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Research paper

Ea Governance towards Sustainability of Ea Practices in Digital Government: A Systematic Review

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Abstract

Enterprise Architecture (EA) has been identified as one of the prime initiative to drive the establishment of digital government towards world class public service delivery. However, building upon several public sector agencies that had implemented these initiatives, it was reported as unfavourable in sustaining EA practices. This study aims to i. review and identify related issues ii. identify factors that influence sustainability of EA practices also iii. identify elements of EA governance. Through the systematic literature review (SLR) five related issues were discerned, four key factors were established in sustaining EA practices while five elements of EA governance emerged in the construction of EA governance framework.

Keywords: *Enterprise Architecture, Enterprise Architecture Governance, sustainability, practices*

1. Introduction

Digital government or e-government adoption is usually anchored around government transformation programs. Towards adoption, the aims are mainly to improve the way government services to citizens and businesses are delivered together with enhanced public sector efficiency. Effectiveness, efficiency and agility (responsiveness) are achieved through a combination of organizational and IT transformation mechanisms in which governance, management, division of labour, work processes and competencies are all impacted[1]. A review of current literature reveals the criticality and centrality of Enterprise Architecture (EA) to digital government programs. EA is critical to digital government and countries have admitted this[1].

Over the last 40 years, the Malaysian Government IT landscape has changed tremendously. Approximately 77 per cent of Government services are now online[2]. While the Government has reacted positively to this rapid change being the biggest employer in the country, it is still playing catching-up with the demands of its external stakeholders and the world at large. The traditional way of doing work cannot persist, therefore there is a need for immediate revamping of the way how work is done. Those agencies which were able to synchronize their business process with IT infrastructure were able to deliver superb services. Thus, EA must be implemented towards a better digital government service delivery. EA is an approach for an organisation to plan strategically to facilitates in decision making process through systematic arrangement. It also can act as a blueprint for organisation to achieve current and future business objectives by alignment of strategy with business and technology. Therefore, the agenda towards establishing a world class public service delivery has continued through various national programs. For instance, under the Entry Point Project (EPP8) of the National Key Economic Area (NKEA) in the Malaysian Economic Transformation Program (ETP), EA has been identified as one of the prime initiative to drive the establishment of connected government in the country[3].

Although the EA implementation were initiated since 2011, due to some issues and challenges, the implementation of EA initiatives is still in its infancy stages among agencies in public sector[3]-[4]. Studies in Malaysia, found that ten organizations conduct variations of EA, particularly at the planning level[5]. Hence, The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) envisioned that the implementation of EAs in silos by individual agencies would restrain any hope of an integrated and connected government system in the future unless efforts are taken to lead this exercise. Thus, Malaysian Government has come out with an initiative called 1 Government Enterprise Architecture or 1GovEA.

1GovEA is a systematic approach in guiding an organization to transform both business and technical aspect. 1GovEA Blueprint consist of framework, methodology and implementation plan to assist the agencies in the public sector to foster EA initiatives for their respective agencies[6]. 1GovEA implementation is important towards better development of Digital Government service delivery

through alignment of business strategy and ICT strategy. Through 1GovEA practices, it will support the government via information as references provided by centralised repository of EA. Hence, the initiative of 1GovEA will improve ICT governance for monitoring and project implementation and to support initiatives of Big Data, Open Data and Green Technology. Besides, this initiative will assist in preventing duplication of ICT application and business process in government agencies [6]. It will also lead to establishment of a single view of the current business and technical environment for agencies.

However, building upon several public sector agencies that had implemented these initiatives, it was reported that to sustain the practices of EA is articulated as unfavourable[7]–[9]. This study sets to achieve three objectives namely i. review and identify related issues of EA practices in organisations ii. identify factors that influence sustainability of EA practices also iii. identify elements of EA governance. The following section describes the review method using SLR while the next section highlights the findings. A discussion follows with the SLR findings based on the synthesis of evidence. Finally, the last section ends with conclusion.

2. The Review Method

In conducting the literature review, this research follows a systematic review (SR) method[3]-[4]. The SR method was conducted in three stages: planning the review, conducting the review and reporting the review. The method is depicted in Figure 1.

Figure 1 SR phases and stages

Planning the review involve preparation in conducting the review. It includes activities such as specify the research questions, design search strategy and define quality assessment. From this, the review conducted accordingly by identification of research, selection of primary studies, data extraction and monitoring and quality assessment. Result from the assessment are reported based on synthesis of data.

2.1 SR Research Questions

The formulation of research question(s) comprised of five major components such as population, intervention, comparison and outcomes model and context[12]. Table 1 shows the criteria and scope of research question.

Table 1 Criteria and scope of research question

Criteria	Scope
Population	All organisations that have established EA.
Intervention	EA Governance, issues and elements
Comparison	Public and private sector organisation
Outcomes	Elements, issues for EA Governance Framework deployment
Context	Reviewed of any studies of EA Governance Framework and deployment issues

Based on the criteria and scope of the research question in Table 1, the SR questions are:

RQ1: What are the issues in sustaining EA practices in an organization?

