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Content Validation of an Enterprise Architecture (EA) Readiness Assessment Instrument

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Abstract. Although Enterprise Architecture (EA) is becoming an important agenda to align business with information technology plan, not many organisations, especially in the public sector, are ready to implement it. Therefore, there is a need to identify the readiness factors that affect the implementation of EA in the Malaysian Public Sector (MPS). Even though the readiness factors identified are influenced by a previous study, the instrument used to validate the factors needs to be re-evaluated to increase the probability of obtaining a supportive construct validity. Thus, the objective of this study is to present the content validity of an EA readiness instrument designed to validate EA readiness factors. This study used the content validity index (CVI) to quantify the relevance of EA readiness factors. To examine the content validity in the judgement stage, professional individual judgement is required. Questionnaires with four-point Likert scale were used for collecting feedback from experts. Item–Content Validation Index (I-CVI) was used to check the validity of individual factors and items for MPS with experts' feedback. Seven experts with information system background specifically in EA and having a wide experience on EA implementation were selected to participate in this study. The result showed that all 14 factors and 42 items scored above 0.857, suggesting that the instrument is valid and accepted for further studies.

1. Introduction

The emergence of e-government theories, and practices of public sector have made another phase of inclination in a new digital era. Enterprise architecture (EA) has become an important agenda of e-government to strategize business with an information technology plan. EA is a strategic approach to manage the complexity of an organisation [1][2]. This includes the public sector that recently has an interest in EA, thus the attention to this approach is evolving. Among the many benefits of EA, the public sector may foresee that EA is upheld as a holistic and feasible approach to tackle organisations with complex and fragmented portfolio [4]. However, the establishment of EA in public sectors faces some challenges. In Netherland, 66 per cent of the EA programme did not fulfil the expectation due to prolonged EA establishment [5].

One of the challenges identified is the readiness of the organisation itself to embrace EA. Readiness is the organisation's ability to adapt to the change. It includes both the people as well as the process and technology aspects of the organisation [6]. Thereby, several studies have been conducted on the importance of the organisation's readiness towards EA establishment. Jahani, Javadein, and Jafari [7] pointed out that any organisation that plans to establish EA must measure its readiness as a beginning step in the preparation process, since EA establishment may be unsuccessful if the organisation is not

ready for EA [3]. Readiness publication of EA studies in Malaysia began to grow from 2007. According to statistics, the lack of readiness in agencies to embrace EA is one of the critical problems that leads to slow EA establishment [10].

Based on this phenomenon, a study of factors that influence readiness in the establishment of EA needs to be conducted, which may consequently lead to the development of an EA readiness assessment model. A complete and comprehensive assessment instrument for readiness has not been established, although the factors that influence readiness have often been discussed in the literature. Hence, there is a need to have a standard EA readiness assessment instrument to get an accurate landscape of an organisation's readiness in EA establishment.

In instrument construction, a procedure called content validity is a vital step to validate the identified factors [11]. According to Singh [12], the purposes of content validity are to minimise the possible error variance associated with an assessment factor and to increase the probability of obtaining supportive construct validity indices in later studies. Therefore, content validity should be prioritised during instrument construction [13] and should be based on valid and reliable evidence [14].

The objective of the study is to present the content validity of an EA readiness instrument designed to validate EA readiness factors. This study uses content validity index (CVI) to quantify the relevance of EA readiness factors for the instrument development.

The following sections are structured as follows: Section 2 presents the related work, Section 3 describes the method used in this study, Section 4 discusses the results this study, and Section 5 concludes the study and offers recommendations.

2. Related Work

EA establishment describes a process that is involved in establishing the EA initiative [15]. According to Dang and Pekkola [16], establishment of EA programmes was initiated by the law, or by political or other pressures. Organisations had to react to these pressures by proposing requirements. The agencies saw EA as a promising solution to the apparent problems in their e-government initiatives.

