International Journal of Engineering & Technology, 7 (4.31) (2018) 52-57

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Association of People Factors with Successful Enterprise Architecture Implementation

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Abstract

Many organizations are facing problem in Enterprise Architecture Implementation as it fails to meet expectations. While much has been written about the success factors related to EA framework, EA tools, and business-IT alignment process, there are few empirical investigations focusing on the people factors. Therefore, this paper aims to investigate the association of people factors with successful EA implementation by identifying seven people factors from the literature. A quantitative survey was conducted to assess the hypothesis that these seven people factors are associated with the successful EA implementation. The analysis reveals that only five factors are associated with the success of EA implementation, while two are not. Based on the result, this study highlighted that it is important to analyze the people factors in details rather than one whole factor because each of the people factors identified has their own uniqueness and success elements

Keywords: *enterprise architecture; EA implementation; people; public sector;*

1. Introduction

Enterprise Architecture is regarded as a practice linking strategy formation to strategy execution based on the shared, systematic model of information systems, organization structure, business processes and people. A robust architecture of EA will translate the vision and mission of the organization to an optimized operation by leveraging unified technology across the organization [1, 2]. It provides a comprehensive plan consisting of structure and process in the organization throughout these four layers, business, data, application and technology [3]. EA provides guidance to the organization by providing clear direction for managing business information, applications and technology. With the existence of EA, the interoperability between organizations will be more effective.

EA development has started 25 years ago in oil and gas company [4]. However, to date, most organizations are still facing the issues in EA development and implementation [5]. To combat this issue, many studies are investigating the critical success factors for a successful EA implementation. While much has been written about the critical success factors related to EA framework, EA tools, and business-IT alignment process; only a few empirical investigations focusing on the people factors.

One of the factors that lead to this issue is lack of focus on EA soft aspects. The EA soft aspects such as organizational culture and EA people factors are being neglected because most EA developers and researchers assume that these soft elements will implicitly exist when the EA gets implemented [6]. According to a study by Rouhani, Mahrin, Nikpay, Ahmad, & Nikfard [7], at lower levels of EA maturity, the focus should be on people aspect. Therefore, this paper aims to investigate what are the existing people factors and what are their association with EA implementation.

2. Literature Review

This section defines the EA, existing success factors identified followed by the explanation of proposed research framework of this study.

2.1. Enterprise Architecture

EA is a common framework and development methodology that will guide the organization to achieve its current and future business objectives. It is a comprehensive framework or taxonomy of systems analysis models for aligning organizational strategy with IT [8]. It describes how the information technology, processes, organization and people in an organization function [9-11]. EA is fundamentally focused on identifying shared assets and relationship of all different elements in an enterprise-wide manner [12]. EA is typically not limited to IT but also encompasses the relation and support within the business.

Academically, EA was extensively explained in Zachman's IBM Journal article [13] and book on EA by Spewak and Hill [3]. EA then has emerged and gained attention from the industry and they began to aware of the potential benefits of EA. The Open Group Architecture Framework (TOGAF) stated that *"EA is a complete architecture for IT solution comprises of four domains, which are business, data, application, technology"*[14]. EA implementation is described as the recurring methodology of describing the 'as is' and 'to be' states of an enterprise and IT developments, interventions and processes to take an organization from the one state to the next [1]. The first EA was implemented in 1990 when Texaco

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and Star Enterprise EA adopting the EA in their oil and gas business operation [4]. Since then, EA implementation is expanding parallel with the increasing number of EA frameworks introduced by both academic and industry.

2.2. Enterprise Architecture

Investigating the success factors of EA implementation is essential to ensure its high rate of success. There are many studies on success factors for an EA implementation however, only four studies provide a comprehensive factors in covering the organization perspective. These studies are from Nikpay, et al. [7], Jusuf and Kurnia [15], Kaisler, et al. [16] and Lange, et al. [17]. Table 1 shows the identified factors.

Table 1: Success Factors in EA Implementation

Author	Factors
Nikpay et al. [7]	EA Planning EA Governance EA Management EA Communication EA Support
Jusuf and Kurnia [15]	Product Quality Infrastructure Quality Service Delivery Organization Anchoring
Kaisler et al. [16]	Defined EA Goal
Lange et al. [17]	Top Management Buy-in Governance Process

Literature analysis shows that Nikpay et al. [7] proposed five factors covering EA Planning, EA Governance, EA management, EA Communication and EA Support. All of these factors are at the organization level none is looking into people aspects. Similarly, Jusuf and Kurnia [15] proposed factors also abandoned the people factors by only focusing on the technical aspects of EA that consist of Product Quality, Infrastructure Quality, Service Delivery and Organization Anchoring. Meanwhile, Kaisler et al.[18] just highlighted on EA Goals and Lange et al.[19] mentioned Top Management and Governance Process.

