MODERATING EFFECT OF ORGANISATION SIZE IN MEASURING THE TECHNOLOGY ORGANISATION ENVIRONMENT AND PRESSURE (TOEP) IN ENTERPRISE ARCHITECTURE ADOPTION

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ABSTRACT

Different names of the model have been proposed from various factors and fragmented perspectives. Besides, overall studies have put much attention on post-adoption process and EA implementation phase. Previous scholars used one or combination of different theories to identify the existing approach and perspective for formulating EA adoption model. However, not many studies were emphasized during the stage of the adoption phase. Currently, EA adoption model was also being emphasized in EA implementation. Notwithstanding these limitations, the researcher will further be investigating the possible development of EA adoption model during the adoption phase and early phase of the EA cycle. This can provide wide-ranging and rational views of business, information, and technology for the organisation. It is also found out that, the organizational adoption of EA is still missing from the technological, organizational, environmental and pressure (TOEP). Based on inferences from the previous study, there were relatively little empirical studies conducted in EA adoption studies. The existing studies tend to apply single and multiple theories from organization and management domain in one study. Therefore, this paper aims to investigate the factors that influence EA adoption at the organization level and propose a conceptual model for EA adoption from TOEP perspective. The research method of the survey using questionnaires will be employed on the multiple organizations as the selected sample size of the population**.** This study would be integrated with the advanced knowledge with the development of the extended and integrative TOE model with the inclusion of institutional theory and moderator variable and its relation to Enterprise Architecture adoption. This research may shed the light on the EA adoption process in organisation by proposing EA adoption model as guidelines for the decision makers in understanding factors that influence EA adoption in the MPS in the future.

Keywords: *Enterprise Architecture, Adoption, Technology-Organisation-Environment (TOE) Framework; Institutional Theory*

1.   INTRODUCTION

This research investigates factors influencing EA adoption in the organisations. The purpose behind the investigation is to build and test a model in order to provide guidelines for its introduction and anticipating factors important for realising the benefits that EA can deliver. Enterprise Architecture (EA) provides a holistic view that effectively integrates different domains in business, data, application, and information in organizations. Through this, businesses and technical people can have mutually understandable language in their communication to achieve the organization's goal, for example, decision-making and citizen-centric services. Malaysia, as one of the developing countries, has allocated large investment in the

development of Malaysia Government Enterprise Architecture (My1GovEA). My1GovEA is one of enabling ecosystem towards achieving initiatives in Digital Government agenda for the public sector, which is stated in Malaysia Public Sector (MPS) Strategic Plan 2016-2020 [1]. MPS also realized all the benefits of EA that could be accomplished by adopting EA.

However, a report conducted by MAMPU Malaysia in 2014 reveals that the EA Capability Maturity Assessment in MPS with regards to the adoption of EA practices is moving towards Level 2 (Formalized Stage) [2]. The government targeted 25 public sector agencies to implement EA in their business and ICT functions, but to date only two (2) public sector agencies implemented EA. Although MAMPU has been actively providing awareness and transfer of knowledge (ToK) of MyGovEA to all ministry-level in MPS since 2014, the number of MPS adopting EA in their organization remain the same [3]. The decision to institutionalize EA in the organization seems to be difficult in MPS.

Based on the inferences from literature and discussion, it could be concluded that the motivation to carry out this research is based on the premise that there are insufficient attention and inadequate reference given to the adoption of Enterprise Architecture in Malaysian Public Sectors (MPS). It refers to a set of issues and factors related to the context of the new practise or technology (Enterprise Architecture) (T), the context of the organization (O), the context of the environment (E), and the context of the pressure (P). These factors are important as guidelines for decision makers and the implementation strategic plan of the EA adoption in MPS.

In addition, a few studies investigated the most significant influencing factors of the four contexts over the EA adoption among Malaysian Public Sectors. Therefore, this study is important because it will lead to an understanding of the factors and the underlying relationships of EA adoption. These factors are important as guidelines for the decision makers and implementation strategic plan of the EA adoption in the MPS in the future. As a result, an effective adoption of EA can be facilitated in the organizations. Further, the study attempts to develop and test an integrated Technology, Organizational, Environment and Pressure (TOEP) model that make the model relevant to EA marketplace and allow a greater prediction of the factors for EA implementation in

the organization. Based on the gaps identified, this study aims to explore the new insight of developing the conceptual EA adoption model from TOEP perspective. This study also will include both individual and organizational level of analysis in understanding the factors that influence the EA adoption in the organization.

2.   OBJECTIVE OF THE STUDY

This paper attempts to identify the predictors of EA adoption in the Malaysian Public Sector, which is not adopted by the EA, by applying the TOE framework and Institutional theory. The aim is to propose an integrated TOEP model which is a combination of these theories in the Information System field. The objectives of this study are:

1.   To determine the factors (technological, organizational, environmental, pressure) that may influence EA adoption in Malaysian Public Sectors (MPS).
2.   To identify the relationships between the factors (technological, organizational, environmental, pressure) and EA adoption based on the organization size in Malaysian Public Sectors (MPS).

This study also will include both individual and organizational level in understanding the factors that influenced the EA adoption in the organization. The importance of this study will lead to an understanding of the factors and the underlying relationships of EA adoption. As a result, the effective adoption of EA can be facilitated in the organizations. Further, the study could allow a greater prediction of the factors for EA adoption in the organization.

