

12-10-2021

## Enterprise Architecture Practice under a Magnifying Glass: Linking Artifacts, Activities, Benefits, and Blockers

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### Recommended Citation

Kurnia, S., Kotusev, S., Shanks, G., Dilnutt, R., Taylor, P., & Milton, S. K. (2021). Enterprise Architecture Practice under a Magnifying Glass: Linking Artifacts, Activities, Benefits, and Blockers. *Communications of the Association for Information Systems*, 49, pp-pp. <https://doi.org/10.17705/1CAIS.04936>

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# Enterprise Architecture Practice under a Magnifying Glass: Linking Artifacts, Activities, Benefits, and Blockers

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## Enterprise Architecture Practice under a Magnifying Glass: Linking Artifacts, Activities, Benefits, and Blockers

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### Abstract:

Enterprise architecture (EA) is a collection of artifacts that describe an organization from an integrated business and IT perspective intended to improve business and IT alignment. EA artifacts can be very diverse in nature and have different use cases in disparate organizational activities. Previous studies have identified numerous benefits and challenges of establishing EA practice. However, most existing studies discuss the benefits and problems of EA practice in general without relating them to any particular activities constituting EA practice. In order to address this gap, this study analyzes the benefits and blockers associated with specific EA-related activities and respective artifacts. Based on 18 interviews with practicing architects, we identify eight consistent activity areas constituting EA practice. Each of these activity areas essentially represents a separate “story” in the context of EA practice and implies certain activities supported by some EA artifacts leading to specific benefits often impeded by some blockers. These eight activity areas provide a more detailed understanding of EA practice than the one offered by the current EA literature. Moreover, our findings indicate that EA practice should not be viewed as some homogeneous organizational activity and that EA should not be conceptualized simply as a unified blueprint for information systems. We also argue for the need to rethink the very terms “enterprise architecture” and “EA practice”, which appear to be oversimplified and unsuitable for analyzing EA practice in depth. This study has significant implications for both research and practice.

**Keywords:** Enterprise Architecture, Artifacts, Activities, Benefits, Blockers, Qualitative Analysis.

This manuscript underwent peer review. It was received 11/21/2019 and was with the authors for eight months for one revision. Tilo Böhmann served as Associate Editor.

# 1 Introduction

In the digital epoch, achieving business and IT alignment still remains among the topmost concerns of IT executives (Kappelman et al., 2018). Enterprise architecture (EA) is a collection of special documents, typically called artifacts, that describe various aspects of an organization from an integrated business and IT perspective (Kotusev, 2019; Niemi & Pekkola, 2017). EA facilitates communication between business and IT stakeholders and helps improve business and IT alignment.

Various EA artifacts used in organizations may be very diverse in nature and range from executive-level architecture principles (Greefhorst & Proper, 2011) and core diagrams (Ross, Weill, & Robertson, 2006) to rather detailed and technical project-start architectures (Foorthuis, van Steenberg, Brinkkemper, & Bruls, 2016). These EA artifacts have different usage scenarios in organizations ranging from guiding IT investments (Pessi, Magoulas, & Hugoson, 2011) to ensuring that separate IT projects comply with an organization-wide architecture (Foorthuis & Brinkkemper, 2007). EA practice, as an organizational activity that implies using EA artifacts, may also include a variety of diverse actions permeating the whole organization from top-level corporate strategic management (Simon, Fischbach, & Schoder, 2014) to mid-level IT portfolio management (Makiya, 2008) to separate system development processes on the ground (Armour, Emery, Houk, Kaisler, & Kirk, 2007).

EA practice is associated with numerous benefits (Bradley, Pratt, Byrd, Outlay, & Wynn, 2012; Schmidt & Buxmann, 2011) and problems (Ajer & Olsen, 2018; Banaeianjahromi & Smolander, 2016). However, the pertinent studies have focused on benefits and problems of some highly abstract notions such as “EA management” (Lohe & Legner, 2014; Schmidt & Buxmann, 2011), “EA programs” and “EA projects” (Alaeddini & Salekfard, 2013; Levy, 2014), or even simply “enterprise architecture” (Bradley, Pratt, Byrd, & Simmons, 2011; Dang & Pekkola, 2016), but none of these studies distinguishes any concrete activities constituting EA practice and analyzes the benefits and problems specifically in relation to these particular activities.

In order to address this gap, we explore EA practices at a more detailed level and identify the benefits and blockers<sup>1</sup> associated with specific EA-related activities and EA artifacts. Put it simply, we “connect” various EA artifacts and activities with corresponding benefits and blockers. In particular, we address the following research question (RQ):

**RQ:** What benefits and blockers are associated with specific EA-related activities and respective EA artifacts?

This paper proceeds as follows: in Section 2, we discuss EA with its artifacts and EA practice with its activities, benefits, and blockers before discussing how we formulated our research question. In Section 3, we describe our research method, data collection, and analysis procedures. In Section 4, we describe eight identified activity areas of EA practice and their interrelationships. In Section 5, we discuss our findings in the context of the existing EA literature. In Section 6, we describe the contribution of this study to the EA discipline. Finally, in Section 7, we highlight the limitations of our study, propose directions for future EA research, and conclude the paper.

## 2 Literature Review

In this section, we discuss the concept of EA and its artifacts, EA practice, and its activities. Subsequently, we discuss the anticipated benefits of EA practice and their potential blockers. Finally, we explain the motivation behind and formulate the research question of this study.

### 2.1 Enterprise Architecture, Its Artifacts and Their Usage

EA comprises multiple separate components typically called EA artifacts (Kotusev, 2019; Niemi & Pekkola, 2017; Winter & Fischer, 2006). An EA artifact is a descriptive document providing a certain view of an organization from the perspective of its business and IT (Abraham, 2013; Kotusev, 2019; Kotusev, Singh, & Storey, 2015; Niemi & Pekkola, 2017). Various EA artifacts used in organizations as part of EA practices can be very diverse in nature. Table 1 provides a selection of popular EA artifacts in alphabetical order with their brief descriptions.

<sup>1</sup> In the context of this paper, we use the term “blocker” as an overarching umbrella term for problems, challenges, obstacles, pitfalls, and inhibitors of EA practice

**Table 1. Popular EA Artifacts**

EA artifacts	Reference(s)	Description
Business capability models (or maps)	Scott (2009), Bondel, Faber, & Matthes (2018), Khosroshahi, Haider, Volkert, Matthes, & Gernegross (2018)	Structured graphical representations of all organizational business capabilities, their relationship and hierarchy
Conceptual architectures	Kotusev (2018b)	Abstract descriptions of separate IT projects outlining their goals, objectives and proposed high-level designs
Context diagrams	van't Wout, Waage, Hartman, Stahlecker, & Hofman (2010)	High-level graphical diagrams illustrating key elements of organizations, their interactions with each other and the external environment
Core diagrams	Ross (2004), Ross et al. (2006)	Explicit depictions of high-level customer groups, business processes, corporate data and underlying infrastructure representing the desired operating model
Enterprise data models	Peels, Bons, & Plomp (2016)	Comprehensive data definitions describing the structure of main data entities used in the organization
Maxims	Broadbent & Weill (1997), Broadbent & Kitzis (2005)	Brief executive-level imperatives governing the use of IT in the entire organization
Principles	Aier (2014), Greefhorst & Proper (2011), Richardson, Jackson, & Dickson (1990)	High-level policy guidelines with their more detailed statements, rationales and implications for IT
Project-start architectures	Wagter, van den Berg, Luijpers, & van Steenbergen (2005), Foorthuis et al. (2010), Foorthuis et al. (2016)	Descriptions of separate IT projects with rather detailed Technical information regarding their implementation
Roadmaps	McGregor & Blanton (2014), Kotusev (2021a), Kotusev (2019)	Structured graphical views of all planned IT initiatives in specific business areas having direct business value
Standards	Boh & Yellin (2007), & Mueller, Dittes, Ahlemann, Urbach, & Smolnik (2015)	Various guidelines of technical nature relevant to all organizational information systems
Technology reference models	Kotusev (2021a), Kotusev (2019)	Structured graphical representations of all technologies used in an organization

Various EA artifacts have different use cases and usage scenarios in organizations (Kotusev, 2019; Niemi & Pekkola, 2017). Table 2 briefly overviews popular usage scenarios of EA artifacts described in the literature.