From the literature, it is clearly shown that no people factor is being investigated despite any IT initiative, people is one of the key elements. Therefore, in the next section, further literature analysis is performed to understand what the key elements of people factors are and how it could possibly affect the EA implementation success.

2.3. Proposed People Factors in Enterprise Architecture Implementation

No doubt, that people factors are vital in ensuring the successful EA implementation. Only if the right people equipped with the necessary competencies to fulfil the tasks correctly that should be done in their designated roles, the full concept of EA can be deployed [20]. Through identification of related people factors on use and impact of EA as strategy, organizations can ensure that the implementation and execution of EA succeed [21].

Besides the people who work to create, administer, and manage EA, there is one more extremely important group of people: the users of EA. This group represents a very large percentage of the people involved. If the user is not able to successfully learn and use an EA, it is doomed to failure. Studies by Zhang et al. [1] found that misalignments of people deployment, diverse understanding and intentions, rigid organization hierarchy, unclear roles and responsibilities, communication failure and less participation could result in the failure of the EA deployment [1]. Following are the detail explanation of the proposed people factors in EA.

2.3.1. Trained EA Talent

The profession of the enterprise architect is strongly connected with knowledge gained in formal training as well as with real-world experience gained through practice in the domain [22]. Therefore, all academic and training programs should incorporate competency-based learning strategies for the development of EA specific competencies. However, current studies highlight an only small number of EA training available [23, 24]. Therefore, it is essential for an organization to develop the architect skill through training in both formal and informal methods. As stated in the literature, comprehensive training in EA lead to seamless EAI process [25].

2.3.2 Certified EA Talent

Studies also show only a few EA certifications available [20]. As stated in ITABOK [26], certified EA Talent will increase the quality of EA implemented. A solid foundation needs to be built among the team. However, varies of EA certifications such as TOGAF, ZACHMAN, and others will create delay due to the dissimilar views [3]. This made it difficult to find consensus among the consultants, experts, and employee on even the simplest details, which caused severe delays and wasted time. Therefore, it is essential for an organization to develop the architect skill, training and certification program in both formal and informal methods to create a solid foundation of EA practices among employees.

2.3.3 Skilled EA Talent

Lack of knowledge available in the organization significantly affects employees' inability to effectively deploy EA initiatives [9, 27]. Employees in IT department focused on the IT and technical knowledge in IT projects rather than EA initiatives. Thus, the EA programs ignored business services and emphasized IT issues. The studies show that it is important to have a team of competence enterprise architects for EAI [28, 29]. In EAI, it is crucial to manage enterprise architects' skill and to sustain their expertise for the organization's benefits [30].

2.3.4 Centralised Enterprise Architect Team

Short and Burke [31] stated that an efficient team of enterprise architects should be around 2 to 4 per cent of the IT staff in the organization. Unfortunately, according to Aier [32] and Van der Raadt et al [33] in most organization, there is lack of staff with EA skills and expertise to form an ideal EA team. As a result, some of the key areas of the EA deployment were undelivered, resulting in prolonging the EA deployment processes [8]. Moreover, most people treated the EA pilot projects as one of as one of many IT projects because of a lack of understanding about the nature of EA. Therefore, it is suggested for the agency to have a specific EA office to ensure all EA activities will be executed as planned with a sufficient workforce.

2.3.5 Talent Management Plan

Chief Information Officer (CIO), Information Technology Officer (ITO), Head of Departments (HODs) and IT architects are the key role players in the EAI [27]. Their knowledge and skills are critical to translate the EA initiative into the employees' understanding and interpretation of the tasks given. Therefore, to ensure the continuity and clear succession plan of enterprise architect, a formal Talent Management Plan for EA play important roles in this matter.

2.3.6 Talent Retention Program

It is important to have a team of competent enterprise architects in EAI process, especially during EA design, development, implementation and operation [28, 29]. Thus, it is crucial to manage this enterprise architect's talent and retain their expertise for the organization's benefits. Another concern is on people resources.

