detailed later on.

Figure 2 summarizes our extended model, which we will detail in the following subsections together with the identified EA success factors and benefits.

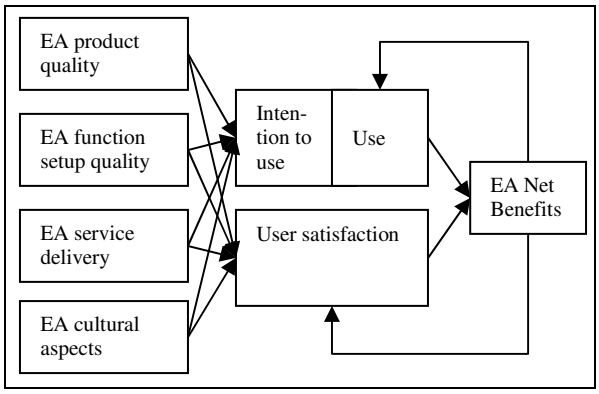

Figure 2. The EA Benefit Realization Model

B. The EA products quality (*P*)

EA products are the artifacts created by the EA function typically comprise at least the as-is architecture, the to-be architecture, and the roadmap. Hence, this dimension is concerned with the questions of what information these EA artifacts provide with which characteristic and in which quality:

P1 **Desirable information about the as-is architecture should be provided to satisfy the needs of the EA stakeholders in an effective and efficient way.** This first core product of EA is the documentation of the current implementation of business processes, IT systems and infrastructure [8, 30, 35, 36]. It needs to provide a current (*P1a*) [8, 9, 37, 38] and complete (*P1b*) [39–41] view of the as-is architecture providing the right degree of detail (*P1c*) [8, 39, 42].

P2 **Desirable information about the to-be architecture should be provided to satisfy the needs of the EA stakeholders in an effective and efficient way.** This documentation describes, similar to the as-is architecture, business processes, IT systems and infrastructure but focuses on the desired state in the future. Here as well, the documentation needs to provide a complete (*P2a*) [8, 40, 41, 43] view of the desired architecture providing the right degree of detail (*P2b*) [8, 39, 42]. In addition to these two key characteristics, the to-be architecture also needs to be updated regularly to changing conditions as the organization itself or the environment might change over time (*P2c*) [8].

P3 **Desirable information about the EA roadmap should be provided to satisfy the needs of the EA users in an effective and efficient way.** The EA roadmap schedules the transformation steps, i.e. the implementing projects, that evolve the as-is architecture step by step to the to-be architecture. It brings the transformation steps in a desired sequence accommodating contextual factors such as business priorities, budgets, and urgency [30]. The roadmap needs to be feasible given the resource and other organizational constraints (*P3a*) [44, 45], complete in terms of considering all relevant steps to transform from the as-is to the to-be architecture (*P3b*) [40, 41], and integrated by considering and solving dependencies between different transformation steps (*P3c*) [46].

C. The EA function setup quality (*F*)

The EA function setup is concerned with the condition in which the EA function operates as well as the provided infrastructure used by the EA function. This dimension is concerned with the questions of which EA infrastructure setup needs to be provided to operate EA most effectively and efficiently.

F1 **A clear EA mandate should define the appointed organizational and business/IT scope of the EA function.** It needs to be clearly defined which part of the organization is in scope of the EA, i.e. the entities and subsidiaries that are under consideration (*F1a*) [45, 47]. This scope should be tailored to the intended purpose and management expectations [48, 49] and consider the desired strategic long-term focus [41]. Next, there seem to be advantages to position the EA function well between the business and IT department (*F1b*) [37, 46, 50]. Thereby, being an organizational rather than an IT practice is seen to be beneficial [6] as it allows to leverage interdisciplinary teams [37] that continuously exchange information between business and IT [37, 50] and that are aligned with business objectives [37, 41]. Furthermore, the EA function needs to be positioned to be integrated and aligned with

boundary functions [35, 41, 51] such as project portfolio management, business and IT strategy definition, or project management [37]. It needs to be positioned so that it has not to compete with these boundary disciplines [45].

