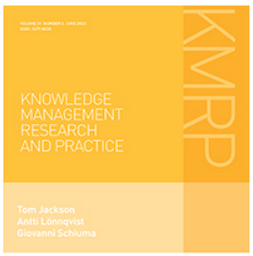

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RESEARCH ARTICLE

Enterprise architecture artefacts as instruments for knowledge management: a theoretical interpretation

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ABSTRACT

Enterprise architecture (EA) involves a collection of special documents, or artefacts, describing various aspects of an organisation from an integrated business and IT perspective. Knowledge management is a practice of generating, storing and sharing knowledge within an organisation and EA artefacts can be clearly viewed as special instruments for managing knowledge. Based on the analysis of EA artefacts used in 27 diverse organisations, we study the properties of the most popular artefacts through the conceptual lenses of knowledge management. Specifically, we analyse what forms of knowledge these EA artefacts represent, what knowledge management strategies they implement, what knowledge management systems they leverage and how these features correlate with other properties of EA artefacts. This study provides arguably the first available in-depth analysis of EA artefacts as instruments for managing knowledge. Our analysis demonstrates a wide diversity of EA artefacts from the perspective of their approaches to knowledge management.

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Enterprise architecture; EA artefacts; knowledge management; explicit knowledge; tacit knowledge; case studies

1. Introduction

Enterprise architecture (EA) is a set of special instruments, approaches and techniques intended to facilitate information systems planning and improve business and IT alignment (Kotusev, 2019; Niemi & Pekkola, 2017). Separate documents used as part of EA efforts are typically called EA artefacts (Niemi & Pekkola, 2017; Winter & Fischer, 2006). These EA artefacts provide various descriptive views of an organisation from the perspective of its business and IT (Abraham, 2013; Kotusev et al., 2015).

Knowledge management is a discipline of generating, storing, transferring and sharing knowledge possessed by an organisation (Alavi & Leidner, 2001; Davenport & Prusak, 2000). Practicing knowledge management can bring considerable value to organisations. For instance, recent studies demonstrate that effective knowledge management efforts are associated with the accumulation of intellectual capital (Buenechea-Elberdin et al., 2018), increased innovativeness (Inkinen, 2016; Jarmooka et al., 2020) and improved overall organisational performance (Ali et al., 2019; Inkinen, 2016; Latilla et al., 2018).

While knowledge exchange issues are pervasive in organisations and affect numerous aspects of organisational behaviour, the practice of using EA artefacts, or simply an EA practice, can be viewed as a special, narrow-purposed form of knowledge management practice addressing specifically the knowledge translation difficulties arising between business and IT actors during the information systems planning activities (Buckl et al., 2009; Struck et al., 2010). Moreover, EA artefacts themselves, as documents intended to transfer certain information from people to people, clearly represent special instruments for managing knowledge in organisations (Kotusev & Kurnia, 2021) and, thus, can fairly be related to knowledge management artefacts (Mariano & Awazu, 2016). For example, Kourdi et al. (2007) propose a conceptual framework for discovering and extracting knowledge from the repositories of EA artefacts. Dyer (2009) goes further and argues that the effectiveness of EA efforts in organisations can be evaluated by the extent to which they enable knowledge management.

Knowledge management represents a full-fledged research stream with its own established notions, concepts and theories. For instance, the existing literature on knowledge management distinguishes different types of knowledge with disparate properties (Alavi & Leidner, 2001; Magnier-Watanabe & Benton, 2017), different knowledge management strategies suitable for different situations (Hansen et al., 1998; Venkitachalam & Ambrosini, 2017) and different knowledge management systems addressing different knowledge sharing needs (Chhim et al., 2017; Kankanhalli et al., 2005). These concepts from the knowledge management literature can offer a valuable perspective for exploring in greater detail EA artefacts and their usage in organisations.

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However, despite the obvious relevance of the powerful analytical lenses provided by the knowledge management discipline for interpreting the roles of EA artefacts in an EA practice as a means of knowledge capturing and sharing, a systematic analysis of EA artefacts as instruments for managing knowledge and their properties is still absent. Unsurprisingly, Buckl et al. (2009) and Struck et al. (2010) long ago called for further research to study EA practices from the knowledge management perspective.

To understand EA artefacts as instruments for managing knowledge, this paper intends to analyse the properties of key EA artefacts used in organisations through the lenses of knowledge management. Specifically, the research question of this study can be formulated as follows: "How are EA artifacts used as instruments for managing knowledge in organizations?"

This paper continues as follows: (1) we discuss EA artefacts, knowledge management, the relationship between them and then formulate our research question, (2) we describe our research design, data collection and analysis procedures, (3) we thoroughly analyse various properties, qualities and features of EA artefacts as instruments of knowledge management, (4) we discuss our findings in light of the existing literature and (5) we conclude the paper.

2. Literature review

In this section we discuss the concept of EA and its artefacts, knowledge and its management in organisations, the relationship between EA artefacts and knowledge management and finally formulate our research question.

2.1. Enterprise architecture and its artefacts

Although EA has no single commonly accepted definition (Saint-Louis et al., 2019), it can generally be understood as a set of special instruments, approaches and techniques intended to facilitate information systems planning and improve business and IT alignment (Kotusev, 2019; Niemi & Pekkola, 2017). EA usually addresses multiple different domains relevant from the perspective of the relationship between business and IT, e.g., business, applications, data, integration, infrastructure and security (Behara & Paradkar, 2015; Kotusev, 2021; Winter & Fischer, 2006).

Material instruments used as part of EA efforts are typically called EA artefacts (Kotusev, 2019; Niemi & Pekkola, 2017; Winter & Fischer, 2006). An EA artefact is a descriptive document providing a certain view of an organisation from the perspective of its business and IT (Abraham, 2013; Kotusev, 2019; Kotusev et al., 2015; Niemi & Pekkola, 2017). Even though EA artefacts used in organisations as part of their EA practices can be remarkably diverse and organisation-specific, some types of artefacts enjoyed widespread acceptance and are adopted in the industry rather widely (Kotusev, 2021; EA on a Page, 2021). These popular EA artefacts include, but are not limited to, principles, business capability models, roadmaps and solution designs (Kotusev, 2017, 2019).

For example, architecture principles (Aier, 2014; Greefhorst & Proper, 2011; EA on a Page, 2021) provide brief, executive-level imperatives or policy guidelines governing the use of IT in the whole organisation. Principles typically consist of detailed statements clarifying their meaning, rationales explaining their motivation and implications outlining their consequences for organisations and their IT landscapes. Architecture principles guide all IT-related decision-making processes in organisations at strategic, tactical and project levels.

Business capability models, or maps (Khosroshahi et al., 2018; EA on a Page, 2021; Scott, 2009), provide structured graphical representations of all organisational business capabilities, their relationship and hierarchy. Different business capabilities can be colour-coded in a variety of ways to indicate their perceived importance for the organisation and its long-range strategy. Thereby, business capability models highlight strategic business areas and help concentrate future IT investments on these areas.

Investment roadmaps (Kotusev, 2021; McGregor & Blanton, 2014; EA on a Page, 2021) provide structured graphical views of all planned IT initiatives in specific business areas. In some cases, they may also offer high-level views of the current and desired business or IT capabilities in the respective areas. Roadmaps allow linking business and IT plans in terms of the corresponding initiatives and their tentative timelines.

