

Systematic Literature Review of Enterprise Architecture Change Management in the Australian Public Sector

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ABSTRACT

Enterprise Architecture (EA) is getting attention from the public sector in providing the guidelines and disciplines for organisational changes, enhancing the coherent relationship between business processes and information technology. Many governments worldwide are adopting EA to facilitate the digital transformation process to improve public services. However, the majority of academic papers focus on the suitable approaches, the benefits and difficulties in implementing EA in the public sector, yet lack discussion in detail about the change management in EA, especially in Australia. Our research thus deploys a systematic literature review methodology to examine Enterprise Architecture Management (EAM) in the public sector, specifically addressing its current challenges in Australia. We found that ineffective communication structure, loose integration of EA systems and cloud security vulnerabilities are the main challenges faced by the Australian public sector. Thus, there is a need for an adaptive EAM approach to ensure that the government-wide EA continues to serve as an effective tool, successfully connecting business and information technology domains and enhancing public services in the digital transformation era. Moreover, this paper recommends focusing on effective communication, integrated architecture change management, empowered human capabilities and enhanced cloud security to enhance EAM in the Australian public sector.

1. Introduction

The objective of EA is to collect, analyse, produce, and distribute information effectively. To respond to the ever-changing business IT environment, public sector agencies must continuously improve EA to accommodate technological advancements, and effective change management is crucial to this process. In Australia, EAM plays a pivotal role in enhancing efficiency, transparency, and agility within the public sector (Hylving & Bygstad, 2018). However, government agencies' operations are normally bounded by a highly complex and regulated operating environment (Gill et al., 2014). Furthermore, the unique characteristics of the Australian public sector, including federal-state relations and Indigenous affairs, complicate EAM practices (Mohammad & Lan, 2010). Although several journals have examined EA in the public sector, EAM still has not been strongly addressed, especially in Australia (Gou & Gao, 2020).

This research aims to analyse the current state of EAM in the Australian public sector, identify unique challenges, and propose relevant solutions to answer: "What current challenges does the Australian public sector face in managing change within its enterprise architecture?"

A systematic literature review has been used as our research methodology to perform a comprehensive analysis across three key areas: EA in the public sector, EA change management, and current challenges in Public Sector Architecture Change Management (ACM). The remainder of the paper continues with the subsequent discussion proposing potential solutions to bridge existing gaps. These solutions focus on enhancing communication, integrating ACM in the Australian public sector, addressing the human factors and improving information security in public sector ACM. We conclude the research with a discussion of limitations, including the limited geographical scope and restricted access to government documents, and finally suggest recommendations for future research.

2. Methodology

This paper is structured to transition from a broad overview to a detailed examination of challenges. A systematic literature review approach was employed to achieve the objective, encompassing the identification, analysis, and synthesis of existing scholarly research on three key topics:

(1) EA in the Public Sector: accesses a broad overview of EA frameworks and implementations in the public sector globally, providing the foundation for understanding its role and importance.

(2) EA Change Management: narrows the focus to the strategies, government-level frameworks and human factors involved in managing changes within EA initiatives.

(3) Current Challenges in Public Sector ACM in Australia: zooms in on the specific context of the Australian public sector, identifying unique challenges.

For this literature review, we focused on Australian government sources and academic databases such as Google Scholar to reputation journals with academic papers' content related to the public sector EA, the Australian public sector and the ECM (See Figure 1).

Emerald Management eJournals Collection	https://www.emeraldgrouppublishing.com/
Emerald Insights	https://www.emerald.com/insight/
IEEE Xplore	https://ieeexplore.ieee.org/Xplore/home.jsp
Research Gate	https://www.researchgate.net
Science Direct	https://www.sciencedirect.com
Springer Link	http://www.springerlink.com
The University of Melbourne Library	https://library.unimelb.edu.au
Google Scholar	https://scholar.google.com/
Queensland Government	https://www.qld.gov.au/
Government of Western Australia	https://www.wa.gov.au/
Australian Government - Digital Transformation Agency	https://www.dta.gov.au/

Figure 1: Source of papers used

Using these sources, we began narrowing our research terms by applying the keywords: “Enterprise Architecture public sector”, “Enterprise Change Management in public sector”, “Australian public sector”, “Australian Enterprise Architecture”, “Australian Enterprise Change Management”, “Enterprise architecture management in public sector”, “digital transformation”, “e-government”.

