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Enterprise Architecture Challenges in Malaysia's Public Sector Digital Transformation: Uncovering competency gaps

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Abstract
This study examines the competency-related challenges that enterprise architects face when implementing digital transformation initiatives in the Malaysian public sector. Using Actor-Network Theory (ANT) as a socio-technical lens, it explores interactions between human and non-human actors influencing enterprise architecture (EA) practices. In-depth semi-structured interviews with seven enterprise architects from various public sectors, supported by policy document analysis. Thematic analysis using ATLAS.ti identified three key competency challenges: navigating technological change, building and sustaining collaborative networks, and developing and adapting EA competencies. The findings highlight critical technical and collaborative competency gaps that hinder effective EA implementation in public sector digital transformation.

Keywords: Enterprise architect; enterprise architecture; competence; digital transformation; Malaysian public sector

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1.0 Introduction

Digital transformation integrates digital technology into organisational processes and operating models, thereby reimagining value delivery rather than simply automating it (Brunetti et al., 2020; Joel et al., 2024). Evidence from multiple jurisdictions indicates that well-executed transformation improves service quality and access, enables data-informed policy, and lowers friction in interactions with the state (Anthony Jnr et al., 2021; Corbos et al., 2023; Gong & Janssen, 2021; Hardi & Legowo, 2023). The COVID-19 pandemic further accelerated demand for digital services and exposed limitations of legacy ways of working, highlighting the need for strategic approaches that address both technical and organisational dimensions (Corbos et al., 2023; Hardi & Legowo, 2023).

EA is often positioned as the structural discipline that connects mission and strategy to the data, applications, and infrastructure that support them (Ahlemann et al., 2021; Bakar et al., 2023). EA helps rationalise portfolios and encourage interoperability and reuse (Grave et al., 2023). Enterprise architects must translate strategy into achievable roadmaps, navigate inter-agency dependencies, and make design choices that balance local agility with enterprise coherence (Marth et al., 2020)

In Malaysia, policy directions emphasise a digitally driven public sector, inclusive connectivity, and partnerships with technology providers (Edrak et al., 2022). However, relatively little empirical work has documented the specific competence-related difficulties enterprise architects encounter when moving from concept to execution (Othman et al., 2021). To address this gap, this study investigates the following research question: What competency-related challenges do enterprise architects in Malaysia's public sector

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face when applying their skills to digital transformation initiatives? Using ANT as a lens foregrounds the interactions among human actors and non-human actors that shape outcomes (Callon, 1981). The study aims to provide practical insight that can guide training, organisational strategy, and policy support.

2.0 Literature Review

2.1 Government initiatives and context

Malaysia has articulated a sustained commitment to a digital economy and to modernising public services (Azhar & Shakil, 2021). Landmark initiatives include the Malaysia Digital Economy Blueprint (MyDIGITAL) and budgetary measures supporting AI readiness, data centres, and broader digital infrastructure (Treasury, 2024). These programs emphasise inclusive connectivity and preparation for emerging technologies such as 5G alongside collaborations that strengthen data centre and cloud capabilities.

2.2 The significance of EA for transformation

EA provides integrated views of business capabilities, information, applications, and technology, enabling decisions to be made in the context of the whole enterprise rather than in silos. When institutionalised, EA supports portfolio rationalisation, interoperability, and alignment of technology with mission outcomes. However, EA's efficacy is sensitive to the breadth of practitioners' competencies and to the surrounding culture and governance (Gellweiler, 2020).

2.3 The evolving role of enterprise architects

Contemporary enterprise architects straddle strategy, delivery, and governance. They articulate current and target states, define transition roadmaps, codify principles and standards, and partner closely with product, security, and operations(Grave et al., 2023). This evolution requires fluency in emerging technologies, integration, security, business acumen, and facilitation skills. In Malaysia's public sector, architects also contend with hierarchical structures, resource constraints, and varying degrees of organisational readiness for EA (Othman et al., 2021).

2.4 Actor–Network Theory as an analytic lens

ANT treats both human and non-human entities as actors capable of shaping outcomes (Hanseth et al., 2004). Applied to EA, ANT reveals where translation falters, such as misaligned incentives and rigid procurement (Callon, 1984).