2.3.7 EA Learning Culture

According to Faller and De Kinderen [34], organizational culture is one of the important factors in EAI. Organizational culture can be defined as the sum of values, norms, and attitudes, which are adopted by the members of an organization. Current studies report there is lack of EA learning culture which resulted in slow EA adoption for the organization [6, 32] and communication failures [35]. Hussein, et al. [36] also stated that EA readiness is required for a successful EAI.

As stated by Radeke, F. [37] EA readiness and awareness or sociological elements in EA implementation is needed to monitor enterprise performance and enterprise transformation. Knowledge exchanges between architects and project members also have a significant influence on EAI [38]. In brief, this study identified seven people factors from literature as projected in Table 2

Table 2: Identified People Factors from Literatures

Author	Factors
1. Trained EA Talent	– Virili & Sorrentino [22] – Aier, Gleichauf, & Winter [23] – Winter & Aier [24] – Jick & Peiperl [25]
2. Certified EA Talent	– Wißotzki et al. [20]
3. Skilled EA Talent	– Iyamu, [9][27] – Besker, Olsson, & Pessi [28] – Gotze [29] – Steghuis and Proper [30]
4. Centralized Enterprise Architect Team	– Short and Burke [31] – Van der Raadt, Bonnet, Schouten, & Van Vliet [33] – Iyamu & Mphahlele [8]
5. Talent Management Plan	– Iyamu [27]
6. Talent Retention Program	– Besker et al.[28]; Gotze [29]
7. EA Learning Culture	– Faller & De Kinderen [34] – Aier [32] – Faller [6] – Seppanen, Heikkila, & Liimatainen, 2009 [35] – Hussein, Mahrin, and Ismail [36] – Radeke [37] – Gaver [39]

Therefore, it is important to instil learning culture through series of workshops, seminars and events. As a result, these activities will lead to strong EA stakeholders support in knowledge exchange and change management [39]. In summary, it can be concluded that people factors are often neglected and hardly investigated. As argued by Faller, et al. [40] traditional EA frameworks such as TOGAF, ARIS, Zachman framework, TEAF, FEAF, CIMOSA seldom consider the EA soft aspects such as organisational culture and EA effectiveness because they assume that these soft elements will implicitly exist when the EA gets implemented. Nevertheless, studies also found that 'people' have been ranked as a major problem in EAI [33, 41]. Lack of focus on the 'people' factors of EA could be the reason why many organisations still struggle with successful EA implementation.

Thus, Nuryatno and Dobson [42] suggest that in EA domain, more focus should be given to social elements such as collaborative organisational leadership, political dynamics and work culture. This dictates that people factor is vital as it largely influences the EAI success [6]. Selecting the wrong person to lead EA initiative and not engaging business people are two biggest pitfalls in EAI. It is advised that the key for EAI is to create not the perfect or most elegant architecture for the moment, but the most adaptable architecture for the future.

3. Research Framework

Findings from literature review reveal seven (7) people related factors in EA implementation. The factors are Trained EA Talent [TT], Certified EA Talent [CT], Skilled EA Talent [ST], Centralized Enterprise Architect Team [CR], Talent Management Plan [TM], Talent Retention Program [TR] and EA Leaning Culture [LC]. Fig. 1 shows the proposed research framework of this study.

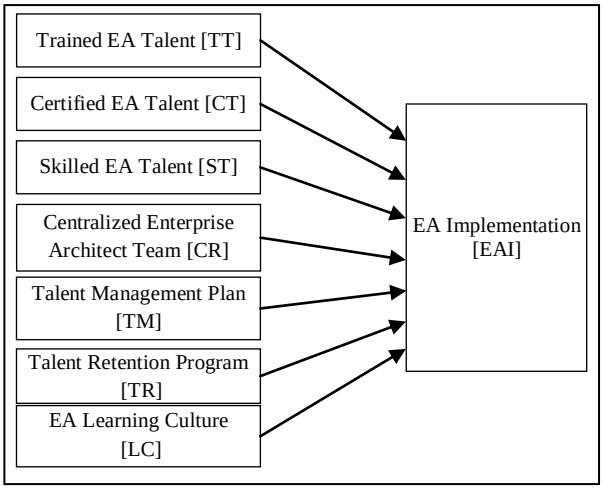

Fig. 1: Research Framework

4. Research Methodology

This study applied a survey through questionnaires to measure the identified factors. The reason for choosing this approach is to get a wide view from the all the respondents which were the EA practitioners in Malaysian Public Sector (MPS). The decision on selecting MPS is because to date, there is lack of studies that focus on the people aspect of public sector scope [43]. This will be an interesting finding since public sector itself is large and diversified, but yet all agencies in public sector have to comply to one general requirement set up by the central government agencies [44, 45]. Hence, this study will highlight how the people aspects are the vital element to the EA implementation success in the public sector.