Besides the relevant titles and keywords mentioned above, we specifically selected relevant studies by scanning the content of the abstract, introduction, discussion, and conclusion. Our selection criteria excluded academic papers not in English, those with titles and contents unrelated to our research question, publications outside the 20 years, and papers with fewer than four citations. Based on these criteria, we narrowed the selection to 54 studies used across the above-mentioned three sub-topics.

3. Systematic Literature Review

3.1 EA in the Public Sector

EA - a guidance or a mechanism that enables organisational changes, aligning business strategy with information technology (Kurnia et al., 2020; Dang & Peloka, 2017; Gregor et al., 2007; Al-Kharusi et al., 2018) - is not only popular in the private sector but is also gaining increasing attention in the public sector (Seppänen et al., 2009; Ahmad et al., 2020; Public Sector Network, 2024). At the government level, countries implement EA to bring business and technology together for a common goal of enhancing public sector services, such as the United States, Denmark, Finland, Ireland, Australia, Canada, Korea, Norway, Oman and Malaysia (Gregor et al., 2007; Al-Kharusi et al., 2018; Lee et al., 2016; Ahmad et al., 2020b; Dang & Peloka, 2017; Ajer & Olsen, 2020).

Unlike in the private sector, EA in the public sector is more likely affected by political decisions, legal requirements or the operating environment in general (Lee et al., 2016; Hjort-Madsen & Pries-Heje, 2009; Ajer & Olsen, 2020; Dang & Peloka, 2017). The Open Group Architecture Framework (TOGAF®¹) is the most widely used EA framework in the public sector (Ansyori et al., 2018; Ajer & Olsen, 2020; Seppänen et al., 2009; Afarini & Hindarto, 2023). Nevertheless, the frameworks should be customised to organisational needs or require agile EA (Ajer & Olsen, 2020; Gill et al., 2014). Indeed, many countries have developed their own EA framework such as the United States, which established the Federal Enterprise Architecture Framework (FEAF) - based on the Zachman Framework^{TM2} - for its architecture program (Guijarro, 2007) or the Malaysia Government Enterprise Architecture (MyGovEA) framework deployed by the Malaysian government to promote the digital transformation for its public sector (Ahmad et al., 2020) and the Australian Government developed the Australian Government Architecture Framework (AGA), adapted from the FEAF framework, as a guideline for Australian agencies to build their EA, supporting the digital transformation (Western Australian Government, 2011).

However, most of the aforementioned journals focused on the approach, obstacles and benefits of implementing EA in the public sector, and only a few of them discuss the EAM role (Singh et al., 2024; Ajer & Olsen, 2020; Lee et al. 2016; Gill et al., 2014). Accordingly, the first three studies state that the EAM is an effective control tool for monitoring organisational changes. Likewise, Gill et al. (2014) emphasise the importance of EAM in managing the whole process of cloud adoption when discussing the Australian Government Cloud EA. These findings highlight the non-technical side role of the EAM in enabling successful EA initiatives in the public sector.

3.2 EA Change Management

Change management is inherently complex, dynamic, and critical, involving various components that significantly influence the long-term success of organisational operations (Benson, 2021; Kupiek, 2021; Paton et al, 2016). EA change management necessitates specific guidelines and appropriate frameworks. For example, TOGAF® provides a general practice guideline on Architecture Change Management (ACM), emphasising the need for a governance body to establish criteria for updating architecture or initiating a new Architecture Development Method (ADM) cycle ("Phase H: Architecture Change Management," n.d.).

At the governmental level, the Australian Government entities have various tailored guidelines associated with change management. The Australian Government has introduced a strategy for the Australian Public Service (APS) to access competitive solutions, promoting autonomy and collaboration among entities (Commonwealth of Australia, 2021). The APS Change Management Centre of Excellence has launched its inaugural framework to facilitate APS-wide enterprise change management (Commonwealth of Australia, 2023). Besides the AGA serving as a common EA guideline nationally, different Australian states have also developed their own EA frameworks, adapting to unique regional characters and local government requirements. The Western Australian Enterprise Architecture Framework (WEAF) standardises and enhances EA practices within the public sector, supporting methodologies like TOGAF's ADM and the Collaborative Planning Methodology (CPM) (Government of Western Australia, 2017). The Queensland Government has been updating the Queensland Government Enterprise Architecture Framework to enable government agencies to collaboratively provide seamless services, maximising investments and transforming technology infrastructure (The State of Queensland, 2009, 2013). The South Australian Government's Change Management Toolkit (2022) provides guidance on managing human factors during changes.