Finally, solution designs, or project-start architectures (Foorthuis et al., 2016; EA on a Page, 2021; Wagter et al., 2005), provide descriptions of separate IT projects in the overall organisational context with rather detailed technical information regarding their implementation. Typically, they cover the entire stack of EA domains, from business and applications to infrastructure and security. Using solution designs helps ensure the conformance of new IT systems to various business and architectural requirements.

2.2. Knowledge and its management in organizations

Organisations in their daily activities operate not only tangible objects, but also intangible assets including data, information and knowledge (Alavi & Leidner, 2001; Bibi et al., 2020; Tangaraja et al., 2016). Data can be defined as "simple observations of states of the

world", information can be defined as "data endowed with relevance and purpose", while knowledge can be defined as "valuable information from the human mind" (Davenport, 1997, p. 9).

Knowledge can take two different forms: explicit and tacit (Alavi & Leidner, 2001; Lopez-Cabarcos et al., 2020; Magnier-Watanabe & Benton, 2017; Nonaka, 1994). On the one hand, explicit knowledge can be easily formalised and converted into symbols, words or figures. For this reason, it is amenable to documentation and can be freely transferred and disseminated across multiple people via respective documents (Nonaka, 1994; Santos et al., 2021). On the other hand, tacit knowledge is a much more subtle and elusive substance. It is embedded in the human brain and cannot be easily formalised. This type of knowledge cannot be documented and even clearly communicated from people to people verbally (Hau et al., 2016; Munoz et al., 2015; Polanyi, 1966).

> *"We can know more than we can tell. This fact seems obvious enough; but it is not easy to say exactly what it means. Take an example. We know a person's face, and can recognize it among a thousand, indeed among a million. Yet we usually cannot tell how we recognize a face we know. So most of this knowledge cannot be put into words"* (Polanyi, 1966, p. 4)

Knowledge management is a discipline and organisational practice of deliberate generating, coordinating, storing, transferring and sharing knowledge possessed by the organisation (Davenport & Prusak, 2000; Inkinen, 2016). For instance, Alavi and Leidner (1999, p. 6) define knowledge management as "a systemic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work".

Knowledge management in organisations can be approached with two different strategies: codification and personalisation (Chai & Nebus, 2011; Hansen et al., 1998; Venkitachalam & Ambrosini, 2017). The codification strategy relies on recording codified knowledge in documents or specialised information systems and then sharing this knowledge through providing access to these knowledge databases to all employees (Hansen et al., 1998; Venkitachalam & Willmott, 2015). The personalisation strategy relies more on organising direct interactions between people possessing the required knowledge and channelling individual expertise through providing creative, rigorous and timely advice (Venkitachalam & Ambrosini, 2017; Wipawayangkool & Teng, 2016).

Knowledge management systems can also be classified into two different types: knowledge repositories and knowledge maps (Davenport & Prusak, 2000; Wu & Wang, 2006). Knowledge repositories essentially represent comprehensive document databases for capturing, storing and searching organisational knowledge (Chhim et al., 2017; Kankanhalli et al., 2005), while knowledge maps provide searchable catalogues or networks of expertise held by individual employees for the purposes of interpersonal knowledge exchange (Gray, 2000; Wu & Wang, 2006).

Different types of knowledge, knowledge management strategies and systems highly correlate with each other. Specifically, explicit knowledge can be best managed according to the codification strategy and supported by knowledge repositories, while tacit knowledge can be best managed according to the personalisation strategy and supported by knowledge maps (Hansen et al., 1998; Venkitachalam & Ambrosini, 2017; Wipawayangkool & Teng, 2016).

2.3. Enterprise architecture artefacts and knowledge management

The practice of using EA in organisations has long been recognised as a practice highly overlapping in its goals, approaches and methods with knowledge management. For example, Buckl et al. (2009) and Struck et al. (2010) interpreted an EA practice as a specific way of managing knowledge on the structure and relationship of business and IT elements of an organisation. First, Buckl et al. (2009) conceptually analysed the existing EA frameworks from the perspective of a typical knowledge management lifecycle: goals-setting, identification, acquisition, development, use, preservation, distribution and measurement. Then, Struck et al. (2010) formulated a number of hypotheses regarding the possible relationship between EA and knowledge management practices and conducted an empirical analysis to validate them. Other studies (Dyer, 2009; Kourdi et al., 2007) also established a strong connection between EA and knowledge management efforts in organisations.

EA artefacts themselves, as documents containing diverse information, obviously represent certain instruments for managing knowledge in organisations (Kotusev & Kurnia, 2021) and, for this reason, can even be viewed as a special case of knowledge management artefacts (Mariano & Awazu, 2016). Furthermore, different types of EA artefacts are associated with different usage scenarios that can be related to the codification or personalisation knowledge management strategies. For example, formal and comprehensive technical diagrams depicting the existing IT landscape and stored in specialised EA repositories (Kotusev, 2019; Wierda, 2017) clearly implement the codification strategy (Kotusev & Kurnia, 2021). At the same time, abstract and informal core diagrams providing a certain basis for establishing a constructive dialog between senior business and

IT executives regarding the desired long-term future (Ross, 2004; Ross et al., 2006) evidently gravitate more towards the personalisation knowledge management strategy (Kotusev & Kurnia, 2021).

2.4. Research motivation and question

Currently the usage of EA artefacts in organisations remains largely an unexplored area of the EA discipline (Kotusev et al., 2015; Niemi & Pekkola, 2017). For instance, despite the evident relevance of the knowledge management lenses for interpreting the role, meaning and purpose of EA artefacts in the context of an EA practice, a systematic analysis of EA artefacts as instruments for managing knowledge and their properties in the current literature is missing. Although Buckl et al. (2009) and Struck et al. (2010) promoted studying EA practices from the knowledge management perspective and called for further research in this direction, no such research has followed.

To address the existing gaps and better understand EA artefacts as instruments for managing knowledge, this paper intends to thoroughly study the practical usage of EA artefacts in multiple organisations and analyse their properties through the conceptual lenses of knowledge management. In particular, the research question of this study can be formulated as follows:

> *"How are EA artifacts used as instruments for managing knowledge in organizations?"*

Answering this question requires clarifying (1) what types of EA artefacts can be considered as instruments for managing knowledge, (2) what forms of knowledge these artefacts represent, (3) what knowledge management strategies they realise and (4) what knowledge management systems they leverage.

3. Research design

This research is exploratory, qualitative and inductive in nature since our research question is barely studied in the existing EA literature and implies obtaining purely qualitative answers highly specific to the unique EA context, which cannot be hypothesised based on the earlier findings of other more "general" literature, e.g., literature on management and organisational behaviour. Accordingly, we chose the case study research method as the most appropriate approach for studying qualitatively a contemporary unexplored phenomenon in its full complexity and natural settings (Eisenhardt, 1989; Yin, 2003). To achieve a broader coverage of EA artefacts and their usage in the industry, we focused specifically on multiple case studies (Benbasat et al., 1987; Yin, 2003).

3.1. Data collection

Data for this study has been collected as part of a broader research effort intended to explore the usage of EA artefacts in organisations (Kotusev, 2019). In total, we took 63 face-to-face and Skype one-hour semi-structured interviews with architects of different denominations and architecture managers from 27 diverse organisations predominantly in Australia, but also in New Zealand and Europe. These organisations employed from tens to thousands of IT staff and represented different industries including finance and insurance, food and retail, manufacturing and delivery, education and telecommunication, energy and natural resources, government agencies and emergency services as well as some other industry sectors. Summary information regarding the interviews taken as part of this study is provided in Table 1.

