

Business architecture methods: An initial review and mapping study

Research-in-progress

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Abstract

Organisations are increasingly interested in applying digital data and technology to achieve their strategic sustainability and digitalisation goals, such as environmental, social and economic. Interest is there; however, the challenge is how to do so. Business architecture methods offer systematic approaches and techniques to help organisations achieve their strategic goals through effective planning, design, and adaptation to changes. This draws attention to a pressing need to review and map the available business architecture literature. Thus, this research uses adaptive enterprise architecture as a theoretical lens to systematically review and map the selected business architecture methods. This review's results will help determine the support and limitations of existing methods and provide a foundation for their improvement to support sustainability and digitalisation goals, offering actionable strategies for integrating AI and digital technologies to optimise resources and enhance environmental performance.

Keywords: Business architecture (BA), business architecture methods, BA artifacts, BA capability mapping.

1 Introduction

There is an increasing interest in sustainability (Klement et al. 2020; Vasauskaite and Gill 2015) and digitalisation (Shoilekova 2021) among organisations to support their environmental, social and economic goals. This requires organisations to fundamentally change their business models and operating environment by adopting contemporary data and digital technology (e.g. AI/ML, Cloud, Robotics Process Automation) (Klement et al. 2020). For instance, integrating artificial intelligence (AI) into business architecture presents substantial opportunities, particularly in enhancing operational efficiency in terms of assisting architecture modelling via prompts (e.g. architecture co-pilot), enabling evidence-based decision-making via AI/ML algorithms, and reducing errors caused via manual handling. Despite the potential influence of data and digital technologies on business architecture methodologies, a key challenge for organisations is identifying the capabilities and tasks that can be augmented or supported via AI and automation. This draws our attention to the need for contemporary business architecture (BA) methods within the enterprise architecture (EA) discipline to support organisations' sustainability goals via data and digital technologies. EA comprises four domains: business architecture, data architecture, application architecture and technology/infrastructure architecture. BA is useful for capturing the business views of the enterprise in terms of business strategies and goals such as sustainability and digitalisation, business processes, organisational structure, and their interconnections (Nayeem et al. 2023).

Sustainability and digitalisation have opened pathways and need for researchers and practitioners to relook into (Shoilekova 2021) existing literature on business architecture methods and related artifacts, techniques and tools, and identify gaps for improvement. This attracted our interest towards the overarching research question for this paper:

- What is currently known about business architecture methods and their support for sustainability and digitalisation?

A systematic literature mapping study was carried out to address this research question through two sub-questions mentioned in Table 1, that aim to identify BA methods, languages, tools, techniques, and metamodel core elements used in existing literature. Our findings were framed using the adaptive enterprise architecture framework as a theoretical lens AEA, a.k.a Gill's framework (Gill 2022). This research aims to provide an initial review and mapping of business architecture methods and their underlying elements. This review highlights gaps and trends that inform future research in this important study area. The critical insight is that there needs to be more representation of business processes and business products in literature, as well as their explicit support for sustainability and digitalisation. ArchiMate and analytics are the most used languages and tools, respectively, with AI/ML tools emerging as a trend. However, BA tools such as Jalapeno, Abacus, Neo4J, and UML are mainly absent in the literature, indicating gaps from a practice perspective and pointing out opportunities for further research into business architecture practices for supporting sustainability and digitalisation.

This paper is organised as follows. Section [2] discusses the background and related work. Section [3] the systematic literature review mapping method, and Section [4] provides the results and analysis. The paper concludes with a discussion and conclusion in Sections [5].

2 Background and related work

BA captures the enterprise's business views and rationale from designing, integrating, coordinating, and executing strategies using emerging opportunities, new technologies, systems, and data for value creation (Widadi et al. 2021). BA facilitates business-IT alignment and establishes a comprehensive communication framework (Whelan and Meaden 2016). BA reference models are essential tools that empower stakeholders such as executives, managers, and employees to analyse, convey, and make crucial decisions effectively. Simultaneously, they enable business architects to streamline the development of tailored BA more efficiently.

