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Research paper



Development of E-Procurement System to Reduce the Non-Compliant Work Behavior in Purchasing

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Abstract

E-procurement has been widely used as a tool to manage purchase and sale of goods or services between the company and the suppliers among multinational companies and government sectors. But, there are many small and medium enterprise companies still uses traditional procurement method to manage their suppliers. Maverick buying issues had been a major concern among business and the solutions for it still not clear. Therefore, the aim of this project is to identify the current process and system requirements in the procurement activities and to design and develop an e-procurement system to reduce the maverick buying. This system has been developed in accordance to rapid application development (RAD) methodology which consists of four phases which are requirements planning, user design, construction and cutover. The functionality and usability testing were then conducted with three (3) experts and thirty (30) respondents to evaluate the system based on the interface design, usability, efficiency, ease of use, user experience and satisfaction. As a result, the construct with the highest mean, 4.5 (SD = 0.57) whereby the user is satisfied with the interface of the system. To sum up, this system simplifies the traditional procurement process especially on the acquisition of suppliers and help in reducing maverick buying in terms of purchasing power.

Keywords: *e-procurement; maverick buying; rapid application development (RAD)*

1. Introduction

Procurement is defined as organizations activity in purchasing goods and services. Traditional procurement process might be cumbersome and complicated as there are many activities involved in the procurement activities [1]. Information technology is evolving and gives small medium enterprise (SMEs) companies to improve their business process and helps in managing their procurement activities in a more systematic way. Nowadays, electronic procurement or e-procurement is a common practice performed by companies in order to ease their traditional procurement process, whereby it requires a great amount of times and efforts. Hassan et al. stated that most companies implement e-procurement to procure goods rather than services [4]. E-procurement is described as any technology devised to help the procurement of goods by industrial or government companies over the internet [2][3].
Among the benefits of e-procurement is the reduction of maverick buying or unplanned purchases made by a company in order to obtain the product needed.

2. Literature Review

2.1 Maverick Buying (MB)

Maverick buying can be defined as the buying of goods and services without abiding to the company's formal defined structure. It can also be explained as buying outside instead of that the contracts or buying processes that is not corresponded with the maximum utilization of money [5], [6]. Lonsdale and Watson define maverick buying as the quantity of spending standing outside of any formal process and commercial rules of the organization [7]. Hornyak [8] also explained that maverick buying occurs when employees avoid corporate purchasing policies by buying materials outside authorized channels at retail prices from non-contracted suppliers
Giordano [9] explained that maverick buying is the expenses incurred when purchases that are not complied with the company's policy and procedures. It happens when the purchases are either not intended or without any negotiation with the sellers. The buyers usually skipped the approval processes with the top management and made direct purchases and not within the specified contract suppliers. This created drawbacks to the company as it incurs much hidden cost that is not justified and vague for company to make analysis. Managers mostly prefer to make purchasing by them, without consulting the upper management and upper management wants to minimize total cost of ownership [10].

2.2 Solutions to Maverick Buying

There are few solutions suggested by Giordano in order to reduce maverick buying. First, the company needs to focus on the purchases from pre-negotiated suppliers who have approved prices with the company. This is to make sure that the company will get the benefits of lower price and discounts. E-catalogue is proven to be helpful as it provides the assigned buyer with the list of products that the price had been approved by both parties; suppliers and the company itself. Then, the company should authorize a purchase approval system whereby the system will advocate the workflow of purchase approvals between the employees and the

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management without constant monitoring. The third solution is to lessen the delays and errors in processing invoice. With this, the accounting department do not have to spend more time on the misalignment of invoice and purchase order (PO). Combination of e-procurement tools and e-invoice tools can help to solve this problem and will be implemented in the proposed system.

2.3 E-procurement

Turban, King and Lang defines that e-procurement is the acquisition of goods and services electronically [1]. It supports the purchase of direct and indirect materials and consists of several web-based modules such as e-catalogue, contracts, purchase order and shipping notice. It is stated that e-procurement system improved the effectiveness of operation processes and the transparency of the supply chain. Firstly, e-procurement improves transparency and accountability of the procurement process. Secondly, access to market is improved and fair competition is ensued. The third objective is the improvement of the level of efficiency in procurement activities and last but not least, e-procurement supports process of monitoring and auditing, while providing real-time accessibility to information. E-procurement is a solution to overcome the various problems in procuring of goods and services. E-procurement changes the method an organization adopts in procuring goods or services.