In addition, human factors are pivotal in successful EA change management (Checinski et al., 2019; Gilliland et al., 2015; Carlson et al., 2019). People's emotions also significantly influence agile development in digital transformation (Kupiek, 2021). Furthermore, research by Roth and DiBella (2015) identifies five human capabilities commonly found in organisations that excel through change: promoting enterprise awareness, fostering innovation, balancing push and pull change, seeking growth and distributing leadership.

¹ TOGAF is a registered trademark of The Open Group.

² The Zachman Framework is a registered trademark of Zachman International.

3.3 Current Challenges of the Public Sector’s ACM

Numerous studies have highlighted the communication structures within the public sector as a significant barrier, leading to slow decision-making, limited agility, and reduced effectiveness in responding to the need for change (Kaddoumi et al., 2016; Ludviga & Kalvina, 2023; D’Ortenzio, 2012; Sultan & Miransky, 2018; Moussa, 2023; Moussa et al., 2022). Further challenges in the public sector include unclear distinctions between operational and project management, poor communication, and insufficient change leadership (Blixt & Kirytopoulos, 2017). Additionally, individuals undergoing changes may exhibit scepticism (Jensen, 2010), and public sector employees often exhibit risk aversion due to fears of public scrutiny, political backlash, and legal ramifications (Moussa et al., 2022).

Integrating new EA systems introduces challenges such as compatibility issues with legacy systems and the complexities of balancing technical and non-technical factors in new integration (Mondorf & Wimmer, 2017; Guo & Gao, 2020). Inadequate EA integration can obstruct the effective implementation of IT solutions and interoperability among systems and databases (Amalia & Supriadi, 2017; Mondorf & Wimmer, 2017; Nunes et al., 2017). Moreover, government agencies face challenges in enhancing consistency across customer service channels and reusing digital capabilities to ensure cost-effectiveness (Commonwealth of Australia, 2021). Furthermore, ensuring the safe use of technology, protecting public data, and maintaining compliance are critical considerations during EA transformations (Commonwealth of Australia, 2021, 2023).

The rapid adoption of cloud capabilities in government EA presents significant challenges in ensuring cloud security (Lnenicka & Komarkova, 2019). Large volumes of data generated by multiple government agencies are stored across multiple cloud service providers (Biddle et al., 2022; Mitchell & Samlidis, 2021). The invaluable government data in EA supported by cloud capabilities become vulnerable to cyber threats such as compromised verification, distributed denial-of-service (DDoS) attacks and social engineering attacks (Ali & Osmanaj, 2019; Ali et al., 2020; Deshmukh & Devadkar, 2015). These challenges require tailored EA change management to manage risks and ensure a secure digital environment for public services.

4. Discussion

EAM is an essential aspect of EA. It ensures that any changes made are well overseen by the organisation, thereby mitigating associated risks and ensuring that EA initiatives meet organisational requirements. Derived from the literature review, three main challenges to the Australian public sector EAM have been identified: communication structure, integration, and cloud security. To address these challenges, our study suggests four areas for improvement (See Figure 2).