RQ2: What are the factors that influence sustainability of EA practices?

RQ3: What are the governances' elements in existing EA framework?

2.2 Data Sources

Databases used as sources of data are ACM Digital Library, IEEEXplore, Emerald, ScienceDirect, SpringerLink, Scopus, and Google Scholar as sources of data. The selected online databases library was chosen based on their "Enterprise Architecture" studies indexes.

2.3 Search Strategy

The initial search strings are Enterprise Architecture, Enterprise Architecture Governance, Framework, Model, Implementation, Practice and Sustainability. To build the search strings, the steps required are (i) source of major terms from the research question, (ii) identification of synonyms for major terms, (iii) identification of keywords in relevant papers or books, and (iv) Usage of the Boolean OR and Boolean AND to allow synonyms and world class variants of each keywords.

2.4. Study Selection

For the selection of study, the source of papers being selected were rank from highest to lowest priority: journals, conferences or proceedings, technical reports, thesis reports, books and magazine articles.

2.5. Inclusion and Exclusion Criteria

The articles reviewed were peer-reviewed articles in English on EA governance framework studies published between January 1, 2005 and December 15, 2015. Articles on the following subtopics were included in the search:

(i) Purposes and aims to foster EA governance framework.
(i) Strategies and methodologies for development.
(ii) Status or level of implementation.
(iii) Issues and obstacles in implementation.
(iv) EA governance in ensuring the sustainability of e-government services.
(v) Consequences of having EA governance including outputs and benefits.
(vi) Include study published within the period of 2005 to 2015.
(vii) Articles on the following topics were excluded:
   a. Non-research articles with no supporting evidence.
   b. Articles that only described tools only
   c. Articles that is not written in English.
   d. Articles that did not match the inclusion criteria.

2.5. Data Extraction and Study Quality Assessment

Quality assessment study checklist was used to ensure the data extraction meets the quality criteria. According to the SR guidelines, which were proposed by Kitchenham and Charters[11], the general

questions asked to measure the quality of the selected studies are shown in Table 2 below.

Table 2 Quality assessment study checklist

No	Questions	Answer
SQ1	Are the aims of the research clearly stated?	Yes/No
SQ2	Is the research design clearly specified?	Yes/No /Partially
SQ3	Do the data collection being carried out accordingly?	Yes/No /Partially
SQ4	Does the researcher(s) display(s) enough data to support their understandings and conclusions?	Yes/No /Partially
SQ5	Is the method of analysis appropriate?	Yes/No /Partially

The study checklist used three scale which are coded accordingly: Yes = 1 point, No = 0 point, and Partially = 0.5 point. From the item checklist, the sum of quality score for each article was measured between 0 (very poor) and 5 (very good).

3. Findings

Figure 2 illustrates the summary of the stages of study selection in this SR guidelines[11]. Using the search item defined, 1672 studies being identified. Consequently, only 52 relevant studies were selected based on the screening of contents of the frameworks. Next, the relevant studies will be synthesis after being filtered according to the inclusion and exclusion criteria. All possible duplicates and similarity of the frameworks are excluded too. Finally, only 25 studies were selected and believed capable of providing answers to the formulated research questions.

Figure 2 Findings from primary studies procedures

3.1. Quality of Factors

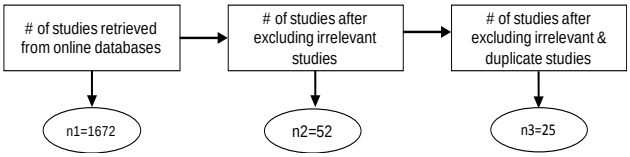

Table 3 indicates the quality scores of 20 identified articles. Eight (40%) are of good quality while six (30%) studies were rated as very good quality. Four (20%) studies as fair, two (10%) as poor however no study was found to of very poor quality. Therefore, all 20 selected articles were included for further analysis.

Table 3 Quality Scores

Quality Scale	Very poor (>=1)	Poor (>=2)	Fair (>=3)	Good (>=4)	Very Good (=5)	Total
Number of studies	0	2	4	8	6	20
Percentage (%)	0	10	20	40	30	100

4. Discussion

In this section, the study results are based on the research questions developed.

4.1 Issues in Sustaining EA Practices in an Organization

According to literature, there are issues regarding sustainability of EA practices in both private and government sectors. The complexity of the organizations leads to this [7]. The complexity many large organizations face is mostly similar in terms of business and IT structures, processes, systems and procedures. EA approaches receive major criticisms due to frequent changes in processes landscape, practices and procedures of government and governance that leads the difficulty in fitting them in stages-of-growth model [8].