**Table 2. Various Usage Scenarios of EA Artifacts**

Usage scenario	Relevant EA artifacts	Reference(s)
Analyzing availability of information systems	Various technical EA diagrams <sup>2</sup>	Narman, Franke, König, Buschle, & Ekstedt (2014)
Assessing data accuracy	Various technical EA diagrams	Narman, Johnson, Ekstedt, Chenine, & König (2009), Narman et al. (2011)
Analyzing enterprise systems and applications modifiability	Various technical EA diagrams	Lagerstrom, Johnson, & Hook (2010), Osterlind, Lagerstrom, & Rosell (2012)
Analyzing potential security breaches	Various technical EA diagrams	Sommestad, Ekstedt, & Johnson (2008)
Analyzing system quality	Various technical EA diagrams	Narman, Schonherr, Johnson, Ekstedt, & Chenine (2008)
Assessing system availability	Various technical EA diagrams	Raderius, Narman, & Ekstedt (2008)

<sup>2</sup> “Various technical EA diagrams” in this table refer to a broad class of graphical models and diagrams depicting the technical structure of the IT landscape. These diagrams arguably have no distinctive, commonly accepted titles in the EA literature and may vary widely in their properties (e.g., scope, focus, granularity and notation). For example, these diagrams can range from layered ArchiMate diagrams (Narman et al., 2012a; Osterlind et al., 2012) to free-form diagrams using no particular modeling approaches (Lagerstrom et al., 2010; Sommestad et al., 2008). Some sources collectively call them simply “landscape diagrams” (Kotusev, 2019, 2021a, 2021b)

**Table 2. Various Usage Scenarios of EA Artifacts**

Ensuring compliance of separate IT projects with an organization-wide architecture	Project-start architectures	Foorthuis & Brinkkemper (2007)
Estimating service response times	Various technical EA diagrams	Narman, Jolm, Ekstedt, & Honeth (2012a)
Guiding IT investments	Principles	Hugoson, Magoulas, & Pessi (2010), Pessi et al. (2011)
Improving strategic business and IT alignment	Business capability models	Keller (2015), Kotusev (2021b)
Predicting application usage	Various technical EA diagrams	Narman, Holm, Hook, Honeth, & Johnson (2012b)
Supporting acquisitions of other companies	Enterprise reference models	Toppenberg, Henningsson, & Shanks (2015)

## 2.2 Enterprise Architecture Practice and Its Activities

EA practice is an organizational activity that implies using EA artifacts for facilitating IT-related decision-making and improving business and IT alignment (Fallmyr & Bygstad, 2014; Kotusev, 2017a; Kotusev & Kurnia, 2021; Rahimi, Gotze, & Moller, 2017). EA practices in organizations include a variety of very diverse activities (Ahlemann, Stettiner, Messerschmidt, & Legner, 2012; Kotusev, 2021b; Ross et al., 2006; Wagter et al., 2005). For instance, Ahlemann and El Arbi (2012) argue that EA practices are closely interrelated with three key organizational processes: 1) strategic planning (Radeke & Legner, 2012), 2) project life cycle (Lux & Ahlemann, 2012), and 3) operations and monitoring (Legner & Lohe, 2012). Kotusev (2021b) shows that EA practices include three different but interrelated processes: 1) strategic planning process where architects communicate with business leaders to determine the desired future course of action for the organization, 2) initiative delivery where architects communicate with business leaders and project teams to determine what solution implementation options are acceptable and then how exactly the respective IT solutions should be implemented, and 3) technology optimization where architects analyze the existing IT landscape and formulate various technical rationalization suggestions.

Other authors also describe the integration between EA practices and other disparate activities and practices taking place at different levels of the organizational hierarchy. Table 3 briefly overviews various EA-supported activities grouped by the corresponding organizational levels.

**Table 3. Various EA-supported Activities at Different Organizational Levels**

Organizational level	EA-supported activities	Reference(s)
Top executive level	Corporate strategic management	Simon et al. (2014)
	Strategic planning	Aldea, Iacob, Quartel, & Franken (2013), Blomqvist, Halen, & Helenius (2015)
	Business model management	Petrikina, Drews, Schirmer, & Zimmermann (2014)
Middle management level	Risk management	Barateiro, Antunes, & Borbinha (2012)
	Information management	Aitken (2009)
	Change management	Radeke (2011)
Portfolio level	IT portfolio management	Makiya (2008)
	Investment selection processes	Armour et al. (2007), Emery, Faison, Houk, & Kirk (2007)
Project implementation level	System development processes	Armour et al. (2007) and Emery et al. (2007)
	Agile software development	Hanschke, Ernsting, & Kuchen (2015)

## 2.3 Benefits of Enterprise Architecture Practice

Benefits of EA practices are among the most extensively studied topics in the available EA literature (Kotusev, 2017b). Various studies of EA value include empirical quantitative surveys (Alaeddini & Salekfard, 2013; Bradley et al., 2012, 2011; Schmidt & Buxmann, 2011; Shanks, Gloet, Someh, Frampton, & Tamm, 2018; Valorinta, 2011), some qualitative case studies (Carvalho & Sousa, 2014; Fallmyr & Bygstad, 2014), and literature reviews (Boucharas, van Steenberg, Jansen, & Brinkkemper, 2010; Gong & Janssen, 2019). These studies focus on analyzing the benefits of EA, EA management, EA services and EA projects. Table 4 overviews prominent studies of EA benefits grouped by the objects of their focus.

**Table 4. Various Benefits of EA Practices**

Object of focus	Identified benefits	Reference(s)
Enterprise architecture	Identify 100 unique benefits of EA that can be related to financial, internal, and learning and growth perspectives	Boucharas et al. (2010)
	Better business and IT alignment, greater overall value of IT, and higher quality of risk management	Bradley et al. (2011)
	Improved business and IT alignment	Valorinta (2011)
	Improved business and IT alignment, operational IT effectiveness and enterprise agility	Bradley et al. (2012)
	Improved organizational agility	Carvalho & Sousa (2014)
	Identify nine broad categories of EA value: strategic and political, transformational, communicational, economic, flexibility and agility-related, integration and interoperability-related, inter-organizational, knowledge management-related, and others	Gong & Janssen (2019)
EA management	Increased IT efficiency and IT flexibility, greater IT connectivity, compatibility, and modularity	Schmidt & Buxmann (2011)
EA practice	Improved organizational agility	Fallmyr & Bygstad (2014)
EA projects	Improved business and IT alignment through its six relevant aspects: communications, value measurements, governance, partnership, skills, and scope	Alaeddini & Salekfard (2013)
EA services	A number of organizational benefits achieved through the realization of project benefits	Shanks et al. (2018)

## 2.4 Blockers of Enterprise Architecture Practice

EA practices are traditionally associated with numerous problems, challenges, obstacles and pitfalls (Burton, 2009; Kaisler, Armour, & Valivullah, 2005; Rehkopf & Wybolt, 2003; Zink, 2009). Unsurprisingly, the studies of various blockers in EA practices constitute an articulate stream of academic EA research (Kotusev, 2017b), which includes multiple case studies (Ajer & Olsen, 2018; Dang & Pekkola, 2016; Levy, 2014; Lohe & Legner, 2012, 2014; Seppanen, Heikkila, & Liimatainen, 2009), surveys (Hauder, Roth, Matthes, & Schulz, 2013), and interviews (Banaeianjahromi, 2018; Banaeianjahromi & Smolander, 2016, 2019; Chuang & van Loggerenberg, 2010) in addition to some purely conceptual papers (Kaisler & Armour, 2017; Kaisler et al., 2005) and literature reviews (Lucke, Krell, & Lechner, 2010). These studies focus on analyzing blockers of EA, EA development, EA implementation, EA management, EA programs, and enterprise architecting. Table 5 overviews prominent studies of EA blockers grouped by the objects of their focus.



**Table 5. Various Blockers of EA Practices**

Object of focus	Identified blockers	Reference(s)
Enterprise architecture	Eight generic root causes: organization structure, legal rule and regulation, politics and sponsors, forming an EA team, ability and capability of an EA team, capabilities of users, conflicting benefits, and EA basis	Dang & Pekkola (2016)
	26 different challenges that can be grouped into five broader categories: complexity, objectives and benefit, organization, people and processes, and understanding and trust	Ajer & Olsen (2018)
Enterprise architecting	A number of potential problems related to modeling, managing and maintaining EA	Kaisler et al. (2005), Kaisler & Armour (2017)
	Five main challenges: communication, obtaining stakeholder buy-in, ownership, perception of enterprise architects and organizational politics	Chuang & van Loggerenberg (2010)
	14 critical issues: management commitment, EA governance, stakeholders, coordination, communication, understanding requirements, shared understanding, lack of experienced architects, complexity, rapidly changing conditions, scoping of architectural descriptions, EA frameworks, knowledge management, insufficient tool support	Lucke et al. (2010)
EA development	Eight main obstacles: lack of communication and collaboration, lack of management support, lack of knowledge among management, lack of motivation among personnel, lack of knowledge among personnel, personnel resistance to change, EA consultant-related issues, and government-related political issues	Banaeianjahromi & Smolander (2016, 2019), Banaeianjahromi (2018)
EA implementation	Three core issues: EA governance, insufficient support of EA and insufficient resources	Seppanen et al. (2009)
EA management	Three major challenges: effort regarding the initial EA documentation, existing EA artifacts remain unused and lack of acceptance of EA in the organization	Lohe & Legner (2012, 2014)
	20 diverse challenges and range them according to their perceived importance	Hauder et al. (2013)
EA programs	Four key inhibitors: isolationism, jurisprudence, techne, and knowledge availability	Levy (2014)

## 2.5 Research Motivation and Question

Practicing EA may involve a broad spectrum of different EA artifacts (see Table 1) that may have diverse usage scenarios (see Table 2) integrated with various organizational activities performed at disparate levels of the organizational hierarchy (see Table 3). However, all the previous studies of EA benefits and blockers analyzed the respective aspects only in relation to some rather vague and ill-defined high-level abstractions (e.g., EA management, EA development, EA implementation, EA programs, and EA projects) (see Table 4 and Table 5). Essentially, all these studies analyzed EA practice only in very broad “strokes”, while none focused on distinguishing concrete activities constituting EA practice or analyzing the benefits and blockers specifically in relation to these particular activities.

In order to address this long-standing gap in the EA literature, we explore EA practices at a more detailed level and identify the benefits and blockers associated with specific EA-related activities and EA artifacts they leverage. In other words, we link various aspects of EA practice (e.g., artifacts, activities, benefits and blockers) together and, thereby, provide a certain fine-grained integrated view of EA practice currently missing in the literature. In particular, as we state in Section 1, we address the following research question (RQ):

**RQ:** What benefits and blockers are associated with specific EA-related activities and respective EA artifacts?



### 3 Research Method

Since our research question addresses a previously unexplored area of the EA discipline, this study can be considered an early exploratory investigation. Although some empirically validated lists of EA artifacts that can be used as a basis for research purposes have been developed (Kotusev, 2019), no such lists are available for EA-related activities, benefits, and blockers. Therefore, our research question is qualitative in nature and can hardly be answered with any quantitative research methods (e.g., structured mail questionnaires or surveys). Due to the lack of any established theories that can be taken as a basis for our research, this study is also inductive in its approach.

