

A Literature Study on Benefits Provided by Enterprise Architecture Management

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Motivation

EAM has been introduced in organisations for many years and the discipline evolved over time resulting in a plethora of frameworks, methods, and tools [21, 23]. Consequently, today's EAs reflect this evolution through a multitude of artefacts and systems being implemented in a corporate environment. Despite the fact of developing a business-oriented IT, EAM is often perceived as bureaucratic, document-centric and hampering agility as it is focussing on long-term effects [5, 46, 19]. A study conducted by Kurnia et al. analyse the current state of EA in companies and identify several blockers [24], like a negative perception by business stakeholders or a lack of communication skills. Furthermore, EAM tends to be IT-centric rather than involving business as a driver for IT-related decisions [25].

Consequently, EAM initiatives need to have a clear focus on providing significant benefits in order to be successful [18]. The paper at hand aims to provide an overview on benefits from academic research by conducting a structured literature review. It reveals benefits as they have been identified by various empirical studies in the past. The purpose of that list is manifold: First, it provides an overview on benefits as they are expected or achieved among practitioners. It can support setting up EAM initiatives and define a clear focus on benefits based on best practices (i.e. as performed by others). Nevertheless, professional enterprise architects are usually well aware of potential benefits but lack management support or buy-in by the business. The list may help substantiate an architect's objectives with empirical evidence.

Of course, an academic study might still be perceived as a result from the ivory tower (a classical prejudice that also enterprise architects are usually confronted with). We, therefore, complemented the results of the literature study with results from surveys conducted by practitioners. Before presenting related results, we start this paper with a short description of the research method in the following section Research Method and then immediately present the results from the structured literature review in section Results. A summary is already visible in table 1. The benefits have been categorised and then checked against the results from non-academic surveys. Observations and implications are discussed in the concluding section Practitioners' perspective.

Research Method

A systematic literature review allows a targeted search for academic publications that address a given problem. Thus, gathering and presenting the state of the art on this topic is possible [35, p. 32]. Therefore, the systematic literature review allows us to find primary research on EAM benefits. These publications can be examined on one or more aspects of interest and presented appropriately [44, p. 208]. The method used within the paper at hand is based on the framework by vom Brocke et al. [43, pp. 2210-2213]. It has been primarily used for finding and filtering academic publications. Publications by practitioners or non-academic organisations have been identified through our network or search engines.

The search and review process comprises 6 phases and is shown in figure 1. It starts with defining the scope in the first step (benefits of EA in this case). The identification of key concepts is done in the subsequent step. Before starting the search, one has to select appropriate databases and keywords for the database query (step 3). We have chosen five academic databases from computer science and information systems: ACM Digital Library, AIS eLibrary, IEEE Xplore, Science Direct, and Web of Science. The following keywords were used to query the databases for either the publication title, abstract or publication keywords: "Enterprise Architecture", "Enterprise Architecture Management", "Benefit", "Success Factor", and "Impact Factor".

The fourth step ensures the inclusion of further publications within the research objective. Formal criteria comprise the publication year, type of publication, language, the existence of an abstract and access to the full text. Content-driven criteria include naming at least one EAM benefit in the publication's text and providing empirical evidence of this benefit. Backward and forward search have been performed so that we can find further papers. Through a backward search, the references of a given publication are scanned regarding other potentially relevant articles. In the case of a forward search, articles that have cited a given publication will be investigated. [45, p. 16]

As a result of this process, 31 publications were discovered which are relevant to the research scope. They have been analysed with respect to EAM benefits (step 5). The last step cannot be found like this in the framework by vom Brocke et al. [43]. Since it would be the identification of gaps for future research, and it does not fit in the setting of this paper. For this reason, we have adapted the process to our needs and added the categorisation of EAM benefits as step 6. The result of step 6 can be found in section 3, table 1.