3.0 Methodology

3.1 Design

A generic qualitative approach was adopted to surface practitioners' lived experiences without binding the study to a single qualitative tradition such as phenomenology or grounded theory (Kahlke, 2014). The design combined a literature review and document analysis with semi-structured interviews; this multi-source approach supported triangulation.

3.2 Participants and data collection

Seven practitioners with active EA responsibilities were recruited through purposive sampling to ensure relevance and diversity of perspective. Roles included a principal assistant director in a state-level organisation, senior leadership within federal agencies, and information technology officers practising EA in line ministries. Interviews were held by video conference and typically lasted 45–60 minutes. Data source triangulation included analysis of policy documents (e.g., MyDIGITAL and Budget speeches).

3.3 Ethics and trustworthiness

All participants provided informed consent. Interviews were recorded with permission and transcribed. To enhance credibility, a second researcher independently coded a portion of the transcripts; discrepancies were discussed and resolved. Dependability was supported by maintaining an audit trail of coding decisions and theme refinements within ATLAS.ti memos (Patton, 2014).

3.4 Analysis

Thematic analysis proceeded in iterative cycles. After familiarisation, initial codes were created by combining deductive categories suggested by prior literature and with inductive codes emerging from the interviews.

4.0 Findings

The thematic analysis revealed three key themes: navigating technological change, building and sustaining collaborative networks, and developing and adapting EA competencies.