3.   SIGNIFICANCE OF THE STUDY

EA adoption, organization size, technological, organizational, environmental, and pressure (TOEP) are vital concepts at the heart of the TOE framework and Institutional theory. Two particularly influential issues related to EA adoption are of concern for the researcher. The first issue is pertaining the relationship between TOEP factors and EA adoption in the organization and the second issue is the dynamic between organization size and EA adoption. Although organizational size has long been considered to be an important predictor of innovation adoption [4],

the empirical results on the relationship between them are limited in the context of EA adoption. In contrast, organization size has been used as a control variable in different contexts. This study could advance knowledge with the development of the integrated TOE model and Institutional theory with the inclusion of moderator variable. Therefore, this study views the organization size as a moderating variable between TOEP factors and EA adoption in the organization. The result of the study would identify the most significant factors influencing EA adoption and the effect of moderating variables in relationships. The implication of study would provide insights toward EA adoption for public sector organisations especially in Malaysia.

4. LITERATURE REVIEW

This section reviews existing research on the EA and related theoretical contexts in Technology, Organisation, Environment and Organisational Pressure (TOEP).

4.1 Enterprise Architecture

In the field of EA, various definitions of EA are identified, and scholar claimed that there are uncertain EA paradigms which are scope and purpose [5]. Based on the perspective of Zachman [6], architecture is a set of design artefacts, or graphic representations, that are relevant for describing an object that can be produced to requirements (quality) as well as maintains over the period of its useful life (change). Moreover, EA is p coherent whole of principles, methods, and models that are used in the design and realisation of an enterprise's organisational structure, business processes, information systems, and IT infrastructure [5, 7]. Whereas Behrouz and Fathollah [8] defined EA as the process of translating and converting strategic requirements to processes, data, and technology, providing the organization with a big picture in detail and handling change management, which are the primary purpose of EA.

EA acts as a management tool between business and IT. It also plays an essential role in facilitating the evolution to higher level capabilities at the organization level [9] and managing the change from the current state to the future state [10]. Therefore, the EA implementation is beneficial in promoting better decision-making. Main sectors such as Small Medium Enterprise (SME), banking, and private sector implemented

EA to gain its benefits. Several researchers have discussed the state of EA in literature and practice from different scopes and perspectives. Some researchers concentrate on EA frameworks, some deal with both EA development and implementation and others focus on EA sustainability or EA review. For example, Lankhorst [11] provided a detailed overview of the existing EA framework, methods and techniques. The most leading cycle of EA establishment includes several phases and process, as stated by Christiansen and Gotze [12], which includes three phases. A.Bakar, et al. [13] further enhanced these phases by incorporating seven (7) processes and grouped these processes into three (3) phases. Phase 1 includes initiate, plan, analyze and assess, design and develop, and implement processes. Meanwhile, in Phase 2, requires maintenance process and Phase 3 is review process. These phases are shown in Figure 1.
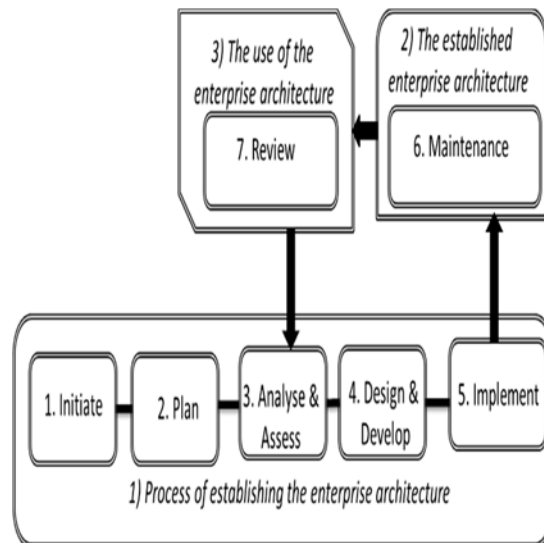

Figure 1: EA cycles [13]

4.2 Technology Adoption Model in IS Research

A wide range of theories and models in the Information System study are used in technology adoption or acceptance. The purpose is to exploit the determinants and mechanisms in the individual as well as organizational levels. EA is seen as an organizational innovation that incorporates different business functions, cultures, tools, methods, and information within the organization. From the theoretical lens, EA requires a wide-ranging theory to explain its adoption challenges in the organization. The noticeable theories and models that focus on individual adoption level include but were not restricted to, Technology Acceptance

Model (TAM) Davis [14] and extended TAM Venkatesh and Davis [15], Unified Theory of Acceptance and Use of Technology (UTAUT) [16].

TAM proposed three core elements which are perceived usefulness, perceived ease of use and behaviour intention, however, it only focuses on technology aspect and does not include a social element in this model. Meanwhile, UTAUT might be a reliable model because it integrates determinants from eight prominent theories and its parsimonious structure and higher explanatory power (R^2) [17, 18]. Four critical determinants include performance expectancy, effort expectancy, social influence, and facilitating conditions [16].

Meanwhile, on the organization level of adoption, Innovation Diffusion Theory (DOI) [19], Technology-Organization-Environment framework (TOE) [20], Institutional Theory [21], and DeLone & McLean's Information System Success Model [22] are prevalent theories in IS research. Rogers Everett [19] proposed DOI for innovation acceptance and adoption among individuals and organization. The theory focused on technology characteristics such as relative advantage, technical complexity, trialability, observability, and technical compatibility in individually technology adoption such as cloud computing [23]. The theory elucidates "innovations as being communicated through certain channels over time and within a particular social system" [19]. DOI does not emphasize on environmental aspect.