4.1 Sampling Population and Frame

This sample population are the EA practitioners in MPS, which was obtained from MAMPU, the central agency that leads the EA in MPS. In total, this study selected 273 respondents that meet the criteria defined. According to Creswell [46] if possible it best to select a large sample as possible from the population because the larger the sample, the less the potential error is that the sample will. Hence, this study includes all identified population as its sampling frame.

4.2 Questionnaire

There is two section in this questionnaire, Section A on the demographics information and Section B, the measurement of the people factors. Section A that consists of eight questions asking on respondent's profile such as job function, number of years of working experience, level of EA knowledge, EA training attended, EA certification obtained, years of EA experience, years of organization involvement in EA and the EA implementation status in the organization. Meanwhile, Section B acquires the respondent opinion on people factors in EA implementation, which are Trained EA Talent [TT], Certified EA Talent [CT], Skilled EA Talent [ST], Centralized Enterprise Architect Team [CR], Talent Management Plan [TM], Talent Retention Program [TR] and EA

Leaning Culture [LC]. The survey items were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability of the instrument was analyzed using Alpha Cronbach method, with reliability coefficients result is (α=0.952), hence it complies with Hair et al. [47] that stated, a reliability coefficient above 0.60 indicates that instrument measured has achieved acceptable reliability.

4.3 Data Collection and Analysis

The data collection is based on self-administered questionnaires, means respondents read the survey questions and record his or her responses without the presence of a trained interviewer. This is to allow the respondents to give honest answers compared to any other data collection approach [48]. This study used both manual and online questionnaires. For manual questionnaires, the researcher met the representative to deliver the survey questionnaires to respondents. Once done, the researcher collected the completed questionnaire from the representative [48, 49]. This method was applied to the respondent resides in Putrajaya and Klang Valley. On the other hand, an online questionnaire was given for those who are located outside of Putrajaya and Klang Valley.

Subsequently, the process of data analysis began with preparing the data for the analysis, where the data is filtered, and coded accordingly. In this study, the codes are based on the model proposed. Next step is to execute data screening process, whereby the missing data and outliers are identified and treated. Next, the statistical analysis was conducted using The Statistical Package for Social Sciences for Windows (SPSS, v23.0). The Cronbach's alpha test was applied to evaluate the reliability of the Likert-type scale questions with the aim of ensuring each question under a variable is all measuring the same underlying attributes. Then, the respondents' demography and mean scores were analysed through descriptive statistics (frequencies). Finally, Pearson correlation coefficient was executed to identify the association of factors on the successful EA implementation.

5. Analysis and Result

This section explains the analysis and result of questionnaires, which consist of descriptive analysis and statistical analysis.

5.1 Descriptive Survey Results

A total of 155 questionnaires were returned to the researcher. Most all the respondents of this questionnaire are in a professional executive level and above. The majority comes from Assistant Director (Information Technology) (54.2%) followed by Deputy Director (Information Technology) (18.7%). The rest of the list are various roles from both Information Technology (87.1%) and Business (12.9%) respondents thus this indicates that this survey has successfully covered the broad range and diversified opinion. Table 3 shows the details of respondents' role in their organization.

Table 3: Distribution of Respondents based on Roles

Department	Role in organization	Number of respondents (N=155)	(%)
Information Technology	Chief Information Officer	5	3.2%
	Director	8	5.2%
	Deputy Director	29	18.7%
	Head Assistant Director	9	5.8%
Business	Director	2	1.3%
	Deputy Director	2	1.3%
	Head Assistant Director	8	5.2%
TOTAL		155	100%

The respondents were also asked about the years of working experience. Fig 2 depicts the details described. As shown, the years of working experience was grouped into five main groups which are more than 20 years (14%), 16 to 20 years (17%), 11 to 15 years (28%), 5 to 10 years (10%) and less than 5 years (25%). The finding shows the distributions of groups are balanced thus this ensures the survey conducted is reliable and thorough.