All the interviewees have been asked to list key types of EA artefacts used in their organisations and then to describe in detail their informational contents and various aspects of their usage, e.g., users, use cases and purposes. All the conducted interviews have been recorded with the permission of the interviewees for further qualitative analysis. Numerous samples of architectural documents demonstrated by the interviewees were captured and analysed as well.

The research process generally progressed through two consecutive phases: initial studies and results confirmation. During the first exploratory phase, we conducted in-depth case studies of specific organisations (#1-7, see Table 1) where we analysed the use of EA artefacts in great detail and identified their common usage patterns and scenario. Then, during the second confirmatory phase, we carried out a cursory analysis of a larger number of companies (#8-27, see Table 1) where we validated the preliminary findings and enriched them with new observations. This approach allowed, first, to achieve a thorough understanding of the practical usage of typical EA artefacts in a limited number of organisations (i.e., ensure internal validity) and, then, to confirm these findings on a broader sample of companies (i.e., ensure external validity), thereby combining depth and breadth. The interviewing process was stopped when the state of theoretical saturation was reached as new interviews and organisations did not add any noteworthy observations to our study (Eisenhardt, 1989).

3.2. Data analysis

Since the core intention of this study was to analyse EA artefacts specifically as instruments for managing knowledge in organisations, we used the knowledge management lenses as a conceptual framework for our

Table 1. Interviews taken as part of this study.

Country	#	Industry	Size of the organisation	Interviews
Australia	1	Education	More than 7000 employees and 500 IT employees	9
	2	Finance	More than 40,000 employees and 3000 IT employees	7
	3	Telecom	More than 4000 employees and 500 IT employees	7
	4	Delivery	More than 30,000 employees and 500 IT employees	5
	5	Telecom	More than 30,000 employees and 3000 IT employees	5
	6	Finance	More than 40,000 employees and 5000 IT employees	4
	7	Retail	More than 80,000 employees and 1000 IT employees	3
	8	Resources	~6000 employees and ~550 IT employees	2
	9	Retail	More than 20,000 employees and 500 IT employees	2
	10	Automobile	~2600 employees and ~120 IT employees	1
	11	Education	~5000 employees and ~250 IT employees	1
	12	Education	More than 5000 employees and 200 IT employees	1
	13	Emergency	~2100 employees and ~60 IT employees	1
	14	Emergency	More than 17,000 employees and 300 IT employees	1
	15	Energy	~2500 employees, ~25 permanent in IT + outsourcers	1
	16	Finance	~250 employees and ~40 IT employees	1
	17	Finance	~7000 employees and ~500 IT employees	1
	18	Food	~1600 employees, ~15 permanent in IT + partners	1
	19	Government	~250 employees and ~100 IT employees	1
	20	Government	~2500 employees and ~400 IT employees	1
	21	Insurance	~20,000 employees and ~1500 IT employees	1
	22	Manufacturing	~3500 employees, only ~4 permanent in IT + partners	1
	23	Marketing	~2500 employees and ~600 IT employees	1
	24	Transport	~2000 employees and ~300 IT employees	1
New Zealand	25	Resources	~2000 employees and ~200 IT employees	2
	26	Delivery	~8000 employees and ~500 IT employees	1
Europe	27	Resources	~80,000 employees and several thousand IT employees	1

data analysis. In particular, our data analysis has been guided by the main research question of this study and its narrow sub-questions formulated earlier and inspired by the key findings on knowledge management.

First, we analysed what types of EA artefacts used in practice can be viewed as instruments for managing knowledge and, in this case, what valuable knowledge they convey. Second, we analysed whether these types of EA artefacts represent explicit, tacit or mixed forms of knowledge. Thirdly, we analysed whether the usage of these EA artefacts embodied codification, personalisation or combined knowledge management strategies. Finally, we analysed whether these EA artefacts are closer to knowledge repositories or knowledge maps from the perspective of the "technical" approaches that they leverage to enable access to knowledge.

4. EA artefacts as instruments for managing knowledge

In this section we provide a thorough analysis of EA artefacts as instruments for managing knowledge. We start by providing a descriptive view of EA artefacts and then focus on analysing their properties from the perspective of knowledge management.

4.1. EA artefacts as instruments for managing knowledge

The analysis of EA artefacts used in the 27 studied organisations suggests that organisations used different types of artefacts in their EA practices many of which can be considered highly organisation-specific and even unique. Therefore, we focus our further analysis and discussion specifically on the most popular EA artefacts that have been identified in some or the other form in more than half (i.e., at least 14) of the studied organisations, though often under different titles. Eight EA artefacts satisfying this criterion are business capability models, guidelines, landscape diagrams, principles, roadmaps, technology reference models, solution designs and solution overviews. These popular artefacts with their brief descriptions, typical users and analyses of their informational contents from the knowledge perspective are shown in Table 2.

The analysis of popular EA artefacts summarised in Table 2 shows that all these artefacts can be clearly interpreted as instruments for managing knowledge. Each of these artefacts reflects certain knowledge related to business and IT aspects of organisations. Each of these EA artefacts is also used by groups of people, often by representatives of different occupational communities, to exchange knowledge.

4.2. Forms of knowledge reflected in EA artefacts

Of the two disparate forms of knowledge, only explicit knowledge can be formally documented and, therefore, fully contained in EA artefacts. In other words,

Table 2. Eight popular EA artefacts with their descriptions, users and reflected knowledge.

EA artefacts	Brief description	Typical users	Reflected knowledge
Business capability models (sometimes can be also called business capability maps or capability reference models)	Structured graphical representations of all organisational business capabilities, their relationship and hierarchy	Architects and senior business leaders	Knowledge of the current structure of the business and its required future improvements
Guidelines (can be also called standards)	IT-specific implementation-level prescriptions applicable in narrow technology-specific areas or domains	Architects and subject-matter experts	Knowledge of adopted or desired technical best practices relevant to the organisation
Landscape diagrams (can be used under very diverse titles including relational diagrams, platform architectures, integration contexts, etc.)	Technical "boxes and arrows" schemes of different scopes and granularities describing the organisational IT landscape	Mostly architects	Knowledge of the high-level structure of the existing organisational IT landscape
Principles (sometimes can be also called maxims or drivers)	Global high-level guidelines influencing all decision-making and planning in an organisation	Architects and senior business leaders	Knowledge of overarching imperatives driving the organisation
Roadmaps (can be called investment roadmaps, capability roadmaps, application roadmaps, etc.)	Structured graphical views of all planned IT initiatives in specific areas, often with some indication of the current and target states	Architects and senior business leaders	Knowledge of IT investments planned in the future and their expected impact
Technology reference models (can be also called technology standards, technical reference models or technology reference architectures)	Structured graphical representations of all technologies used in an organisation	Architects and subject-matter experts	Knowledge of the currently used technologies and their future prospects
Solution designs (can be also called detailed designs, technical designs, project-start architectures, solution architectures, etc.)	Detailed technical and functional specifications of approved IT solutions actionable for project teams of ~25-50 pages long, in some cases longer	Architects and project teams	Knowledge of the detailed technical structure of planned IT systems
Solution overviews (can be also called solution outlines, conceptual architectures, conceptual designs, solution briefs, etc.)	High-level descriptions of specific proposed IT solutions understandable to business leaders of ~15-30 pages long	Architects and business leaders	Knowledge of the high-level conceptual structure of planned IT solutions

for purely explicit knowledge, EA artefacts can be regarded as the primary source of knowledge. With regards to tacit knowledge, this type of knowledge simply cannot be documented and EA artefacts, thus, cannot contain tacit knowledge directly. However, EA artefacts still can reflect certain *manifestations* of tacit knowledge inscribed in them by people possessing the original tacit knowledge in their minds, so that these people remain the primary source of this knowledge (Davenport & Prusak, 2000).