TOE framework proposed that the decision of adoption is influenced by three contexts namely technological, organizational and environmental. As the theory provides generic contexts; it allows easy inclusion of new predictors [24]. Therefore, the empirical study applying the TOE framework used slightly different factors in the technological, organizational, and environmental contexts [25].

Institutions are a critical component in the environment and exert three type of pressure namely coercive, normative, and mimetic [21, 26]. These pressures are presented in the Institutional theory. The Institutional theory focuses on the extensive and more robust characteristics of the social framework [27]. Meanwhile, the DeLone & McLean model focuses on six significant dimensions which are information, system, and service quality, (intention to) use, user satisfaction, and net benefits [22]. These dimensions are

interrelated and interdependent to forming IS success. The theory is suitable to the IS product implemented in organization or marketplace. Based on the literature reviews, this study takes into consideration two of the adoption models, i.e TOE framework and Institutional theory based on their relevance to EA adoption. These models are explained as follows in the following sections.

4.2.1 Technology-Organization-Environmental (TOE) framework

TOE framework is an organization-level theory that consists of Technological (T), Organisational (O) and Environmental (E) contexts [20]. It has been described as a generic theory as it allows easy inclusion of additional construct as well [24]. TOE framework is consistent with the theory of the Diffusion of Innovations (DOI), as the DOI adoption are comparable to the TOE organizational and technological contexts elements [25]. Indeed, the TOE framework has been shown to be useful for a wide range of innovations and contexts as well as it has been broadly supported by empirical work and well-established studies [28].

The adoption of innovations is affected by technological, organizational, and environmental contexts within a firm [25, 29]. Many Information System studies have utilized the TOE framework in different settings such as Halal warehouse service by Ngah, et al. [30], Electronic Customer Relation Management (e-CRM) by Sophonthummapharn [31], e-Procurement by Teo, et al. [32], RFID by Wang, et al. [33], e-government by Pudjianto, et al. [34], Open Government Data (OGD) by Wang and Lo [35], open platform by Shim, et al. [36], Software as a Service (SaaS) by Yang, et al. [37], and the Internet of Things (IoT) by Hsu and Yeh [38].

4.2.2 Institutional theory

Similarly, Institutional theory focuses on organizational pressure (P) such as coercive and normative and mimetic pressure [39]. The Institutional theory is an approach to analyzing many diverse sectors and organization fields. It probes how organizational pressure is created, diffused, adopted, and adapted over space and time by rules and regulation, cultural expectation and limitation from other organizations [40]. Pressure is an influential factor for organization reform [41-43]. Pressure has been examined as a motivational pressure in green IT and suggested as a motivational factor for EA adoption [44]. The elements of the Institutional Theory are comparable

to the TOE environmental context elements; for instance, regulatory and internal pressure. Other information studies have analysed organizational pressure in different contexts such as IT Green by Kuo and Dick [45], ecological sustainability by Chen, et al. [40], and public sectors by Hjort-Madsen [43].

EA is seen as an organizational innovation that incorporates different business functions, cultures, tools, methods, and information within an organization. From the theoretical lens, EA requires a wide-ranging theory to explain its adoption challenges in the organization. As such, technology adoption or acceptance theories suits as a theoretical lens in EA adoption study. However, there is lack of studies to analyze the determinants from the perspective of pressure in EA adoption study. The prior research on the adoption of EA also reveals that there is a dearth of environmental and organizational pressure factors, Therefore, there is a need to adopt an organizational-level theory to understand and explain the EA adoption at the organization level. This study chooses the TOE framework and institutional theory to investigate the EA adoption in the context of influence factors within the scope of TOEP.

5. RESEARCH METHODOLOGY

The preliminary information is gathered by Systematic Literature Review (SLR) and unstructured interview with EA experts. SLR is a primary study that encompasses secondary study and individual studies. This technique was performed at the beginning to identify and review the current evidence relating to criteria and scope towards EA adoption. The technique adopts SLR guidelines of [46]. This study follows the criteria by Barbara and Stuart [46] to design the SLR questions where the criteria are namely population,

Table 2. These identified factors are also grouped into four contexts namely Technological, Organizational, Environmental and Pressure (TOEP).

As Sekaran and Bougie [47] mentioned preliminary information gathering could be conducted to several people in the work setting or other relevant sources, therefore this study conducted a series of unstructured interviews with three (3) EA experts from both industry and academia. The objective is to seek the information especially contextual issues and factors of EA

intervention, outcomes, comparison, and context. Thus, the research question formulated is *"What are the factors that influence EA adoption in organizations?"*

The published articles were reviewed from six online scientific databases comprised of the ACM Digital Library, Scopus, SpringerLink, ScienceDirect, Emerald, Wiley and Google Scholar. Search terms comprised of the following combinations; 'enterprise architecture', 'adoption', 'challenge', 'issues', 'research method', 'theory', influence factor'. The search string is then assembled using Boolean connectors "AND" and "OR" to allow synonyms and word class variations of each keyword. The search string was fulfilled in the online database to titles, abstracts, and metadata, assuming these offers a short outline of the work. The criteria comprised of articles in English from journal articles, conference proceedings, technical reports, theses, and books as well as studies that fit the research question. Articles that are not written in English and mismatched the inclusion criteria were excluded.