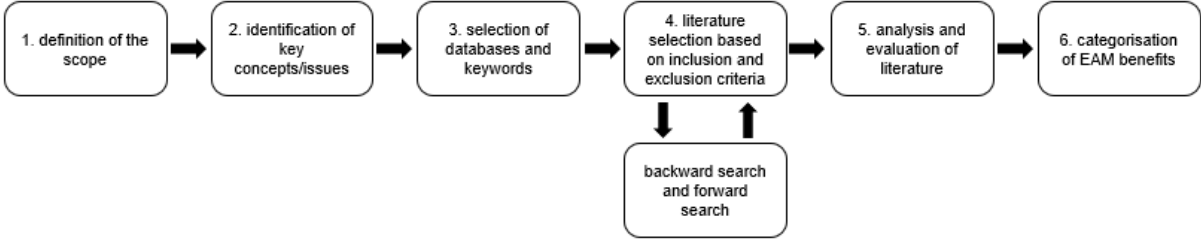


Figure 1: Process of the systematic literature review

Results

One aspect while querying and scanning academic publications was their engagement with the topic of EAM benefits. The academic publications were scanned regarding benefits, and these were collected, consolidated, summarised, and assigned to a specific category. The category aims to depict the positive impact of EAM at a high level. In total, 29 benefits were found and assigned to one of six categories. The result is shown in table 1.

Collaboration: Collaboration means that cooperation within a company is enhanced. IT encompasses EAM benefits that are difficult to measure through appropriate numerical values because it arises on an interpersonal level.

One of the benefits is the *improvement of communication*. Thereby the communication is increased between different departments, resulting in a better overall relationship, more innovative ideas/concepts, more coordinated project rollouts, and fewer conflicts [3, p. 59] [14, p. 554] [20, p. 4892]. Important to realise is the direct connection between the benefit of an improvement of communication and the *unified use of definitions/terminology*. The latter provides equal knowledge and allows a dialogue on the same level, especially between people from different subject areas, such as programmers and businesspeople [9, p. 554] [11, p. 6013] [14, p. 554].

Cross-departmental thinking fosters the awareness of departments among each other, which initiates a cultural change and a mindset change within the company [3, p. 59]. Interestingly, one of the interviewees mentioned that EA needs these cultural changes like silo-thinking reduction to perform well [6, p. 139].

Out of all benefits, an *increasing business-IT Alignment* was mentioned the most. With 16 mentions, more than half of the studies quoted this benefit. Various assumptions can now be made about why it was found most often. One of the reasons can be the wide-ranging nature of this subject, as nearly every company has some interrelationship between their business and IT. Also, it is only natural that EAM aligns the business and IT aspects. Since the Zachman-Framework from 1987, things like a technical perspective and a business perspective had to be related while creating EA [47]. An interesting note that many studies highlighted is the implementation of EAM at the right place in an enterprise. This place needs to be right between the business and IT parts [37, p. 9] [38, p. 19] [39, p. 16]. None of the studies hints on how to determine this place in a company or why exactly this place was chosen. However, two studies give a more detailed description of this place. Van de Wetering et al. [39, p. 7] mention that it has to be in the middle of the company. This “middle” is not further discussed, but the study says one has to place it directly at the key stakeholders. It enables EAM to respond directly to the wishes of the stakeholders/beneficiaries and orient EA based on these. A study by Toppenberg et al. [38, p. 11] confirms an implementation directly at the stakeholders. Here EAM is placed right between the Chief Operating Officer and the Chief Information Officer. Further, this study performed a case study in Cisco Systems and said: “*In Cisco, this orchestrating role is enabled by structurally positioning EA as a crossfunctional capability, sitting between the business and IT functions [...]*” [38, p. 19]. Also, EAM should not be seen/understood as an IT tool. It must be oriented towards business objectives rather than IT objectives [34, p. 344]. An interviewee in a study by Alwadain et al. [4, p. 8] strengthens this argument: “*EA must be driven by business. It must be viewed as a tool that translates business strategy and the business model into an executable operating model [...] [If not,] EA risks being IT-driven which yields projects and investments that do not provide business value*”.

Transformation: The category transformation comprises benefits that help to reshape a company. This can be an individual process or an entire business sector, especially when it is a question of leading something from an as-is state to the desired to-be state. Essential for the transformation of a company is a kind of *future orientation*, where the favoured to-be state is illustrated through fitting EA Artefacts [20] [36, p. 17].

