

# Procurement Framework Analysis and Evaluation of E-procurement Implementation Adoption using UTAUT Model

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**Abstract**—The study has developed a Customized Procurement Framework by integrating the Frameworks from Project Management Body of Knowledge (PMBOK), Information Technology Services Management (ISO 20000-1) and Methodology for Assessing Procurement Systems (MAPS). The gap of procurement process in the company was analysed by comparing to a Customized Framework through Focus Group Discussion. The gap analysis showed that Process Group Vendor Relationship, Procurement Core Process and Administration were significantly improved after the implementation of e-Procurement system, whereas Customer Relationship and Procurement Control & Audit was only partially improved. The Process group of Legal Compliance and Management Direction were not impacted by the system implementation; hence those would lead to the recommendation for company to enhance the development of the area aforementioned. Furthermore, the analysis also considered the user adoption of e-Procurement software implementation by using UTAUT Model. The online questionnaire was distributed to 30 respondents as key users of the eProcurement system that has been implemented. The users were representing vendor, user requester, IT support and the Procurement Operation team. Result of UTAUT evaluation showed that Behaviour Intention to Use the system was most influenced by Performance Expectancy, hence it should be considered when developing the next phase of e-Procurement application.

**Keywords**—e-procurement, framework, PMBOK, ISO, MAPS, UTAUT

## I. INTRODUCTION

### A. Background

Procurement Process in the company is managed by particular function appointed by Board of Directors, namely Procurement and Investment Function (PIN). It reports directly to the Board of Directors, and its responsibility is to

manage the procurement process of product as well as services.

There are some hurdles experienced by PIN officer, such as many hardcopy documents have to be kept, with the risk of hardcopy documents damaged or lost. Current average leadtime of processing the procurement request in the company is 14.7 days. This leadtime is considerably too long because when the requested users especially in the business operation are preparing the heavy equipment unit by adding the auxiliary components, they need to get the goods in shortest time possible. If this process is delayed then the heavy equipment unit cannot be delivered to customer, and that will affect the billing-cycle time as well. The ideal average time should be less than one week.

### B. Research Objectives

The Research objectives of this study are: 1) Framework evaluation of procurement process in the company comparing to the customized integration framework of established framework (ISO, PMBOK, MAPS). 2) Find correlation of user adoption of e-procurement system using UTAUT methodology. 3) Analyze the Gap of procurement framework & give recommendation for improving e-procurement system implemented hence shorten the leadtime.

### C. Significance of Study

The implementation of e-procurement would give positive impact to company if the system is used effectively by all stakeholders. This study will find out and analyze the gap between procurement management system implemented in the company and the customized integrated framework, thus the company could pursue for enhancement of the business process. Furthermore, the company could identify what factors were most affecting

the intention to use the system, hence it can be used for enhancing the software system.

#### D. Research Questions

- 1) What gaps are occurred between procurement framework in the company and standard Framework?
- 2) What factors are affecting most to User Adoption of e-procurement system?

#### E. Hypothesis

- 1) There are gaps between the integrated framework and procurement framework in the company that has not been covered by the procurement system implementation.
- 2) Performance Expectancy have significant influence to Behaviour Intention to use the system.

## II. LITERATURE REVIEW

### A. Research model

Research Model in this study will use framework analysis and the integration of framework approach. The UTAUT model framework is used for assessing the adoption of e-procurement system implemented,

### B. Previous study

This study will develop the customized procurement framework based on the previous research that said the combination from three framework can be used to define a guidance [1]. However, in her case is using the framework combination for Risk Management, while in this study the framework would be in procurement management. The procurement management would use PMBOK but the combination with other frameworks would be the corresponding frameworks namely ISO 20000 and MAPS.

Another highlight would be from previous research that has similarities with the company condition in this research. The mentioned research was taken in the Samarinda City Investment, that has implemented the system but not yet conduct the system evaluation [2]. The study from that research has the result stated that Performance Expectation is the variable that most influencing the adoption of the system implemented in Samarinda office. Therefore, they could improve the system in order to support their services. This is the same way that this study wants to achieve the objectives for improvement in the company.

Another research [3] will also enrich this study because they use the same standard as reference, namely PMBOK. Slightly different in this study the focus would be on Procurement Management, so we could learn from those researches that both standards are meant to be complementary to each other, so that we could have beneficial of those respective frameworks.