Initially, a total of 1,674 studies were retrieved from the databases using the search strategy. After an exhaustive elimination over the titles and abstracts, only 51 studies were found to be potentially relevant. Then, full-text articles were used when abstracts were not adequate in identifying the relevance of a paper. The remaining 51 articles were filtered by looking at the introduction, headings, and conclusions. Finally, after a thorough evaluation of relevant articles and exclusion of duplicates, 16 studies were recognized for the synthesis of evidence. The result from literature contributes to the identification of 15 factors that influence EA adoption by organizations as presented in

adoption [47]. All experts have working experience more than eight years in academia and three years in the field of EA. The interviews were conducted individually with time allocation approximately 30 minutes to one hour. Experts are defined in a number of ways are such as the person who is knowledgeable or very skilful in particular area [48], their position in a hierarchy [49], and suggested a representative of a professional group [50].

The interviewees for this research were identified using criteria such as working experience in IS/IT, years of experience in EA, qualification,

and position in the organization [51]. Relatively, the experts have working experience of more than ten (10) years in academia and three (3) years in the field of EA. The interviews were conducted individually with time allocation of approximately 30 minutes to one hour as shown in Table 1. The summary of the most recent literature points out several key themes and needs for further investigation into EA adoption. Considering that it was not possible to include all potential factors affecting the adoption of EA, the choice of theoretical constructs were determined through an extensive literature review issues, challenges and factors influencing EA adoption.

Table 1: The information of interviews.

Position	Academician (EA practitioner in MPS, certified TOGAF EA)	EA expert (a Lead agency in MPS)	Project Management Office of EA (EA practitioner at ministry level in MPS)
Expert ID	Expert 1	Expert 2	Expert 3
Agency	Agency A	Agency B	Agency C
Category	Senior Lecturer	Top management	Senior executive
Interviews information	Date: 16 April 2018 Day: Monday	Date: 18 April 2018 Day: Wednesday	Date: 23 April 2018 Day: Monday

6. A PROPOSED CONCEPTUAL MODEL

This study takes into consideration two of technology adoption models, which are TOE framework and Institutional theory which have been widely adopted for studies in organizational context. A wide range of factors has been found in the literature, instead of repeating them, this study chooses to focus on a few factors that are believed to be important in understanding and explaining EA adoption. It is observed that there are common factors identified from different studies for instance; good governance [52, 53], clear communication [8, 53, 54], top management support [9, 10, 52, 55], EA knowledge and skill [10, 56, 57] and other business influences.

Indisputably, technological factors for example technology readiness [52, 58], vendor support [52, 54], and technology complexity [8, 59] as well as environmental aspects such as competitive pressure MacLennan and Van Belle [52] play an important role when adopting EA in the organizations. Also, organization size is included as a moderating factor to determine the level of influence of the TOEP factors to EA adoption. Organization size indicates the organization's number of employees [60]. A specific study by MacLennan and Van Belle [52] reveals that human resources or organization size critically influences the adoption of EA, whereas other studies [10, 44, 54, 61] show significant factor in their research. Organisation size is an important variable to measure the moderating influences in EA adoption, as TOE is enhanced in explaining inter-organization innovation [62].

From the interview, Expert 1, an academician also adds that organizational context such as top management support, clear communication, EA knowledge and skill and financial commitment are important factors that influence the organization to adopt EA. This statement is consistent with the opinion of industry experts, which are Expert 2 and Expert 3. Besides, all experts agree that pressures such as rules, norms, and regulation affect the organizational adoption of EA. Expert 1 also adds that the size of the organization has a potential factor toward EA adoption in different organizations. In line with previous researches, the identification of possibly TOEP factor to EA adoption. In this paper context, the underpinning theories should have been shown to be useful through a wide range of innovations and contexts.

EA adoption requires the organizations to change their baseline architecture when transforming. In this aspect, the principles guiding this paper in choosing the appropriate theory are based on the following principle. The principle is the adoption level is prominent in the effort that the adoption process will be adapted collectively. Reasonably, the social impacts of innovation such as EA that transforms how people acquire and use EA need to be taken into account [63]. It is generally referred to as organizational users [64]. The users of different levels that execute different business' function are such as employees who handle human resources management, strategic development, IT specialists who provide technical support, and managers who make decisions based on the information obtained. Thus, it is suggested

that TOE and pressure are used as a lens to view EA adoption. This is consistent with the previous study suggested that organizational theories would explain the change or transformation in the organization [65]. The summary of identified factors that influence adoption of EA is stated in Table 2.