Table 1: EAM benefits from academic studies

Category	Benefit (number of mentions)
Collaboration	<ul style="list-style-type: none"> Improved communication (8) Cross-departmental thinking (5) Increased business-IT alignment (16) Unified use of definitions/terminology (4)
Transformation	<ul style="list-style-type: none"> Future orientation (6) Dealing with change (4) Responsiveness to external circumstances (5) Improve agility/flexibility (8)
(Process) optimisation	<ul style="list-style-type: none"> Improved and fast decision-making (9) Improvement of acquisitions (3) Faster evaluation (6) Increased quality and performance (5) Reduce costs (8)
Uncover/Reveal	<ul style="list-style-type: none"> Disclosure of dependencies (6) In-depth project insights (4) In-depth understanding of the systems and processes (8) Disclosure and improvement of business capabilities (8) Greater transparency (4) Top-down overview and a better understanding of the enterprise (8)
Organisation	<ul style="list-style-type: none"> Central point of information (4) Coordination and support (5) Governance role (9)
Simplification	<ul style="list-style-type: none"> Reduced complexity and enhanced complexity management (6) Increased standardisation (13) Increased reuse (8) Simpler integration processes (5) Increased efficiency and effectiveness (7) Reduction of redundancies (8) Increased interoperability (5)

In practical use, many things, such as strategies, can be adjusted early/fast to the desired to-be state [11, pp. 6011, 6013] [40, p. 1959] [41, p. 357]. Therefore, projects should be primarily directed to meet the to-be state in their initiation phase/early stage. Under the circumstances that it is documented in an early EAM cycle.

The benefits of *dealing with change* and *responsiveness to external circumstances* depend on each other. Often, the former influences the latter. Unfortunately, the studies only have a few ideas on how both can be understood and how they can be seen in practice. For example, a study by van de Wetering et al. [39, p. 16] speaks of transparency in internal business processes as a key enabler for making it easier to implement changes. However, practical advice on how to use certain EA artefacts to foster these benefits is not given.

In order to *improve agility/flexibility*, a certain degree of simplification must be first achieved [24, p. 5588] [37, p. 10]. Furthermore, as it is a long-term benefit, the maturity of the implemented EAM is a crucial factor [8, p. 116]. For example, one must first create a configurable IT infrastructure to deal with change in an agile way. This reveals that it is vital to transform the environment in a way that allows you to act flexibly.

Process optimisation: Process optimisation covers the optimisation of processes to achieve specific goals like cost saving or workflow efficiency. EA artefacts play a fundamental role in decision-making processes by providing relevant information and can be an additional determinant. Through this, an *improved and fast decision-making* process can be obtained.

As mentioned by Alwadain [4, p. 9], quality standards on artefacts are noteworthy: “*Needless to say, the EA team must produce quality output*”. Moreover, they must be up-to-date, understandable and contain sufficient information for a given aspect, as Alwadain further indicates: “[*Provide artefacts that*] are relevant to them [Stakeholders] by creating various architectural views and reports” [4, p. 9]. Furthermore, some studies indicate that one should consider other departments regarding potential conflicts and impacts on decision-making [24, p. 5589]. Hence it links to our collaboration category and shows the close networking of the benefits among each other, which means that certain benefits should not be neglected due to potential unimportance.

Artefacts are also an essential factor for a *faster evaluation*. Different elements for the evaluation, like integrability, usefulness, and risks, can be depicted and considered by fitting artefacts [32, p. 11] [38, p. 8]. One of the interviewees in a study by Burmeister et al. [10, p. 5597] said: “*When a new product comes into the house, the EA model helps us to do a conformity test. [...] We can predict dependencies, assess risks, and evaluate how it meshes with personal data and whether it complies with our privacy policy*”. Since artefacts are created before the evaluation process in an optimal scenario, they can optimise it. In addition, these benefits can be seen as part of improved and fast decision-making. Although it is often criticised in practice that EA hinders the daily work and these processes, e.g. by approving artefacts first [28, p. 3885]. Since six studies find this beneficial, it seems that a well-rehearsed process is needed to optimise the usage of EAM.

One of the most specifically named benefits is the *improvement of acquisitions*. As the name suggests, it is about integrating an acquired company's processes, systems, and projects into one's own. Since such a project is special and does not concern every company, only three studies mention this benefit. To summarise it clearly, one must be aware of its own company's as-is state and the acquired company's as-is state to plan how they can be merged into a new to-be state [24, p. 5589] [38, p. 26].