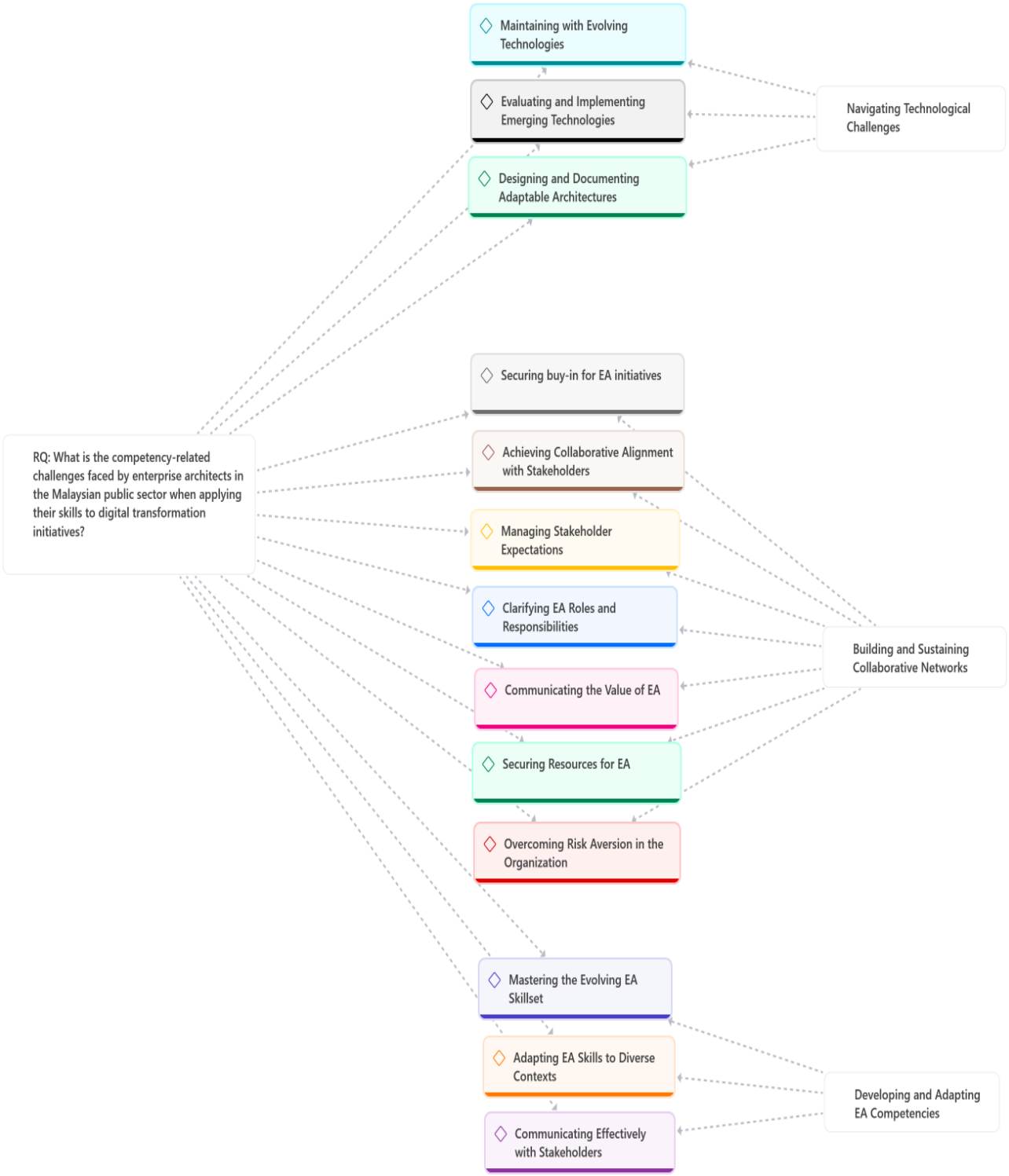

Fig. 1. Interview Thematic network for challenges to competency application from the interview

4.1 Theme 1: Navigating Technological Change

Theme 1, Navigating Technological Change, revealed significant challenges that indicate specific competency gaps.

4.1.1 Maintaining Alignment with Evolving Technologies

Enterprise architects in the Malaysian public sector face a considerable challenge in keeping pace with swiftly advancing technologies, as illustrated by Participant 1's description of it as a "constant uphill battle". This highlights a critical competency gap between continuous learning and technology foresight. From an ANT perspective, emerging technologies, such as AI and blockchain, act as powerful non-human actors that need to be translated and enrolled into the existing socio-technical network. It is crucial for enterprise architects to actively explore, grasp, and anticipate how emerging technologies will impact the provision of public services.

4.1.2 Evaluating and Implementing Emerging Technologies

Another key challenge lies in the practical evaluation and implementation of emerging technologies within organisations. As highlighted by Participant 2, architects must not only grasp the technologies themselves but also comprehend how they "fit together in a complex ecosystem with legacy systems and inter-agency dependencies". This understanding is crucial for their role. This highlights a significant competency gap in technology assessment and integration within a complex ecosystem that is reliant on legacy systems. The prevalence of legacy systems introduces another challenge: expertise in data migration and security, compliance with regional regulatory requirements, and the development of interoperability strategies. Without this vital skill, it will be tough for Malaysia's public sector to use new technologies such as cloud computing and AI effectively. Lacking this competency would significantly impede the successful adoption of such innovations within the governmental framework.

4.1.3 Designing and Documenting Adaptable Architectures

Furthermore, designing and documenting adaptable architectures that can accommodate future technological changes is crucial. Participant 4 highlighted the need for flexibility, stating, "The architecture we build must be able to adapt and change over time." This reveals a competency gap in the design of adaptability and future-proofing. Enterprise architects must be proficient in creating architectures that are robust, adaptable, and well-documented, using the principles of modular design, open standards, and scalability. Lacking this competency, the public sector risks investing in rigid, unsustainable systems that fail to meet future citizen needs and to adapt to the swiftly evolving technological landscape.

Table 2. A comparative analysis of interview and document analysis findings

Theme	Interview Findings	Document Analysis Findings	Interpretation
Navigating Technological Change	Enterprise architects face challenges keeping pace with emerging technologies, assessing their compatibility with current systems, and crafting adaptable architecture.	Document emphasises technology foresight, continuous learning, and adaptable architectures, also considering strategies to address tech and organisational aspects of digital transformation.	A disconnect exists between policy emphasis on technological adaptability and architects' current capacity. Highlights the need for practical support, training, and addressing organisational challenges.
Building and Sustaining Collaborative Networks	Challenges include securing buy-in, aligning stakeholders, managing expectations, clarifying EA roles, communicating value, securing resources, and overcoming risk aversion.	Document stresses stakeholder engagement, communication, transparent governance, and resource allocation. Also, there is a need to foster an innovative culture in public institutions.	Documents outline formal processes, yet challenges in implementation, communication strategies, and organisational culture hinder collaboration, suggesting a potential need to cultivate an innovative culture.
Developing and Adapting EA Competencies	Challenges in mastering evolving skill sets, adapting to diverse contexts, and communicating effectively with stakeholders.	Document highlights the need for continuous professional development, specialised training, and adaptable skills.	Recognises the necessity for ongoing learning and flexibility. Inadequate access to training, limited practical application, and the absence of a continuous learning mindset may cause gaps.