There are various challenges in planning the execution of EA implementation. Among them are creating awareness, getting recognition and acceptance, political barriers, getting support from the top management, conducting training, culture cultivation, data control and cooperation from users [13]–[15]. Apart from that, the effective use of EA faced obstacles due to the lack of understanding on how decisions are made, what processes are being implemented and what the desired outcomes[9]. It was noted that in order for EA to succeed, stakeholders should be made to understand and be clear of EA practices. Ultimately, the critical part is the formation of shared vision, communication among stakeholders, and unclear evaluation of the impact. Architects are primarily in charge of developing these building blocks. Clear roles between project managers, project architects and intended users is crucial that may lead to good governance. Good communications with rampant feedbacks, and mutual understanding lead towards effective use of EA [9].

Governance is a complex, dynamic system involving multiple disciplines and multiple stakeholders[16]. Good governance practices include: legitimacy, rule of law, transparency, integrity, efficiency, coherence, adaptability to new challenges, participation and involvement. As agencies realise the need to move beyond mere operational efficiencies through automation to transformation of the business of government, EA comes to the forefront as an enabling mechanism [1]. A major challenge when proposing a governance model for EA governance is the different perspectives being identified from various stakeholders. Thus, these perspectives need to be assessed via a stakeholder analysis. This includes stakeholder identification and application scenarios that are to be mapped to the model. It seems that the challenge is typically the lack of competency and stakeholders' readiness to explicitly describe their requirements and application scenarios[17]. Lack of governance also may cause substantial risks and can create inconsistencies among agencies, which are usually not acclaimed by the decision makers[10-11]. In comparison to business and ICT governance which are already established and matured in form of reference models, EA governance is still in their early stage[20]. Hence, there is a need for a clear definition of EA governance that reflect revolutionary EA in strategic manner currently downplayed by IT governance [21].

4.2 Factors that Influence Sustainability of EA Practices

SR research question 2 seeks to understand how governance affects sustainability of EA practices in an organization. Four factors were identified as exhibited in Table 4.

Table 4 Factors influencing sustainability EA practices

Key Factors	Authors
Detailed, formal description of a process	[22]
Sufficient resources, top management support and acceptance	[1], [22], [23]
Strategic and standardized governance	[1], [22], [23]
Learning, support, collaborate	[24], [25]

Detail and formal description of process ease people in organization to execute tasks**.** Thus, it will contribute towards better management and maintenance of EA practices[22]. To sustain, sufficient resources with the support from top management is important factors. Sufficient resources are important to conduct main task, such as documentation and maintenance, the development and updating of EA standards and execution of project from EA initiatives[23].
Strategic governance involves strategy, communication, evaluation of change requests/new requirements, strategic alignment check and business capability monitoring[26]. Governance is the key factor to oversee and steer strategic changes during the process. It is also necessary to have some central governance. This comprises central planning and prioritization processes[27]**.**

The aspect of learning and support must be given an EA practices. Therefore series of workshops, seminars and events can be initiated to get the buy-in from EA stakeholders in the organisation [24][25].

4.3 Elements of Governances in Existing EA Framework

EA governance can assist in decision making of management[28]. Based on the SR conducted, there are many approaches in adopting governance in implementing EA in an organization. Each approach consists of elements that build up the governance framework. Table 5 lists the EA governance elements based on authors' works from the year 2005 to 2015. Emphasis had been given to 'Structures' as it act as a backbone for communication and interaction on EA among stakeholders [29]. 'Structures' integrate EA function into the overall organizational towards effectiveness [30]. All the elements recorded in Table 5 will be considered for the proposed EA governance framework.

Table 5 EA governance elements with supported authors

Elements	Authors
Structures	[9], [12], [9], [20], [21], [23], [31], [32], [33], [34], [35]
Processes	[7], [9], [17], [20,] [28], [36], [37]
Roles and Responsibilities	[7], [17], [31]
Standard, Policies and Principles	[17], [31], [34]
Others (Organisation, Measurements, Tools, maintenance, communication, investment, resources)	[9], [21], [31], [32], [36]

5. Conclusion

This ongoing study had successfully identified five related issues. They are i. complexity of organizations ii. attaining support from top management iii. lack of understanding of EA processes iv. different stakeholders' perspectives and v. lack of governance. The review indicates that there is limited research on factors that influence the sustainability of EA practices suggesting more work to be done on this issue. Secondly, four key factors were established in sustaining EA practices namely i. detailed description of a process ii. top management support and acceptance with sufficient resources iii. strategic and standardized governance and iv. support towards learning and collaboration. Third, five elements of EA governance emerged in the construction of EA governance framework. The elements are i. structures, ii. processes, iii. roles and responsibilities, iv. standards, v. policies and principles.

With such a paucity of research in EA therefore this study would provide some insights toward sustainability of EA implementations and its practices. This would advocate as an initial effort towards a more conclusive EA governance adoption for the Malaysian setting. Notwithstanding the issues involved, along with recognising the sustainable factors had aligned the determinants of governances' elements. Hence, leads to the construction of EA governance framework. EA experts of selected Malaysian government agencies will assist in evaluating the proposed EA governance framework. A Delphi methodology will be employed in the data collection phase.

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