#### 3.1 Data Collection

Our research question is company agnostic and does not focus on separate organizations or specific industries; rather, it relates to EA practice in general. In order to exclude potential organization-specific bias in our findings, we avoided in-depth case studies of a limited number of companies. Instead, we achieved a broad coverage of EA practice and interviewed multiple experienced EA practitioners representing different companies and industry sectors. For this purpose, we selected semi-structured interviews as the most appropriate research method for our study (Creswell, 2003, 2007; Saunders, Lewis, & Thornhill, 2009). In particular, we conducted 18 one-hour interviews with practicing architects who had at least five years of active industry experience in EA. Table 6 provides profiles of our research participants and their organizations.

**Table 6. Profiles of Participants Interviewed in Our Study**

#	Title	Experience	Industry	Employees
1	Enterprise architect	~7 years	Retail	10,000-20,000
2	Architecture manager	~13 years	Diversified	5000-10,000
3	Enterprise architect	~8 years	Bank	5000-10,000
4	Lead enterprise architect	~10 years	Telecom	5000-10,000
5	Chief architect	~15 years	Finance	20,000-40,000
6	Lead enterprise architect	~6 years	Healthcare	>80,000
7	Enterprise architecture manager	~12 years	Retail	>80,000
8	Enterprise architect	~10 years	Steel	10,000-20,000
9	Head of strategy and architecture	~20 years	Bank	20,000-40,000
10	Enterprise architect	~8 years	Government	10,000-20,000
11	Enterprise architecture manager	~10 years	Retail	>80,000
12	Head of application management services	~10 years	Retail	10,000-20,000
13	Chief enterprise architect	~7 years	Healthcare	10,000-20,000
14	Enterprise architecture manager	~11 years	Resources	40,000-80,000
15	Information architect	~5 years	Government	2000-5000
16	Architecture manager	~12 years	Finance	<1000
17	Enterprise architect	~6 years	Public services	20,000-40,000
18	Chief enterprise architect	~17 years	Telecom	20,000-40,000

All the interviews were guided by a standardized interview protocol covering four key areas of our interest: artifacts, activities, benefits, and blockers. Additional questions were asked to clarify the relationships between different concepts from these categories. Table 7 provides some sample interview questions asked in relation to different areas of interest and their interrelationship. All the interviews were recorded with the permission of the interviewees and then transcribed for a detailed qualitative analysis.

**Table 7. Sample Interview Questions for Different Areas of Interest**

Area of interest	Sample interview question
Artifacts	"What sorts of artifacts are you producing?" (Interview 14)
Activities	"What are the enterprise architecture services that you or the architecture group in [your company] actually provide?" (Interview 9)
Benefits	"What are the benefits that are being derived or you are seeing from the group [of enterprise architects]?" (Interview 4)
Blockers	"What are the major blockers around enterprise architecture for you [and your team]?" (Interview #1)
Artifacts to activities	"If you are producing [this] artifact, what use case is that artifact actually for?" (Interview #7)
Activities to benefits	"In terms of what you have been doing [i.e. specific activities discussed earlier], what benefits do you think the organization has realized?" (Interview 3)
Benefits to blockers	"When you are trying to [realize the benefit that we discussed earlier], is there something which is a blocker?" (Interview 16)

### 3.2 Data Analysis

Due to the exploratory, qualitative, and inductive nature of this study, we analyzed all the interview data that we collected following the qualitative analysis method that Miles and Huberman (1994) proposed. This method provides a suitable and convenient analytical approach for building conceptual constructs and frameworks from raw qualitative data. Accordingly, we followed three essential stages of data analysis: 1) summarizing and packaging data, 2) repackaging and aggregating data, and 3) identifying patterns and constructing a conceptual framework.

The first stage, summarizing and packaging data, included reading the transcribed interviews line by line, coding data, chunking it into meaningful fragments, and identifying significant concepts relevant to our research question (e.g., distinct types of EA artifacts, activities, benefits, and blockers that the interviewees mentioned). As part of this stage, we decomposed the text of the original transcripts and "sliced" it into separate snippets relevant to different aspects of EA practices.

The second stage, repackaging and aggregating data, involved rereading the transcribed interviews, reviewing the identified concepts, and merging and generalizing them based on their differences and commonalities to form higher-level categories constituting the resulting conceptual framework (e.g., capability modeling, roadmapping, portfolio management, asset assessment, etc.). As part of this stage, we joined and "glued" various text snippets reflecting the same or similar phenomena together into expanded descriptions of relevant categories. Table 8 shows some samples of the original interview snippets, lower-level concepts associated with these snippets, and higher-level categories resulting from their grouping.

The final stage, identifying patterns and constructing a conceptual framework, involved establishing consistent relationships between the various concepts and categories identified during the two previous analysis stages and then unifying all these concepts, categories, and associated relationships into a single "big" picture. As part of this stage, we organized the entire network of categories and their interconnections into a manageable number of coherent and largely independent "storylines". As a result of these data analysis procedures, we articulated eight consistent higher-order activity areas to answer our research question.

The first and second author collaborative performed all the analytical procedures described above, though they fulfilled rather different roles in the analysis process. Specifically, the second author solely conducted the initial comprehensive data analysis and conceptualization. Then, the first author independently validated the results of the analysis. The two authors resolved a number of disagreements that appeared between them via personal communication.

**Table 8. Sample Text Snippets, Associated Concepts and Resulting Categories**

**Table 8. Sample Text Snippets, Associated Concepts and Resulting Categories**

Snippet	Associated concept	Resulting category
<i>I would think in twelve months' time we want to have our capability model endorsed and used in business strategy, that is the key. We have come up with a capability model and so far every business unit that we have taken through it have loved it. (Participant 2)</i>	Capability model	Business capability models and maps
<i>[Long-term planning] basically starts with the capability map first, we take the capability map and then use it.... Let's say I need to have a marketing capability. So, what I do is measure the requirements for the marketing capability. Then, you can map your systems to it [capability map] and when you map those systems to it you can say "okay, how do I get this information in?". Now, when you are doing these capability gaps, you might look at the information gap. (Participant 17)</i>	Capability map	
<i>When you go out and document systems that are there, and people do not know they are there, then when people want to do something new and they are going to get a new something [system], you say, "hey, hang on, we have already got one of those over here, let's reuse that". So, we had a little bit of that. (Participant 1)</i>	System reuse	Increased reuse of IT assets
<i>I can [document] a number of different technologies, and that is at every layer of the stack. So, a number of different applications. And if I can reuse applications and show how particular applications can be reused, then I get benefit. If I can reuse software, if I can reuse parts of the infrastructure layer technologies or same database technology, all those things are beneficial. And it is the strong enterprise architecture function that drives you towards that. (Participant 11)</i>	Technology reuse	

## 4 Eight Activity Areas of Enterprise Architecture Practice

Our qualitative analysis of the collected interview data identified eight key activity areas mentioned in some or the other form by multiple EA practitioners. These activity areas are organized around the respective actions of architects and reflect different aspects of their work in organizations. Each of these activity areas implies certain activities supported by some EA artifacts (though not all activities can be clearly associated with any particular artifacts) leading to specific organizational benefits often impeded by some blockers. We describe the eight identified activity areas with exemplary quotes from the interviewees in Sections 4.1 to 4.8.

### 4.1 Business Capability Modeling

The business capability modeling activity area encompasses all activities of architects related to dealing with business capabilities. These activities often include identifying organizational business capabilities, assessing their relative maturity (often against external industry benchmarks), articulating necessary capability improvements and "heatmapping" the respective capabilities to indicate future priorities for IT investments.

This activity area is normally supported by EA artifacts most often called business capability models or less often business capability maps and highly similar business function models. These EA artifacts provide holistic one-page views of the whole organization from the perspective of its business capabilities or activities often also describing their underlying components (e.g., people, processes, information and systems).

*We do a maturity assessment: people, processes and systems. ....It gives [business stakeholders] the heatmaps and what we are trying to get them to do is to look at these heatmaps when justifying their investments. Because we do an investment overlay on the capability model and they can see where the money is going. When you put the heatmap on it, you can see whether it is being spent on the right areas. (Participant 2)*

All organizational benefits associated with this activity area can be broadly summarized as the clarity of priorities. Business capability modeling helps business executives and architects agree on the set of strategic business capabilities, discuss their priority and criticality to the organization, develop a shared understanding of their required maturity levels and propose some IT investment programs intended to uplift their maturity.

The first evident blocker associated with the business capability modeling activity area mentioned by the interviewees is the situation when architecture is not positioned high enough in the organizational hierarchy to access senior business executives. The second common blocker related to this activity area is the general cultural alienation between business and IT sometimes described as “us and them” culture.

*You will have the commissioner of IT, then he will have a director underneath him and then enterprise architects will be one or two layers below. So, they are three or four levels below any serious decision making. (Participant 6)*

*There is a culture in the IT area of [our company] which says that you cannot go and talk to the business.... So, most of my information about what is going on in the business is “second hand”..., this is my big blocker. (Participant 1)*

## 4.2 Roadmapping and Portfolio Planning

The roadmapping and portfolio planning activity area encompasses all activities of architects related to defining future IT initiatives. These activities often include proposing new IT initiatives aligned to strategic business priorities; arranging these initiatives based on their importance, mutual dependence, and deadlines; scheduling their execution at specific time intervals; and, finally, shaping the IT investment portfolio based on the tactical priorities for the upcoming budgetary period, often for the next financial year.