To *increase the quality and performance*, many aspects like reduction of redundant processes or decent governance play a role [20, p. 4890] [36, p. 16]. The latter ensures quality by complying with requirements, and the former increases performance [32, p. 10]. Although there is no guidance on achieving it, it indicates that these benefits come after realising other preliminary benefits.

The same goes for the benefit of *cost reduction*. As it is the desired economic outcome of more optimisation, it is also more of an indirect benefit. There is no standardised way for how EAM can achieve it, but the studies name some steps that can lead to it. For example, re-arrangement and merging processes, standardising systems to reduce/save software license costs or standardising processes like project initiations to save time and money [1, pp. 8, 10] [4, p. 9] [6, p. 138] [22, p. 4609] [25, p. 4236].

Uncover/Reveal: This category aims to disclose all areas in an enterprise and make this information available to everyone. Artefacts play an essential role and are the foundation of it. Also, it seems to be an inevitable category that arises when EAM is correctly performed/executed. A step to better align business and IT is the *disclosure of dependencies* in various aspects. Processes depend, for example, on applications (business support), or applications depend on other applications (e.g. data flows). It might also help with decision-making, e.g. which of the business processes are affected by the replacement or addition of new systems [29, p. 67] [40, p. 1960]. Therefore, the disclosure of dependencies is essential for the realisation of other benefits. Furthermore, it depicts the connection between an organisation's different architectural layers/components [15, p. 6].

The gain of *in-depth project insights* seems not a typical EAM benefit at first sight since EAM is often viewed as a so-called town planner. Though only four studies mentioned this benefit, we try to find possible assumptions. One can be that every company uses EAM for other reasons, which means maybe they intend to use it for project insights. Another question is the integration of EAM in a company. That means how does EAM get these detailed insights into

specific projects. The outcome of other benefits could ensure that like a governance role to control if a project aligns with given rules or a supporting role where architects are actively asked to help in a project. The following statements in Cammin et al. as well as in Niemi and Pekkola highlight this: “LogCo highlights the intermediary role of EAM by, e.g., supporting the exchange about project experiences between the stakeholders” [11, p. 6011]; “This was emphasised with the centralised architectural support for projects and programs. It was considered crucial that the support is given in the early phases of the project [...]” [29, p. 3884]. Unfortunately, there are only very few studies addressing the mutual benefits of EA and project management..

An *in-depth understanding of systems and processes* is mainly gained through EA artefacts [14, p. 554] [40, p. 1960]. It is possible to get a better understanding, e.g. of the data flow to ensure data privacy [10, p. 5597] [14, p. 554] [15, p. 6] [29, p. 67] [40, p. 1960]. “The people here are so happy that they invested in EAM to create basic overviews. I mean, the EA models inform us about all applications. I know exactly which application uses which data and where to designate a processing activity” [10, p. 5597]. Furthermore, systems and processes can be re-evaluated regarding their importance. For example, in one study, resource usage (workload, staff, physical, etc.) was modelled for a manufacturing process [42, p. 18]. This shows that it can be used in non-IT scenarios, too. Overall, this benefit gives more transparency and is essential to get a more detailed view compared to the later-mentioned top-down overview.

Artefacts like the business capability map are a core element to *disclose and improve business capabilities* [22] [38, p. 12]. Thus, what is done in the company. Therefore, it is essential to identify capabilities in the first step and use the gained knowledge to take the necessary steps for targeted improvement [20, p. 4890] [24, p. 5587] [38, p. 12]. One study finds a direct connection and a positive effect of EAM on IT capabilities [30, p. 573].

Four studies mention the vague finding of *greater transparency*. The researchers agree on the increase of transparency through artefacts. So, transparency results in more specific benefits like those mentioned in this category. Other than that, it describes this category well.

The benefit of a *top-down overview and better understanding of the enterprise* fits the often-used analogy where EAM is described as a town planner pretty well. By modelling different enterprise layers, this holistic view is gained step-by-step. Additionally, their connections are more apparent [1, p. 6] [14, p. 554] [20, p. 4892] [33, p. 4112]. Furthermore, it can be used to model a less detailed to-be state and align projects and strategies to it [40, p. 1959] [41, p. 357]. Other than that, it has a connection to the collaboration category. Departments become more aware of their role in a company and perhaps see their relationships with others [9] [14, p. 554]. The top-down overview is a foundation for the realisation of other benefits. It can be seen as an increase in knowledge from a holistic/less detailed view.