3. Conceptual Framework

The system architecture used in the system is three-tier architecture, which the architecture consists of three layers; user interface tier, application tier and database tier. User interface tier is the first tier and it is a platform of communication between the end users and the system. The second layer is application tier, whereby it serves as a bridge to the user interface and database. It holds logical processes that carrying information in and out from the database to the interface. Database tier is the last layer which is the storage of information and data needed for the system to process. Data needed by the user will be retrieved from database, processes in the application tier before being displayed to user via user interface provided. Figure 1 shows the system architecture of the system. From the system architecture proposed for the system, the application tier is where the e-procurement system architecture model lies. This proposed system implement buy-side one-to-many model, where the company acts as a buyer, maintains internally the catalogues and databases of various suppliers' goods and services. It is adapted based on Neef's model of buy-side e-procurement architecture [11]. See Figure 1.

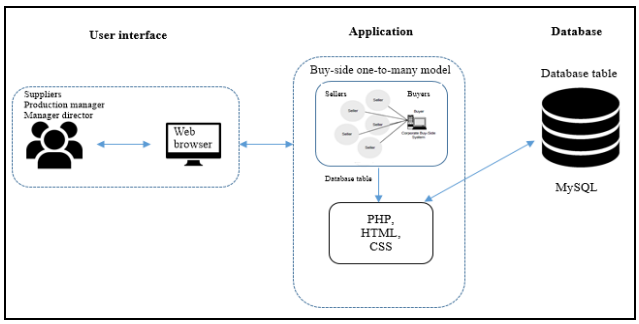


Fig. 1: Conceptual framework for e-procurement system

4. Methodology

4.1 Rapid Application Development (RAD)

Rapid application development (RAD) is a software development life cycle that allows organization building product quickly while cost and time are lessened. It is a software development method that was introduced by James Martin in 1980 as an improvement to traditional development method such as Waterfall model [12]. RAD is focusing on developing prototype model in a quick manner so that the feedback from the customer can be obtained along the development. RAD is one of the agile software development techniques and this approach is highly interactive, as it requires the participation of customers or clients during each development phases. RAD is divided into four phases; requirements planning, design, construction and cutover. The process flow is illustrated in Figure 2.

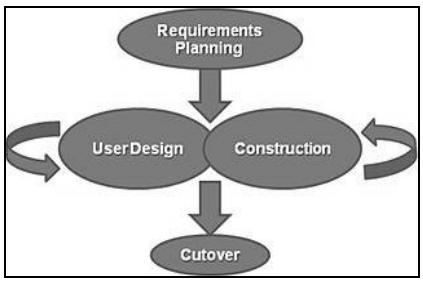


Fig. 2: Rapid Application Development (RAD) phases

4.2 System Analysis and Design

System analysis and design is the most important aspect in developing a system. System analysis helps identify the flow of the processes in a system. Several diagrams are used in order to define the system processes in designing phase such as data flow diagram (DFD) and entity relationship diagram (ERD). Figure 3 illustrate the three users involved in e-procurement system which are suppliers, production manager and manager director. Firstly, the system catered on supplier management whereby the suppliers entered the system and provide the company with their list of products which uploaded into company's e-catalogue. Production manager then created requisitions and manager director will make an approval to the requisition. Purchase order (PO) will be ensued to the supplier and later invoice is created (Figure 3 and 4).

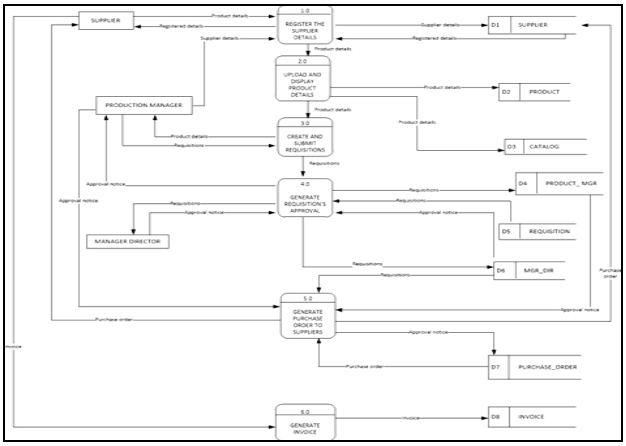


Fig. 3: Data Flow Diagram (DFD)