*Roadmapping is a key [activity that we do]. It is an understanding of how we change. How do we address the capabilities that the business needs to improve on? How do we get from here to there? And how do we put in the right technology to get there? (Participant 11)*

This activity area is typically supported by various sorts and “flavors” of architecture roadmaps where all envisioned IT initiatives are depicted (e.g., investment roadmaps, application roadmaps, and technology roadmaps). These roadmaps show all planned IT investments in different business units, areas or capabilities, their commencement and completion dates and, in some cases, also the respective target states in terms of necessary information systems or capability maturity levels.

*[Our] roadmaps are broken down into domains. We do two levels of roadmaps: one horizontal, which is cross-cutting concerns around the organization (things like customer, information, etc.), versus vertical domains, which is the lines of business and the outcomes that we are trying to achieve. (Participant 17)*

Typical organizational benefits associated with this activity area all relate to the improved alignment, traceability and linkage between the business strategy and IT initiatives. Roadmapping and portfolio planning help business leaders and architects synchronize business and IT plans, develop mutually agreed delivery schedules for IT projects and allocate adequate financial, human, and organizational resources required for their implementation. These activities also allow balancing strategic and tactical imperatives and achieving more proactive business ownership of IT.

*We have the investment roadmap being derived from our strategic directions and then for every project that we are running, we require the strong identification of benefits.... So, there is a connection up from the project to the architecture that is in place.... All of these projects need to link up into the roadmap and the roadmap is driven from the strategy, so there are definitely links there. (Participant 15)*

The first popular blocker associated with the roadmapping and portfolio planning activity area reported by the interviewees is the lack of understanding, if not ignorance, of architecture among business leaders that undermines productive communication. The second blocker related to this activity area is the reluctance of business managers to discuss their future plans and needs with architects, which is also harmful to the quality of dialog between business and IT.

*The number one blocker [is that] I do not think there are many people in the organization who actually had any exposure to enterprise architecture. ...I have to convince these people that [roadmapping] is useful to them and I have to convince the people above that this is necessary. (Participant 4)*

### 4.3 IT Asset Management

The IT asset management activity area encompasses all activities of architects related to managing existing IT assets in the organization. First, these activities include all the actions necessary to keep track of the assets constituting the current IT landscape (e.g., identifying IT assets, recording their properties and relationships to each other, and updating these descriptions when the structure of the landscape changes). Second, these activities also include all the actions intended to assess the overall adequacy of the available IT assets (sometimes called “health checking”) and their fitness for the current and future business needs.

*We have a Casewise repository and it has datasets for infrastructure platforms, networks, applications, business users, business communities. It helps us identify quite a bit of information about the status, state and lifecycle of assets that we own and control, or are managed on our behalf by [external vendors]. (Participant 10)*

This activity area is typically supported by various EA artifacts accurately capturing the current state of the IT landscape. These EA artifacts may be titled as architectural repositories, asset registers, system inventories, application master lists or represent collections of separate graphical models providing diverse views and slices of the corporate IT landscape (e.g., application interaction diagrams, information exchange models, and infrastructure deployment diagrams)<sup>3</sup>. Often this architectural information is stored in specialized EA repositories based on commercial software tools for EA.

*We maintain a full repository of all applications within [our company]. It is available online, so anyone can actually access this. ...Associated with that we have obviously our assets, which is mainly our applications, but we also have a physical infrastructure being mapped to the logical model. ...All these things are inside the tool that we use. (Participant 16)*

All organizational benefits associated with this activity area can arguably be best summarized as the general rationalization and optimization of the IT landscape. This optimization implies several related aspects including lowered complexity and overhead, simplification of the landscape structure, increased reuse and decreased duplication of IT assets, and enhanced agility in terms of planning new IT initiatives.

*When you go out and document systems that are there, and people do not know they are there, then when people want to do something new and they are going to get a new something, you say “hey, hang on, we have already got one of those over here, let’s reuse that”. (Participant 1)*

Essentially, the only considerable blocker associated with the IT asset management activity area mentioned by the interviewees is insufficient tool support making the tracking, maintenance, and analysis of extensive architectural information rather problematic, time consuming, and clumsy.

*The first year of enterprise architecture was about finding its fit in terms of the right tool to use. ...We used [one tool] as our key architecture tool, but I would not say that it actually helped us greatly. (Participant 18)*

### 4.4 Opportunity Assessment

The opportunity assessment activity area encompasses all activities of architects related to evaluating possible options for addressing specific business needs with IT. These activities typically include clarifying the original business needs and goals of the initiative; identifying available solution implementation options; assessing their architectural and technical feasibility; developing more detailed solution proposals; estimating their costs, timelines, and risks; and, finally, contributing to their business cases.

*If the business wants to proceed [with the initiative], it will come to us to identify what options are there to meet the business need. We will typically identify three or four options, we will do some more work on each of these options [to evaluate them] and we will go back to the business. After we have done that assessment work on the options, we typically get them down to just one or two. [...] And it goes back to the business to provide them with some early feedback, order-of-magnitude costings and delivery timeframes so that they can make an assessment of how to proceed. (Participant 10)*

<sup>3</sup> These graphical models and diagrams correspond to what has been mentioned earlier as “various technical EA diagrams” in Table 2.



This activity area typically leverages various EA artifacts providing high-level views of proposed IT initiatives at different stages of their approval. These EA artifacts may include idea-stage project briefs with very abstract solution suggestions, early-stage options papers with the analysis of available solution alternatives, finalized conceptual architectures with rather elaborate descriptions of IT solutions, and somewhat more technical preliminary solution architectures with necessary IT-specific details.

*For technical feasibility studies [we produce] just position papers around an idea that someone has around evaluating products to solve a particular problem. We also have preliminary solution architectures, which help with estimations [and ensure that] previous mistakes were not feeding into the business case. (Participant 2)*

Organizational benefits resulting from this activity area are associated primarily with the ability to realize greater business value from respective IT investments. First, adequate opportunity assessment helps stakeholders achieve better clarity and transparency of anticipated business benefits. Second, it allows them to estimate benefit-to-cost ratios and ensure the efficiency of IT investments. Third, it also helps mitigate possible risks associated with the implementation of corresponding IT solutions and improve the overall quality of project delivery.

*I think [our work has led to] better outcomes for the project delivery. There have been a few projects where they were just going to go and do X. But then we had some discussions, we had a couple of rounds of discussions, and what they were going to do has changed quite a bit, or how they thought about it has changed quite a bit. So, I think some of the project delivery outcomes have been improved. (Participant 1)*

*[Our involvement] lowers the risk of delivery of projects because as architects, we can think broadly outside of the context of that specific project to understand the implication of decisions that are made within that project and how it impacts on other parts of the organization. And as architects, we can identify or raise flags to indicate risk areas. In other words, we can mitigate risks before they become issues. (Participant 6)*

Three different groups of blockers associated with the opportunity assessment activity area have been reported by the interviewees. First, in some cases, architects focus excessively on the technical side of IT initiatives and pursue mostly the objectives related to IT and set by the CIO, instead of ensuring the achievement of business objectives. Second, in some public sector organizations, the use of EA is mandated legislatively, but the genuine value of architectural involvement in initiatives is not recognized. Third, some business managers do not feel comfortable having negotiations with architects.

*We have an enterprise architecture that is sitting there [in IT], we need to support the CIO and the CIO will position us to the business. That was one of the fundamental flaws we had because we were trying to bring business knowledge in, trying to serve the business. ...Who we were serving was oriented towards the CIO. That was not going to be successful. (Participant 18)*

*The reason why enterprise architecture is adopted in government agencies like [our organization] has more to do with a governmental edict saying that we should have architecture, rather than people intrinsically seeing the benefit of architecture. (Participant 18)*

## 4.5 Project Governance

The project governance activity area encompasses all activities of architects related to reviewing and approving the implementation plans for new IT projects. These activities often include studying proposed system designs as part of the project lifecycle, ensuring their compliance with established implementation standards, discussing possible deviations, approving justified exceptions and giving respective dispensations.

*When we do an architecture review [of the project], there is an assessment sheet which gives you a traffic light [indicating compliance of the project with] the IT strategy. Is this project advancing, does not affect or goes against our IT strategy? There is also some commentary around system qualities, performance, security... those sorts of things. (Participant 1)*

*What the enterprise architecture office is doing well here is the governance or compliance capability, where they specify how solution architectures should be written, what format of standard solution architectures is and the governance points by which these solution architectures need to be governed. ...That is called the design authority within [our*

*organization]. So, enterprise architects sit on that design authority. ...Ultimately, any solution architecture needs to go through and pass that design authority as part of governance. (Participant 6)*

This activity area is usually supported by a very broad variety of EA artifacts providing certain rules relevant to IT projects according to which these projects can be assessed. Most often, these EA artifacts include high-level policies and abstract principles, technical standards and detailed guidelines, recommended technologies and patterns (building blocks representing reusable solutions to typical problems), and conceptual data models.