***F2* Central and local accountabilities should be defined for EA decision making.** As EAM is aiming at a holistic optimization of the EA in alignment with global and long-term objectives, central governance plays a crucial role [8]. The absence of such superordinate coordination mechanisms would lead to local and also often short-termed optimization omitting global and long-term objectives [2, 8]. Consequently, without the right degree of centralization for budgets (*F2a*), operational process optimization and implementation (F2b), application development project prioritization and approval (F2c), IT development and implementation (F2d) and infrastructure planning and management (F2e) [2, 50, 52–54], EA compliance and ultimately the pursued EA goals are not enforceable.

***F3* Governance mechanisms should be defined for EA decision making.** It specifies the formal decision rights to encourage the desired behavior [40, 55]. To do so, EA literature suggests formally defined policies (F3a) [8, 47], formalized communication of all stakeholders over boards (F3b) [6, 36], formal review gates (F3c) [6], and incentives [2] as formal governance mechanisms.

***F4* The EA frameworks & tools should found an infrastructure to support the EA service delivery.** Having an EA framework in place (*F4a*) [38, 47, 56] guides the EA service delivery and improves efficiency and effectiveness [41, 52, 57]. Such a framework should be accepted by all relevant stakeholders [8] as a reference for EA products. In order to increase efficiency and effectiveness of such a framework, it should be aligned with the organizational needs [51, 58], in particular to set goals [59] and stakeholder needs [41, 59]. In addition to a framework, using EA tools support (*F4b*) [35, 40, 50] establishes a central repository of the EA products [8, 37] enabling advanced EA analyses and a corporate wide access [6, 23, 60, 61]. In addition to employing an EA framework and a central EA tool, reference architectures are discussed in literature to further increase efficiency and effectiveness of an EA practice (*F4c*) [8, 62].

***F5* The EA principles should provide guidance to reach the to-be architecture.** EA principles are "fundamental propositions that guide the description, construction, and evaluation of enterprise architectures [63]." They can differ in terms of scope addressing business application issues to technical infrastructure issues as well as in the level of detail [2]. Consequently, they need to be directive (*F5a*) [2, 8], specific (*F5b*) [8, 64], and implementable (*F5c*) [4].

***F6* EA staff should be well trained and integrated in the organization.** Having clearly defined and set up EA roles (*F6a*) [2] ensures that all activities are properly assigned and conducted with the right skills. Furthermore, a continuous training of EA staff is required (*F6b*) [40, 65]. In addition to the right expert knowledge, it is important that EA staff is well equipped with soft skills such as facilitation and communication skills (*F6c*) [64, 65] to be able to moderate between all stakeholders [44, 55, 60]. In addition, EA roles need to be well integrated with other organizational roles and EA architects need to be well linked in the organization with an extensive network (*F6d*) [37]. Furthermore, the boundaries between the differing roles in the organization need to be clear (*F6f*) [40].

D. The EA service delivery (*D*)

The EA service delivery provides EA services to all relevant stakeholders. Thereby, the communication with EA stakeholder, the compliance validation and decision making, and the support of projects has a crucial role [8, 36, 47, 66]. This dimension is therefore concerned with the question of what EA services are provided with which characteristic to the organization. This means that this dimension does not focus on the particular EA processes (i.e. not focus on processes such as the EA-internal processes to update EA products) but on the actual services provided to stakeholders external to the EA function.

***D1* The 'EA communication' should educate EA stakeholders about their activities.** The EA communication has to communicate stakeholder-specifically (*D1a*) [35, 43, 67, 68] so that the information is understandable [35, 48] and accessible by all stakeholders [8]. When communicating with EA stakeholders about acceptance inhibitors, it is also argued that it is important to convince EA stakeholder of the value of EA (e.g. through success stories) (*D1b*) [45, 48, 68]. Furthermore, the involvement of EA stakeholders should be conducted proactively in order to increase the visibility of EA outside the EA function (*D1c*) [2, 37, 40, 47, 65]. This visibility is said to improve top management cognition of EA, which, in turn, contributes to improved effects and benefits of EA [49, 52].

***D2* The 'compliance validation and decision making' should support management in deciding on an architecture and assuring project conformance.** To evaluate whether the set EA principles are fulfilled, regular project or architecture reviews need to be done (*D2a*) [2, 8, 41, 69] Thereby, the defined approach for reviews and decision making should be transparent and consistent to be understandable by all stakeholders (*D2b*) [36, 70]. Also violations need to be tracked and sanctioned (*D2c*) [8]. In addition, top management

should be briefed regarding the results of reviews and advised for decision making proactively (*D2d*) [60].