The most explicit form of EA-related knowledge is the knowledge of the current IT landscape, which can be accurately recorded in EA artefacts, e.g., in landscape diagrams. On the contrary, the most tacit form of knowledge is arguably the knowledge of the external market environment, business opportunities, problems and needs, which is always kept in the minds of business executives and only some manifestations of this knowledge can be reflected in EA artefacts. For example, business capability models often indicate required strategic capabilities, but never provide exhaustive explanations of why these particular capabilities are deemed strategic. In this case, the explicit indication of strategic capabilities represents only a formalised manifestation, or extract, of executives' tacit knowledge regarding what their organisation needs to do in the future, but not the knowledge itself in its full enormous complexity which always stays with executives.

Moreover, many EA artefacts can reflect a mix of both explicit and tacit knowledge at the same time. For example, technology reference models depict all technologies used in the organisation and also often colour-code them based on their disposition, e.g., legacy, active and strategic. On the one hand, mere depiction of technologies themselves contains explicit factual knowledge on what technologies are maintained by the organisation. On the other hand, colour-coding of technologies based on their status in the IT landscape reflects the tacit knowledge of senior IT experts regarding the desirable future of these technologies. Similarly, roadmaps express the entire time spectrum from the present moment to the long-term future. Some elements of roadmaps capture explicit knowledge on the current capabilities or systems, approved, funded and active initiatives. By contrast, their other elements, like planned IT investments, desired capabilities and systems, reflect only some manifestations of a rich tacit strategic context kept in the heads of business leaders. Hence, EA artefacts can generally reflect combinations of explicit and tacit knowledge in different proportions. The analysis of the eight popular EA artefacts from the perspective of different forms of knowledge reflected in them is provided in Table 3.

Table 3. Forms of knowledge reflected in popular EA artefacts.

EA artefacts	Explicit knowledge	Tacit knowledge (its manifestations only)
Business capability models	Business capabilities possessed by the organisation, i.e., what the organisation can do	Business capabilities considered unimportant, important, strategic, mature or immature (complex reasons behind such classifications are kept in the minds of business executives)
Guidelines	Currently adopted system implementation practices	Desired system implementation practices (complex reasons behind these choices are kept in the minds of IT experts)
Landscape diagrams	The current structure of the organisational IT landscape, i.e., existing IT assets and relationships between them	Arguably little or no tacit knowledge (all knowledge is explicitly captured in EA artefacts)
Principles	Arguably little or no explicit knowledge	Conceptual imperatives defining how the organisation needs to work from the perspective of the relationship between business and IT (complex motivation behind these imperatives is kept in the minds of business executives)
Roadmaps	Approved, funded and active initiatives, sometimes current systems or capabilities	Planned future IT initiatives and their timelines, sometimes also desired systems and capabilities (complex motivation behind these plans is kept in the minds of business executives)
Technology reference models	The current structure of the technology portfolio, i.e., what technologies are used in the organisation	Technologies considered legacy, unsupported, retiring, active, emerging or strategic (complex reasons behind such classifications are kept in the minds of IT experts)
Solution designs	Technical elements of the surrounding IT landscape	The planned technical structure of required IT systems (complex reasons justifying this structure are kept in the minds of IT experts)
Solution overviews	Key elements of the surrounding IT environment	The planned conceptual structure of required IT solutions (complex reasons justifying this structure are kept in the minds of business and IT experts)

The analysis of popular EA artefacts summarised in Table 3 shows that most artefacts tend to combine elements of both explicit and tacit knowledge. However, the "proportion" of explicit and tacit knowledge reflected in these EA artefacts can be different.

4.3. Knowledge management strategies realised by EA artefacts

As physical documents, all EA artefacts naturally realise the codification knowledge management strategy, at least to some extent. However, some EA artefacts are very closely aligned with the canons of knowledge codification, while other artefacts use only weak forms of codification and actually rely more on knowledge personalisation.

For example, landscape diagrams realise the knowledge codification strategy in its pure and classic form, i.e., they are typically stored in a shared location accessible to all relevant users and can be always looked up and studied when necessary by anyone interested in the current structure of the IT landscape.

> *"We have quite a few contractors who come and work on specific projects, so they use [landscape diagrams] as a reference point. Somebody is coming in to do architecture within this space, and they do not understand the space, and they do not know what technology we have, we will refer them back to [landscape diagrams]. So, it is a way of capturing our knowledge base"*

On the contrary, solution overviews and solution designs, though also stored somewhere and can be accessed by all interested persons, are actually more closely aligned to the knowledge personalisation strategy. Both these EA artefacts are always created by tightly coupled teams, usually through direct face-to-face collaboration between different team members. Essentially, these EA artefacts are co-created collectively by different parties, including business leaders, architects and project teams, and each party contributes its tacit knowledge to the resulting structure of IT solutions. For this reason, these artefacts can be considered more as *vehicles* for exchanging tacit knowledge between people with diverse expertise, than as a means of documenting explicit knowledge.

> *"The solution design not only gives you a cornerstone that defines what you are delivering, but also the design process. During that design [process] the architect works with other technical people and they [decide on] what we are actually trying to develop here. All the right conversations happen, so that we can thrash that out and agree on what needs to be delivered"*

The analysis of the eight popular EA artefacts from the perspective of different knowledge management strategies is provided in Table 4.

The analysis of popular EA artefacts summarised in Table 4 shows that most artefacts tend to combine elements of the codification and personalisation strategies, i.e., they can be used both as passive retrievable reference materials and as enablers of active dialog between various stakeholders. However, different EA artefacts have different value in these qualities.

4.4. Knowledge management systems leveraged by EA artefacts[1]

Since all EA artefacts represent physical documents stored in some or the other form in computer systems, all artefacts can naturally be considered as components of knowledge repositories, at least to some extent. However, many EA artefacts also leverage some elements more typical for knowledge maps and facilitate the location of competent people.

For example, landscape diagrams in most cases are stored in specialised EA repositories, which represent exemplary electronic knowledge repositories, or

Table 4. Knowledge management strategies realised by EA artefacts.