Organisation: The category *organisation* contains benefits where an EAM department is actively involved in providing solutions and answering questions rather than only creating artefacts. Here EAM can be seen as a *central point of information*. Participants in a study by Burmeister et al. mention: “[...] the EAM department provides a central point of contact for the data protection officer to get specific information needs continuously satisfied” [10, p. 5597]. Therefore, EAM is seen as capable of concentrating and sharing information with the whole company, making it a central point of information. Also, EAM/architects can actively help in projects, e.g. give information/possible solutions for problems or control if it complies with standards [40, p. 1961] [41, p. 356]. A statement in Cammin et al. [11, p. 6013] backs this: “It is added that in the context of project support, EAM is a central point of contact that incorporates the knowledge of many projects and can, therefore, provide certain guidance (on-demand) to project teams.”

Coordination and support builds on a *central point of information*. In practice, a visualisation of the to-be state allows EAM to lead and support the company to realise it. This can be in project coordination or to ensure that company goals are met rather than individual department goals [6, p. 138] [41, p. 352]. But now comes the critical part to gain this benefit: EAM needs

leadership authority to easier realise it. To get the authority, EAM needs backup from the Top-Management. Otherwise, it may not prevail. Other than that, the studies hint at how EAM can provide support. Fundamental is the correct usage of artefacts where EAM should advise users on selecting a fitting artefact in a specific scenario and motivate using EA in their daily work [4, p. 9] [6, p. 139] [37, p. 4]. Besides, good communication by the architects is a crucial qualification. For example, to communicate the enterprise's vision or goals to people from different disciplines in a proper manner (IT needs an explanation other than business) [14, p. 554] [15, pp. 8, 9].

The *governance role* is needed to realise the other two benefits in this category. Since nine studies found it, its relevance/importance is known. Mainly the governance role takes place on the project level, where EAM ensure compliance with standards, rules, vision, goal contribution, and many more [1, 11, 14, 40, 41]. A conducted Delphi method by Plessius and van Steenberg [32, pp. 9,10] backs this. In order to enforce a kind of compliance, EAM needs help from the management level as Foorthuis et al. [14, p. 554] describe it as follows: *"Furthermore, having management emphasise the importance of EA and announcing compliance assessments increases a project's motivation and commitment to become compliant, possibly to avoid confrontation."* Here, too, the architects' communicative skills are an essential factor. Furthermore, Foorthuis et al. [14, p. 554] show a practical example of the importance of communication: *"[...] knowledge exchanges between architects and project members result in an increased ability to work in a compliant fashion."*

Simplification: Simplification is an extensive term and was deliberately chosen. Basically, it is about simplifying the work through appropriate measures. The benefit of *reduced complexity and enhanced complexity management* can be realised by introducing standards to reduce it and an overview of processes, systems, etc., in order to manage it properly [1, 14]. Although complexity is not reduced, two studies suggest identifying complex processes and splitting them into little but less complex ones to manage them better [6, p. 138] [16, p. 4]. In addition, Khosroshahi et al. [22, p. 4608] suggest that only a few dependencies between the capabilities should exist to avoid complexity.

After business-IT alignment, the *increased standardisation* is the second most named benefit. According to the studies, increasing standardisation is one of the most critical steps to reduce complexity. It goes so far as to say that it is a primary reason to implement EAM. Two quotes from the studies by Hiekkanen et al. and Makovhololo underline this: *"The most important organisational drivers for EA work were [...] Unifying Enterprise IS Environment [...]"* [17, p. 294]; *"When asked about the reason for GWEA [Government Wide Enterprise Architecture] implementation within the department, a participant replied, 'It was all about standardisation because there was no standards, nothing was standardised' [...]"* [27, p. 342]. The total number of 13 mentions shows the importance of standardisation in EAM initiatives. Other benefits arising from an increase in standardisation are interoperability, easier adoption of new technology and fewer costs (especially software license costs) [1, p. 10] [6, p. 138] [24, p. 5588] [29, p. 74]. Interesting for small- and medium-sized enterprises is that Qi et al. [33, p. 4112] also observe this benefit in them. Unfortunately, such a statement is not found for other benefits, but that does not mean small- and medium-sized companies cannot achieve them. The question of what can be standardised is only answered with vague hints (e.g. application landscape, project initiation, etc.).