Table 2: Factors that influence the adoption of EA

CONTEXT	FACTORS	SLR															INTERVIEW			TOTAL
		[43]	[9]	[44]	[5]	[52]	[56]	[10]	[53]	[55]	[54]	[8]	[59]	[57]	[58]	[41]	Expert 1	Expert 2	Expert 3	
TECHNOLOGYY	Technology Readiness					√				√			√	√	√			√	√	7
	Technology Complexity											√	√					√	√	4
ORGANIZATION	Top Management Support		√			√	√	√	√	√			√				√	√	√	10
	Relative Advantage			√		√									√		√	√	√	6
	Organisational Readiness		√	√			√	√		√			√	√			√	√	√	10
	Clear Communication								√		√	√	√				√	√	√	7
ENVIRONMENT	Good Governance					√			√	√			√	√	√		√	√	√	9
	Vendor Support					√					√							√		3
PRESSURE	Mimetic Pressure	√														√	√	√	√	5
	Coercive Pressure	√														√	√	√	√	5
	Normative Pressure	√		√				√								√	√	√	√	7
Organisation size						√											√			2
TOTAL		3	2	2	1	5	3	3	3	3	3	2	6	3	3	3	9	11	10	75

6.1 Hypothesis Development

The research hypotheses can be classified by technological, organizational, environmental, and organization pressure context variables. The conceptual model consists of twelve factors that are hypothesized to have a direct influence on the adoption of EA. The hypothesis development is essential to test factors toward EA adoption are indicated in following sections.

6.1.1   Technological context

The technological context includes the internal and external technologies that are relevant to the firm. Technologies may include both types of equipment as well as processes [20]. Many studies argued that technology plays an important role and found positive effect in innovation adoption at organization level [30, 31, 35-37, 66]. The accessible technology variables are perceived advantage, perceived easiness, compatibility, observability, trialability, compatibility, complexity, and perceived barrier.

However, this study will employ the technology variables of technology readiness and technology complexity as suggested by [10, 44, 52, 54, 59, 61, 67]. The logic argument that technology readiness is crucial to the pace of adoption will become faster than an organization that does not have the technology. Technology readiness is the degree to which a focal firm has the necessary technology infrastructure and IT human resources to implement the Inter-organizational Business Process Standards (IBPS) [68].

Meanwhile, vendor support was identified and recognized in the technology adoption phase especially in Enterprise Resource Planning (ERP) [69]. While the technology complexity has been recognized as technological factors as it affects time, cost and management control [70, 71]. The explanation of technology complexity is the degree to which the use of technology is free of effort [72]. These analyses of the relationship between technological factors and technology adoption can be extended to EA adoption. Therefore, this paper proposes the following hypothesis based on the evidence:

H1:   The technological factors influence EA adoption.

H1a: The technology readiness significant positively influences EA adoption.

H1b: The technology complexity significant negatively influences EA adoption.

6.1.2   Organizational context

The organizational context refers to the characteristics and resources of the firm, including top management support, relative advantage, organizational readiness, and clear communication which are among the most accepted predictors of innovation [29, 63] [20, 29]. These characteristics also refer to descriptive measure. However, the extent to which these organizational variables influence phases of innovation adoption has not been examined [29]. Top management support has been considered one of the most influential organizational factor for IT adoption in organizations [73, 74]. Other scholars argued that top management support is accountable for the norms, cultures, values, visions, and missions as indicated by Balaid, et al. [75], which eventually encompass the entire community in the forms of regulations, policies, routines, and procedures, and serve as powerful templates. Study by Wang, et al. [76] reveals that top management support provides necessary involvement, resources, and authority in guiding and assisting the innovation. For example, the financial resource has long been posited as a barrier to innovation adoption [77].

Unlike the typical study that focuses on post-adoption stages, that is, the actual use of innovation like e-business Zhu and Kraemer [78], this study focuses on adoption stages (or intent to adopt). EA is a costly investment in hardware, software, system integration, and change management [55]. Sufficient financial resource helps the organization to obtain these necessary resources and develop EA skillset and competency. The researcher argued that to ensure the innovation is cost-effective for the organization, a considerable amount of money is often allocated for innovation with greater motivation exerted for the innovation within the organization [79]. This is also consistent with prevailing scholars who studied on EA [10, 52, 59, 61]. The choice of this variable also emerged during an interview session with the EA practitioner team. Top management support is an important factor in the adoption of innovation and has been found to be positively affected in Radio frequency identification (RFID), software-as-a-service (SaaS), e-Government adoption, and cloud computing [23, 34, 37]. Specific studies on EA [43, 44, 52, 54, 59, 80-82] found that top management support is a critical determinant adoption.

Relative advantage is reasonable to take into account the benefits that stem from adopting EA. It can be seen as the relative advantage, "*who saw it as the degree to which an innovation is perceived as providing greater organizational benefits than the idea it supersedes or the status quo*" by Rogers Everett [19], can form part of the organizational context. Many studies have found that the benefit of EA is an important factor to influence organization in adopting EA [5, 10, 44, 61, 83, 84]. Organizational readiness is another crucial variable in innovation adoption [76, 85]. Organizational readiness includes the support from different organizational level, adequate technical support and experienced people within the organization that can provide a significant business advantage [86]. In general, the EA knowledge and skill represents the totality of organizational EA knowledge and skilled personnel within an organization. This factor is part of the requirements among organizational employees for adoption to gain specific knowledge and skill [10, 54, 56, 87]. In the context of EA adoption, EA knowledge and skill are practical ways in which organizations can promote EA adoption. In return, the organization would be benefited from the return on investment [88]. Hence, organization readiness has found a driver of adoption in similar IS studies such as Halal warehouse service by Ngah, et al. [30], Internet of Things (IoT) by Hsu and Yeh [38] and Open Government Data (OGD) by Wang and Lo [35].

