A Study of B2B System with Blockchain

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Abstract – in this paper we consider the purchasing operation tools used to catalog, request-for-quote (RFQ), order, prepare quotation and receipt of goods, and to study and design the Blockchain system for the B2B portal for E-procurement. The B2B portal system is implemented on the seller B2B information system infrastructure to facilitate the procurement operations on both the user and seller sides. Answers were collected from 19 e-procurement personnel from home hub buyer database who were anticipated to be end-users of the system. The raw data we analyzed were derived from the questionnaires distributed, completed and returned by 100% of the participants. An SPSS, Statistical Package for the Social Sciences, program was used to calculate the level of agreement concerning the users' opinions on which necessary features that facilitate the users of the B2B procurement portal should be developed and the satisfaction of trial users. The "End-users" opinion on which necessary features that facilitate the users of the B2B procurement portal should be developed shows that they strongly agreed that the "RFQ features that users can submit to request for quotation for the selected products under the desired buying options and conditions". The system prototype trials showed that the most satisfaction was on the "All proposed tools deliver high usability and capabilities".

Keywords - B2B, RFQ, quotation, PO, receive, invoice, blockchain, B2B evaluation

I. INTRODUCTION

Electronic commerce transactions have been growing since 1994. There are three main trading systems, namely B2C (Business to Consumer) for companies selling products via the Internet to buyers, B2B (Business to Business) systems for companies selling to other companies, or trading between each other, and the C2C system (Consumer to Consumer) is the purchasing or selling of goods between consumers. Internet trading is an important strategy in the digital age, and in terms of trading, there is an emphasis on O2O (Offline to Online) trading, which is conducted both online and, on the web, and in the real world.

Types of B2B

There are a variety of forms for B2B, but it can be divided into 3 main types as follows.

(1) E-Procurement is a system where the buyer shall announce their requirements and set a price or bidding method.

(2) E-Distribution provided by the seller is for the purpose of providing better services. It allows customers to order products through an online catalog system and to provide product delivery services to customers in a systematic manner.

(3) E-Marketplace that is provided by third party for the matching between buyer and seller.

Size of B2B Business

(1) B2B Market in Thailand

The Electronic Transaction Development Agency (ETDA) under the Ministry of Digital Economy and Society continuously conducts comprehensive E-commerce value surveys to collect statistical data on the value of E-commerce in Thailand. The results of the E-commerce in Thailand survey made in 2016 for the year of 2015, the value of E-commerce in Thailand was worth over 2.24 trillion baht, mostly from B2B which was worth 1.33 trillion baht while 0.51 trillion-baht worth of sales belonged to the B2C segment, and approximately 0.40 trillion baht from the B2G. The forecast shows that in the year 2017 the growth will be increased by 12.42% which constitutes a total value of 2.52 trillion baht.

The survey of E-commerce value was from a sample of 527,324 E-commerce entrepreneurs nationwide, with cooperation from the Thai Electronic Commerce Association, Department of Business Development (DBD) and the National Statistical Office. This survey utilized quantitative and qualitative research approaches. The traders were divided into 2 groups using the criteria of operating results. Firstly, the entrepreneurs who had the value of E-commerce business of more than or equal to 50 million baht per year, by which the face to face interview method was used. Another group was a group of entrepreneurs with E-commerce turnover worth less than 50 million baht per year, by which the survey made via online questionnaire (Online Survey). The period of data collection was during from April - October 2016.

In Thailand, we defined E-commerce industry group into 8 categories which are (1) manufacturing, (2) retailing and wholesaling, (3) transportation, (4) accommodation, (5) information and communication, (6) insurance, (7) arts entertainment and recreation, and (8) other services. Among

these the top three group that generates highest E-commerce values were:

- The accommodation industry that generated E-commerce value of 559,697.54 million baht (30.21%).
- The retail & wholesale industry that generated E-commerce value of 536,725.26 million baht (28.97%).
- The manufacturing industry that generated E-commerce value of 428,736.23 million baht (23.14%).