Increased reuse can be found in different aspects such as processes, systems, or even EA artefacts [6, p. 138] [10, p. 5596] [16, p. 4] [32, p. 11]. Here the category Uncover/Reveal is an essential factor to see what can be potentially reused. Toppenberg et al. [38, p. 16] observed that it is even possible to reuse capabilities. For example, in a case study by Saleem and Fakhie [36, p. 16] low detailed models for various business requirements were created to use as a foundation in different scenarios. This benefit is mainly used to reduce costs and effort.

Simpler integration processes are mainly based on the realisation of other benefits. Hence only five studies mentioned this benefit. The integration process refers to integrating new technology, systems, and strategies. It follows that not only the IT level in a company is affected

but also the business level [6, p. 138] [20, p. 4892] [36, p. 16]. For example, standardised solutions or processes are much easier to implement in different scenarios. According to Ahlemann et al. [1, p. 9], improving the change-management through EAM is one reason for simpler integration processes.

Further simplification and the previously mentioned benefits foster *increased efficiency and effectiveness*. According to Bradley et al. [8, p. 116] and Hiekkanen [17, p. 296], IT efficiency can be increased, e.g. by standardising (and reducing) the used programming languages so the personnel can focus only on a few. Furthermore, Bradley et al. [8, p. 116] observed higher efficiency in companies with a higher EAM maturity. But also, an improvement in business capabilities positively affects efficiency and effectiveness [14, p. 555]. This circumstance may cause this benefit to be achieved rather in the long run. Unfortunately, no further instructions for practice are given.

Redundancies are often an unnecessary driver of complexity, and through the benefits of the category *Uncover/Reveal*, a *reduction of redundancies* can be achieved. Typical redundancies in the business layer are processes, efforts or even requirements [20, pp. 4890, 4892] [33, p. 112]. For the IT layer, these are software, systems, and data. As observed by Khosroshahi et al. [22, p. 4609] and Makovhololo [27, p. 342], the positive effects of minimising redundancies are cost reduction, higher productivity, and interoperability. None of the studies gives best practices for identifying them. Still, one study says that fewer redundancies in the future can be forced through architectural principles: *“An architectural principle in ToolCo that strengthens simplicity is that a business requirement should only be implemented once.”* [11, p. 6013]. Otherwise, our introduced Uncover/Reveal category provides a good hint on how to disclose accrued redundancies.

EA artefacts disclose parts where systems and solutions may work together, leading to *increased interoperability*. In addition, interoperability can be increased through standards in the application portfolio/landscape and data structures [29, p. 67]. At the business level, it can be improved through standardised processes to increase their interaction and information exchange [6, p. 138].

Finally, it is important to note for all benefits in the simplification category: to simplify, one must first uncover its organisation (or parts of it). This indicates a hierarchical order on what benefits should be prioritised in the first place because their achievement makes it easier to achieve further benefits. It applies to all categories that some benefits (also across categories) have a strong connection and accelerate each other in their realisation.

Practitioners' perspective

Results from academic studies have been compared with practical-oriented studies. These were not identified through the systematic literature search but by network or search engines. A total of four studies were included. Selected studies were conducted by the companies BizzDesign, Capgemini, and LeanIX as well as by the journal EAPJ. Also, they were published between 2018 and 2021, making the findings up-to-date.

All the non-academic studies conducted a survey and the number of participants ranges from 57 to 1.892. The participants have mainly a background in IT management, C-level, or being an architect. The industries they come from are diverse and range from government to banks, healthcare, or manufacturing – just to name a few. The main goal of the studies is to show the current state of EAM as well as the challenges which EAM faces and can solve. Only the study by EAPJ acknowledges that participants are heavily biased by the authors' network and mainly come from the EAPJ audience. The other studies do not mention this, but it can be assumed that their participants belong to the respective customer network.

Such a comparison has several objectives: First, our findings from section 3 are to be validated. Furthermore, a practical-oriented viewpoint yields the chance to find further EAM benefits. After all, there is still a discrepancy between academics and practice (the former is often too

detached). This leads to the opportunity to examine and present both perspectives, especially as practitioners are to be addressed in this paper.