The other supporting research would be a good source of knowledge to have a practical use of methods taken in this study, like in the Exelsa research they use the similar analysis method [4] to evaluate the application system. The enhancement of procurement also supported by the research that has proven in improving the purchasing function [5].

Table I showed the list of previous study which become the major literature reference of this research. The research explained in this section considered as the main literature of this study, according to the construct/variable, methodology, and research area similarities to this.

TABLE I  
PREVIOUS STUDY

Author	Objective	Framework	Result	Adaptability
[1]	to created a guidance to manage the IT Risks through combination of three frame-works	PMBOK, COBIT 5, ISO 31000	IT Risk Management guides	+++
[2]	to determine the variables that affect use and to provide input & suggestion to organization so that system can be better & accepted	UTAUT	performance expectation greatly influence the acceptance and utilization of this information system	+++
[3]	to compare and evaluate two most popular versions of PM standards; PMBOK and ISO 21500.	PMBOK, ISO 21500	Recommend to use both stand-ards as comple-mentary and use their text to pro-mote of standard projects	++
[4]	to find relation-ship of factors that influence acceptance and use of Exelsa	UTAUT	PE, EE, SI, and FC each have a positive and sig-nificant correla-tion on BI. Meanwhile, FC does not have a significant correlation with UB.	+
[5]	IT can explain performance of the purchasing function	own framework, SEM	positive effect of implementa-tion advanced purchasing prac-tices, (eg. sup-plier control), contribute to improve quality, cost, flexibility and reliability outcomes.	+

Note: Adaptability (+++) means similar condition with this study  
 (++) means medium adaptability with some conditions could be applied  
 (+) means can be referenced for the methods but in different conditions

### C. State of the art

There is no previous study that integrate procurement frameworks that use standard framework of PMBOK, ISO-20000, MAPS.

This study is also observing the IT system development feedback from the UTAUT model study to find out what factors affected most to User Adoption of system and could then be improved accordingly.

So, this study would make beneficial contribution to the company, and could be used as a referenced procurement framework whenever other organization facing similar conditions.

### III. RESEARCH METHODS

#### A. Research Process

The research methodology applied for this research is to form a customized procurement framework, then have it be validated in current company condition, and have the hypothesis tested according to the theories and prior empirical studies.

The research followed the process flow as shown in Fig.1 below, starting from data collection, then do the validation stage. The approval of those validations will determine whether the process can continue, otherwise the validation stage is repeated. Next the correlation test will bring the result to be discussed and come to the end of process.

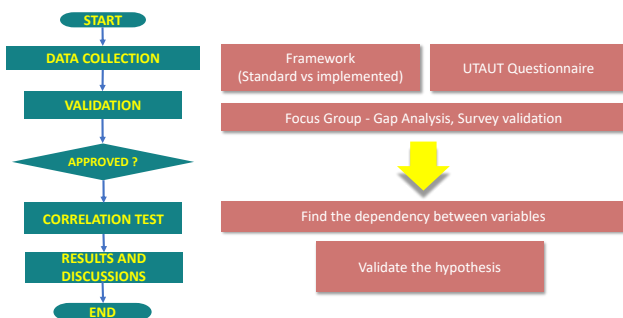


Fig.1. Research methods flow

The assessment and validation depicted in Fig.2 explain that the activity of Framework Analysis will develop the integrated framework from the established frameworks as

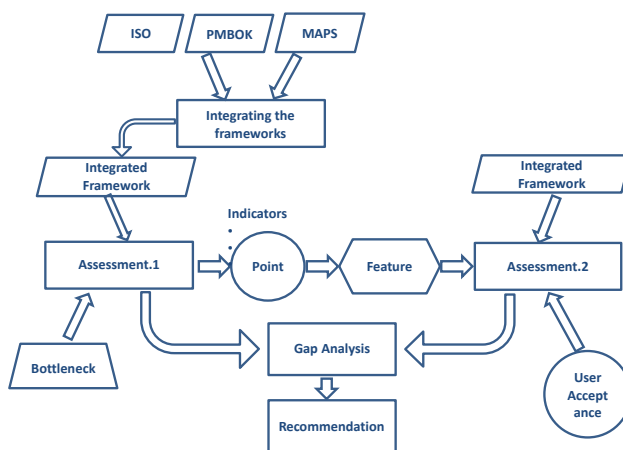


Fig.2. Research assessment framework

reference. After that we would make assessment analysis of existing implemented framework compared to the standard reference.