*There is a strong governance role in enterprise architecture. So, enterprise architecture should be defining principles, standards and patterns that we should be using within IT. I think they are the three things that governance really revolves around. (Participant 11)*

The most prominent organizational benefits of this activity area are related to the ensuing economy of IT budget, cost savings and reduced total cost of ownership (TCO) closely associated with the standardization of technologies and implementation approaches. These benefits may be realized through diminishing the number of supported technologies, products, and vendors and through achieving considerable economies of scale. Additionally, standardizing technologies and data structures also leads to improved technical and logical interoperability across the organizational IT landscape.

*Reference architecture consists of everything from policies to standards, blueprints, guidelines, patterns and anything that you can imagine. The reason for the reference architecture is that you clearly understand what standards are within the [company]. So, we can start building things consistently. ...That way you get scale, you get much better discipline. (Participant 17)*

The first clear blocker associated with the project governance activity area mentioned by the interviewees is the resistance to the restrictions imposed by architecture among project teams. The second and less common blocker related to this activity area is the lack of support for architecture governance from the senior IT leadership (e.g., CIO) and the resulting inability of architects to enforce compliance with established standards.

*Initially, we had a lot of resistance. There was very much this attitude: "Well, I am running my project, what is it to do with you?"... "Just give me a solution architect and leave me alone". So, they saw the value of the solution architect: "I would like to have a smart guy who can help draw pictures of what we are trying to build". But they kind of did not get the governance piece. (Participant 11)*

## 4.6 Communication and Coordination

The communication and coordination activity area encompasses all activities of architects related to the overall coordination of business and IT efforts in the organization. These activities typically include identifying key business and IT actors and decision-makers; engaging with relevant stakeholders; establishing a productive dialog and trusted relationships with these stakeholders; understanding their genuine interests, concerns, and plans; and trying to influence these plans via informing them about other stakeholders' views and opinions.

*[One of our major responsibilities] is establishing communication to make information transparent and open to the right people so that they can actually do their roles and also to have workshops with our business stakeholders. We spend a lot of time doing facilitated workshops and communicating [architecture]. One part of our role is to talk to the business. ...Our other responsibility is to talk back down to IT. From the communication perspective, our wiki is really there to support what I call broadcast communications. But we also do targeted communication to important business stakeholders in terms of trying to get them agree on strategic initiatives. (Participant 4)*

*EA here means someone who engages strongly with the business and coordinates the business and the IT branch's response to business needs in light of our current and planned investments. It is a pretty broad role. ...There is quite a bit of aiding people to form a sensible path. (Participant 10)*

Unlike all the previous activity areas described earlier, this activity area can be considered as "general" and is not associated closely with any particular types of EA artifacts. Although various EA artifacts can



certainly be used as part of this activity when they are necessary (e.g., roadmaps for communicating future plans or landscape diagrams for explaining the current situation), this activity area relies more on verbal communication, than formal documents.

All organizational benefits of this activity area are associated with better partnership and closer collaboration between business and IT communities within the organization. Specifically, these benefits often include achieving more intensive communication and networking between various decision makers, building trustful relationships and deepening mutual understanding between them, promoting knowledge sharing, dissemination of ideas, and coordination of plans.

*The benefit of EA is removing the stickiness and friction through sharing ideas, communicating common goals, highlighting that we actually have enterprise assets that can be leveraged.... And it is not necessarily in the technology area, it is also about leveraging people. ...It is about injecting into the discussion marketplace knowledge and research trends to provide guidance to our decision-makers so that they can then better position the organization. Ultimately, we are mindful of linking all that to our strategic intent, goals and objectives, and so the value is making sure that what we want to achieve from a strategic point of view is achievable with outcomes that are clearly demonstrable. (Participant 3)*

Essentially the single major blocker associated with the communication and coordination activity area reported by the interviewees is poor communication skills of architects that prevent achieving mutual understanding with other EA stakeholders and the inability of architects to find an appropriate language for participating in direct conversations with these stakeholders (especially senior business leaders).

*An architect really needs to be someone who is right there at every leadership meeting and is actively participating at the highest levels. Just because someone has a software engineering background does not mean that they have the skillset to be able to participate at that level. There really has to be some deliberate decision on the part of that architect to skill up on IQ and communication skills to be able to effectively work as an architect. (Participant 3)*

#### 4.7 Consulting and Mentoring

The consulting and mentoring activity area encompasses all activities of architects focused on educating, advising and guiding other organizational actors. These activities may include mentoring project teams or less senior architects in various technical areas, educating business leaders regarding the opportunities and limitations of specific technologies, advising CIOs on the subjects relevant to the long-term IT strategy, and consulting other IT managers on the questions related to the structure of the existing IT landscape and its capabilities.

*What services do we provide? Obviously, we are providing advice to the delivery managers around major projects. ...We provide advice around the designs, around what they are trying to do and whether we think it is a good thing or not, or what else they might like to consider. (Participant 1)*

*[We employ] a couple of principal enterprise architects and they work very closely with the CIO. They are treated as trusted advisors to [the CIO]. Basically, if he [is thinking of some changes], he always includes enterprise architects to make sure that he gets their input into the impact assessment for those changes.... So, if you think about the services that EA provides, it is very much a trusted advisory service to the CIO. (Participant 6)*

*We have an advisory practice. We work probably above solutions, more a technology strategy or an application capability level, and we act as an advisory function. We get contacted, we work across projects or business problem areas and typically this is either an informal advisory (we have discussions, we attend workshop meetings, etc.) or a formal advisory where we set positions, where we actually create a document. ...Typically, it is a position around technology, but it also could be a formal position around a strategy. (Participant 7)*

Similarly to the communication and coordination activity area, this activity area arguably also cannot be associated directly with any particular types of EA artifacts. The primary "resource" in this activity area is unique expertise and deep knowledge possessed by architects rather than EA artifacts, though some artifacts can be leveraged if beneficial or necessary (e.g., principles, standards, or patterns for explaining the appropriateness or infeasibility of certain approaches and planning decisions).

Key organizational benefits of this activity area are related primarily to achieving better overall consistency of IT-related planning decisions made in the organization. Adhering to the same line of thinking can lead to a more holistic approach towards architectural planning and decision making. Following the same course of action in similar situations and contexts contributes to the harmonization of different aspects and elements of the organization.

*[One of the benefits of EA] is that it takes away from a fragmented approach. Without enterprise architecture, [there would be] different approaches in different ways and we would end up with a store of technologies that we would have to maintain, instead of a relatively small subset of technologies. (Participant 11)*

The first significant blocker associated with the consulting and mentoring activity area that the interviewees mentioned is proving the value of architects' competence to the rest of the organization or "finding a customer for the consulting service". The second blocker related to this activity area is the reputation and general perception of architecture as a blocker rather than an enabler.

*The key is to just build up the reputation of architecture as an enabler, rather than as a blocker. ...I have been in organizations where architecture had a bad reputation and people say no all the time. (Participant 2)*

*The architect is always the guy who says "no". So, I am often at odds with a lot of people because I am telling them why they cannot do what they want to do. (Participant 11)*

#### 4.8 Audit of Mergers and Acquisitions

Finally, the audit of mergers and acquisitions activity area encompasses all activities of architects related to scrutinizing and analyzing the IT landscapes of other organizations prior to closing respective merger and acquisition deals. Architects often accomplish these activities as part of more general due diligence procedures conducted before mergers and acquisitions of other companies.

*We are involved in due diligence [processes]. During a merger and acquisition, we do due diligence and we do the risk assessment stuff. From a technical perspective, can their applications actually live in our system? ...And how do those applications then get supported? (Participant 2)*

*The organization grows through mergers and acquisitions. I am one of two others in my team who work closely with the team in the business that looks after mergers and acquisitions. What generally happens on those engagements, I lead the IT strand of activity and that means bringing together various parts of the IT organization to support me in doing the due diligence activities for the target. ...And then after doing that, basically an IT audit, [my responsibility] is to work out what may be the potential implications. I am also accountable for making recommendations or suggestions on the integration strategy or stand-alone strategy or whatever it is the appropriate strategy for the target. (Participant 3)*

Analogously to the two previous activity areas, this activity area is also largely artifacts neutral in nature and can hardly be linked to specific types of EA artifacts. Instead, this activity area is driven predominantly by the intimate knowledge of the organizational IT landscape, its overall structure, constituting systems, and underlying technologies possessed by architects, though various EA artifacts still can be used within this activity when they are necessary (e.g., architectural repositories and asset registers for understanding the composition of the existing IT environment).

All organizational benefits associated with this activity area can be related to a more adequate assessment of the implications and consequences of mergers and acquisitions between different companies from the perspective of IT. For instance, active participation of architects in due diligence processes helps think ahead more proactively, estimate the architectural compatibility between two IT landscapes, foresee potential problems, and better plan the necessary integration efforts in advance.

*It is about better planning. So, in other words, architects are now seen as someone who can contribute to the planning process [for mergers] in a much more rigorous way. (Participant 6)*

During our interviews with EA practitioners, we identified no articulate blockers that we could specifically relate to the audit of mergers and acquisitions activity area.

## 4.9 Summary View of the Eight Activity Areas

All the prominent EA artifacts, activities, benefits, and blockers identified as part of this study can be grouped into eight major activity areas constituting EA practice. Figure 1 schematically summarizes these activity areas and their components.