These were followed by the information and communication industry which had an E-commerce value of 232,721.36 million baht (12.56%), the transportation industry (3.46%), other services industry (1.03%), arts, entertainment, and the recreation industry (0.51%). The industry with the lowest E-commerce value was the insurance industry. (0.11%)

The forecasted value of E-commerce trends in Thailand in 2016 showed a rapid and continuous growth rate, which is expected to have a value of approximately 2,523,994.46 million baht, representing 40.08% of the total sales and services which is an increase from 2015 by 12.42%.

As for the value of the sales, most of them are the value of type B2B E-commerce, totaling approximately 1,381,513.39 million baht (54.74%) which increased from the year 2016. This represented 3.50%, followed by the value of E-commerce type B2C with amounted to 729,292.32 million baht (28.89 %) which increased from 2015 by 43.00%, and value of type B2G E-commerce amount to 413,037.84 million baht (16.37%) an increase from 2015, representing 3.21%. The value of type B E-commerce 2 B, B2C, and B2G accounted for 72.05%, 27.53% and 0.43% of E-commerce value in 2015, respectively. Overall, the industry forecasts for 2016 of the top three E-commerce values are as follows:

- Retail and wholesale industries with an E-commerce value of 731,828.33 million baht (34.55%).
- Accommodation service industry with an E-commerce value of 643,033.15 million baht (30.35%).
- Manufacturing industry with an E-commerce value of 343,866.80 million baht (16.23%).

These are followed by information and communication industry which has an E-commerce value of 281,866.93 million baht (13.30%), transportation industry (3.32%), other service industry (1.65%), arts, entertainment and recreation industry (0.53%). The industry with the lowest E-commerce value is the insurance industry (0.08%).

When studying and analyzing the above data in detail, it was found that the value of E-commerce in Thailand (including the value of online procurement of government agencies) has had a growth trend causing the E-commerce market to remain a remarkable business that gets more interest regarding investing, trading, and using services especially the value of E-commerce type B2C. When comparing statistical data in six countries in ASEAN, which

are Thailand, Malaysia, Philippines, Vietnam, Singapore, and Indonesia, it was found that Thailand was stepping into the region's E-commerce leadership role. However, the average value per capita is still lower than in Singapore and Malaysia, respectively.

Based on the statistics mentioned above the E-commerce market in Thailand is likely to grow in a better direction. This is the result of a result of 3 main factors: (1) technology factors that have evolved considerably causing a form of communication technologies and innovations occur uninterrupted, (2) the policy of the government to drive digital economic and social (Digital Economy) aimed at promoting and encourage entrepreneurs to expand its E-commerce market to ASEAN and the global market, and (3) factors in the form of financial transactions that change rapidly which drives the economy progress and international standards conformance such as Any ID or Prompt Pay. The expansion of electronic card usage, improvement of tax system, and electronic transaction documents will help increase convenience and speed. Additionally, it will reduce costs in the business process of the private sector (papers on the survey of the value of electronic commerce in Thailand in 2016. (https://www.etda.or.th/publishing-detail/ value-of-e-commerce-Thailand-2016.html).

(2) Global B2B Market

B2B E-Commerce has expanded dramatically such as the current B2B market in the United States which is approximately US 829 billion and is projected to grow to a US $ 1.2 trillion in the next 5 years. B2B business is the online trading and purchasing business that does not use EDI. The B2B market is larger than the B2C market [Frost & Sullivan] whereas the global B2B E-Commerce will be reaching 12 million individuals by 2020; the important business statistics are summarized as follows:

- The B2B trading business is two times worth more than B2C as a business.
- 80% of the non-executive personnel of the companies have an influence on the purchase decision.
- 31% of revenue from B2B has increased gradually.
- 69% of B2B business operators indicate that they will stop printing catalogs in 5 years. Online catalogs will replace the printed catalog.
- The Average Order Value (AOV) is the US $491 for B2B and the US $147 for B2C.
- Currently, there is only 10% of sales of the business and industry conducted through the B2B system (implies that the chance for B2B growth still widely opened)
- 42% of the B2B business indicates that customer retention is the most important indicator of the transaction through the B2B system.

Statistics regarding technology trends and integration

- 40% of buyers who use the B2B system specifies that what they want more on existed B2B system are financial services and purchase order system.
- 85% of large companies with more than 5,000 employees indicate that CRM is very important to customer service.
- 60% of B2B company executives indicate that interconnection to ERP and accounting systems are very urgent.