The procedure for the analysis followed the same scheme as the steps 5 and 6 in figure 1. Following table 1, the categorisation of benefits from non-academic studies is shown below in table 2.

Category	Benefit (number of mentions)
Collaboration	<ul style="list-style-type: none"> Increased business-IT alignment (2) <i>Improvement of Customer Experience (1)</i>
Transformation	<ul style="list-style-type: none"> Future orientation (1) <i>Support for digitalisation (2)</i> <i>Reduce Legacy Risk (1)</i>
(Process) optimisation	<ul style="list-style-type: none"> Improved and fast decision-making (2) Reduce costs (1) <i>Improvement/automation of processes (2)</i> <i>Competitiveness and stand out from the competition (1)</i>
Uncover/Reveal	<ul style="list-style-type: none"> In-depth understanding of the systems and processes (1) Disclosure and improvement of business capabilities (2) Greater transparency (1) Top-down overview and a better understanding of the enterprise (1)
Organisation	<ul style="list-style-type: none"> Coordination and support (2) Governance role (2) <i>More Security (2)</i>
Simplification	<ul style="list-style-type: none"> Reduced complexity and enhanced complexity management (2) Increased standardisation (1) Increased efficiency and effectiveness (1) Reduction of redundancies (1)

Table 2: EAM benefits from non-academic studies

The analysis shows that the practice-oriented studies confirm 14 out of the 20 benefits from table 1 and an addition of 6 new benefits can be found through these (new benefits are marked in italics). However, if you look at the “number of mentions” in table 2, it is striking that no benefit is confirmed by more than 2 studies or gets high encouragement even though only four practical-oriented studies were considered.

First, a few points that can be found in the non-academic studies and confirm findings from the academic studies in the last section. As we mentioned in section 3, the survey by Capgemini [12, pp. 15, 16] confirms that EAM should be actively involved in projects to direct/match them in an early phase to given (company/business) strategies. In interviews conducted by Jung [18], interviewees need to assess whether a project should be executed. To enforce this, EAM needs to get the authority to decide things to a certain degree, emphasising the to-be architecture and its goals.

In addition, two studies [12, p. 10] [26, p. 14] confirm the importance of communication. They do not mean the benefit of *improved communication*, but the need that architects must often communicate with the stakeholders.

Two of our academic studies observed that an increased EAM maturity leads to the realisation of certain/more benefits (e.g. business-IT alignment). This statement concludes that not every benefit can be achieved directly or in an early stage of an EAM initiative. Non-academic studies by BizzDesign [7, pp. 26, 28] and LeanIX [26, p. 11] confirm this statement by saying, “higher

maturity leads to a higher return on investment and higher customer experience” [7, 26]. So the outcome seems that EAM can realise its full potential after a longer period of time and when a company fulfils a certain EAM maturity. How long this takes is not said, but both studies give a checklist where one can look roughly at which maturity stage its own company lays [7, Fig. 1] [26, p. 11].

In academic studies, EAM is often described as a tool for performing transformations or in general, to implement change/improve change management. The participants of the study by Capgemini [12, p. 10] confirm this. Here 95% of the participants are involved in the transformation process. In accordance, the development of digital strategies and a target architecture are placed in this study [12, p. 10] as the first and second place of the roles where EAM plays a crucial part [12, p. 10]. Somehow it can be linked to the *future orientation* benefit from the last section, where we described that EAM creates views for a to-be state and therefore executes new strategies [36, 20].

The comparison has also revealed some differences between academic and non-academic studies. The topic of security (i.e. less risk) is not mentioned in any of the academic studies. However, benefits like knowing your systems and processes as well as their dependencies can influence more security/less risk. It is kind of surprising that it is not mentioned at all since security is a big topic nowadays. In Jung [18], architects are confronted with the question of existing dependencies between technologies and applications or which applications pose a potential security risk. Unfortunately, the practice-oriented studies do not dive into this field other than just mentioning *more security*. In BizzDesign [7, pp. 14, 15] this benefit occurs in the IT and business side of organisations. How exactly it manifests on both sides is not said.

Another topic which does not appear in academic studies is *support for digitalisation*. This is remarkable since EAM is often described/viewed as a tool for implementing digital advances. Only *Gong and Janssen* investigate the mitigation role of EAM in a digital transformation (here i.e. Big Data). Nevertheless, the specific naming of EAM as a digitalisation tool is missing in the academic studies but mentioned by two non-academic studies. So, this topic is known in practice.