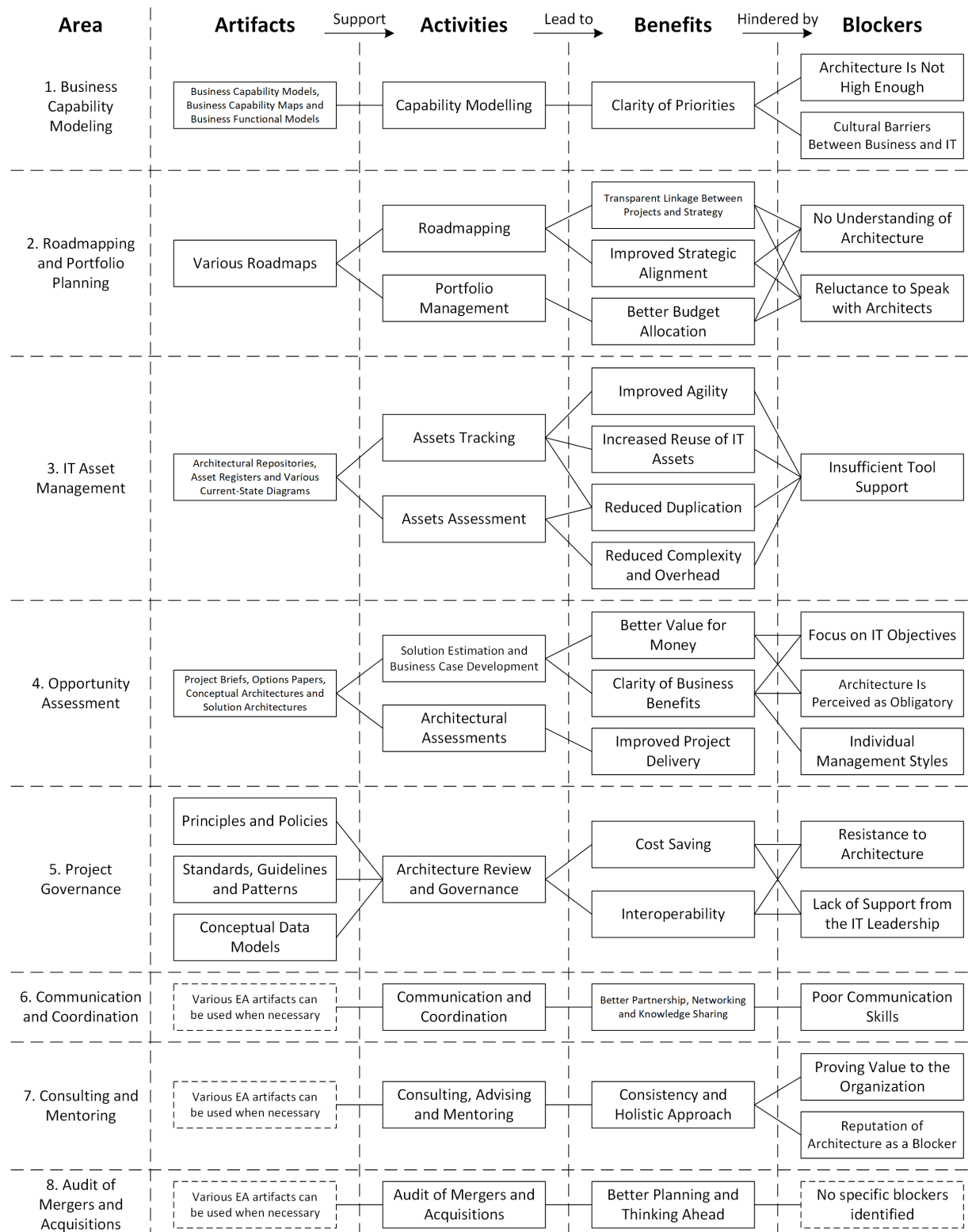


Figure 1. Eight Major Activity Areas Constituting Enterprise Architecture Practice

#### 4.10 Relationships between the Eight Activity Areas

As Figure 1 shows, EA practice can generally be viewed as a set of eight distinct activity areas. All these activity areas cooperate together within EA practice and essentially represent different elements of a single complex mechanism. Unsurprisingly, these eight activity areas are not completely independent and have rather clear relationships in the context of EA practice. These relationships have various causal, temporal, logical, or merely information components.

Most notably, business capability modeling, roadmapping and portfolio planning, opportunity assessment, and project governance form an articulate sequential flow, or a “value chain”, of EA practice where global strategic planning decisions get gradually refined and converted into local project-specific decisions. Namely, business capability modeling provides an overall direction for roadmapping and portfolio planning activities by indicating strategic business areas that require improvements in the long run. Roadmapping and portfolio planning, in turn, initiate new IT projects that subsequently become the subject of opportunity assessment activities. Then, opportunity assessment eventually triggers architecture review processes that constitute the essence of project governance activities.

Other activity areas, however, are not included directly in the decision-making flow described above. For instance, the audit of mergers and acquisitions is a separate activity that takes place at specific time moments (i.e., during the discussions of possible corporate mergers and acquisitions). Communication and coordination as well as consulting and mentoring essentially represent context-neutral “background” activities that permeate the entire EA practice; they are intertwined with all other EA-related activities and may be carried out continually in some or the other form. Finally, IT asset management is also a continuous activity which informs all other EA-related activities regarding the available IT assets and the general structure of the existing IT landscape. Figure 2 schematically summarizes the relationships between the eight activity areas of EA practice described above.

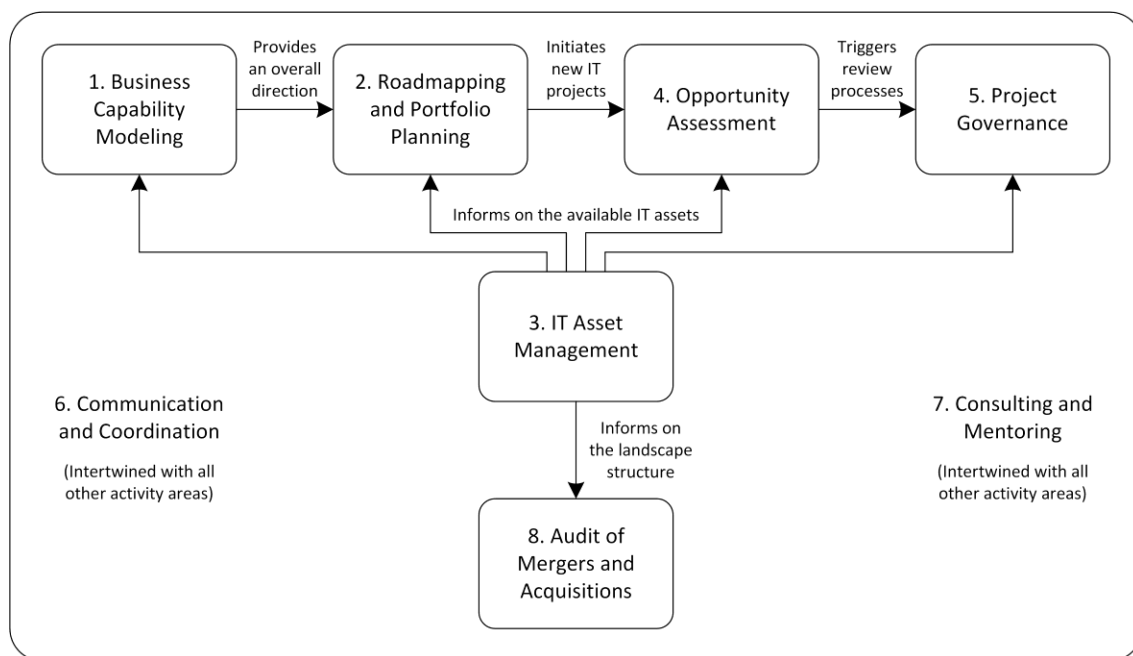


Figure 2. Relationships between the Eight Activity Areas of Enterprise Architecture Practice

## 5 Discussion of Findings

The analysis of EA artifacts, activities, benefits, and blockers reported by the interviewees suggests a number of interesting conclusions on EA practice.

### 5.1 Activities of Enterprise Architects

The role, skills, and activities of enterprise architects have received relatively little attention in the existing EA literature (Kotusev, 2017b). Moreover, the corresponding studies have mostly focused on the skills,

competencies, personality types, and worldviews of enterprise architects (du Preez, van der Merwe, & Matthee, 2014; Evans, 2010; Evernden, 2015; Gotze, 2013; Steghuis & Proper, 2008; Wagter, Proper, & Witte, 2012; Ylinen & Pekkola, 2018, 2020), focused on the EA profession in general (Besker, Olsson, & Pessi, 2015; Strano & Rehmani, 2005; Walrad, Lane, Jeffrey, & Hirst, 2013), or provided anecdotal descriptions of enterprise architects' work (Potts, 2010). However, the literature lacks sound evidence-based studies analyzing the role of enterprise architects from the perspective of their activities. For instance, one of the few available empirical studies of the role of enterprise architects conducted by Strano and Rehmani (2007) concluded that their role is multidimensional and actually implies many different roles. Specifically, Strano and Rehmani (2007) grouped these roles into five broad categories: change agent, communicator, leader, manager, and modeler. However, these roles are rather generic, largely disconnected from any particular context (e.g., relevant EA artifacts) and arguably offer only a very abstract view of enterprise architects' work. For this reason, we argue that currently the work of enterprise architects is insufficiently understood, no sound lists of their activities exist in the literature and exactly what enterprise architects actually do on a daily basis still remains largely unclear. Interestingly, as Olsen (2017, p. 642) has noticed, "even enterprise architects do not have clear conceptions of their role".

This study provides arguably the most comprehensive, detailed, and contextualized list of enterprise architects' activities available today in the EA literature. The eight identified activity areas and the 11 underlying activities (see Figure 1) are very diverse in nature and range from organization-wide capability modeling to reviewing designs of separate IT systems. These observations generally support the view of an enterprise architect as a "jack of all trades" (Steghuis & Proper, 2008; Ylinen & Pekkola, 2020) capable of communicating with business executives, mid-level managers, and project teams and converting high-level business plans into low-level IT actions.