B2B E-Commerce

The importance of B2B is to make buyers confident so they have a good feeling of ordering products from B2B seller. B2B systems often have products that are the component materials for production that have complex properties and there are still parts that are different in some properties but may be used instead, therefore, in B2B systems there are some important mechanisms that researchers need to understand. The key components in B2B systems in order to understand B2B operations are as follows:

1. Search Engine Optimization (SEO)
2. Advanced and specific search
3. Multiple search
4. Catalog and contract
5. Product page
6. Personalization
7. Quotation and request for quotation (RFQ)
8. Quick order
9. Product chooses
10. Product configuration
11. Split shipment

Research Rationale

Trading in the modern digital age is an international trade especially for B2B businesses with a large number of suppliers, with hundreds of thousands of products, the ordering involves a comprehensive process covering contacting, negotiating, bidding, issuing orders, and use of financial mechanisms for shipment and payment by which buyers and sellers who have previously known may be able to easily solve problems if there are special cases. In the case of, they were never known there will be a problem in the event that something unexpected happens. Therefore, a better mechanism is needed for the following topics:

1. Building trust between B2B buyers and sellers
2. Untrustworthy of the intermediary agent
3. Ability to reach customers
4. Increased transparency
5. Increased functionality

Statement of the Problem

The conventional B2B system for the operation of B2B E-Commerce normally lacks the functional tools necessary for the purchasing operation which are, for instance, RFQ, order, quotation, and receipt of goods, in order for buyers and suppliers to complete their operation seamlessly from the system.

More importantly, as the solution is required to remedy the problem of building trust between buyers, sellers, and B2B Portal for documents forgery and to correct the mistakes in transactions as well as getting better transparency of the supply chain, maintaining personal information.

This research was to study and to design the purchasing operation tools which are, for instance, catalog, RFQ, order, quotation, and receipt of goods, and to study and to design of the Blockchain system in order to solve or reduce such aforementioned problems.

Objectives of the Study

1. Study and create specific features that are necessary for the operation of the proposed system.
2. Study of the Blockchain technology to be applied to the B2B system.
3. Design and develop prototypes for understanding of the proposed capabilities.
4. Evaluate the satisfaction of users on the proposed system prototype.

II. MATERIALS AND METHODS

Hypothesis

The B2B portal with Blockchain that has newly developed features will increase the purchasing operation efficiency and also the transaction security by the adopted Blockchain technology [11].

Scope of Research

This research will study and design the B2B portal and create a system prototype to be used for evaluation of the specified development by sample groups that understand and experience the B2B procurement operation.

Research Procedures

This research employs the following research and development studies:

1. Study and analyze the success B2B patterns
Study and analyze the pattern of B2B, and supply chain performance management including problems and suggestions for the development, improvement or solution

of the problems that affect the success of B2B and the performance model for B2B management that responds to the supply chain.

2. Study the concept and theory of B2B

3. Study and design the necessary features of the B2B purchasing operation.

4. Study methods and steps in the design and development of B2B system with Blockchain.

5. Program development process

5.1 System architecture analysis and design
To design the B2B system with Blockchain technology

5.2 Program design
To design the system and functionalities of necessary features of the B2B purchasing operation.

5.3 Database design
To study the program systems that needed to be created a database to store data for future uses.

5.4 Display screen design

5.5 Program development
• To develop necessary features of the B2B purchasing operation
• To develop the B2B system with Blockchain technology

6. Program testing
To perform the program testing to check for correctness and accuracy of the program and do fixing for development errors according to the processes of Unit Test, Integration Test, Performance Test, and User Acceptance Test (UAT).

7. Program Implementation
To install the completely tested programs on the host system for trial uses.

8. Evaluation from trial users
The evaluation made by trial users collected from questionnaires respondents of the opinions in order for improvement.

9. Population and sample group for the evaluation

9.1 The population used in this research is the B2B E-procurement personnel of the buyers those directly involved in online purchasing through B2B procurement portal. With the support from Homehub who partially sponsors this research, the population is picked out from Homehub Online Shop B2B customer database.

9.2 The sample group will be selected in accordance with Taro Yamane's reference table with a 95% confidence level and a sampling error of level 0. 05 or ± 5%, therefore the questionnaires would be distributed to a targeted audience of 20 persons.