The process to define the integrated framework is as follows:

Split each indicator from respective framework, then find out the common indicator from each domain. Mark each indicator clause number, and put in the domain. Then define each domain a name to reflect the group of processes. Next conduct the FGD to identify and determine the gap between processes before and after system implementation. Score are made base on how many indicator are fulfilled.

With reference from those previous research, this study will further enhance the procurement management in the company with the coverage of the integrated framework built, by giving the visibility of current condition when compare to the framework. The enhancement of management process could take place in parallel with the enhancement of the system application developed.

The former established framework (namely PMBOK, ISO, MAPS) would be used as a standard to conduct first assessment. Since we have several frameworks then those frameworks are combined to become a modified integrated framework, thus we can also identify potential bottleneck that are expected to be solved.

The first assessment taken would then identify the Points that were derived from the combined indicators. Those will then lead to provide some Features that are considered as demanded for ideal condition. Then this feature is evaluated through the second assessment.

To validate the framework assessment we use FGD with stakeholder expert, and alongside we conduct the User Acceptance measurement by applying UTAUT Methods using questionnaire survey.

UTAUT Model also have advantages because it is built based on extensive research review and considering the aspects of earlier study [6].

The UTAUT is widely used as shown in previous research, and has proven its purpose to fit with the system application evaluation. This purpose is also in line with the company intention to have improvement in the area of procurement management, and also the company want to make sure that the investment in developing application can be used effectively by the targeted users.

The Results are then to be analysed and Gap Analysis and recommendation are produced.

To validate the proposed framework, we call for FGD with the expert from procurement function, then from the FGD result we could take the gap analysis between standard framework and existing condition.

Focus group discussion is used in qualitative research to gain a thorough understanding of social study. The method focus on obtaining data from group of individuals which are purposely selected, rather than from a statistically sample of large population. [7]

Next step is to collect data from respondent through Questionnaire in order to capture the dominant factors affecting user behavior to use the e-procurement system that

has been implemented. The Questionnaire will follow the UTAUT Research Model.

After the distribution of questionnaire, the data is analysed through statistical tool mainly Microsoft Excel and SmartPLS to test the significance of the correlations and proving the hypothesis.

#### B. Data Sources and Collection

Primary data will be used in this research through distribution of questionnaire to the direct user that use the e-procurement software. Since the software itself is still in first phase of implementation, which are deployed to cover 30 user; therefore this study will conduct the questionnaire to all respective user. So this study will not use sampling method, but will cover all respondent as a census.

### IV. RESULTS AND DISCUSSIONS

#### A. Framework Mapping

PMBOK, ISO 20000, and MAPS, they all have common stages or processes for managing procurement. Before compiling the stages of the procurement process through a combination of the three, each of those procurement management processes is selected to be the chosen process. PMBOK will be used as the main guidance in the selection of this process. The sequence is then as follows: PMBOK will be compared with ISO, then after that it will be compared with MAPS. Processes which have the same activity or are assessed as having similar activities, will be combined into the same group.

Each framework will be chosen in accordance with its respective advantages. From the beginning, it has been explained that PMBOK has the advantage in this study that it has an explanation of how-to in managing procurement. PMBOK will be used to map the procurement process in the company because PMBOK is able to cover every phase in the procurement process in the company. However, for the details of procurement activities in facing to customer or user in the company, ISO has a more complete and clear picture, such as business relationship management, service level agreement.

After combining processes from those three frameworks, then it is being modified and integrated into a framework in Fig.3.

The house of procurement management defines the cluster of processes taken from three different frameworks. The symbol in each cluster identify the framework used as reference. There are two supporting of procurement main activities, namely Procurement Regulation, Legal and compliance together with Procurement Control and Audit. Those supporting process is important to make sure the Procurement activities are conducted in good governance and to avoid any misconduct either intentional or accidental. Another important aspect is the Management direction to guideline the procurement management and at the same time has visibility through the analytics.

Core process are grouped in three consecutive process, namely vendor relationship, procurement core process and administration, and customer relationship.

The Focus Group Discussion also conducted with selected audience. The participant is selected based on their expertise role. There are 6 persons join the Focus Group, with their detail role as follows. The Procurement PIN Function Head has expertise for more than 20 years in his Management Position and he currently lead the Procurement Function. There are 2 Procurement Department Heads that also join in the FGD, their experience is more than 10 years. One senior procurement team associates also has more than 5 years experience in the procurement organization. One representative from the requester user also join and he has managed the role in the requester for 3 years. Last one is the officer from the vendor, that also has the authorization to process the order from the company. As mentioned earlier regarding the conducted forum group discussion, it is performed via Microsoft Teams online video call also.