Results on EA knowledge analysis show none of the respondents considers themselves as Excellent. A total of 10.87% are rated good, 43.48% are average, 43.48% is fair and 2.17% are rated poorly. Fig 3 shows the distribution of respondent based on the level of EA knowledge.

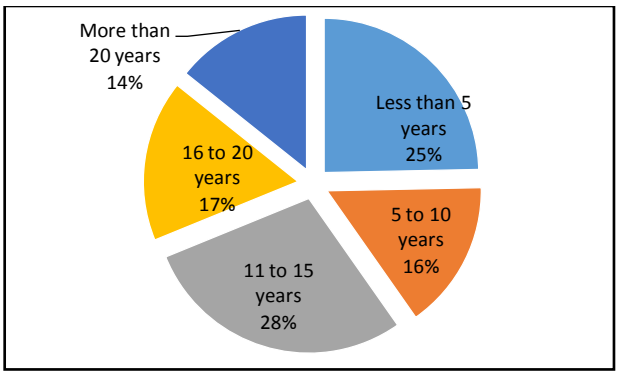

Fig 2: Distribution of respondents based on years of working experience

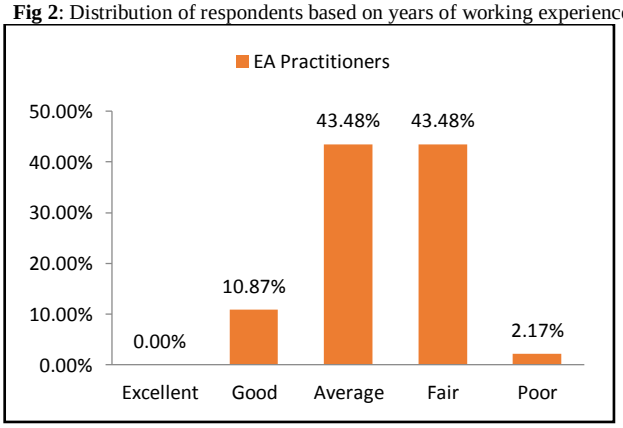

Fig 3: Distribution of respondent based on the level of EA knowledge

5.2 Analysis of the Association of People Factors with EA Implementation Success

Next analysis is to investigate the association between the proposed people factors with EA implementation success. Firstly, the means value of each criterion defined were computed. Findings show all factors, the mean score is between 3.9226 and 3.4129. This indicates that the level of agreement is from Neutral (3) and above. When these factors were arranged in order of magnitude, Trained EA Talent [TT] score the highest mean value with 3.9226, followed by Certified EA Talent [CT] at 3.9161 and Talent Management Plan [TM] at 3.6968. This study then examined the intercorrelation of the factors (Table 4) whereby independent variables were related to EA Implementation [EAI]. Overall, correlations range from .131 to .329 and were significant at .05.

Since the rating scales is used in this study, all correlations results provide general indications of the factors stated. Total of five (5) factors are associated with EA implementation success, starting from EA Learning Culture [LC] (.329), Talent Retention Program [TR] (.321), Centralized Enterprise Architect Team [CR] (.296), Skilled EA Talent [ST] (.272) and Talent Management Plan [TM] (.238). Meanwhile, two (2) factors, Certified EA

Talent [CT] and Trained EA Talent [TT] only scored (.183) and (.131 respectively

Table 4: Means, SD and Correlation Analysis of People Factors

	Mean	SD	TT	CT	ST	CR	TM	TR	LC	EAI
Trained EA Talent [TT]	3.9226	1.02903	1							
Certified EA Talent [CT]	3.9161	.82142	.937**	1						
Skilled EA Talent [ST]	3.5613	.94720	.811**	.862**	1					
Centralised Enterprise Architect Team [CR]	3.4065	1.01736	.632**	.647**	.725**	1				
Talent Management Plan [TM]	3.6968	.92844	.730**	.741**	.653**	.874**	1			
Talent Retention Program [TR]	3.6452	.87343	.143	.257**	.289**	.682**	.643**	1		
EA Learning Culture [LC]	3.5161	.95588	.688**	.701**	.883**	.704**	.573**	.283**	1	
EA Implementation [EAI]	3.4129	1.01154	.131	.183	.272**	.296**	.238**	.321**	.329**	1
***p< .05*										