D3 **The 'support of projects' should integrate the EA function with actual implementation in projects.** The active involvement in ongoing projects (*D3a*) [9, 40, 53, 54] for architectural considerations and methodical questions is said to be crucial to ensure compliance and project success [40, 41]. This involvement should also not be simply process-related in order to achieve compliance, but also the EA experts should spent a significant share of their time on projects by taking an active project role (*D3b*) [8, 44] ensuring the transfer of tacit knowledge [49].

E. The EA cultural aspects dimension (*C*)

This fourth dimension 'EA cultural aspects' is introduced to accommodate people and soft aspects of EA. These human aspects of EA are said to be a fundamental part that is often neglected [33, 34]. Similar to [71], we define EA culture as *"the specific collection of [EA] values and norms that are shared by people and groups in an organization and that control the way they interact with each other and with stakeholders outside the organization."* Therefore, this dimension is concerned with the implicit EA values and norms that are lived to implement EA successfully.

C1 **EA leadership commitment ensures priority and resources.** Various researcher report on top-management support being a crucial component for EA success. Without a culture of the management support, the EA initiative fails to find resonance within the organization and resources are hardly assigned to it. The degree of top-management commitment [9, 41, 50, 54, 65, 67] is therefore a crucial element in shaping the EA functions setup and ensure to have sufficient resources (*C1a*) [44, 45, 57]. Therefore, top-management need to see the high importance of EA (C1b) and consequently needs to allocate sufficient time to this topic (C1c). Thereby the leadership needs to be clear and communicate passion and excitement for EA (C1d) [45, 65].

C2 **A high awareness of EA should be reached among all EA stakeholders.** To be accepted in the organization all the EA function should be known by all relevant stakeholders (C2a) and be perceived by them as an important topic (C2b) [6, 67]. Furthermore, EA stakeholders should be educated continuously in order to be aware of EA and understand it better (*C2c*) [40]

C3 **A common understanding for EA should be established for both business and IT employees.** To create an understanding for EA, it is said to be important to have a common, shared vision for the long-term (*C3a*) as well as a common understanding of EA for the short-term both among business and IT employees (C3b) [6, 50, 65, 67]. Thereby the understanding needs to have a clear business purpose and needs to be integrated in the overall business strategy (*C3c*) [48].

F. The EA net benefits dimension (*B*)

Finally, the EA net benefit dimension elaborates on the ultimate benefits obtainable from EA. In contrast to the lack of an overview of EA success factors in literature to date, for EA benefits recently first literature reviews [1, 72] and practitioner surveys [6, 10, 73] emerged to identify and categorize EA benefits. Based on their literature review, Tamm et al. [1] distinguish the identified benefits in direct benefits from EA and indirect benefits. While they categorize the direct benefits in organizational alignment, information availability, resource portfolio optimization and resource complementary, the indirect benefits are not further elaborated. They claim that the latter category is impacted by EA but can be influenced by further factors such as the actual operation of the platform. Espinosa et al. use a different approach to categorize EA benefits by using three different benefit layers, namely IT, business, and organizational benefits [6]. In contrast to these categorization, Foorthuis et al. categorize the benefits in organization-related and project-related benefits [9].

Dissecting the above outlined literature about EA benefits, shows a high agreement among the authors in three areas: Firstly, EA is said to improve efficiency, especially by reducing cost, reducing complexity, increasing integration, and improving utilization. Secondly, EA assists business IT alignment by creating transparency and establishing a common language. And lastly, it fosters the ability to change. Nevertheless, the evidence and explanation for these EA benefits are mostly anecdotal or identified in exploratory studies. In this research we use these three areas to structure the benefits identified in the literature reviews and hence do not elaborate further on the interdependencies between and structure of the different benefits, as these.

B1 **EA enables the reduction of cost.** Having a well operating EA allows to better integrate (*B1a*), standardize (*B1b*) and consolidate (*B1c*) processes as well as application that often emerged as 'silos' during past years of organic growth. With the transparency created with EA and clear EA standards and policies how to develop going further, these 'silos' can be broken and consequently the standardization, consolidation, and integration leads to lower complexity (*B1d*) and better controlled and improved utilization (*B1e*) which in turn increases efficiency and reduces costs (B1f) [1, 3, 6], 7, [7, 54, 74]. Similarly, using EA, implementation projects are expected to save resources (*B1g*) and time (*B1h*) and to mitigate risks (*B1i*), since EA prod-

ucts can be used as a starting point, relevant knowledge is brought into the projects by actively involving experienced architects, and an overall, integrated planning of the EA allows to identify and mitigate project risks early. Furthermore, the usage of EA allows managing the project complexity analogous to the complexity reduction on the organizational level (*B1j*) [9].