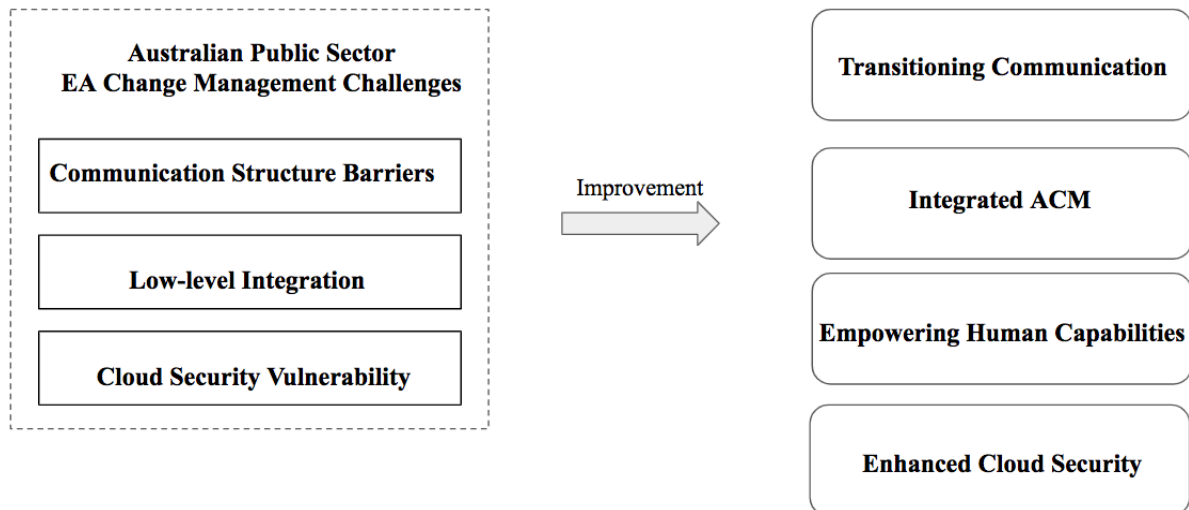


Figure 2: Overview of Challenges and Recommendations for Improvement. Own work.

4.1 Transitioning Communication in the Australian Public Sector ACM

In response to the challenges regarding slow decision-making and limited agility in the public sector, this paper proposes an Extended Workflow Management System (WFMS). WFMS is able to provide a structured digital planner to enhance the decision-making speed and operational agility of the Australian public sector (Kaddoumi et al., 2016). This system directly addresses these inefficiencies by clearly defining task roles and sequences. It is

suggested that a centralised argumentation system be implemented that provides a secure and structured discussion platform among different levels of people, addressing the challenge of poor communication. Lastly, an ontology framework could be adopted to standardise the terminology used across different layers of government. The framework acts as a common language or dictionary, ensuring that all teams use the same terminology to avoid misunderstandings, which is especially important in a sector known for its complexity and bureaucratic nature (Afarini & Hindarto, 2023).

Besides, ACM in the public sector usually involves multiple internal and external stakeholders, complex organisational information, and diverse regulatory compliance. The extensive information gathered from these sources necessitates effective communication, regular information updates and efficient decision-making. In these cases, generative AI offers innovative opportunities for the public sector to increase communication effectiveness. With the growing availability of generative AI tools and models for the AU government, adopting AI and machine-assisted decision-making technologies in government settings can streamline the business process, minimise the risk from legacy systems, enhance the overall transparency of decision-making and process a significant amount of information, leading to improved outcomes for the public (Digital Transformation Agency [DTA], 2023).

4.2 Integrated Architecture Change Management in the Australian Public Sector ACM

Integrated change management is crucial for successfully executing EA change initiatives and facilitating the transition to the target stage (Wanner, 2013; Amalia & Supriadi, 2017; Guo & Gao, 2020). Building on existing enterprise capabilities and government frameworks, several key considerations are crucial to bringing ACM to a high-level integration, including enhanced interoperability (DTA, 2023, 2024) and Agile Enterprise Architecture (AEA) deployment.

Therefore, the integrated ACM should adopt APIs and standardised data exchange protocols to achieve interoperability among affected systems and data sets. Furthermore, system orchestration will necessitate an iterative development process (DTA, 2023). AEA can enable an iterative development process in EA change management, enabling rapid adaptation, enhanced stakeholder engagement, and increased transparency through regular updates and sprint reviews (Abdullah et al., 2023; Kupiek, 2021; Baumgartner, 2021). Through AEA, the Australian public sector can iteratively improve and ensure the architecture remains ready to change in managing transformation within technological disruption (Kaddoumi & Watfa, 2022; Kaddoumi & Watfa, 2016).

4.3 Human Factor in Public Sector EA Change Management

This paper recognises the crucial role that human factors play in EA Change Management. As previously discussed, change management in e-government has not been adequately addressed. Our paper suggests maximum public benefit through EA change management, and it requires strong change leadership, streamlined coordination, and a focus on citizen-centric design (Dilmegani et al., 2014). Despite differences between the public and private sectors in terms of organisational characteristics and goals, we can leverage private-sector best practices, nurture IT talent, and set digital targets to ensure comprehensive digital transformation in the public sector (Dang & Peloka, 2017; Hjort-Madsen & Pries-Heje, 2009).

Furthermore, fostering an agile organisational culture is crucial for effective EA change management and for meeting the evolving demands of governance and public service. An agile organisational culture facilitates adaptation to internal and external changes (Nafei, 2016). By promptly responding to customer needs and leading improvements, public agencies can maintain a competitive edge, ensuring efficient and effective service delivery. Given the unique characteristics, Australian governmental organisations should swiftly adapt to changes in policies, societal expectations, and technological advancements (Holbeche, 2019). For instance, to achieve these goals, the Australian government could enhance its online services platform to feature more personalised, user-friendly interfaces that adapt to user behaviour and feedback.