4.2 Theme 2: Building and Sustaining Collaborative Networks

4.2.1 Securing Buy-in for EA Initiatives

Building and sustaining collaborative networks is crucial for successful EA implementation in the Malaysian public sector. However, this study revealed significant challenges in this area. Participant 5 highlighted difficulties in securing buy-ins for EA initiatives, often encountering a lack of understanding and awareness of EA among stakeholders. This shows a significant lack of skills in communication and advocacy for the value of EA. Enterprise architects must clearly, succinctly, and persuasively communicate the advantages of EA, adapting their messaging to different audiences and addressing concerns and viewpoints.

4.2.2 Achieving Collaborative Alignment with Stakeholders

Getting stakeholders to agree to work together is one thing, but getting them to collaborate effectively is another. Participant 2 noted that different departments may have distinct priorities and may not want to adopt new frameworks, such as data governance. This shows that some enterprise architects may not be able to effectively engage stakeholders, build consensus, and help everyone understand the value of EA. They need to explain the benefits of EA in a way that makes sense to each group.

4.2.3 Managing Stakeholder Expectations

Getting people on board and ensuring everyone is on the same page are essential for successful EA implementation, but so is managing stakeholder expectations. Participant 4 said that managing stakeholder expectations became a big problem because people thought that EA was only about technology and only for the IT team. This shows the difference in skills between managing expectations and clarifying roles. When enterprise architects do not clearly define and communicate their roles, responsibilities, and boundaries, it is hard to manage expectations for EA contributions. This lack of clarity makes it easier for people to misunderstand and set unrealistic goals, which can make them angry about how well EA initiatives are working.

4.2.4 Clarifying EA Roles and Responsibilities

This problem of managing expectations is exacerbated by the need to clearly define and communicate the roles and responsibilities of enterprise architects, especially in organisations with many levels. Participant 2, who is in a lower-level position, said that people think enterprise architects at their level are just technical implementers rather than strategic thinkers. This made it harder for them to help

make strategic decisions and use their skills to the fullest. This shows a lack of skill in demonstrating EA's strategic value within organisational hierarchies.

4.2.5 Communicating the Value of EA

Communicating the value of EA to a wide range of people, especially those who are sceptical, is a big problem. Participant 7 pointed out how hard it is to convince stakeholders who prefer less-structured methods, often because they do not understand how EA contributes to strategy. This shows a lack of skills in demonstrating real EA results and the benefits of ensuring translation works well within the actor network. To fix this, enterprise architects need to do more than talk about how EA has made things more efficient, cheaper, and better service delivery. They need to show real examples of how it has done these things. If you cannot show how EA can lead to real results, people will remain sceptical, which will make it harder to get people to sign up and limit EA's impact on digital transformation projects.

4.2.6 Securing Resources for EA

Also, if people in an organisation do not understand or prioritise EA, it can be hard to get the resources needed for EA projects and professional growth. Participant 4's experience of not getting funding for an EA workshop is a good example of this problem. This can make it harder for enterprise architects to grow professionally and support digital transformation projects. Enterprise architects need to explain the resource needs for EA projects, such as training, tools, and people, and back them up with expected benefits and a return on investment. They also need to show a clear link between EA resources and successful digital transformation outcomes. Without this ability to secure the necessary resources, EA efforts will be underpowered and less effective.