***B2* EA ensures business-IT alignment**. By improving communication between business and IT, EA supports the alignment of business and IT, and hence facilitates the achievement of set business goals. Firstly, EA is said to enable a global optimization when working against set goals (*B2a*) avoiding that individual parts of the organization optimize locally. Furthermore, EA allows aligning business processes with the supporting IT applications (*B2b*) [3, 43, 75]. This horizontal and vertical business-IT alignment is important to realize organizational value [76]. Furthermore, EA provides a common language and a holistic overview of fundamental aspects of the organization that enables an effective communication between the different stakeholders in an organization (*B2c*) [1, 9, 11, 77].

***B3* EA fosters the ability to change.** Providing sound transparency on the different aspects of the organization, EA enables the management of the underlying complexity and hence facilitates the identification of required changes (*B3a*) [1, 8, 9]. This in turn allows the organization to deal with its environment effectively and adjust quickly (B3b) as well as drive appropriate innovation (*B3c*). Furthermore, this transparency and awareness of organizational structures facilitates the cooperation with other organizations by being able to integrate easily (*B3d*) [7, 43, 78].

V. Discussion with EA experts

Our five expert interviews confirmed in general the findings from our literature review. All experts agreed that the proposed dimensions are relevant and complete compared to their experiences. They also attested that the suggested model provides valuable insights for practice to establish an instrument that measures the value of EAM.

In particular, our interviewed experts confirmed the need for a thorough consideration of cultural aspects when discussing the realization of EA benefits. To their experience this dimension is one of the most important factors when establishing an EA practice. They support this by highlighting three points. Firstly, the experts also see top-management support for EA as a key success factor. Our interviewed experts agreed that it ensures that required resources are available as well as fosters acceptance within the organization. Secondly, the experts agreed that building a community around EA helps to establish EA and shape a supportive culture. The active establishment of an EA community shall involve not only direct EA roles but also people from other functions to engage them in EA topics. Thereby, EA is not conducted in the EAM function only but also lived by the main stakeholders. And thirdly, the establishment of an EA culture is said to avoid the perception that EA is an ivory tower that slows down projects with its policies and guidelines. It rather helps to communicate the value of EA especially for transformation projects.

In addition to these cultural aspects, our experts highlighted the importance of the soft skills of EA staff as well as their network into the organization for success of EAM. As one expert stated especially *"communication is a truly important skill for an architect, if not the most important one"*. Furthermore, supporting innovation in transformation projects seems to be an additional point that is important for the dimension of EA service delivery quality. However, this point has not been mentioned in the identified literature. In addition to the consultation of projects regarding the architecture, one expert stated "*to challenge projects and to suggest innovative approaches helps the projects to implement cutting edge technology that delivers high business value."*

VI. Conclusion

Based on an extensive literature review and expert interviews, we discussed EA success factors and EA benefits as part of a comprehensive EA benefit realization model. Our model builds upon the DMSM and considers existing research in the area of EA as well as related IS and management theories. The contribution of this paper is twofold: On the one hand, this paper compiles existing knowledge about the topic of EA success factors and EA benefits and on the other hand it combines this knowledge to a comprehensive theoretical model, which provides direction and guidance to further theoretical and empirical research in this area. Limitations of our research include the scope of the literature review that focused on the domain of EA only, and the limited amount of empirical verification of the model, considering five experts only. Additionally, we recognize that EA benefit realization is also susceptible to organizational and political problems existent in an organization. This aspect, whilst relevant, is not part of our model; mostly because we do not regard these socio-organizational dimensions as enablers (but rather inhibitors) of EA benefits.

In conclusion, we see our model as a first step to gain insights into, and start a discussion about, a theory of EA benefit realization. In turn, we call for further discussion and validation of this model from various perspectives to establish further evidence and also to empirically validate the proposed comprehensive

model. Our next step will be to conduct an empirical study in two phases: (1) we will develop and validate instruments and (2) test the model. Furthermore, we plan to conduct detailed case studies to elaborate on focused aspects of the model.

VII. References

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