EA artefacts	Codification	Personalisation
Business capability models	Can be retrieved and used as reference models, but are arguably not particularly valuable in this quality	Offer convenient points of discussion for supporting strategic dialog between senior business and IT stakeholders
Guidelines	Can be used as reference materials on adopted system implementation approaches	Offer points of discussion around desired implementation approaches between senior IT experts
Landscape diagrams	Classic instruments of knowledge codification, offer comprehensive knowledge based on the current IT landscape	Imply little or no knowledge personalisation
Principles	Can be used as sources of reference on critical strategic imperatives	Offer points of discussion for supporting strategic dialog between senior business and IT stakeholders
Roadmaps	Can be used as reference materials on the current status of various IT initiatives	Offer convenient points of discussion for supporting strategic dialog between senior business and IT stakeholders
Technology reference models	Offer useful reference materials on the corporate technology portfolio	Offer convenient points of discussion around technologies that should be used in the future
Solution designs	Can be used as reference materials on the technical structure of IT systems, but only after they have been implemented	Offer convenient points of discussion around specific IT projects between architects and project teams
Solution overviews	Can be used as reference materials on the high-level structure of IT solutions, but only after they have been implemented	Offer convenient points of discussion around specific IT initiatives between business leaders and architects

document databases, where the necessary information can be searched and accessed by all their users. These repositories are usually implemented by commercial EA-specific software tools offered by many global vendors, e.g., Sparx Systems (Enterprise Architect), Planview (Troux), BiZZdesign (Enterprise Studio), Orbus (iServer) and Software AG (Alfabet) (McGregor, 2016; Searle & Kerremans, 2017). The primary functionality of these tools includes powerful capabilities for storing, updating, searching, querying, extracting, analysing, collating, modelling, visualising, presenting, publishing and exporting the architectural information. Moreover, they also provide various supporting functions that allow their productive usage in multi-user corporate environments, e.g., authentication, access control, versioning, auditing, change reconciliation, workflow management, configurable permissions and meta-models (McGregor, 2015; Searle & Allega, 2017). EA-specific tools embody classic knowledge repositories that enable convenient storage and exchange of information in a codified digitised form with little or no emphasis on interpersonal communication (Chhim et al., 2017; Kankanhalli et al., 2005). Similarly to landscape diagrams, other technical EA artefacts such as technology reference models and guidelines are also often stored in specialised EA repositories and have little or no resemblance to knowledge maps.

On the contrary, solution overviews and solution designs are usually stored as regular MS Word documents and often contain the lists of project participants and stakeholders so that the people possessing the necessary expertise can be found and contacted personally for their opinion or advice. Therefore, solution overviews and solution designs referring to specific people can be viewed essentially as local, project-specific knowledge maps. Likewise, business capability models are also typically created as plain MS Visio drawings and often refer to business owners of specific capabilities so that these people can be contacted for their expertise. From this perspective, business capability models can be interpreted as global, organisation-wide knowledge maps.

> *"The business capability model is used for a number of reasons. [One of these reasons is that] we need to identify and know our stakeholders: who will be impacted and who do we need to engage with in order to successfully execute the project?"*

The analysis of the eight popular EA artefacts from the perspective of different knowledge management systems is provided in Table 5.

The analysis of popular EA artefacts summarised in Table 5 shows that most artefacts tend to combine the elements of knowledge repositories and knowledge maps in their technical approaches to managing knowledge. As knowledge repositories, many EA artefacts offer certain knowledge bases where the necessary information can be searched. As knowledge maps, many EA artefacts refer to specific people possessing sought-after expertise.

4.5. The spectrum of EA artefacts as instruments for managing knowledge

The essential properties of EA artefacts from the perspective of knowledge management discussed above highly correlate with some of their properties important from the EA viewpoint. First, since the future course of action is always determined by people based on their own personal understanding of the complex environment and its trends, which is extremely hard to formalise, all EA artefacts focusing on the future are naturally more associated with tacit knowledge than current-state artefacts representing explicit knowledge of what already is. Second, since tacit knowledge can be exploited only via the personal presence of the people

Table 5. Knowledge management strategies leveraged by EA artefacts.

EA artefacts	Knowledge repositories	Knowledge maps
Business capability models	Barely resemble knowledge repositories in their approach to managing knowledge	Various business capabilities are explicitly or implicitly associated with their business owners who can be contacted for their expertise
Guidelines	Can be regarded as knowledge repositories where recommended implementation approaches can be looked up	May be explicitly or implicitly associated with relevant subject-matter experts
Landscape diagrams	Classic knowledge repositories, in most cases are implemented via specialised EA repositories	Barely resemble knowledge maps in their approach to managing knowledge
Principles	Can be considered as knowledge repositories where strategic imperatives can be looked up	Are usually implicitly associated with senior business and IT stakeholders who define strategic imperatives
Roadmaps	Barely resemble knowledge repositories in their approach to managing knowledge	Various initiatives are explicitly or implicitly associated with their business sponsors who can be contacted for their expertise
Technology reference models	For most purposes, can be viewed as knowledge repositories where the information on available technologies can be looked up	Barely resemble knowledge maps, though different technologies may be associated with specific subject matter experts
Solution designs	For most purposes do not resemble knowledge repositories in their approach to managing knowledge	Often explicitly contain the lists of project participants who need to be contacted for their expertise
Solution overviews	For most purposes do not resemble knowledge repositories in their approach to managing knowledge	Often explicitly contain the lists of initiative participants who need to be contacted for their expertise

possessing this knowledge, all future-focused EA artefacts reflecting tacit knowledge require an active group involvement of their stakeholders. Only current-state EA artefacts containing explicit knowledge can be worked with by separate individuals. Third, since tacit knowledge can be leveraged only through direct collaboration between different stakeholders with complementary expertise, all future-focused EA artefacts reflecting tacit knowledge tend to be represented in more "lightweight" formats optimised for productive teamwork, ease of editing and distribution, e.g., simple MS Office files or wiki-based platforms. At the same time, the formats of current-state EA artefacts containing explicit knowledge that can be worked with individually are more "heavyweight" and more often optimised for long-term storage, searchability and analysis of information, e.g., specialised EA repositories, configuration management databases (CMDBs) or other comprehensive repositories.

These interrelated knowledge management and EA-related properties can be represented as a continuous spectrum along which all EA artefacts can be positioned to illustrate their key properties. Although the positions of specific EA artefacts along the spectrum can fairly be considered approximate, somewhat debatable and largely subjective, these positions generally still help illustrate many important differences between various artefacts used in practice. The spectrum of EA artefacts as instruments of knowledge management with their most important properties is shown in Figure 1.

Figure 1 demonstrates the approximate distribution of the most popular EA artefacts used in practice along the spectrum of their essential properties relevant from the knowledge management and EA perspectives. Even though their positions are unquestionably subjective, at least to some extent, this positioning exercise arguably helps better understand the essential properties of EA artefacts and their mutual interrelationship.

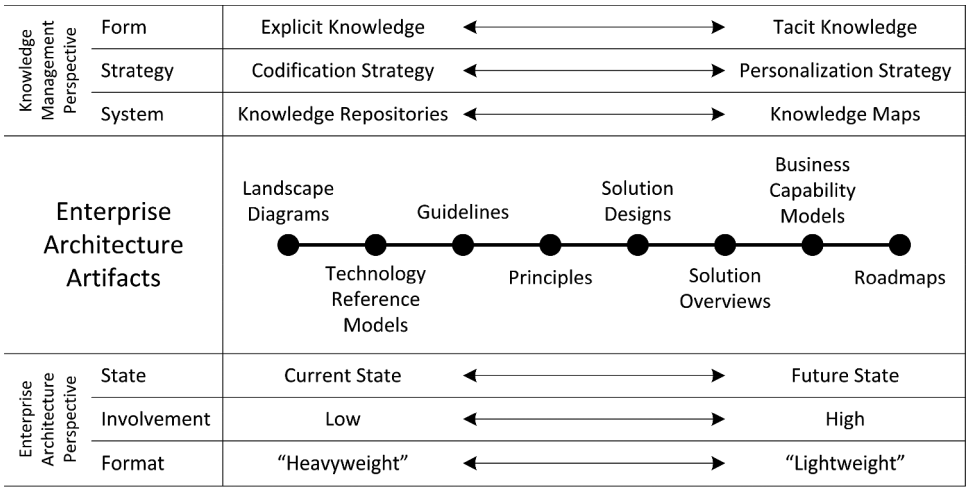

Figure 1. The spectrum of EA artefacts as instruments of knowledge management.