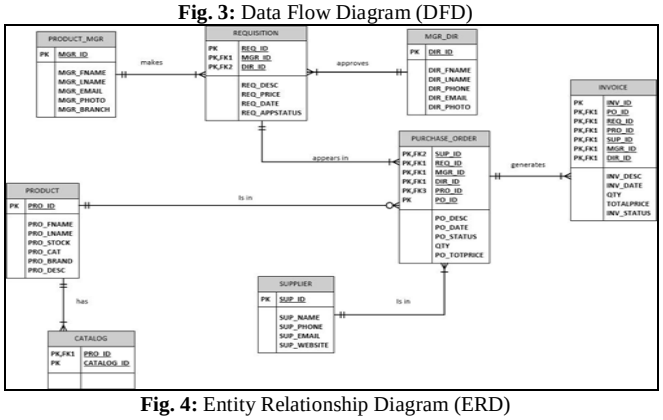


Fig. 4: Entity Relationship Diagram (ERD)

4.3 System Module for Production Manager

Purchase approval is one of the solutions of maverick buying that is implemented in this project. Supplier's products were displayed in e-catalogue based on their respective companies. Production manager will click on the *'Make Requisitions'* button for requesting the product, or click on *'More Info'* to know the details about the product. If the requisition had been made, production manager can view the status of the product requests. If it is *'Approved'*, purchase order will be generated. If the status is '*On hold'* or '*Rejected'*, there is no option for creating purchase order.
Production manager also will be provided with the reports that consist of graph and chart on the total requisitions that have been made in the dashboard system. The production manager is also allows to update the supplier's status and add new supplier. Registered supplier will be notified through email by the production manager. New supplier will be provided with their password and username to access the system (Figure 5).



Fig. 5: Approval status on the production manager

4.4 System Module for Manager Director

Manager director is accountable to manage requisition. Approval status will be given for each requisition. If it is approved, the status will be in green color. If it is in '*On hold'* status, the manager director will have an option to update whether it is rejected. If it is '*Rejected'*, it will be in red color. Other than that, this system also provides some reports on sales and is displayed in the dashboard for manager director (Figure 6).

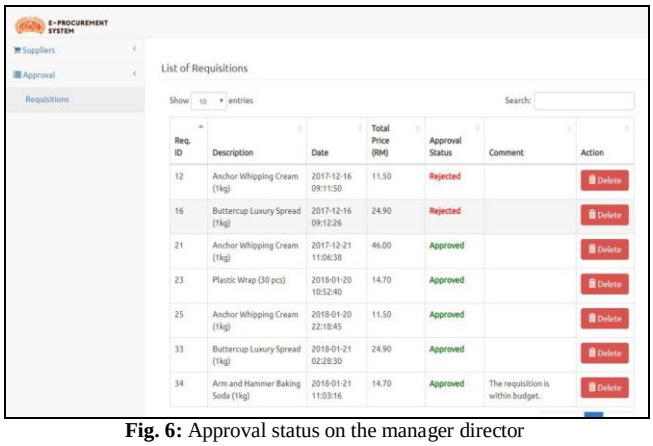


Fig. 6: Approval status on the manager director

4.5 System Module for Supplier

If the approval had been received by the production manager, production manager can proceed to send purchase order to the supplier. Purchase orders will be displayed and the supplier can update the status of the order. If the order has been processed, invoice will be generated. Besides that, the reports that consist of graph and chart on the sales will be displayed in the dashboard. Supplier can update their products or add new products. They can also remove unnecessary products. This system also allows supplier to manage the status of invoice if the invoice was paid by the company (Figure 7).