In the last section the benefit of *improve agility/flexibility* is mentioned by ca. 1 out of 4 academic studies. In non-academic studies, this benefit plays only a minor role. The participants in the study by BizzDesign [7, p. 15] placed it under the benefits for business only in 6th place (out of 9). This somewhat less confident view towards agility is also reflected in the way EAM is integrated into agile work approaches, as observed by [12, pp. 15, 16]. Here 75% of the respondents stated that architects are “usually not” or “never” part of agile teams (in IT projects). In addition, 46% of architects are not working agile for their architectural work. These discrepancies between working agile and achieving/improving an organisation's agility may be one reason why many practitioners do not see an increase in (business) agility through EAM. One can ask himself the following question: “How can EAM benefit agility if the architects themselves do not even act/work agilely?”

Another interesting topic is that it is often said in academic papers [e.g. 34, 4] that EAM should not be viewed as an IT tool but rather as an enabler for business. At least for the respondents in Capgemini's study [12, p. 10] 61% said that EA works as an IT practice and only a little over a third perceive EA as a cross-organisational practice, as we noted in the last section. This result indicates that architects or in general EAM could not overcome this prejudice of being seen as an IT tool. Furthermore, this difference between aspiration and reality could explain why architects find it challenging to implement goals from academic studies in their organisation.

In the last section, we also addressed the importance of management support for an EAM initiative. In LeanIX [26, p. 14], out of 1.595 respondents, 33% say that a “Lack of awareness of EA” and 28% say that a “Lack of top leadership support” are major hurdles for EAM work. In BizzDesign [7, p. 28], 21% of the companies which do not have a high EAM maturity see the receiving of top-management support as a top priority. In comparison, companies with high

EAM maturity do not list this as a priority at all. These results underline the importance of top management support to successfully execute EAM work.

All in all, the practice-oriented studies were a valuable contribution to our paper. On the one hand, 14 of the 20 EAM benefits from the academic studies could be confirmed, which shows similarities in the results between the two. On the other hand, six new EAM benefits could be found from the non-academic studies, which strengthened the importance of these since they also serve as a new point of view. Topics not covered in the academic studies, like digitalisation, are a good example of this new viewpoint. However, the non-academic studies have also revealed realities that do not appear in the academic field, such as the challenge, that EAM is still often viewed as an IT tool or that organisations which implement EAM have to struggle with too little management support in early phases.

Conclusion

Work on this contribution started as a thesis project at the Frankfurt University of Applied Sciences. The objective was to identify reasons for implementing and performing EAM by focussing on respective benefits. Following a research methodology, it was conducted as a structured literature review on academic papers. We followed the objective of providing a list of relevant benefits expected from EAM in a corporate environment. This list should not only cover the classical, rather abstract, purposes of EAM but focus on benefits that have been investigated academically. The result of this task is presented in *Results* section

While performing the literature review, it became obvious that relevant work by practitioners was not covered by rigorously following a research method. Hence, a subsequent phase has been introduced that allowed us to include these results as well. Implications from this step are explained in section previous section on the *practitioner's perspective* Some of the benefits from the original study were confirmed, while additional ones have been revealed. It is surprising that some of those were only marginally covered by academic studies (e.g. security & risk or digital transformation).

We got intrigued by the idea of providing a catalogue of benefits for practitioners when starting the project. Such a list can (or should) help companies with focussing an EA initiative on achieving relevant benefits. It might help understanding why others are doing it. Having said this, it is important to note that most EA practitioners are well aware of some or most of these benefits. They might not need this list for themselves but rather to substantiate their work in their job environment. It is still difficult to motivate management or colleagues for following a discipline with rather long-term effects. We are aiming to support this by providing not only a list of benefits but also their reasoning from academic and practitioners' publications.

However, this study only reflects a snapshot of the status as existing during the time of writing this paper. Expectations and the awareness might change over time so that further research will be required in the future. Especially the digital transformation of corporations represents a huge research object for understanding the benefits of EA. It will also be interesting to observe, whether EAM will develop more towards tangible methods for aligning business with IT. Future studies may also address a weakness of the study at hand: We did not differentiate between expected benefits and achieved benefits.

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