5. Discussion of findings

In this section we discuss the value of knowledge management lenses for understanding EA practices, the diversity and multifaceted nature of EA artefacts, the role of specialised EA modelling languages for managing knowledge and the necessity of direct stakeholder involvement in EA-related activities.

5.1. The value of knowledge management for understanding EA

The use of the knowledge management lenses in this study proved helpful and explanatory. Specifically, taking the perspective of knowledge management allows understanding and explaining many important properties of EA artefacts as well as the essential differences existing between them (see Figure 1). Furthermore, analysing EA artefacts and their usage through the prism of knowledge management also helps understand the underlying reasons behind them rooted in the fundamental difference between explicit and tacit knowledge.

On the one hand, the properties of EA artefacts associated with more "tangible" explicit knowledge are significantly influenced by the properties of respective knowledge: (1) they focus more on the current state which is largely objective and, unlike the future, does not depend on human opinions or expectations, (2) they can be used by individual actors directly as learning materials and do not require the involvement of other actors to convey knowledge and (3) they are stored in more sophisticated formats and systems facilitating their effective use as searchable reference materials. On the other hand, EA artefacts associated with more subtle implicit knowledge are also shaped by the properties of respective knowledge: (1) they focus more on the future which inevitably depends on different people's opinions, expectations and interpretations, (2) they are used by groups of actors mostly as discussion points for transferring knowledge during personal meetings and conversations and (3) they are stored in simple formats and systems facilitating their shared use, editing and distribution.

5.2. The multifaceted nature of EA artefacts

The analysis of popular EA artefacts used in the industry and their properties suggests that EA artefacts are very complex and diverse instruments. On the one hand, most EA artefacts reflect combinations of different types of knowledge (see Table 3), mix different knowledge management strategies (see Table 4) and elements of different knowledge management systems (see Table 5), though to different extents. Moreover, different types of EA artefacts significantly differ from each other in many important aspects (see Figure 1).

This multifaceted nature of EA artefacts suggests that the very phenomenon of EA artefacts is often treated superficially in the mainstream literature. On the one hand, the academic EA literature often views EA simply as a collection of unspecified or all EA artefacts (Alaeddini & Salekfard, 2013; Lange et al., 2016; Schmidt & Buxmann, 2011; Tamm et al., 2011). However, in light of the diversity of EA artefacts uncovered in this study, this conceptualisation can be considered overly simplistic or even unreasonable. Likewise, the mainstream practitioner EA literature focuses almost exclusively on the explicit side of knowledge and essentially ignores its tacit side (Bernard, 2012; Lankhorst, 2017; TOGAF, 2018; van't Wout et al., 2010), i.e., recommends creating numerous EA diagrams and models for capturing each and every aspect of the organisation in a comprehensive EA documentation, but pays little or no attention to communication aspects related to EA artefacts necessary to transfer tacit knowledge between various organisational actors.

5.3. The role of EA modelling languages in knowledge management

EA is closely associated with specialised modelling languages providing a formalised means of depicting the structure of business and IT landscapes of organisations. The most widely known of these languages include newer ArchiMate (Lankhorst, 2017) and older ARIS (Scheer, 1992). Since all EA modelling languages intend to offer standardised graphical notations that can be used for capturing knowledge in the form of architectural diagrams and then exchanging knowledge via sharing these diagrams, their purpose evidently correlates with the codification knowledge management strategy.

Unsurprisingly, these languages are employed primarily in EA artefacts representing more explicit knowledge, rather than in artefacts reflecting tacit knowledge (see Figure 1). For example, landscape diagrams very often use some or the other formal modelling notations to achieve clarity and reduce ambiguity. By contrast, such EA artefacts as solution overviews, business capability models and roadmaps in practice rarely, if ever, utilise any particular modelling languages, but instead benefit from simple, informal and intuitively understandable modelling techniques, even though specialised modelling languages (e.g., ArchiMate) propose some formal graphical symbols and notations that can potentially be used for creating these artefacts.

5.4. The necessity of direct stakeholder involvement

Numerous previous studies identified immediate stakeholder involvement in EA-related activities as one of the most critical success factors of an EA practice (Kotusev & Kurnia, 2019; Kurnia et al., 2021; Schmidt & Buxmann, 2011; Van der Raadt et al., 2010; Ylimaki, 2006). As this study demonstrates, the perspective of knowledge management plays a critical role in understanding the stakeholder-related aspects of the practical usage of EA artefacts. In particular, it offers a clear theoretical explanation of the necessity of direct stakeholder involvement for using EA artefacts reflecting tacit knowledge, i.e., essentially for all artefacts dealing with future intentions, having subtle meaning and allowing subjective interpretation. Tacit knowledge simply cannot be "modeled" and reflected adequately in any EA artefacts and, thus, requires establishing direct personal contacts between people possessing it to enable knowledge exchange. Analogous observations have been reported earlier by reflective EA practitioners, though without any theoretical justifications (Wierda, 2017, p. 17):

> *"I have my doubts that modeling intentions and strategy are actually very useful. Modeling strategy cannot be much more than illustrative for what in reality is a narrative that has many aspects that practically can't be modeled at all in the same way that intelligent behavior cannot be caught in rules. Both intentions and strategy are domains that are far from logical in the real world and trying to map them onto a logical structure [in a way similar to regular modeling of the IT landscape] will have serious limitations"*

The knowledge management lenses help understand why some EA artefacts can be merely retrieved from document repositories and studied to obtain knowledge, while for other artefacts identification and communication with their stakeholders might be critical for their usage.

6. Conclusion

This study offers arguably the first thorough analysis of EA artefacts as instruments of knowledge management. Our empirical analysis of the established EA practices in organisations suggests that the knowledge management lenses may be very important for understanding the usage of EA artefacts and especially for explaining the necessity of direct stakeholder involvement in an EA practice to exchange tacit knowledge.

Despite the novelty of its findings, this study has two important limitations that should be acknowledged and understood. Firstly, this study focused only on EA artefacts that have been used in the majority of the 27 studied organisations. For this reason, only the eight most popular EA artefacts (see Table 2) have been analysed, leaving many other noteworthy artefacts and their properties beyond the scope of this paper. Second, some theoretical interpretations offered in this study can fairly be considered somewhat subjective. Not all of our conclusions can be easily confirmed or proven formally by any "objective" means. Nevertheless, this study arguably provides an important contribution to our theoretical understanding of EA artefacts and their roles in an EA practice.

This study demonstrates that EA artefacts represent a rather sophisticated and insufficiently understood practical phenomenon that definitely deserves further detailed scrutiny by the research community. Therefore, we call for further research on EA artefacts, their practical usage and their theoretical meaning in the broader organisational context.

Note

1. Here and further the term "system" is understood not in a narrow sense as some piece of software, but rather in a broader sense as an overall technical approach underpinning knowledge management activities associated with EA artefacts.

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References

Abraham, R. (2013). Enterprise architecture artifacts as boundary objects - A framework of properties. In J. Van Hillegersberg, E. Van Heck, & R. Connolly (Eds.). *Proceedings of the 21st European Conference on Information Systems*. Utrecht, The Netherlands: Association forInformationSystems.