An additional factor is recognized under organizational context which is clear communication. Clear communication constitutes another important variable in the EA literature [54, 59] and prevalent studies discovered the problem hindering EA adoption is communication failure among the EA team, and business and IT personnel [44, 54, 83]. This variable is strongly recommended by Hjort-Madsen [80] that IT planning must address the language gap between business and IT personnel to gain a mutual understanding about the organization's strategies and objectives. This variable appears vital in the Technology-Organization-Environment framework and diffusion of innovations [19, 20] as both complement one another. Therefore, this study proposes the following hypothesis based on the evidence:

H2: The organizational factors influence EA adoption.

H2a: The top management support positively influences EA adoption.

H2b: The relative advantage positively influences EA adoption.

H2c: The organizational readiness positively influences EA adoption.

H2d: The clear communication positively influence EA adoption.

6.1.3   Environmental context

Environmental context refers to the market or sector within which the organization operates [20, 29, 63]. Concerns are given to two critical environment factors that are factored into this conceptual research framework; governance and vendor support. The definition of governance by Patnayakuni, et al. [89] stated that it is the degree to which long-term considerations, mutual gains, and informal governance characterize a firm's relationships with its partners.

To institutionalize EA in the organization, a new governance regime must be introduced [90]. Although, governance has significant adverse effect in the study of E-Participation and E-Government Maturity (Krishnan, et al. [91], it is highly suggested by other scholars [10, 44, 52, 54, 59, 61, 67, 84] for EA adoption. The vendor support as a third party dependency which the group relies on IT suppliers for problem determination and resolution, customization , interfaces , and functional enhancement to new IT [92]. EA is a long-term view of the organization Gilliland, et al. [55], and therefore it may be a lifelong commitment for many organizations. Consequently, the vendor supports a vital factor in procuring, installing, maintaining, and training the regardless of the type of technology that the organization has. Therefore, this paper proposes the following hypothesis based on the evidence:

H3:   The environmental factor influence EA adoption.

H3a: The good governance positively influences EA adoption.

H3b: The vendor support positively influences EA adoption.

6.1.4   Pressure context

The pressure focuses on the internal and external pressures such as normative, coercive and mimetic [21].   This pressure that is present in the Institutional theory has been widely used in IS research to understand the mechanisms of adoption

and implementation of innovation in the organization. This theory postulates that organizations are influenced by shared normative, external and internal pressures when forming organizational structures [21]. Such pressures have shown significant affect in the adoption of IS studies [29, 93, 94]. Furthermore, other studies claimed that institutional theory is of relevance when examining Open Government Data (OGD), assimilation processes [35], and technology adoption [95]. Thus, this research forecast that such pressures significantly influence EA adoption in the organization as Institutional theory summarizes all external and internal pressures.

Previous studies maintain that mimetic pressure is more noticeable at the early stage of innovation diffusion, where the uncertainty of outcome is high [36, 96]. said the studies indicate that a few organizations adopt the innovation at the early stage in the belief of it is efficiency. Other organizations that have yet to adopt the innovation surrender to the pressure to be different from the norm. Such capitulation then generates added bandwagon pressure [97]. According to Shim, et al. [36], this pressure induces other organization to follow the decision to adopt an innovation. There have been many excellent reviews of this theory [39, 98, 99]. Hence, this study expects the influence of mimetic pressure at an early stage, and it is salient.

Coercive pressure refers to "*the formal pressure and external pressure exerted upon them by other organizations upon which they are dependent, and the cultural expectations in the society within which the organization's function*" [21]. Such pressure has been suggested from previous EA adoption that regulation could affect project result in both ways, negative and positive [87]. Furthermore, by using the force of mandate, this pressure has great influence during adoption phase [100]. This variable is selected because its potential effect on EA has been identified in previous studies [41, 44, 81, 87, 101].

This is consistent with the study of Pudjianto, et al. [34] that a lack of a supportive regulatory environment on e-government will result in a negative effect on assimilation. Normative pressure is "*driven by pressures brought about by professions. One mode is the legitimization inherent in the licensing and crediting of educational achievement. The other is the inter-organizational networks that span organizations. Norms developed*

during education are entered into organizations" [21]. According to DiMaggio and Powell [21], the norm developed during education are included into the organization.

The consequence, people from the same educational backgrounds will approach problems in similar ways. In this case, organizational culture holds the uniqueness in every organization. The specific study reveals that the role of organizational culture is significant to recognise investment needed with limited resources for Enterprise Architecture Management (EAM) in different organizational culture [102]. The organization has different perspective and reaction toward intention to use or adopt EA adoption and hence leads the organization to change, which is one of the hardest things [44, 102]. Organizational culture portrays in term of how committed employees are towards the common objectives and decision in EA adoption. This variable has been shown to influence EA study Simon Weiss [103] significantly and suggest for EA adoption [10, 44, 80, 87]. In this regard, it is the following hypothesis is formed:

H4:   The pressure factors influence EA adoption.

H4a: The mimetic pressure positively influence EA adoption.

H4b: The coercive pressure positively influence EA adoption.

H4c: The normative pressure positively influence EA adoption.