10. Creation of Research Tools

We divided the questionnaire into 3 parts according to the aspect of analysis as follows:

Part 1: Questions about general information of respondents in a checklist-style to analyze personal demography regarding gender, age, education level, organization, and years of work experience using frequency distribution in percentage.
Part 2: Questions about the opinion on which necessary features that facilitate the users of the B2B procurement portal should be developed.
Part 3: Questions about the user opinion on their satisfaction of trial use on the B2B procurement portal prototype.

III. RESULTS AND DISCUSSIONS

Research Questions

To achieve the objectives, the following research questions are defined:

1. How to design and develop the specific features that are necessary for the operation of the proposed system?
2. How to apply the Blockchain technology for the B2B system?
3. What is the level of satisfaction of the user on the proposed B2B system prototype trial?

Part 1: General Information

Most of the respondents of the questionnaire (70%) were male, while the rest (30%) were female. The ages of the respondents were ranked from the highest to the lowest as follows: 31-40 years old (75%), 41-50 years old (25%), and no one less than 31 years old (0%) respectively, which indicated that the majority of the respondents (100%) were between 31 and 50 years old. The levels of education of the respondents were ranked from the highest to the lowest as follows: bachelor's degree or equivalent (90%), a Master's degree and higher (10%), and no one lower than bachelor's degree (0%) respectively. Regarding the respondents' years of experience, they were ranked from the highest to the lowest as follows: less than 6 years (45%), 6-10 years (30%), 11-15 years (25%), and no one more than 15 years (0%) respectively, which indicated that the majority of the respondents (75%) were low to middle experienced.

Part 2: The opinions on which necessary features that facilitate the users of the B2B procurement portal should be developed.

TABLE I. OPINION ON WHICH NECESSARY FEATURES THAT FACILITATE THE USERS OF THE B2B PROCUREMENT PORTAL SHOULD BE DEVELOPED.

Factors	5	4	3	2	1
1. Products catalog that shows products by categories, pricing, description, buying options, and conditions that the buyers can search for and select.	3 15%	11 55%	6 30%	0 0%	0 0%
2. RFQ features that users can submit to request for quotation for the selected products under the desired buying options and conditions.	11 55%	7 35%	2 10%	0 0%	0 0%
3. Ordering features that users can issue buying order for the agreed products under the desired buying options and conditions.	1 5%	12 60%	7 35%	0 0%	0 0%
4. Receipt of goods by lot and location corresponding to the purchase orders made.	4 20%	11 55%	5 25%	0 0%	0 0%
5. The mechanism that increases the safety of the transaction to ensure that transactions can never be illegitimately altered.	4 20%	10 50%	6 30%	0 0%	0 0%

Table I above gives the opinions of the "End-users" on necessary features that facilitate the users of the B2B procurement portal should be developed by choosing the agreement level they rank the importance of those factors, the result shows that they strongly agreed that the "RFQ features that users can submit to request for quotation for the selected products under the desired buying options and conditions." the highest importance by which 100% of respondents agreed at Very high (55%) and High level (35%). The second the highest importance by which 100% of respondents agreed at Very high (20%) and High level (55%) is on the "Ordering features that users can issue buying order for the agreed products under the desired buying options and conditions.". The lowest importance by which 5% of respondents agreed at Very High level and 60% of respondents agreed at High level.

Part 3: The user opinion on their satisfaction of trial use on the B2B portal system prototype.

The Table 2, opposite, is the opinion of the "End-user" of B2B portal system that participates the system prototype trial and responds to the questionnaires by choosing the satisfaction level they perceived, the result shows that the most satisfactions is on the "All the proposed tools deliver high usability and capabilities." (High 65%, Moderate 35%), the second top rank satisfactions are on the "The trial session effective enough to makes you understand how to

use the system in a real environment." at the score of 60% in High level and 40% in Moderate level. The answer that falls into the very low satisfaction level is the "The system has enough supporting information and guidance" at the score of 40% at High level and 60% at Low level.

TABLE II. OPINION OF USER ON THEIR TRIAL USE ON THE B2B PORTAL SYSTEM PROTOTYPE.