There are several enterprise architecture (EA) frameworks available, such as The Open Group Architecture Framework (TOGAF) (Dumitriu and Popescu 2020) and Zachman framework (Zachman 2003). These frameworks were developed using traditional architectural methods and ontologies. TOGAF outlines a process for architecture development, while the Zachman Framework offers a generic ontology. On the contrary, the AEA (Gill 2015) was developed within the ecosystem context, focusing on the contemporary data-informed human-centric approach and offering comprehensive layers for conceptualising the digital enterprise across the ecosystem.

We identified several studies analysing business architecture methods from different perspectives (Guild 2020). However, there is a need for a unified and systematic mapping of business architecture methods through a suitable theoretical perspective. Traditional business architecture frameworks, such as TOGAF and the Zachman Framework, are largely documentation-centric and require adjustment to address the growing need for agility and sustainability. This review aims to systematically examine and consolidate the literature to fill this gap, employing the theoretical framework of AEA. Adaptive EA was chosen for our study due to its relevance to sustainability and digitalisation via the connected layered views of humans, technology, facility, environment, security and their interactions (Gill 2022). BA fits in the human layer of the adaptive EA. The review findings are mapped across different components of BA within the human layer, such as core metamodel, processes, artifacts, modelling techniques and modelling tools/languages.

3 Research method

This study adopted the well-known systematic mapping study (SMS) review approach to search, select and analyse the relevant literature in business architecture methods. SMS is utilised to offer an overview of a research topic by classifying the studies and the results that have been published (Keele 2007; Petersen et al. 2008). Our mapping uses the AEA lens to extract and map the data from the chosen studies and provide insights into the latest business architecture methods. The details of our method are as follows.

3.1 Research questions

Research questions listed in Table 1 are the basis of this study.

Research questions	Motivation
1. What is currently known about business architecture method elements?	Identifying methods associated with BA concepts, roles, processes (stages, tasks, techniques), artifacts, and modelling techniques.
2. What tools/techniques and languages are used in implementing business architecture methods in existing literature?	Identifying BA tools/techniques and languages

Table 1. Research questions addressed and their motivation.

3.2 Research Selection Strategies

PRISMA 2020 (Page et al. 2021) technique was used to identify the studies for our analysis. Figure 1 provides the detailed filtering process. Given that this is a short work-in-progress paper, thus the literature used the well-known AIS e-Library that provides comprehensive coverage of research study across information systems. The AIS e-Library was systematically searched using the keyword (“business architecture”) because we wanted to capture a broad range of articles discussing BA methods and tools and avoid any omissions of important work. The search was based on the article title, keywords abstract, and the publication years between 2019 and 2024. All studies selected with the keywords in the first search were scrutinised based on their titles and abstracts to avoid any omission of pertinent literature.

3.2.1 Inclusion and exclusion criteria

To review the recent research, articles were filtered based on the certain inclusion and exclusion criteria. Inclusion criteria is papers with focus on business/enterprise architecture methods/methodology. Articles providing challenges and solutions in BA/EA methods. Peer-reviewed papers (e.g. journal article, conference paper, workshop proceeding, and book chapters). Papers written in English and industry-wide papers from credible sources for comparison purposes.

Studies that are not relevant to research questions and meet the following exclusion criteria are not selected in this review: Papers not focussing on BA/EA methods/methodology. Papers without any conceptual, theoretical, or technical solution for the proposed approach to BA/EA methods. Tutorial papers, poster papers, or manuals. Papers not accessible openly or through UTS library.

3.2.2 Quality assessment:

Quality assessment criteria (Dybå and Dingsøy 2008) were designed to check the quality of the selected articles. These criteria were based on questions listed in Table 2 provides detailed results of 18 retrieved studies.

Quality criteria
Q1. Is the paper research-based or an experiment?
Q2. Does the paper mention the objective of the research?
Q3. Is the context in which the research was conducted adequately explained?
Q4. Does it mention the findings?
Q5. Is the evaluation of quality aimed at theoretical research or practical implementation?