During EA establishment, processes such as initiating EA program, planning EA activities, analysing and assessing the current state, designing and developing the architecture and its component, and lastly, EA implementation are involved [17]. Recent studies have shown that the actual progress on EA establishment is still unclear and the success rate is unpredictable. Therefore, suggestions by most frameworks and methodologies stated that it is important for organisations to ready themselves before embarking to an EA programme to ensure the success of EA implementation.

In Malaysia, MAMPU is the agency responsible for modernising public administration in the public sector. In 2014, MAMPU announced the adoption of MyGovEA, a common blueprint to guide MPS agencies on EA practices [18]. EA readiness assessment studies were conducted in 2014 and 2016 with the aims to assess readiness of agencies in the EA establishment in MPS. In general, the studies showed that the MPS is moving towards being partially ready to embark on EA practices [8,9]. Both studies were conducted using different methods because they engaged industrial consultants from different companies. Thus, the results may be interpreted in various ways and might not be accurate to cover the MPS landscape.

3. Methodology

The development and content validity of the new instrument involved two stages, namely stage 1: development of instrument and stage 2: judgement and quantification [19].

3.1. Stage 1: Development of instrument

Instrument development involved a two-step process, namely identifying main factors and items, and instrument construction [20]. First, the main factors and items were identified by a systematic literature review (SLR) on the research area and interview sessions with experts. From the SLR, four existing readiness assessment models in IS field were identified. From this, the IT/IS Maturity Model [21] was selected as a base theory for the development of proposed EA Readiness Assessment Model. Additional factors related to EA readiness were also identified from SLR and consolidated with the base theory. From the SLR and conducted interviews, this research identified another five factors that were

subsequently categorised accordingly into each element. Table 1 depicts the 14 factors categorised into Enterprise Environment (EE), People (PP), Process (PS), and Technology (TC).

Table 1. Descriptions and sources for each element and factor

Element	Factor	Description	Sources	Methodology		
				Adopted Theory [21]	SLR	Interview
Enterprise Environment (EE)	EA Vision (EE1)	The ability to clearly define and communicate what to be achieved. Provides the basis/foundation for the entire EA.	[7][22]	X	√	√
	EA Culture (EE2)	Involvement and practices of EA by the employees in the organisation. Includes activities to embrace EA in the environment of the organisation.	[21][23] [24][7][25]	√	√	√
	EA Management (EE3)	Creation of a specific plan and governance structure to facilitate change in the organisation.	[21][23]	√	√	√
	EA Resources (EE4)	Sufficient resource including human resources, asset resources business, and IT capacity in enterprise.	[23][26]	X	√	√
	EA Governance (EE5)	Structure, procedures, routines, and communications involving business and IT.	[21][27–31] [24]	√	√	√
People (PP)	Stakeholder support (PP1)	The highest hierarchy in organisation who continuously supports EA practices and acts as an executive sponsor.	[21][29] [30][32] [33][25]	√	√	√
	Competency and skills (PP2)	The ability to perform all the IT tasks required by the project, including the skills, tools, processes, and management capability.	[21][23] [26][25] [34]	√	√	√
	Management commitment (PP3)	Commitment of both the top management and the employees of the organisation to involve in the EA effort.	[21][32] [30][35] [33]	√	√	√
Process (PS)	Business motivation (PS1)	A business case that consists of focus for the project benefits that must be achieved reflecting vital to succeed. EA is driven by business requirement derived from business case.	[36][35] [30][34]	X	√	√
	Communication (PS2)	A formalised process through which interactions and information sharing between the CIO, ITO, and the chief	[21][26] [25][30] [34][33] [37]	√	√	√