The opinion from FGD respondents are then taken into the observed condition before the system implementation, as well as their opinion on the condition after implementation of the system.

The important activity next is to conduct the analysis of Gap Observed, based on the opinion of FGD experts and considering the amount of indicators, the scale is then applied. For the Gap observed with 80% indicators or more are covered, then classify as significantly improved. They are the process in vendor relationship, procurement core process and procurement administration. When the indicators are not showing any impact to the system implemented then it is marked as not impacted. And for the value of gap indicators in between those category are then stated as partially improved.

This result of Gap observed shown in Table II would be used as the recommendation for the company to improve in the area that has not been impacted by the implemented system but it is considered as an important component in the resulted frameworks.

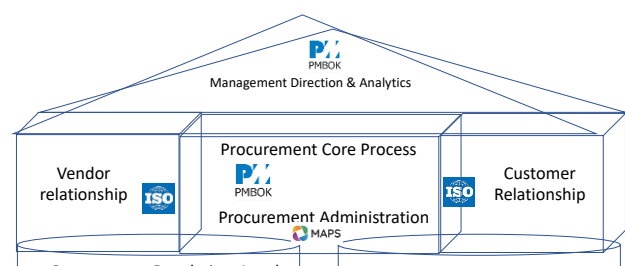


Fig.3. House of procurement framework

**TABLE II**  
**GAP OBSERVED DURING FGD**

Process Group	Condition before system	Condition after implementation	Gap Observed
Customer Relationship	Planning Cycle annually Service Level in separate system User don't have visibility progress	Planning cycle annually can see the historical data. User can see Vendor list and order tracking	partially improved (2/4)
Vendor Relationship	Documents are communicated using hardcopy Selection using Excel Vendor don't have visibility progress	Documents are managed in eProcurement system Vendor can see Document progress	significant improved (5/6)
Procurement Core Process	Procurement process is combination of manual sending and transaction system	Procurement process is managed within single-system	significant improved (5/5)
Procurement Administration	Using hardcopy document Separate system to maintain transaction cycle	Using e-procurement system enhancing the leadtime of transaction cycle	significant improved (4/5)
Management Direction & Analytics	Has Special Function of Procurement & Investment Group	Has Special Function of Procurement & Investment Group	not impacted (0)
Procurement Regulation & Legal Compliance	Policy & SOP has defined Pakta Integritas	Policy & SOP has defined Pakta Integritas	not impacted (0)
Procurement Control & Audit	Has PIN Function Has Pakta Integritas	Has PIN Function Has Pakta Integritas Service Level Review Process visibility	partially improved (2/7)

### B. Questionnaire structure

All of the indicators used in this research are using Likert Scale of 1-4; with (1) represents Strongly Disagree, (2) represents Disagree, (3) represents Agree, and (4) represents Strongly Agree.

The questionnaire is divided into two sections; first section would collect data about respondent identity and demography, while second section would be the UTAUT indicators asked to respondents. During this Covid-19 pandemic condition, it is more feasible to distribute online questionnaire to minimize the risk, as well as cost and time-effective purpose. Data will be collected by the Microsoft Forms and the link is sent via email to all respondents. UTAUT Questionnaire analysis

The respondent of questionnaire are choosed based on their role as direct user of the e-Procurement application. The respondent are consist of 16 person from PIN Procurement Function with their role are ranging from Function Head, Department Head, Section Head, Admin officer and staff. Another respondent are consist of 5 person from the Requester user. Their role is the officer and leader that make the request through the system. The request not only in the form of product but also services. Then there are 5 person representing the vendor user. Their role as the officer in vendor is to process the Purchase Order from the company, starting from their authorization to submit quotation until the process of negotiation and close the deal.

To make the variables and indicators easier to be analysed in the statistic program, this study is using notation mentioned in Table 3.

From the results of questionnaire, we can have information about respondent demography and the response of UTAUT model questions.