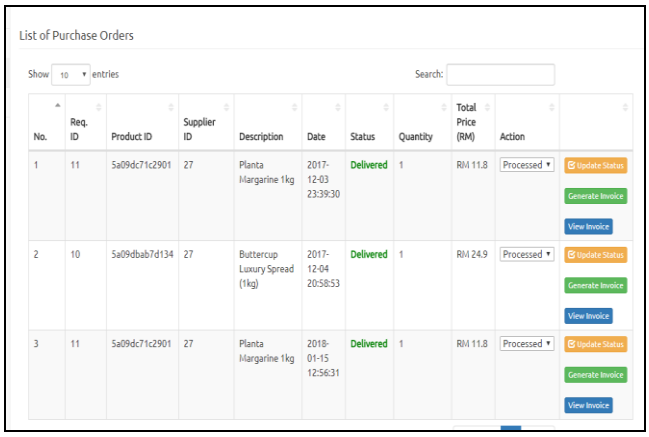


Fig. 7: Approval status on the manager director

5. Finding and discussion

There were thirty (30) respondents involved in the user evaluation phase that cater on system usability and functionality of the system. Each user is asked based on six constructs. There are six items for each constructs. 18 male respondents and 12 female respondents answered the questionnaire. 11 respondents are from the age between 18 to 20 years old and 19 of the respondents are between 21 to 23 years old. Most of the respondents did not have experience in selling or making their own products or services and 12 respondents had their experience in it. 23 respondents also did not have an experience dealing with suppliers for product and the rest had an experience. For the next questions, most of the users never store supplier's information with 11 respondents, followed by storing information using a log book with 10 respondents, using Microsoft Excel with 6 respondents and using company system with 3 respondents. Half of respondents agreed that the benefit of using information system in managing supplier's information is to manage and trace for future reference, followed by supplier's information stored securely with 9 respondents and easy to connect to suppliers with 6 respondents. Table 1 shows the summary of demographic profile for respondents.

Table 1: Demographic Profile

Demographics	Items	Total respondents (N = 30)	Percentage (%)
Gender	Male	5	16.67
	Female	25	83.33
Age (years old)	18 – 20	11	36.67
	21 – 23	19	63.33
	24 – 26	0	-
Do you have experience in selling or making your own products/services?	Yes	12	40
	No	18	60
Do you have experience dealing with suppliers for your product?	Yes	7	23.33
	No	23	76.67
Where do you store supplier's information?	Log Book	10	33.33
	Microsoft Excel	6	20
	Company's own system	3	10
	Others	0	-
	Never	11	36.67

In the system usability and functionality evaluation, the user is asked based on six constructs. There are six items for each constructs. For the first construct, the aspect that was evaluated was on the interface of the system. Based on the result, the range of mean is between 4.3 to 4.5 while mode is between 4 to 5. The highest construct is A6 which is the wording used in the system is familiar with a mean of 4.5. The second construct is on the usability aspect. From the result of the construct analysis, the range of mean is from 4.3 to 4.5. The highest mean is for construct B3 which is the system gives accurate information with 4.47. After that, the third construct is on the efficiency of the system. From the result of the construct, the range of mean is between 4.27 and 4.47. The highest mean is for construct C4 which is easy for user to find what they want with 4.47. Next, the fourth construct is on the system's ease of use. Based on the construct, the range of mean is between 4.3 and 4.4. The highest mean is for construct D4 which is easy for user to find information. The fifth construct is focusing on the user experience. From the result, the range of mean is between 4.27 and 4.37. The highest mean is for construct E4 which is the system enhances user's effectiveness with 4.37. Lastly, the sixth construct is focusing on the satisfaction. From the result, the range of mean is between 4.27 and 4.43. The highest mean and mode is for construct F1 which is user are satisfied with the system with 4.43.

Overall, there are 6 items and 6 constructs, A, B, C, D, E and F and for each of the constructs, the overall highest mean for all the 6 constructs is displayed in Figure 8. The highest mean is from construct A which is in terms of interface with mean of 4.5 and SD = 0.57. The lowest mean is from construct E which is user experience with mean of 4.37 and SD = 0.57.

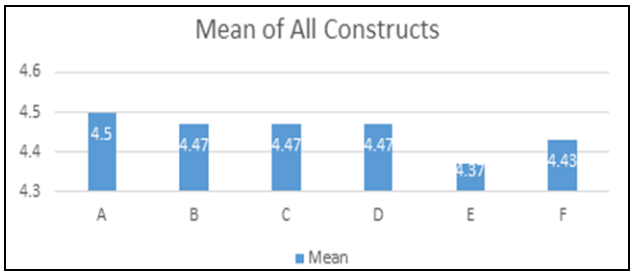


Fig. 8: Overall highest mean for every six constructs of user evaluation

6. Conclusion

In conclusion, the current business process has been improved and enhanced by the development of e-procurement system. A fully functional system has been developed aligned to the objectives of the project and by implementing the solutions to reduce the maverick buying in procurement activities. The system had been evaluated by three expert users according to the functionalities of the system and suggestions from the expert users are taken into consideration for future enhancement. The user evaluations involved thirty (30) respondents had also been conducted and the result from the evaluation were analyzed. Thus, the implementation of e-procurement is argued to reduce maverick buying and improve purchasing process between the company and the suppliers.

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