4.4 Cloud Security in Public Sector Enterprise Architecture Management

The “Cloud first” strategy in EA has been adopted in many countries to enhance “interoperability” in organisations and optimise business values through the transitions (Gill et al., 2014; Lnenicka & Komarkova, 2019). Furthermore, the Australian Government has adopted cloud services for storing extensive confidential data, which signifies the importance of ensuring the security of these cloud-based systems (Ali & Osmanaj, 2020; Ali et al., 2020). Cloud security is paramount to the Australian Government in protecting sensitive data, complying with regulations, and supporting digital transformation within ACM (Gill et al., 2014). To ensure cloud security during ACM, this paper suggests implementing security measures such as establishing access control mechanisms, conducting routine inventory checks, and assigning clear responsibilities for cloud data protection (Hu et al., 2020). Besides, major technology firms are investing in tools like Google Cloud Security AI Workbench, Microsoft Security Copilot, SentinelOne Purple AI etc., which leverage Generative AI to develop robust ways for combating emerging threats (Sai et al., 2024). These AI capabilities offer significant potential for cloud

vulnerability discovery and monitoring suspicious data flows, which the Australian public sector and cloud service providers can leverage to secure the cloud platforms while managing EA change initiatives.

In addition, during architectural transitions, strict adherence to data protection regulations is essential. Improved public awareness and security training is crucial for protecting this sensitive data and involves a thorough understanding of the cloud architecture in EA change management- how data flows, is stored, and services are integrated (Lnenicka & Komarkova, 2019). This training covers best practices for managing changes within the EA framework, detecting and responding to security threats tailored to the cloud environment, and ensuring compliance with regulatory standards (Abraham & Chengalur-Smith, 2019). Regular simulations are also vital to refine response strategies and keep pace with evolving cloud technologies and threats.

5. Contribution

This research paper has focused on researching the current challenges faced by the Australian public sector in EA change management. The primary practical and social contribution of this paper is highlighting key challenges in communication structures, integrating new EA systems, and concerns regarding security issues, particularly with the adoption of cloud computing. To address these challenges, the paper comprehensively considers various perspectives, including the Australian Government's current EA frameworks, government communication structure, human elements and technologies. Then, the paper proposes four main directions for improvement: transitioning communication, establishing integrated ACM, empowering human capabilities involved in EA change, and enhancing cloud security. Detailed solutions are provided for each direction. While the research provides valuable insights, it acknowledges some limitations that could be addressed in further research.

6. Limitations and Future Research

The main purpose of this paper is to address EAM in the Australian public sector. However, the limited availability of relevant studies on EAM in Australia imposes certain constraints on perspectives when discussing potential solutions. The research is also limited by the restricted access to confidential government sources related to current EA data. Additionally, while this paper discusses various aspects of implementing AI capabilities in EA change management, current AI technologies are still emerging and face challenges such as returning incorrect results and high training costs (Sai et al., 2024). Therefore, future research could investigate the development of AI capabilities. Furthermore, case studies analysis could be an alternative methodology to validate and understand the feasibility of the proposed EA change management solutions for the Australian public sector.

7. Conclusion

The current research on EAM in the Australian public sector has revealed several critical challenges and potential strategies to enhance change management processes. To answer the research question, the study uses a systematic literature review methodology, identifying significant issues, including complex communication structures, the integration of new systems with legacy systems, and the crucial need for standardised security for digital transitions. Moreover, the study underscores the necessity for an agile, well-communicated, and secure EAM approach to support the sector's digital adaptation.

Effective communication and agile EA are crucial for responsive and adaptable change management in public agencies, helping them keep pace with rapid changes and engage stakeholders effectively. This ensures that transition processes are both sustainable and aligned with governmental objectives. This review emphasises the importance of a human-centred approach to change management, noting that factors like leadership and culture are vital for successfully implementing new technologies and processes. Cloud security is also a key concern, especially with the increased use of cloud technologies. Robust security frameworks and ongoing cyber threat education are essential to protect sensitive data and maintain public trust.

Future qualitative research is recommended because using case studies can increase the understanding of contextual and human factors affecting EAM in the Australian public sector.

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