Element	Factor	Description	Sources	Methodology		
				Adopted Theory [21]	SLR	Interview
		enterprise architect take place in the organisation.				
	Policy and rules (PS3)	A guideline for decision-making on architecture development, implementation and management, to ensure transparency and objectivity.	[26] [34][31]	X	√	√
Technology (TC)	EA Repository (TC1)	An infrastructure that consists of a storage architecture that manages and moves information to the most cost-effective data repository based on the value of each piece of information at that exact point in time.	[21][25]	√	√	√
	EA Tools (TC2)	EA management supporting tools for its practices and procedures such as modelling and developing tools.	[21][40]	√	√	√
	Security (TC3)	The safety of the communication of systems, flow of information, as well as the exchange of data and business processes. Includes reliability of security system and continuous review for accountability.	[41][36]	X	√	√

Next, from the identified factors, the instrument was constructed with refined items and organised in an appropriate format. Then, this instrument was validated in the next stage through steps called judgement and quantification.

3.2. Stage 2: Judgement and quantification

Stage 2 is the validation of content for the instrument items and the whole instrument. Seven experts were involved in this process. These experts consisted of instrument developer experts (two people) and EA experts (five people). The number of experts that needs to be selected has always been relatively subjective. Generally, to have sufficient control over chance agreement, a minimum of five people is suggested [13]. The probability of chance agreement decreases as the number of experts increases [13]. Following the guidelines by Davis [42] and Rubio [43], we chose experts from the public sector, industry, and academia who were well versed in the content area and knowledgeable about the development of survey measures. Next, we disseminated the instrument among the experts and analysed the results. Then, experts' feedbacks were analysed for relevancy or representativeness, clarity, and comprehensiveness of the items to ensure the content validity of the instrument [11,19].

We analysed the data using content validity index (CVI) approach to quantify the results. It is the most widely reported approach [19,42,44]. According to Davis [42], experts are required to rate instrument items in terms of clarity and its relevancy on a 4-point ordinal scale: 1 (not relevant), 2 (somewhat relevant), 3 (quite relevant), and 4 (highly relevant). To obtain CVI relevancy and clarity of each factor and item (I-CVI), the number of those who rated the factors and items with 3 and 4 was divided by the number of experts. The I-CVI indicated that the proportion of agreement on the relevancy of each item is between 0 and 1 [42][45].

4. Results and Discussion

4.1. Stage 1 results: Development of instrument

In stage 1, the results led to identification of four elements, namely enterprise environment, people, process, and technology. Theoretically, each of these factors and items was defined by combining SLR and interview. Hence, 14 factors and 42 items were identified based on elimination of overlapping and duplication and the instrument was made based on these factors and items.

4.2. Stage 2 results: Judgement and quantification

All 14 factors and 42 items scored 0.857 to 1.00, thus indicating that all are accepted and considered as a valid instrument. Table 2 depicts the analysis of I-CVI. The overall result showed that the number of factors and items considered relevant by all the experts is 14, while the number of items considered relevant by all the experts is 42.

Table 2. Analysis of I-CVI for factors and items of EA readiness.

Factors and items of EA readiness	No. of expert who rated 3 or 4 to relevancy of factor and item	I-CVI	Interpretation
EE1: EA Vision	6	0.857	Appropriate
EE1-1: Align EA with business vision	7	1	Appropriate
EE1-2: Clear objectives	7	1	Appropriate
EE1-3: Defined vision include business and IT	6	0.857	Appropriate
EE1-4: Predict and prove processes	7	1	Appropriate
EE1-5: Clear drivers	7	1	Appropriate
EE1-6: Clear scope and approach	7	1	Appropriate
EE2: EA Culture	7	1	Appropriate
EE2-1: Awareness program	7	1	Appropriate
EE2-2: Encourage participation	6	0.857	Appropriate
EE2-3: EA Culture as delivery oriented	7	1	Appropriate
EE2-4: Empowered and shared EA with staff and stakeholder	7	1	Appropriate
EE3: Change Management	6	0.857	Appropriate
EE3-1: Strategy alignment	7	1	Appropriate
EE3-2: Management of the vertical and horizontal relationship	7	1	Appropriate
EE3-3: Management processes are in places	6	0.857	Appropriate
EE3-4: Reward and recognition	7	1	Appropriate
EE4: EA Resources	6	0.857	Appropriate
EE4-1: Employees capable to perform all the tasks required	7	1	Appropriate
EE4-2: Organisation ensures service management processes are in place	7	1	Appropriate
EE4-3: Sufficient financial resource	7	1	Appropriate
EE5: EA Governance	7	1	Appropriate
EE5-1: Formal governance structure	7	1	Appropriate
EE5-2: Clear identification of stakeholder with interest	7	1	Appropriate
EE5-3: Roles and responsibilities	7	1	Appropriate
PP1: Stakeholder support	7	1	Appropriate
PP1-1: Leadership and management provision	7	1	Appropriate
PP1-2: Stakeholders' continuous support	7	1	Appropriate
PP1-3: Mutual understanding among stakeholders	7	1	Appropriate
PP2: Competency and skills	6	0.857	Appropriate