Aier, S. (2014). The role of organizational culture for grounding, management, guidance and effectiveness of enterprise architecture principles. *Information Systems and e-Business Management*, *12*(1), 43–70. https://doi.org/10.1007/s10257-012-0206-8

Alaeddini, M., & Salekfard, S. (2013). Investigating the role of an enterprise architecture project in the business-IT alignment in Iran. *Information Systems Frontiers*, *15*(1), 67–88. https://doi.org/10.1007/s10796-011-9332-y

Alavi, M., & Leidner, D. (1999). Knowledge management systems: Issues, challenges, and benefits. *Communications of the Association for Information Systems*, *1*(1), 1–37. https://doi.org/10.17705/1CAIS.00107

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, *25*(1), 107–136. https://doi.org/10.2307/3250961

Ali, A. A., Panneer, D. D. D., Paris, L., & Gunasekaran, A. (2019). Key factors influencing knowledge sharing practices and its relationship with organizational performance within the oil and gas industry. *Journal of Knowledge Management*, *23*(9), 1806–1837. https://doi.org/10.1108/JKM-06-2018-0394

Behara, G. K., & Paradkar, S. S. (2015). *Enterprise architecture: A practitioner's handbook*. Meghan-Kiffer Press.

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, *11*(3), 369–386. https://doi.org/10.2307/248684

Bernard, S. A. (2012). *An Introduction to Enterprise Architecture* (3rd ed.).

Bibi, G., Padhi, M., & Dash, S. S. (2020). Theoretical necessity for rethinking knowledge in knowledge management literature. *Knowledge Management Research and Practice*, 19(3), 396-407. https://doi.org/10.1080/14778238.2020.1774433

Buckl, S., Matthes, F., & Schweda, C. M. (2009). Future research topics in enterprise architecture management - A knowledge management perspective. In A. Dan, F. Gittler, & F. Toumani (Eds.). *Proceedings of the 4th Trends in Enterprise Architecture Research Workshop*. Stockholm: Springer.

Buenechea-Elberdin, M., Saenz, J., & Kianto, A. (2018). Knowledge management strategies, intellectual capital, and innovation performance: A comparison between high- and low-tech firms. *Journal of Knowledge Management*, *22*(8), 1757–1781. https://doi.org/10.1108/JKM-04-2017-0150

Chai, K.-H., & Nebus, J. (2011). Personalization or codification? A marketing perspective to optimize knowledge reuse efficiency. *IEEE Transactions on Engineering Management*, *59*(1), 33–51. https://doi.org/10.1109/TEM.2010.2058855

Chhim, P. P., Somers, T. M., & Chinnam, R. B. (2017). Knowledge reuse through electronic knowledge repositories: A multi theoretical study. *Journal of Knowledge Management*, *21*(4), 741–764. https://doi.org/10.1108/JKM-03-2016-0126

Davenport, T. H. (1997). *Information ecology: Mastering the information and knowledge environment*. Oxford University Press.

Davenport, T. H., & Prusak, L. (2000). *Working knowledge: How organizations manage what they know* (2nd ed.). Harvard Business School Press.

Dyer, A. (2009). Measuring the benefits of enterprise architecture: Knowledge management maturity. In P. Saha (Ed.), *Advances in government enterprise architecture* (pp. 106–128). Information Science Reference.

EA on a Page. (2021). *Enterprise architecture on a page (v1.4)*. SK Publishing. http://eaonapage.com

Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.2307/258557

Foorthuis, R., van Steenbergen, M., Brinkkemper, S., & Bruls, W. A. (2016). A theory building study of enterprise architecture practices and benefits. *Information Systems Frontiers*, *18*(3), 541–564. https://doi.org/10.1007/s10796-014-9542-1

Gray, P. H. (2000). The effects of knowledge management systems on emergent teams: Towards a research model. *Journal of Strategic Information Systems*, *9*(2), 175–191. https://doi.org/10.1016/S0963-8687(00)00040-8

Greefhorst, D., & Proper, E. (2011). *Architecture principles: The cornerstones of enterprise architecture*. Springer.

Hansen, M. T., Nohria, N., & Tierney, T. (1998). What's your strategy for managing knowledge? *Harvard Business Review*, *77*(2), 106–116. https://hbr.org/1999/03/whats-your-strategy-for-managing-knowledge

Hau, Y. S., Kim, B., & Lee, H. (2016). What drives employees to share their tacit knowledge in practice? *Knowledge Management Research and Practice*, *14*(3), 295–308. https://doi.org/10.1057/kmrp.2014.32

Inkinen, H. (2016). Review of empirical research on knowledge management practices and firm performance. *Journal of Knowledge Management*, *20*(2), 230–257. https://doi.org/10.1108/JKM-09-2015-0336

Jarmooka, Q., Fulford, R. G., Morris, R., & Barratt-Pugh, L. (2020). The mapping of information and communication technologies, and knowledge management processes, with company innovation. *Journal of Knowledge Management*, *25*(2), 313–335. https://doi.org/10.1108/JKM-01-2020-0061

Kankanhalli, A., Tan, B., & Wei, -K.-K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quarterly*, *29*(1), 113–143. https://doi.org/10.2307/25148670

Khosroshahi, P. A., Hauder, M., Volkert, S., Matthes, F., & Gernegross, M. (2018). Business capability maps: Current practices and use cases for enterprise architecture management. In T. X. Bui (Ed.). *Proceedings of the 51st Hawaii International Conference on System Sciences*. Big Island, HI: Association forInformationSystems.

Kotusev, S. (2017). *Eight essential enterprise architecture artifacts*. British Computer Society (BCS). Retrieved 8 October from https://www.bcs.org/articles-opinion-and-research/eight-essential-enterprise-architecture-artifacts/

Kotusev, S. (2019). Enterprise architecture and enterprise architecture artifacts: Questioning the old concept in light of new findings. *Journal of Information Technology*, *34*(2), 102–128. https://doi.org/10.1177/0268396218816273

Kotusev, S. (2021). *The practice of enterprise architecture: A modern approach to business and IT alignment* (2nd ed.). SK Publishing.

Kotusev, S., & Kurnia, S. (2019). The problem of engagement in enterprise architecture practice: An exploratory case study. In W. F. Boh, J. M. Leimeister, & S. Wattal (Eds.). *Proceedings of the 40th International Conference on Information Systems*. Munich, Germany: Association forInformationSystems.

Kotusev, S., & Kurnia, S. (2021). The theoretical basis of enterprise architecture: A critical review and taxonomy of relevant theories. *Journal of Information Technology*, *36*(3), 275–315. https://doi.org/10.1177/0268396220977873

Kotusev, S., Singh, M., & Storey, I. (2015). Investigating the usage of enterprise architecture artifacts. In J. Becker, J. vom Brocke, & M. De Marco (Eds.). *Proceedings of the 23rd European Conference on Information Systems*. Munster, Germany: Association forInformationSystems.

Kourdi, M. E., Shah, H., & Atkins, A. (2007). A proposed framework for knowledge discovery in enterprise architecture. In M. M. Lankhorst & P. Johnson (Eds.). *Proceedings of the 2nd Trends in Enterprise Architecture Research Workshop*. St. Gallen, Switzerland: Telematica Instituut.