## 5.2 EA Artifacts and Activities of Enterprise Architects

Our study explicitly links the activities of enterprise architects with the relevant types of EA artifacts. On the one hand, the eight identified activity areas (see Figure 1) demonstrate that specific types of EA artifacts are closely associated with certain activities that they support, but irrelevant to other activities. Moreover, no "general-purpose" EA artifacts were mentioned by the interviewed architects. This observation suggests the existence of strong coupling between the activities of enterprise architects and the EA artifacts that they use during these activities. Therefore, in most cases and contexts, it might be unreasonable to discuss architects' activities separately from respective EA artifacts, and vice versa.

On the other hand, though EA practices are closely associated with EA artifacts (Kotusev, 2019; Niemi & Pekkola, 2017), not all activities mentioned by the interviewed architects can be related directly to any specific types of EA artifacts. This observation suggests that the work of an enterprise architect is not limited only to creating and using EA artifacts, but requires a much broader focus and also includes such essential activities as communication with various stakeholders, coordinating their activities, consulting business leaders, advising IT leaders, and mentoring more junior IT specialists.

Furthermore, the observed diversity of EA artifacts and related activities questions the popular view of EA as a single comprehensive blueprint or master plan defining the structure of organizational information systems in their current and future states around which all EA-related activities revolve (Shanks et al., 2018; Tamm, Seddon, Shanks, & Reynolds, 2011). In light of our findings, EA can be considered only as a loose term for denoting all EA artifacts, which are actually very diverse in their meaning, purposes, and use cases.

## 5.3 Activity-Specific Nature of Benefits and Blockers

The existing EA literature tends to discuss the benefits (see Table 4) and blockers (see Table 5) of "EA practice" (Fallmyr & Bygstad, 2014), "EA management" (Hauder et al., 2013; Lohe & Legner, 2012, 2014; Schmidt & Buxmann, 2011), "EA programs" (Levy, 2014), "EA projects" (Alaeddini & Salekfar, 2013), "EA services" (Shanks et al., 2018), "enterprise architecting" (Chuang & van Loggerenberg, 2010; Kaisler & Armour, 2017; Kaisler et al., 2005; Lucke et al., 2010), "EA development" (Banaeianjahromi, 2018; Banaeianjahromi & Smolander, 2016, 2019), "EA implementation" (Seppanen et al., 2009), or, in most cases, even simply of "enterprise architecture" (Ajer & Olsen, 2018; Boucharas et al., 2010; Bradley et al., 2012, 2011; Carvalho & Sousa, 2014; Dang & Pekkola, 2016; Gong & Janssen, 2019; Valorinta, 2011). However, our analysis shows that most reported benefits and blockers associated with EA practice can actually be related specifically to certain activity areas, rather than just to "enterprise architecture".



For example, clarity of priorities may result from business capability modeling but not from project governance, while reduced duplication may ensue from IT asset management but hardly from opportunity assessment. Similarly, the presence of cultural barriers between business and IT may be a significant blocker for business capability modeling but is irrelevant to IT asset management, while insufficient tool support may preclude effective IT asset management but it is of little or no relevance to opportunity assessment. The existence of these relationships between activities, benefits, and blockers provides a more detailed understanding of EA practice than the one offered by the available EA literature.

Moreover, “EA practice”, “EA management”, “enterprise architecting”, and other similar notions widely used in the existing EA literature represent very vague abstractions. For instance, arguably none of them can be clearly interpreted from the perspective of the identified activity areas (see Figure 1). At best, all these notions can be viewed only as broad umbrella terms for some or all EA-related activities. This observation suggests that instead of referring to essentially indefinable terms such as “EA practice”, “EA management”, or “enterprise architecture”, EA scholars should more clearly understand and explicitly indicate in their papers which exactly EA-related activities they study.

Generally, the business value of EA practice cannot be reduced to any single benefit but rather is multifaceted and has clearly traceable links to particular activity areas constituting it. For this reason, the very notion of business value in relation to EA practice is arguably valid only in the highest-level organization-wide context and should be broken down into separate activity-specific components in any more detailed discussions. Moreover, since EA practice seemingly can implement only some, but not necessarily all, of the eight activity areas identified in our study (e.g., due to its immaturity), the business value of EA practice is likely to be contingent on the specific set of activity areas that are actually implemented.

## 5.4 Detailed View of EA Practice

While the existing literature often considers EA practice largely as a set of unspecified activities where some plans are produced, business and IT alignment is improved, and business value is generated (Dang & Pekkola, 2016; Levy, 2014; Lohe & Legner, 2014; Rahimi et al., 2017; Tamm et al., 2011), the eight specific activity areas identified in our study (see Figure 1) allow EA scholars to deconstruct the complex phenomenon of EA practice into a number of more definite and “manageable” discrete components. Each of these components essentially constitutes a separate subpart of EA practice embracing its own artifacts, participants, benefits and blockers. Furthermore, due to their loose interdependence (see Figure 2), each of these components can often be analyzed largely in isolation from other subparts of EA practice. For example, business capability modeling is unrelated to project governance in any real sense and, therefore, these two activity areas can be studied separately from each other, even though both of them constitute EA practice. Similarly, roadmapping and portfolio planning is rather “distant” from IT asset management, which makes these two activity areas suitable for a separate in-depth analysis.

In general, the activity-centric view of EA practice resulting from our analysis starkly contrasts with the step-by-step conceptualization of EA practice promoted in the mainstream frameworks-centric literature (Armour, Kaisler, & Liu, 1999; Bernard, 2012; Bittler & Kreizman, 2005; Boar, 1999; Carbone, 2004; Covington & Jahangir, 2009; Holcman, 2013; Longepe, 2003; Niemann, 2006; Schekkerman, 2008; Spewak & Hill, 1992; Theuerkorn, 2004; The Open Group, 2018). This is, however, not particularly surprising taking into account the prescriptive attitude of the corresponding publications, their origin in fashion-setting networks (consultancies, experts, gurus, etc.) (Abrahamson, 1991, 1996; Miller, Hartwick, & Le Breton-Miller, 2004), their non-evidence-based nature, the lack of documented successful examples, and the abundant criticism in the existing empirical studies (Kotusev, 2018a). In line with many previous empirical studies (Ahlemann et al., 2012; Holst & Steensen, 2011; Tamm, Seddon, Shanks, Reynolds, & Frampton, 2015), our analysis demonstrates the inadequacy and invalidity of the step-wise representation of EA practice and fully supports the earlier observation of Haki, Legner, & Ahlemann (2012, p. 1): “[EA] frameworks have been suggested as guidelines to [EA] implementation, but our experience indicates that very few companies follow the steps prescribed by such frameworks”.

As discussed earlier in relation to the benefits and blockers of EA practice, references to some ambiguous notions such as “EA management”, “EA programs”, and “enterprise architecture” often found in current EA studies make the respective finding barely interpretable. For example, Tamm et al. (2011) studied how “enterprise architecture” adds value to organizations and identified four benefit enablers: organizational alignment, information availability, resource portfolio optimization, and resource complementarity. However, these enablers evidently belong to rather different activity areas within EA practice. While

organizational alignment can result largely from business capability modeling, resource portfolio optimization can result mostly from IT asset management. Likewise, Rahimi et al. (2017) analyzed the applications of “EA management” and identified three different archetypes: implementing IT strategies, implementing business strategies, and complementing the business strategy formation process. However, these applications may be valid only for activity areas dealing with global future planning (e.g., business capability modeling and roadmapping and portfolio planning) and may not be relevant to other activity areas (e.g., IT asset management, project governance and audit of mergers and acquisitions).

These and many other examples from the current EA literature suggest that the inability to distinguish between different activity areas constituting EA practice may lead to confusing findings that can be subjected to multiple inconsistent interpretations. Moreover, the lack of a clear understanding of these activity areas essentially inhibits an in-depth analysis of EA practice. This study offers arguably the first systematic and evidence-based list of EA-related activity areas that clarify the multifaceted phenomenon of EA practice. These activity areas can be taken as an initial basis for more detailed studies of EA practice by other researchers and thereby contribute to further development of the EA discipline.

## 5.5 EA Practice and Other Organizational Practices

The existing EA literature widely recognizes the integration between EA practice and other organizational processes (see Table 3), most importantly with strategic planning and management (Aldea et al., 2013; Blomqvist et al., 2015; Simon et al., 2014), investment prioritization and portfolio management (Armour et al., 2007; Emery et al., 2007; Makiya, 2008), and project management and system delivery efforts (Armour et al., 2007; Emery et al., 2007; Hanschke et al., 2015). However, the corresponding publications, again, refer to “EA management” (Hanschke et al., 2015; Simon et al., 2014) or simply “enterprise architecture” (Aldea et al., 2013; Armour et al., 2007; Blomqvist et al., 2015; Emery et al., 2007; Makiya, 2008) with little or no indication of what particular EA-related activities are integrated with these processes and what specific EA artifacts support this integration.

Our analysis shows that EA practices in organizations are indeed integrated with other organizational processes but that the respective integration mechanisms always relate to particular activity areas. For example, strategic planning and management processes are normally integrated with business capability modeling, roadmapping, and portfolio planning but not with project governance. Investment prioritization and portfolio management processes tend to be integrated with roadmapping and portfolio planning and to a lesser extent with opportunity assessment but not with IT asset management. Finally, project management and system delivery efforts are closely integrated with project governance but rarely, if ever, with business capability modeling. At the same time, other EA-related activity areas arguably have no clear integration scenarios with the external organizational environment.