**TABLE III**  
**VARIABLES CODING**

Construct	Variable	Keyword	Indicator
Performance Expectancy	PE	usefulness	<i>pu</i>
		quickness	<i>pq</i>
		productivity	<i>pp</i>
Effort Expectancy	EE	complexity	<i>ec</i>
		ease of use	<i>ee</i>
Social Influence	SI	social factor	<i>sf</i>
		subjective norm	<i>sn</i>
Facilitating Conditions	FC	resource	<i>fr</i>
		knowledge	<i>fk</i>
		compatibility	<i>fc</i>
Behavioral Intention	BI	voluntarily	<i>bv</i>

The demography results are as follows: There are 80% male respondent, and 20% female. This is typical in the company observed because of the respected industry of the company. With their ages 33.3% are under 30 years old. And 43.3% are between 30-39 years old. The rest is 20% between 40-49 years old and only 3.3% are over 50 years old. So, the user of the system is majority quite middle-aged generation.

Their education background is varying with majority 63.3% are bachelor S1 and the rest is from vocational D3 (26.6%) and high-school (10%). This will be reflected in their capability to acknowledge the learning from the instructions manual. The working experience are balancely distributed between 3-5 years (26.6%), 6-10 years (33.3%), more than 10 years (30%); and only 10% is less than 3 years.

Lastly the experience in working with the computer is 46.6% for more than 10 years and 36.6% for more than 5 years. It means that all the users are computer-literate, hence they are accustomed to use the software application.

Hypothesis test in this study using Partial Least Square (PLS), which is an alternative method of analysis with Variance-based Structural Equation Model (SEM). The SmartPLS application program is specifically designed to estimate structural equations on the basis of variance.

The Result from SmartPLS Software can be seen in the following Fig.4. Based on the accepted hypothesis, it is known that BI mostly influenced by PE. Previous research [8] defines PE as a construct that provides benefits to users in accessing the system. PE is also the most core construct in the acceptance of a technology. This fact is interesting because it rarely happened in previous study literature. The possibility of such condition probably because it is determined by the working environment of the company that the users are all familiar with the IT system. Another possibility is the infrastructure facility of their working area in head office are well provided by the company.

The result of this UTAUT study is very specific to the company situation, so that it must be carefully examined when used as reference.

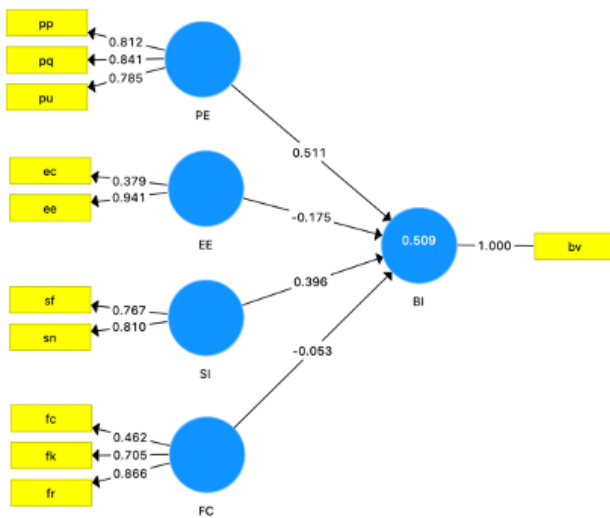


Fig.4 SmartPLS model of UTAUT

## V. CONCLUSIONS AND RECOMMENDATIONS

### A. Conclusions

Based on the results of the research in previous chapter, this study conclude that the standard framework of procurements process has been developed by integrating several standard references namely PMBOK, ISO-20000, MAPS.

The result of integration framework could be used as reference to measure the gap of procurement processes practice in the company.

User adoption of e-procurement system that has been implemented in the company could be observed which has turned out that Performance Expectancy is the major constructs most influencing the Behavioural Intention to use the system.

The study has formulated the gap observed in the company to identify which processes are impacted by e-procurement system implementation. Those gaps are used to establish the solution to be implemented by the company.

The leadtime of procurement process has been improved when compared from before using e-procurement system to leadtime after system implementation with the result to achieve 6.5 days in typical purchasing products. This could further improve by considering the framework as planning of the initiatives and applying the research findings and results.

### B. Study Limitation & Recommendation for future study

This study is limited to exercise the first phase of e-procurement application software implementation. There is a great chance to iterate the study regularly in order to have more benefit of improvements.

Moreover after the next phase of e-procurement system implementation it is expected to have further improvement in leadtime achievement. Another factor that could improve the leadtime is to apply the framework to the processes that not yet been covered by the framework, so that it is easier to pinpoint the ineffective process.

Future study that conducted is recommended to cover various working location of user such as remote branch or remote site instead of just in the head office only.

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