Table 2. Quality assessment criteria

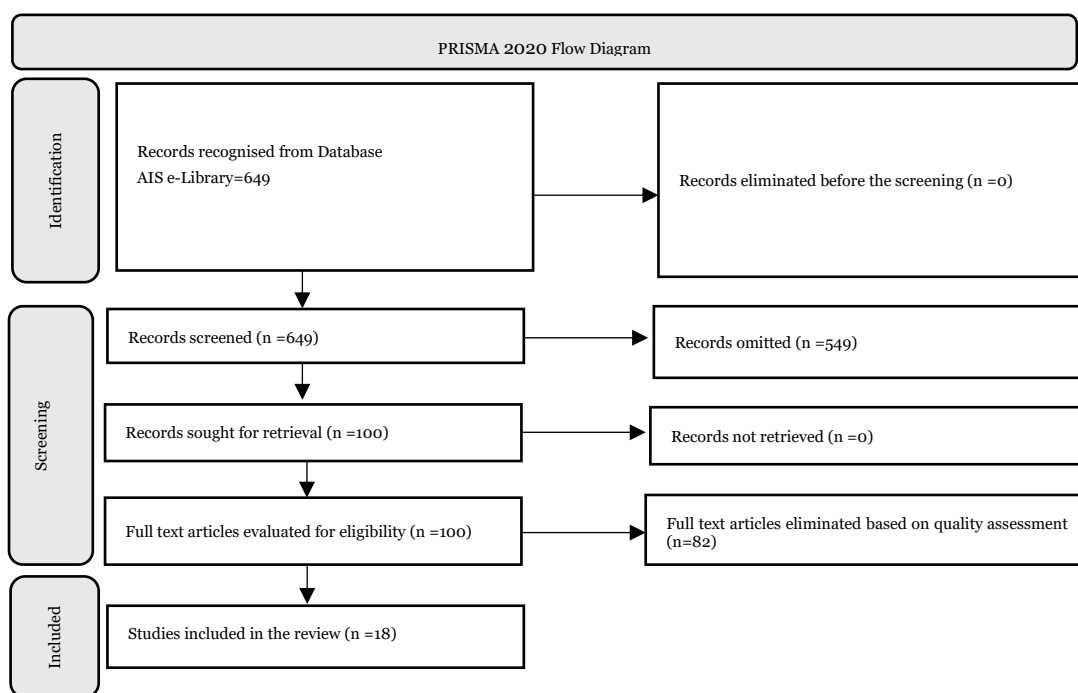


Figure 1. PRISMA Flow Diagram (Page et al. 2021)

3.3 Theoretical Lens

Adaptive Enterprise Architecture (AEA) was used as a theoretical lens to review and map the selected studies. An AEA can be illustrated as “the fundamental concept or property of an adaptive enterprise system or eco-system situated in its heterogeneous networked environment, embodied in its elements, with relationships to each other and its environment, and in the adaptive principles of its secure adaptive design, implementation planning, governance, and evolution”. The AEA’s layers or core elements shown in Figure 2 are as follows: interaction, human, technology, facility, environment and security (Gill 2023). The interaction layer comprises actors, and their interaction is based on different digital stages and mediums. Actors could be individuals or enterprises in a digital ecosystem. This layer provides digitally enabled interaction among other layers. The second is a human layer that includes business, information, social, and professional architecture. The third one is technology, which includes applications, data, platforms, and infrastructure architecture. It also enables human and facility layers. The facility layer discusses the built environment, which includes spatial, energy, HVAC (heating, ventilating, and air conditioning) and FHS (e.g. fire, health, and safety) architecture layers. The fifth layer is the environment, which discusses internal and external factors affecting the enterprise. Security

is the sixth layer, which is an overarching layer. It mainly focuses on risk reduction and boosting the strength of the elements of other layers (Gill 2022). These layers can be adjusted per the business context and stakeholders' needs. Each layer constitutes its elements. Our focus is a human layer that includes business, information, social, and professional architecture. We are targeting business architecture in the human layer, including business capability, process, information, product, service, and performance.