4.2.7 Overcoming Risk Aversion in the Organization

This study uncovered a critical disconnect between the existing literature on public-sector innovation and the experiences of enterprise architects in Malaysia. This research revealed that bureaucratic processes and a risk-averse culture can significantly hinder the implementation of new ideas, as Participant 5 highlighted. This contradicts the prevailing assumptions in the literature and suggests a potential area of novelty for this study. Despite government initiatives to encourage innovation, deeply ingrained bureaucratic practices may impede risk-taking and hinder digital transformation. This disconnect warrants further investigation and could inform the development of targeted interventions to promote a more innovative and adaptable culture in the Malaysian public sector. This reveals a competency gap in navigating organisational culture and promoting innovation within a resistant actor network. Enterprise architects need to understand the cultural barriers to change within their organisations and develop strategies to promote a more agile and experimental mindset, even in a traditionally risk-averse environment. Table 2's comparison of interview and document data shows a significant difference between what policy documents say about the goals of collaborative networks and what enterprise architects in the Malaysian public sector have actually experienced. Documents emphasise stakeholder engagement, transparent governance, and the cultivation of an innovative culture; however, interviews indicate persistent difficulties in securing buy-in, managing expectations, and overcoming a risk-averse culture. Table 2 makes this misalignment clearer by showing that there are fundamental organisational problems that make it hard for people to work together. These problems are caused by poor communication and the way things are done in the organisation.

4.3 Theme 3: Developing and Adapting EA Competencies

This study showed that enterprise architects have significant trouble developing and adapting their EA skills, suggesting a significant skill gap.

4.3.1 Mastering the Evolving EA Skillset

The changing nature of EA is a significant problem for people working in the field. Participant 1 noted that EA's traditional focus on documenting systems and processes is insufficient in the face of digital transformation, which demands flexibility, new ideas, and a customer experience focus. This indicates a significant deficiency in adopting a mindset of continuous learning and professional development. Enterprise architects in the Malaysian public sector need to keep their skills and knowledge up to date to stay current with new technologies, methods, frameworks, and best practices in EA.

4.3.2 Adapting EA Skills to Diverse Contexts

Enterprise architects struggle to align their skills with the diverse needs and circumstances in the Malaysian public sector. Participant 4, who has worked in public administration, said we need to take a more data-driven, citizen-focused, and flexible approach to keep up with the changes driven by digital transformation. This shows the difference in skills between contextual intelligence and adaptability. Enterprise architects need to change how they work with different agencies, focusing on data-driven and flexible methods.

4.3.3 Communicating Effectively with Stakeholders

Enterprise architects need to be able to communicate with a wide range of people for EA to work. Participant 5 stressed the importance of explaining the value of EA to different groups of people and getting people from different departments with different priorities to agree on it. This shows a gap in skills between communicating and engaging with stakeholders. Enterprise architects need to adapt how they communicate with different groups and work with people with diverse viewpoints and priorities to reach consensus on architectural

solutions. The triangulation process uncovered a substantial disparity between the recognised necessity for continuous learning and adaptability among enterprise architects and the tangible obstacles they encounter in enhancing and modifying their skills within the dynamic Malaysian public sector. Both data sources acknowledge the imperative of continuous learning and adaptability; however, the analysis reveals a disparity between this objective and the actual circumstances practitioners encounter. Therefore, continuous professional development is essential to address these competency gaps.

5.0 Conclusion and Recommendations

Three themes stood out. First, navigating technological change requires foresight, rigorous evaluation, and designs that can flex with uncertainty while integrating with legacy realities. Second, building and sustaining collaborative networks hinges on communication, expectation management, role clarity, resource advocacy, and strategies that reduce inertia in risk-averse environments. Third, developing and adapting EA competencies entails broadening the skillset, strengthening contextual intelligence, and improving the translation of technical ideas for diverse stakeholders. Viewed through ANT, many difficulties are translation problems: aligning interests among diverse human actors and enrolling non-human actors' policies, standards, and platforms so that they stabilise rather than fragment the network (Callon, 1981). Bridging the gap between policy aspiration and on-the-ground practice will require investments in people (skills and pathways), in governance (decision rights and metrics that reward coherence and reuse), and in enabling infrastructure (shared platforms and procurement vehicles). These steps can empower enterprise architects to realise the strategic potential of EA and to help deliver responsive, resilient, and citizen-centred digital government (Brunetti et al., 2020). This study recommends establishing a public-sector EA competency pathway to systematically address technical and collaborative competency gaps and thereby strengthen enterprise architects' capacity to deliver responsive, resilient, and citizen-centred digital government.

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Paper Contribution to the Related Field of Study

This study empirically examines competency-related challenges faced by enterprise architects in Malaysia's public sector. It highlights key socio-technical, technical, and collaborative competency gaps affecting enterprise architecture implementation and provides insights to inform targeted training, organisational strategies, and policy interventions for effective digital transformation.

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