6.1.5   Moderating variable
Organization size is indicated by the organization's number of employees [60]. Studies reveal that organization size critically influences the adoption of EA [10, 44, 54, 61]. Organisation size is an important variable to measure the moderating influences in EA adoption, as TOE becomes better able in explaining inter-organization innovation [62]. Other specific studies confirm that size is a critical factor in technology, e-procurement and RFID adoption though non-critical in techno-relationship innovation [32, 33, 95]. While Khan, et al. [4] found the organization size significantly moderates the relationship between transformational leadership and organizational innovation. Bohórquez and Esteves [104] also explored and found organization size moderates the impact of Enterprise Resource Planning (ERP) in Small Medium Enterprise (SME) productivity. The

inclusion of this variable is necessary and possible effect toward EA adoption as it is indicated from literature reviews and diffusion theories [19]. Other prominent scholars investigated that large organization accelerates EA adoption decision compared to the smaller organization as they own a greater number of employee and needed to remain at the leading edge of technology [20, 78, 85]. However, large firms are more likely to possess lack of resources but may be slowed down by structural inertia, and this may be positively related to innovation adoption [19, 105]. Keeping in view these findings, however, the past literature did not show the buffering effect of organization size as an important variable in the relationship between TOEP factors and EA adoption in the organization.

Therefore, this research proposes that organizational size moderates the relationship between TOEP factors and EA adoption in the organization.

H5a: The organization size moderates the relationship between Technological factors and EA adoption.

H5b: The organization size moderates the relationship between Organisational factors and EA adoption.

H5c: The organization size moderates the relationship between Environmental factors and EA adoption.

H5d: The organization size moderates the relationship between Organisational Pressure factors and EA adoption.

A conceptual model for EA adoption that organizes the potential adoption factors into TOEP contexts is developed and depicted in Figure 2.
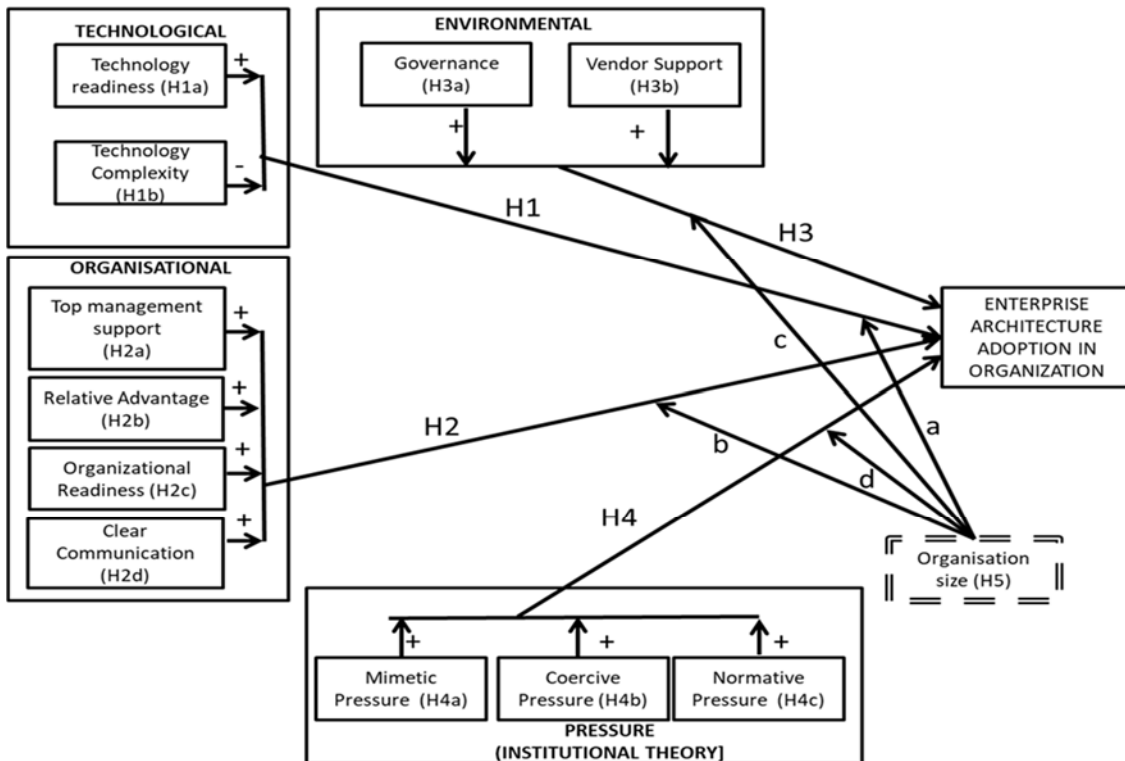

Figure 2: *The proposed conceptual EA adoption model.*

7. CRITICAL DISCUSSION

This research is primarily concerned with the evaluation and understanding of the relationship between technological, organizational, environmental, and pressure (TOEP) and EA adoption in MPS. The factors selected for the study and their corresponding relationship are closely followed by those presented in the TOE framework and Institutional theory, which has been generous, and applying the theoretical model in the field of IT and IS. Thus, the selection of an appropriate research approach is important to fulfil the research objective and research question of this research. There are two general research approaches explained in the research methodology literature, namely qualitative and quantitative research.

The selected research approach in this study is the quantitative approach which is in line with post-positivist philosophical assumptions. Positivism is the theoretical view that supports the use of a quantitative methodology for the present study. In addition, a quantitative descriptive research methodological approach proves most appropriate to explore the issues and factors raised by the research questions**.** Although the quantitative methods are not always directly transferable into social world approach, the methods can illustrate phenomena, show relationships, test hypotheses, make predictions and gain meaning from the implications of a problem to be solved [106]. Creswell [107] indicates pertaining qualitative studies as follows:

"In the scientific method, the accepted approach to research by a post-positivist, an individual begins with a theory, collects data that either supports the theory or refutes the theory, and then makes necessary revisions before additional tests are made."