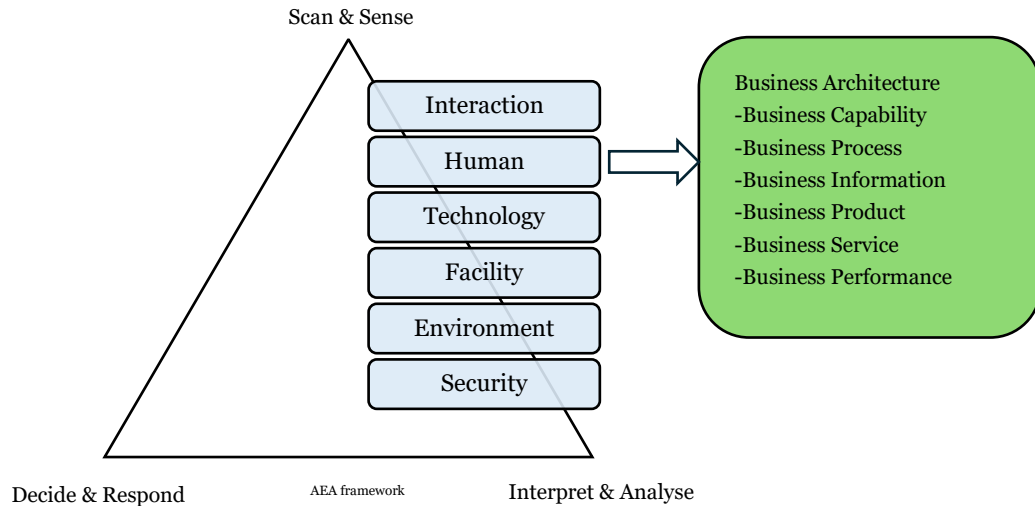


Figure 2. Adaptive EA layers/domains (Gill 2022)

4 Results

Data from the selected 18 studies have been gathered and analysed through the lens of the AEA framework. Results were mapped using the AEA framework's business domain as shown in Figure 2 to get insights from them and answer our research questions. Metamodel core business architecture elements, business processes, business techniques, business artifacts, business languages and tools extracted from the selected papers were reviewed using the AEA human layer and underpinning business architecture elements. This mapping study aims to identify and review the existing literature in mapping the business architecture layer and its underlying elements that characterise the enterprise business design, as shown in Table 3.

Category	Subcategory	Count	Source
BA Metamodel (Core)	Business Capability	18	s1-s18
	Business Process	6	s1, s2, s3, s4, s5, s6
	Business Information	18	s1-s18
	Business Product	8	s5, s6, s8, s9, s10, s11, s14, s15
	Business Service	12	s1, s3, s4, s5, s6, s8, s9, s10, s11, s14, s15, s16
	Business Performance	07	s1, s5, s6, s9, s11, s14, s18
BA Process	Initiate	10	s1, s2, s3, s4, s5, s6, s7, s8, s9, s10
	Discover	14	s1, s2, s3, s4, s5, s6, s8, s9, s10, s12, s13, s14, s15, s16
	Implement	18	s1-s18
	Govern	13	s3, s4, s5, s6, s7, s8, s9, s10, s11, s13, s14, s15, s16
	Adapt	12	s3, s4, s5, s6, s7, s9, s10, s11, s14, s15, s16, s17
BA Artifacts	BA Models	18	s1-s18
	BA Matrices	6	s5, s6, s13, s14, s17, s18
	BA Catalogues	5	s5, s8, s9, s12, s13
	BA Maps	2	s3, s5
Modelling Techniques (digitalisation of BA)	Notation driven	13	s1, s2, s3, s4, s5, s6, s7, s10, s11, s12, s14, s16, s17
	Data-driven	16	s1-s5, s7, s8, s9, s10, s11, s12, s13, s14, s15, s17, s18
	AI-driven	5	s3, s5, s6, s9, s17

Modelling Tools/Languages (digitalisation of BA)	ArchiMate (Language)	9	s3, s4, s5, s6, s13, s14, s16, s17, s18
	Archi (Tool)	0	
	Jalapeno	0	
	Abacus	0	
	Analytics	9	s1, s2, s3, s4, s5, s6, s7, s8, s9
	Neo4J	0	
	AI/ML	5	s3, s5, s6, s9, s17
	UML	0	
Discuss challenges and solutions in BA methods		18	s1-s18
Discuss the sustainability of BA		1	s9

Table 3. Classification count of elements and studies

RQ1: What is currently known about business architecture method elements?