Functions	5	4	3	2	1
1. All proposed tools deliver high usability and capabilities.	0 0%	13 65%	7 35%	0 0%	0 0%
2. Process steps and flow are reasonably simplified.	0 0%	8 40%	12 60%	0 0%	0 0%
3. Menus and navigations lead you to your target easily and conveniently	0 0%	11 55%	9 45%	0 0%	0 0%
4. The system has enough supporting information and guidance.	0 0%	7 35%	13 65%	0 0%	0 0%
5. The trial session effective enough to makes you understand how to use the system in a real environment.	0 0%	12 60%	8 40%	0 0%	0 0%

In brief, the trial user perception is that the system pretty good in delivering the "All proposed tools deliver high usability and capabilities" while the "The trial session effective enough to makes you understand how to use the system in a real environment" is perceived as lowest satisfaction.

IV CONCLUSION

The study revealed these findings based on the research questions as follows:

Research question Part- 1: General information of respondents.

In brief, the general information of the respondents revealed the following findings. There was not much difference in genders of the respondents (male, 70% and female, 30%). The majority of the respondents (75%) were between the age of 31 and 40 years old. The majority of the respondents (90%) were middle educated: bachelor's degree or equivalent and higher. The majority of the respondents (75%) were fall in a low to middle experienced. All of the respondents (100%) were from the procurement unit.

Research question Part- 2: The user opinion on which necessary features that facilitate the users of the B2B procurement portal should be developed.

The opinion of the "End-user" on necessary features that facilitate the users of the B2B procurement portal should be developed by choosing the agreement level they rank the importance of those factors, the result shows that they strongly agreed that the "RFQ features that users can submit to request for quotation for the selected products under the desired buying options and conditions." the highest importance by which 100% of respondents agreed at Very high (55%) and High level (35%). The second the highest importance by which 100% of respondents agreed at Very

high (20%) and High level (55%) is on the "Ordering features that users can issue buying order for the agreed products under the desired buying options and conditions.". The lowest importance by which 5% of respondents agreed at Very High level and 60% of respondents agreed at High level.

Research question Part-3: The user opinion on their satisfaction of trial use on the B2B portal system prototype.

The opinion of the "End-user" of B2B portal system that participates the system prototype trial and responds to the questionnaire by choosing the satisfaction level they perceived, the result shows that the most satisfactions is on the "All proposed tools deliver high usability and capabilities." (High 65%, Moderate 35%), the second top rank satisfactions are on the "The trial session effective enough to makes you understand how to use the system in a real environment." at the score of 60% in High level and 40% in Moderate level. The answer that falls into the very low satisfaction level is the "The system has enough supporting information and guidance" at the score of 40% at High level and 60% at Low level.

REFERRENCES

[1] He N, Milosevic Z. B2B Contract Implementation using Windows DNA, The University of Queensland, QLD 4072 Australia.

[2] Sana Sabah Sabry SS, Kaittan NM, Ali IM. The road to the blockchain technology: Concept and types. Periodicals of Engineering and Natural Sciences. 2019;7(4):1821-1832.

[3] Industrial Distribution, The State of B2B e-Commerce in Industrial Distribution. Advantage Business Media; 2015.

[4] Brody Buhler B. Achieving High Performance in the Post and Parcel Industry. Accenture Consulting; 2015.

[5] An Oracle White Paper, Reinventing the Web Channel to Maximize B2B Sales and Customer Satisfaction. Oracle Corporation; 2011.

[6] Base One and B2B Marketing, A Comprehensive Survey into The Behaviors and Attitudes of The B2B Buyer. Buyer Sphere Report; 2015.

[7] CEB Marketing Leadership Council, The Digital Evolution in B2B Marketing. The Corporate Executive Board Company; 2012.

[8] Capgemini Consulting, Digital Transformation: A Roadmap for Billion-Dollar Organizations. MIT Center for Digital Business and Capgemini Consulting; 2011.

[9] Romanow K. Current and Consistent Product Data Critical for B2B and B2C E-Commerce. Consumergoods.com; 2015.

[10] Lee HY, Wang NJ. The implementation of integrating e-Procurement, e-Contracting and e-Invoice platforms for the B2B E-Marketplace web-based system. International Journal of Engineering Research; 2013.

[11] Swan M. Blockchain: Blueprint for a New Economy. O'Reilly Media 2015.

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