6. Discussion

Based on the results, only five factors confirmed its association with EA implementation namely Skilled EA Talent [ST], Centralized Enterprise Architect Team [CR], Talent Management Plan [TM], Talent Retention Program [TR] and EA Learning Culture [LC]. Meanwhile, the other two such as Trained EA Talent [TT] and Certified EA Talent [CT] did not show the association with EA Implementation [EAI]

The findings agree that Skilled EA Talent [ST] is associated with successful EA Implementation. It is crucial to manage enterprise architects' skill and to sustain their expertise for the organization's benefits. Thus, it also adds to the efficiency in managing the architect, plans the training and succession program. Centralized Enterprise Architect Team [CR] is another important factor in ensuring a successful EA implementation. By having a centralized EA Architect team, the requirement for 4% architects of total IT staff in the organization can be easily achieved.

No doubt, that Talent Management Plan [TM] is vital to ensuring the continuity and career path of the enterprise architect. This is shown from the results of this study, which indicates Talent Management Plan is closely related with the cusses of EA implementation. This EA career path will attract the new talent to be part of architect team hence it will be one of the mechanisms in retaining architect talent.

Talent Retention Program [TR] is also proven as an important factor in EAI. Talent Retention Program is necessary in a large cluster of organizations. Findings from this study are in line with Besker et al.[28] and Gotze et al. [29] that stated it is a must to have a team of competent enterprise architects in EAI process, especially during EA design, development, implementation and operation [28, 29]. This is to ensure continuous support from skilled EA architect, especially during EA design, development, implementation and operation. As the displacement of the officer is unavoidable in a larger organization, hence a solid talent retention program needs to be established to handle this issue.

Learning culture [LC] is the most important factors in EA implementation in MPS. This may due to the work norm in public sector, which every government official is required to follow the common government human resource policy and ethics guidelines. This strongly supports findings by Faller and De Kinderen [34] that highlights EA culture is an important factor in EAI and there is still lack of study on this. Therefore, before any EA implementation activities begin, it is best to conduct an EA acculturation session to all EA stakeholders and explain how to include the EA practice as part of their job responsibility. Ensuring stakeholder at the centre of the architecture is a strong step towards successful EAI.

However, respondents think that Trained EA Talent [TT] and Certified EA Talent [CT] does not bring any significant effect on the success of EA implementation. Though training able to provide the competencies required for EA implementation, still it does not contribute much to EA implementation.

Same goes for certification in EA. Having a certified EA talent does not guarantee a successful EA implementation in the organization. This may be due to the content and delivery of the EA training program itself is not practical enough to be applied in the agency context and varies of EA certifications lead to different understanding. Therefore, it is best to conduct a detail investigation in order to find the clear justification for this finding.

7. Conclusion, Limitation and Future Works

The main contribution of this paper is to investigate the significant effect of people factors in EA implementation. From the analysis, it is found that five (5) factors are associated with EA implementation namely, Skilled EA Talent [ST], Centralized Enterprise Architect Team [CR], Talent Management Plan [TM], Talent Retention Program [TR] and EA Learning Culture [LC]. Meanwhile, two (2) factors are not associated with successful EA implementation, which is Trained EA Talent [TT], and Certified EA Talent [CT].

This finding indicates that people factors also play an important role in EA implementation apart from another well-known factor such as organizational factors and technological factors. The findings also suggest that a detailed analysis need to be conducted for each of people elements, rather than assessing the people factor as a whole. By understanding each key element in people factors, issues in people aspect in EA implementation can be resolved. Although this study successfully delivers its research aim, there are still some limitations that need to be considered. Firstly, this study just focusses on seven people factors identified in the literature. Future research may further investigate other potential factors and expand to another scope as well.

Secondly, the data collection only involved the EA practitioner in the organization which reflect the results from whom who already understand the EA. In the future, this study can investigate from multiple perspectives of respondents, which covers the whole structure of the organization. Next step, this study aims to measure the overall impact of people factors along with organizational and technological factors in EA implementation. Hence, more work is needed to analyze the overall factors since it involves multiple categories. As such, the expected findings will benefit many cohorts either from EA academic researcher or EA practitioner in the organization

Acknowledgement

The research is financially supported by Universiti Teknologi Malaysia (UTM) PAS Grant Q.K130000.2738.03K32. The research team also would like to thank the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU), Ma-

laysia EA team who provided insight and expertise that greatly assisted the research.

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