In line with the similar conclusions discussed earlier, this observation also suggests that a more detailed view of EA practice is necessary for a meaningful analysis of the integration points between EA practice and other organizational practices, which is currently missing in the available EA literature. Rather than discussing the integration between “enterprise architecture” or EA practice in general (Aldea et al., 2013; Armour et al., 2007; Blomqvist et al., 2015; Emery et al., 2007; Hanschke et al., 2015; Makiya, 2008; Simon et al., 2014), the EA discipline would benefit from specifying exactly which EA-related activities are being integrated.

## 5.6 Terminology in the EA Discipline

The EA discipline currently suffers from significant terminological problems and inconsistencies. For example, Saint-Louis, Morency, and Lapalme (2019) identified 160 different definitions of the term “enterprise architecture” used in the academic EA literature. As Ylinen and Pekkola (2020, p. 2) fairly note, “a common denominator of EA research seems to be the absence of commonly and generally agreed definition for EA”. Moreover, some sources define EA as a “noun” (i.e., as a comprehensive blueprint or a loose collection of documents) (Kotusev, 2019; Simon, Fischbach, & Schoder, 2013; Spewak & Hill, 1992), while other sources define EA as a “verb” (i.e., as a process or practice of planning) (FEAPO, 2013; Lapkin et al., 2008). Different terms are also used to denote the sets of all EA-related activities in organizations most popular of which include “EA practice” (Fallmyr & Bygstad, 2014; Kotusev, 2021b; van den Berg & van Steenbergen, 2006), “EA management” (Ahlemann et al., 2012; Lange, Mendling, & Recker, 2016; Schmidt & Buxmann, 2011), “EA program” (DeBoever, Paras, & Westbrook, 2010; Levy, 2014; Zink, 2009), “EA project” (Alaeddini & Salekfard, 2013; Banaeianjahromi & Smolander, 2019; Dang & Pekkola, 2019), and simply “enterprise architecting” (Kaisler & Armour, 2017; Lucke et al., 2010;



Rolland, Ghinea, & Gronli, 2015). Even though we do not focus on comprehensively analyzing the various definitions of EA and accompanying terms in this paper since it falls outside its scope, some important observations relevant to EA terminology still can be made from our analysis.

On the one hand, when EA is viewed as a “noun”, under no circumstances can it be conceptualized as an overarching blueprint or a holistic set of descriptive documentation. Instead, EA as a “noun” can be understood only as a collection of loosely related EA artifacts each of which represents an instrument for supporting specific activities and addressing unique aspects of planning (see Figure 1). For example, business capability models and maps are very different from and essentially unrelated to options papers and solution architectures. These documents solve different types of organizational problems, can be used independently from each other and both of them relate to EA rather conditionally due to their disparate nature and purposes.

On the other hand, when EA is viewed as a “verb”, under no circumstances can it be conceptualized merely as the process of *producing* architectural documents, or “architecting”, since not all EA-related activities imply creating some EA artifacts or even developing concrete plans for the future. For example, IT asset management activities involve mostly maintaining the architectural repository up to date, rather than developing new EA artifacts. Likewise, project governance activities imply predominantly using existing EA artifacts (e.g., principles, standards and patterns) to ensure project compliance, while communication, coordination, consulting, and mentoring activities often are even not associated with any particular EA artifacts.

Additionally, under no circumstances can EA-related efforts be viewed as a “project”. Projects refer to time-limited activities with a definite start and end, while most of the identified EA-related activity areas represent continuous efforts and together they form a sophisticated institutionalized system of organizational decision making (see Figure 2) that, once established, certainly has no specific time boundaries.

## 6 Contribution to Research and Practice

This study represents arguably the first attempt to understand EA practice at the level of specific activities, artifacts, and their respective benefits and blockers. It makes both theoretical and practical contributions to the EA discipline.

### 6.1 Theoretical Contribution

First, this study questions the view of EA practice as a homogeneous planning endeavor (or simply an endeavor with an unspecified internal structure) that is often adopted in the literature (see Table 4 and Table 5) and clearly establishes the fact that EA practice actually includes multiple diverse and loosely related activities. As demonstrated earlier, this fact has critical implications for how EA scholars discuss EA practice, formulate their research questions, and present their findings.

Second, this study offers arguably the first available list of concrete activities constituting EA practice. Such a list is missing in the existing EA literature, while EA scholars often discuss “EA development” or “enterprise architecting” rather than any specific and well-defined activities. Thereby, this study “demystifies” the work of enterprise architects and EA practice in general.

Third, this study establishes the links between different types of activities and EA artifacts that they leverage. The current EA literature often discusses EA artifacts in isolation from EA-related activities and activities in isolation from EA artifacts. However, due to the existence of strong connections between them, it is not always appropriate to discuss them in isolation from each other.

Fourth, this study also connects various activities and respective EA artifacts with the relevant benefits and blockers. As discussed earlier, the vast majority of available studies of EA benefits and blockers do not relate them to any particular activities constituting EA practice when they actually can be strongly associated with concrete activities.

Finally, this study offers a much more detailed view of EA practice than the one offered by the existing EA literature. As an extremely diverse organizational effort, EA practice in most contexts can hardly be analyzed as some overarching high-level abstraction, but rather needs to be viewed at a more granular level, where different activities, artifacts, benefits and blockers can be distinguished. Furthermore, the integration of EA practice into the organizational context also requires activity-specific rather than general

discussions. Therefore, this study arguably makes a significant theoretical contribution to the EA discipline.

## 6.2 Practical Contribution

First, this study offers essentially a reference model of EA practice that may help aspiring enterprise architects understand what practicing EA actually means, what specific activities it includes, what EA artifacts they leverage, and how. The eight activity areas articulated in this paper can also be used in various educational courses to prepare future EA practitioners.

Second, this study explains what kind of benefits may be anticipated from different EA-related activities. This understanding may guide EA practitioners in their work and help them understand what exactly they need to do in order to bring certain business value to their companies. For example, if an organization experiences major problems with unclear IT investment priorities, then it might be worthwhile for enterprise architects to focus their efforts specifically on business capability modeling. Likewise, if an organization is concerned with an uncontrolled proliferation of IT assets, their excessive duplication and redundancy, then enterprise architects may consider focusing primarily on IT asset management aspects of their work.

Finally, this study also explains what potential problems and challenges are associated with different activities constituting EA practice. This understanding may help enterprise architects prepare for these challenges in advance and develop appropriate coping strategies. For example, if architects are planning to establish systematic project governance, then they need to secure support and commitment from senior IT leadership and also think of some ways to overcome the resistance to architecture among project managers and other project team members.

## 7 Conclusion

This study explores EA practice in depth and “decomposes” it into a number of more basic elements: artifacts, activities, benefits, and blockers. The study identified eight distinct activity areas that capture an overall meaning of EA practice at a rather granular level (see Figure 1). These activity areas offer arguably the first detailed view of EA practice available in the EA literature. Our study findings offer an important contribution to research and practice.

However, this study has a number of limitations. First, during the interviews, architects mentioned a very wide diversity of activities that they perform in their organizations. In order to manage this diversity and reduce it into a meaningful conceptual model, we focused primarily on artifacts, activities, blockers, and benefits mentioned in an explicit form by at least two to three different architects. For this reason, a number of other activities mentioned only sporadically, briefly, or implicitly have not been included in the resulting model. These missing activities include some “exotic” activities (e.g., managing vendor relationships and budgeting) and some narrow activities that can be regarded as elements of more general activities (e.g., selecting technologies and architecture debt management). Therefore, full theoretical saturation on architects’ activities in this study might have not been achieved. Second, only architects have been interviewed as part of this study. Hence, the resulting view of EA artifacts, activities, benefits and blockers reflects only perceptions of architects and might be somewhat one-sided. Lastly, due to the clutter with the terminology existing in the EA discipline, all the discussions presented in this paper may not fit seamlessly from the terminological perspective into the bulk of the current EA discourse. In other words, many of our conclusions cannot be perfectly framed within the context of the available EA literature. The lack of complete saturation on the secondary EA-related activities, a potential architects-centric bias of the findings and inherent terminological challenges can be acknowledged as key limitations of our study.

In terms of future research, the findings of this study question the view of EA practice as a simple aggregation of all EA-related activities as well as the view of EA as a collection of homogeneous EA artifacts. Therefore, we call for a more detailed exploration of these activities, EA artifacts and their interrelationships. From this perspective, developing a more granular list of EA-related activities and respective EA artifacts can be considered as a worthwhile direction for future EA research. Moreover, each of the eight identified activity areas essentially represents a separate “story” within EA practice that deserves a more thorough investigation to better understand its internal details. Exploring these activity areas separately in greater detail can also be considered as a potential direction for future EA research.

Finally, we argue that the EA discipline generally suffers from an inadequate, overly simplistic terminology incommensurable with the complexities of real-world EA practices. For example, popular terms widely used in the literature such as “EA management”, “EA programs”, and even “enterprise architecture” itself seemingly fail to capture the meaning of disparate activities constituting EA practice and EA artifacts used as part of them. Therefore, these terms may not be appropriate for a detailed discussion of EA practice beyond some highest-level generalities. For this reason, we also call for developing a consistent terminology suitable for meaningfully analyzing EA practice at the level of detail greater than the one prevalent in the current EA literature.

## Acknowledgments

We thank the Australian Research Council for funding this study (DP14010024). We are grateful to Dr. Keith Frampton for organizing the research interviews for this study. We also appreciate all the support from the individuals who participated in our research.

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