Kurnia, S., Kotusev, S., Shanks, G., Dilnutt, R., & Milton, S. (2021). Stakeholder engagement in enterprise architecture practice: What inhibitors are there? *Information and Software Technology*, *134*(1), 1–23. https://doi.org/10.1016/j.infsof.2021.106536

Lange, M., Mendling, J., & Recker, J. (2016). An empirical analysis of the factors and measures of enterprise architecture management success. *European Journal of Information Systems*, *25*(5), 411–431. https://doi.org/10.1057/ejis.2014.39

Lankhorst, M. (2017). *Enterprise architecture at work: Modelling, communication and analysis* (4th ed.). Springer.

Latilla, V. M., Frattini, F., Petruzzelli, A. M., & Berner, M. (2018). Knowledge management, knowledge transfer and organizational performance in the arts and crafts

industry: A literature review. *Journal of Knowledge Management*, *22*(6), 1310–1331. https://doi.org/10.1108/JKM-08-2017-0367

Lopez-Cabarcos, M. A., Srinivasan, S., & Vazquez-Rodriguez, P. (2020). The role of product innovation and customer centricity in transforming tacit and explicit knowledge into profitability. *Journal of Knowledge Management*, *24*(5), 1037–1057. https://doi.org/10.1108/JKM-02-2020-0087

Magnier-Watanabe, R., & Benton, C. (2017). Management innovation and firm performance: The mediating effects of tacit and explicit knowledge. *Knowledge Management Research and Practice*, *15*(3), 325–335. https://doi.org/10.1057/s41275-017-0058-6

Mariano, S., & Awazu, Y. (2016). Artifacts in knowledge management research: A systematic literature review and future research directions. *Journal of Knowledge Management*, *20*(6), 1333–1352. https://doi.org/10.1108/JKM-05-2016-0199

McGregor, M. (2015). *Critical capabilities for enterprise architecture tools (No. G00274824)*. Gartner.

McGregor, M. (2016). *Magic quadrant for enterprise architecture tools (No. G00294575)*. Gartner.

McGregor, M., & Blanton, C. E. (2014). *Create enterprise roadmaps to communicate and execute strategy effectively (No. G00271512)*. Gartner.

Munoz, C. A., Mosey, S., & Binks, M. (2015). The tacit mystery: reconciling different approaches to tacit knowledge. *Knowledge Management Research and Practice*, *13*(3), 289–298. https://doi.org/10.1057/kmrp.2013.50

Niemi, E., & Pekkola, S. (2017). Using enterprise architecture artefacts in an organisation. *Enterprise Information Systems*, *11*(3), 313–338. https://doi.org/10.1080/17517575.2015.1048831

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, *5*(1), 14–37. https://doi.org/10.1287/orsc.5.1.14

Polanyi, M. (1966). *The tacit dimension*. University of Chicago Press.

Ross, J. W. (2004). *Enterprise architecture: Depicting a vision of the firm*. Center for Information Systems Research (CISR), MIT Sloan School of Management.

Ross, J. W., Weill, P., & Robertson, D. C. (2006). *Enterprise architecture as strategy: Creating a foundation for business execution*. Harvard Business School Press.

Saint-Louis, P., Morency, M. C., & Lapalme, J. (2019). Examination of explicit definitions of enterprise architecture. *International Journal of Engineering Business Management*, *11*(1), 1–18. https://doi.org/10.1177/1847979019866337

Santos, R. F., Oliveira, M., & Curado, C. (2021). The effects of the relational dimension of social capital on tacit and explicit knowledge sharing: A mixed-methods approach. *VINE Journal of Information and Knowledge Management Systems*, *Online*(Online), 1–21. https://doi.org/10.1108/VJIKMS-05-2020-0094

Scheer, A.-W. (1992). *Architecture of integrated information systems: Foundations of enterprise modelling*. Springer.

Schmidt, C., & Buxmann, P. (2011). Outcomes and success factors of enterprise IT architecture management: Empirical insight from the international financial services industry. *European Journal of Information Systems*, *20*(2), 168–185. https://doi.org/10.1057/ejis.2010.68

Scott, J. (2009). Business capability maps: The missing link between business strategy and IT action. *Architecture and Governance Magazine*, *5*(9), 1–4.

Searle, S., & Allega, P. (2017). *Critical capabilities for enterprise architecture tools (No. G00319167)*. Gartner.

Searle, S., & Kerremans, M. (2017). *Magic quadrant for enterprise architecture tools (No. G00308704)*. Gartner.

Struck, V., Buckl, S., Matthes, F., & Schweda, C. M. (2010). Enterprise architecture management from a knowledge management perspective - results from an empirical study. In A. Sansonetti (Ed.). *Proceedings of the 4th Mediterranean Conference on Information Systems*. Tel Aviv: Israel.

Tamm, T., Seddon, P. B., Shanks, G., & Reynolds, P. (2011). How does enterprise architecture add value to organisations? *Communications of the Association for Information Systems*, *28*(1), 141–168. https://doi.org/10.17705/1CAIS.02810

Tangaraja, G., Rasdi, R. M., Samah, B. A., & Ismail, M. (2016). Knowledge sharing is knowledge transfer: A misconception in the literature. *Journal of Knowledge Management*, *20*(4), 653–670. https://doi.org/10.1108/JKM-11-2015-0427

TOGAF. (2018). *TOGAF Version 9.2 (No. C182)*. The Open Group.

van der Raadt, B., Bonnet, M., Schouten, S., & van Vliet, H. (2010). The relation between EA effectiveness and stakeholder satisfaction. *Journal of Systems and Software*, *83*(10), 1954–1969. https://doi.org/10.1016/j.jss.2010.05.076

van't Wout, J., Waage, M., Hartman, H., Stahlecker, M., & Hofman, A. (2010). *The integrated architecture framework explained: Why, what, how*. Springer.

Venkitachalam, K., & Ambrosini, V. (2017). A triadic link between knowledge management, information technology and business strategies. *Knowledge Management Research and Practice*, *15*(2), 192–200. https://doi.org/10.1057/s41275-016-0043-5

Venkitachalam, K., & Willmott, H. (2015). Factors shaping organizational dynamics in strategic knowledge management. *Knowledge Management Research and Practice*, *13*(3), 344–359. https://doi.org/10.1057/kmrp.2013.54

Wagter, R., Van Den Berg, M., Luijpers, J., & van Steenbergen, M. (2005). *Dynamic enterprise architecture: How to make it work*. Wiley.

Wierda, G. (2017). *Mastering archimate (Edition III): A serious introduction to the archimate enterprise architecture modeling language*. R&A.

Winter, R., & Fischer, R. (2006). Essential layers, artifacts, and dependencies of enterprise architecture. In A. Vallecillo (Ed.). *Proceedings of the 10th IEEE International Enterprise Distributed Object Computing Conference Workshops*. Hong Kong, China: IEEE.

Wipawayangkool, K., & Teng, J. T. (2016). Paths to tacit knowledge sharing: Knowledge internalization and individual-task-technology fit. *Knowledge Management Research and Practice*, *14*(3), 309–318. https://doi.org/10.1057/kmrp.2014.33

Wu, J.-H., & Wang, Y.-M. (2006). Measuring KMS success: A respecification of the DeLone and McLean's model. *Information and Management*, *43*(6), 728–739. https://doi.org/10.1016/j.im.2006.05.002

Yin, R. K. (2003). *Case Study Research: Design and Methods* (3rd ed.). Sage.

Ylimaki, T. (2006). Potential critical success factors for enterprise architecture. *Journal of Enterprise Architecture*, *2*(4), 29–40.