Typical examples of quantitative methods are lab experiment, field experiment, survey, forecasting, and simulation. Therefore, the survey method is more appropriate for this study. A survey study is used to gather information about the factors to be investigated and appropriate to the purpose of the study. Subsequently, if this research is planned and carried out by following standard practices, it can produce high reliability analysis and findings [108]. Besides, Sekaran and Bougie [47] have stated that survey methods are inexpensive and efficient to gather information from the targeted population.

While the qualitative approach is best suited to address a research problem in which researchers do not know the variables and researchers seek in-depth information. This approach is in-line with relativist philosophical assumptions in which the view of reality is subjective [106]. Therefore, the methods such as open-ended questions, focus group, open-ended questionnaires are commonly used to gain individual's perceptions. This approach is termed inductive way as it takes one piece of information and tries to generalize the real world phenomena [109]. Hence the generalizability is problematic. As this research intends to investigate the factors influencing EA adoption and examine or measure the relationship between TOEP factors and EA adoption, the quantitative approach is best suited for this research. Such work would extend to prior study by Ylinen and Pekkola [110], which suggests more attention should be given to fundamental factors in EA. The study could be conducted in different type of organisation and deployed in different research method study for future.

The above discussion shows that multidimensional factors can significantly influence the likelihood of the decision maker to adopt EA in their organisation. Despite the many benefits EA can deliver [111-114], to date, little work has been published regarding its intention to use or adopt in developing countries like Malaysia. Although one experience study can be found from Finland [10] and Norway [44] in terms of EA adoption, however, results from these developed countries cannot be applied to the region. Furthermore, previous studies have provided fragmented contexts and post-adoption or implementation phase. According to Expert 2 from Lead Agency in MPS, although MyGovEA has been introduced in 2014 and many programs and awareness session have been done until now in the year 2018, public sector organisations are still in the low adoption of EA. Only two agencies have adopted MyGovEA in their organisations. This scenario indicates that the adoption of EA is slow among MPS organisation. Other recent study mentioned that although EA as an enabler for organisational change, the process of EA adoption is not systematic [110]. Since Malaysia is a developing country and the organisation types consist of federal and state governments [115], it is essential to conduct this study as the result might be different from previous studies regarding EA adoption. In addition, this kind of study is also lacking in the context of EA and public sector [116], specifically in the

Southeast Asian region, especially in MPS. Therefore, this study tries to fill these gaps. Through conducting systematic literature reviews, the researcher discovered the preliminary studies, constructs, and a conceptual model that may influence the EA adoption. The analyses of conceptual model in terms of factors suggest at least two areas of adoption research that need to be expanded for better understanding of the adoption's process. The first is the relationship between TOEP factor or variables and the adoption. The second area is the strength of relationships between variables that may change by adding the moderator. Such work would extend to the prior studies by Hjort-Madsen [80], Seppänen [44], and Syynimaa [10].

8. CONCLUSION AND FUTURE WORKS

To underpin the basis of factors existing in the literature, the study selected the TOE framework for its generic and broad applicability across technological, organizational and environmental contexts. Since the relevance of Institutional theory is found scarcely in the literature and essential to examine the organizational change toward EA adoption, this study developed an integrated TOEP (TOE framework and Institutional theory) for EA adoption. This paper has articulated the principle for choosing these two theories and adoption concept in the TOEP contexts. The objective of the research is to determine the factors that influence EA adoption and proposes the adoption model for organisation. This model offers 12 factors that possibly influence the EA adoption at the organization level. A total of ten (10) positive relationships, one (1) negative relationship and one (1) moderating variable were proposed addressing technological, organizational, environmental, and pressure related to EA adoption.

Therefore, this study is believed to provide advanced knowledge with the development of the extended and integrative TOE model with the inclusion of institutional theory and moderator variable and its relation to Enterprise Architecture adoption. This leads to the contribution in the EA adoption and IT management literatures. Since there is lack of research on EA adoption, this study allows researchers and practitioners to understand the relevant factors influencing EA adoption at the organizational level and adoption phase.

The integrative adoption model could also be used as a guideline that may lead to an understanding of the organizational-related factors and the underlying relationships of EA adoption for decision-makers. As a result, the effective adoption of EA can be facilitated in the organizations. The discussions in this paper are conceptual and must be further validated and verified through empirical testing. Further investigation need to be conducted to explain the relationship between Technological, Organisational, Environmental, Pressure (TOEP) factors and EA adoption in the organisation. The research method of survey using questionnaires is suggested to be employed on the multiple organizations as the selected sample size of the population. A Structural Equation Model (SEM) is also suggested for data analysis for each context of TOEP and concurrently investigates all the relationships. As such, it provides useful insights not only to the public sector industry but also other service-based industries which anticipate EA adoption initiatives. The government can provide the intervention plan such as policy and regulations for embarking EA in Malaysia public sectors. In addition, it also gives an impact to other sectors indirectly such as ICT vendors, consultancy firms who deal with public sector organisation to adopt EA in their business.

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