By analysing selected studies in Appendix 1, we extracted that business capabilities and business information are the widely discussed elements by the researchers appearing in all studies (s1-s18). The second discussed elements are business services, which appeared in 12 studies (s1, s3, s4, s5, s6, s8, s9, s10, s11, s14, s15, s16). Business products and business performance are moderately covered, with 8 (s5, s6, s8, s9, s10, s11, s14, s15) and 7 (s1, s5, s6, s9, s11, s14, s18) sources respectively. However, only 6 papers (s1, s2, s3, s4, s5, s6) discussed business processes. The analysis reveals that business capabilities and information are central to BA methods in the literature. This draws our attention to specific sustainable business capabilities and digital information in BA methods to support the original goals mentioned at the beginning of the paper.

RQ2: What tools and languages are used in implementing business architecture methods in existing literature?

BA methods need to be supported via appropriate technologies. The review identified ArchiMate (s3, s4, s5, s6, s13, s14, s16, s17, s18) and analytics (s1, s2, s3, s4, s5, s6, s7, s8, s9) being the most frequently mentioned languages and tools respectively for implementing BA methods, each being referenced in 9 studies. These languages and tools are essential for modelling, analysing, and visualising business architecture elements and their interactions. Additionally, AI/ML tools are being increasingly utilised, appearing in 5 studies (s3, s5, s6, s9, s17), indicating an emerging trend of integrating advanced technologies into BA practices. However, popular practical tools such as Jalapeno, Abacus, Neo4J, and UML should be mentioned, suggesting they are either underrepresented or less commonly noted in BA literature. This marks a clear gap between BA literature and practice and warrants further research.

5 Discussion and Conclusion

The analysis of BA methods in the existing literature reveals gaps due to a lack of discussion of business processes and a limited focus on business products and performance while heavily relying on languages and tools like ArchiMate and analytics, respectively. Emerging trends, such as AI/ML tools, have been noted from a digitalisation perspective; however, they are yet to be widely researched and adopted. Surprisingly, there is a missing link between sustainability in the BA methods and explicit elements supporting environmental and social goals. These gaps suggest further research to enhance BA practices, making them more robust and adaptable to modern business needs around sustainability and digitalisation. Our analysis revealed that only one study (s9) has discussed general sustainability trends, indicating gaps in the literature and opportunities for further research and exploration in business architecture practices. A fundamental limitation of our paper is that the search scope is limited to the AIS library. It may lead to a narrow focus, excluding relevant studies from adjacent disciplines such as business, engineering, or sustainability, and might miss interdisciplinary insights. Additionally, there is potential for publication bias, where prominent studies dominate over less recognised but equally important research. The exclusion of grey literature, such as industry reports or technical papers, and the limited coverage of non-English publications further restrict the scope. Even though it is the most relevant venue in our scope, we plan to expand our search to other databases that capture information systems and IT research, such as IEEE Xplore, ACM ProQuest, and ScienceDirect. In our future work, we plan to expand and analyse our findings in more detail and identify challenges and opportunities for improving and adapting BA methods.

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Appendix 1 Selected studies

ID	Research Paper
s1	A Generic Business Architecture Reference Model Using Systems Theory Perspective in Enterprise Architecture
s2	A Novel Business Process Prediction Model Using a Deep Learning Method
s3	An Exploration into Future Business Process Management Capabilities in View of Digitalization
s4	Artificial Intelligence in Business: A Literature Review and Research Agenda
s5	Modeling 4.0: Conceptual Modeling in a Digital Era
s6	OT Modeling: The Enterprise Beyond IT
s7	A Method for Developing Generic Capability Maps
s8	Business on Chain: A Comparative Case Study of Five Blockchain- Inspired Business Models
s9	Concepts for Modeling Smart Cities
s10	Design Principles for Shared Digital Twins in Distributed Systems
s11	Digital Agility: Conceptualizing Agility for the Digital Era
s12	Enterprise Architecture Practice under a Magnifying Glass: Linking Artifacts, Activities, Benefits, and Blockers
s13	Maintenance of Enterprise Architecture Models A Systematic Review of the Scientific Literature
s14	Monitoring the Complexity of IT Architectures: Design Principles and an IT Artifact
s15	Service-Dominant Business Model Design for Digital Innovation in Smart Mobility
s16	The Benefits of Enterprise Architecture in Organizational Transformation
s17	The evolution of information systems architecture: an agent-based simulation model
s18	The Role of IT and Organizational Capabilities on Digital Business Value

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