Factors and items of EA readiness	No. of expert who rated 3 or 4 to relevancy of factor and item	I-CVI	Interpretation
PP2-1: Having a competent and skilful EA architect in place	7	1	Appropriate
PP2-2: Presence necessary skills to execute EA programme	7	1	Appropriate
PP2-3: EA competency model	7	1	Appropriate
PP3: Management commitment	7	1	Appropriate
PP3-1: Support from top management	7	1	Appropriate
PP3-2: Top management and stakeholders' continuous engagement	7	1	Appropriate
PP3-3: Active involvement from top management and other stakeholder groups	7	1	Appropriate
PP3-4: Sufficient knowledge about EA to foster commitment	7	1	Appropriate
PS1: Business case	6	0.857	Appropriate
PS1-1: Identification of concrete benefits that organisation needs to deliver	7	1	Appropriate
PS1-2: Clear stated points to goals that the organisation is committed to achieve	7	1	Appropriate
PS2: Communication	7	1	Appropriate
PS2-1: Common, well-defined vocabulary of terms and concepts	7	1	Appropriate
PS2-2: Clear roadmap on EA implementation	7	1	Appropriate
PS2-3: Documentation for references	7	1	Appropriate
PS3: Policy and Rules	7	1	Appropriate
PS3-1: Standard business policies and rules	7	1	Appropriate
PS3-2: Standard principles and guidelines	7	1	Appropriate
TC1: EA Repository	7	1	Appropriate
TC1-1: Centralised digital repository	7	1	Appropriate
TC1-2: Easy access and retrieval	6	0.857	Appropriate
TC2: Security	6	0.857	Appropriate
TC2-1: Reliable security systems are in place	6	0.857	Appropriate
TC3: EA Tools	6	0.857	Appropriate
TC3-1: Suite with selected EA methodology and framework	6	0.857	Appropriate
TC3-2: Adequate support for management and maintenance	6	0.857	Appropriate

Regarding face validity results, the experts' opinion was to make some items more understandable with some examples and explanations and standardisation of sentences. As a result, the instrument was prepared with 14 factors and 42 items.

5. Conclusion

To conclude, this paper presents the analysis and results of the content validity of an EA readiness. The instrument was designed to validate EA readiness factors for the development of an EA readiness assessment model in MPS. This paper illustrates the empirical assessment of the content validity, which can be a useful guideline for researchers in developing their own instruments. More importantly, the development of instrument needs to include the identification of good factors and items deduced from SLR and a series of interviews with an appropriate panel of experts at the beginning of the content validation process. The result showed that all 14 factors and 42 items scored above 0.857, and thus are accepted and considered as a valid instrument. Content validity is a crucial aspect in instrument development and yet is infrequently assessed in instrument validation, especially in the area of

information systems. Thus, it is hoped that this study will promote the use of content validation in a broader context of EA research. There are limitations regarding the feedback from experts. Experts' feedback is subjective; elements of biases may exist among the experts. Thus, it is important for the researcher to identify the contain domain exhaustively to get the maximum feedback.

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7. References

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