

## B2B System Architecture Supporting Operational Tools and Blockchain

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*Abstract*— The B2B system architecture is an implementation model for supporting a number of B2B tools such as RFQ, Quotation, Purchase Order, Product Receive, Invoice, Bid/Offer, Time Management, Cost Code, Community, and Blockchain. The tools increase the efficiency of the business processes. Trading in the modern digital age is a national 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. Therefore, blockchain is a better mechanism for building trust between B2B buyers and sellers; Untrustworthy of the intermediary agent; Increased transparency.

**Keywords**-B2B; blockchain; RFQ;

### I. INTRODUCTION (HEADING 1)

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) Increase efficiency of the business processes by providing a set of B2B tools.
- (2) Building trust between B2B buyers and sellers
- (3) Increased transparency

In designing the system, it is specified that the system must help the project owner, builder, or contractor to access to the related project's related items as follows:

- Able to see the clear overview picture of the incomes and costs of the project (actual budget).
- Able to see the clear overview picture of the project duration.
- Able to provide transparency and trust through blockchain processing [2].
- Able to transfer the BOQ to the cost code
- Able to make the purchase orders directly to the suppliers (Homehub)
- Able to specify costs into the selected cost code of the project.
- Able to issue and receive the RFQ with the specified suppliers.
- Able to create an invoice/receipt for the buyers to realize an income.
- Able to process other function such as Bid/Offer, Time Management, Cost Code, Community.

### II. SYSTEM FUNCTIONAL REQUIREMENTS

The initial analysis of Homehub Builder Portal (HBP) design is used the Use Case method which the summary of the analysis results shown as follows: Ease of Use

#### A. The Actor who involved and use the system consist of:

- Project owner: the person who assigns the contractor to work
- Contractor: the person who oversee the construction works
- Interior designer: the person who responsible for Interior design works
- Seller (material/equipment): the person who has goods related to the construction and interior design

TABLE I. THE ACTORS WHO INVOLVE AND USE THE SYSTEM HAVE THE FOLLOWING ROLES AND RESPONSIBILITIES:

Actor	Roles and responsibilities
Project owner	Records project information, selects good items from electronic catalog, invites the contractor to bid for the project, and considers choosing the winning bidder.
Contractor	Records the project information, cost code plan, income plan, RFQ; compares prices/chooses the winner, creates the purchase order, records the income, proposes the bid price, and receives the goods.
Interior designer	Records the project information, selects goods item from the electronic catalog, invite the contractor to the project bidding, and considers choosing the winning bidder.
Seller (material/equip ment)	Receives the RFQ, proposes the quotation, and receives the purchase order.

**B. Use Case Diagram**

Use case Diagram consists of 14 Use Cases as shown in the following diagram: Use Case Diagram definitions.

1. Recording the project information
2. Selection of the goods item from the Electronic catalog
3. Invitation for the contractor to bid for the project
4. Choosing the bidding winner
5. Recording the Cost code
6. Recording the income plan
7. Recording the RFQ
8. Comparing of the prices/chooses the winner
9. Creation of the purchase order
10. Recording the income
11. Recording the goods receipt
12. Receiving the RFQ
13. Quotation
14. Receiving of the purchase order

**C. Application Architecture**

Application Architecture designed for the research and development for B2B system for The Homehub Builder Portal shown as the following diagram.

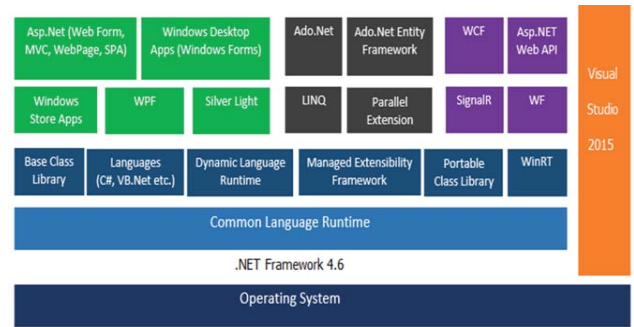


Figure 1. The Homehub Builder Portal

Homehub Builder Portal system will be the Application software (app) which has been developed by the Visual Studio 2015 programming tool. The app will operate on .NET Framework 4.6 technology from Microsoft which has the ability in development that support multi-languages, multi-platform, and high flexibility. It is popular at corporate level and support further expansion development, more over Homehub already has this platform in operation, thus it is selected for the development tool for this project.

.NET Framework 4.6 has been continuously developed (currently at the year 2017 it is the .NET Framework 4.6.1 and 4.6.2). It consists of several parts as the components shown in the figure that the green part consists of ASP.NET (Web Form, MVC, Webpage, SPA), Windows Desktop Apps (Windows Forms), Windows Store Apps, WPF and Silver Light which are the development tool set, presentment, and Apps Store of Windows Desktop and Webpage.

Component in brown shaded consists of ADO.NET, ADO.NET Entity Framework, LINQ and Parallel Extension which are the tool set for the database connectivity and operation that supports many brands of database.

Component in purple shaded consists of WCF, ASP.NET Web API SignalR and WF which are the toolset for Web Service that supports connection and access.

Component in blue shaded consists of Base Class Library, Languages, Dynamic Language Runtime, Management Extension Framework, Portable Class Library and WinRT which are the Class Library, Language Compiler, Extended Framework management and Run Time.

Component in turquoise shaded is Common Language Runtime - CLR which is an important part of .NET Framework work as the Virtual Machine to prepare the virtual environment to support the operation of the system that developed from several languages as the standard language with standard format called Intermediate Language - IL to allow the developer not to worry about the difference of the processing units and be able to make

use of several application software with highest efficiently

So as the .NET Framework is operated on the operating system layer, the development will be used Visual Studio 2015 as the IDE tool.

#### D. Mobile Application Development

It can develop the cross platform Mobile Application using Visual Studio 2015 in many different ways depending on the preferred skill in using languages and supporting tools, which are:

- Build an app for Android, iOS, and Windows (.NET Framework) Single code base (C#) , It is the Cross platform application development by using only single code that is c# by which the Xamarin should be installed for development assistance for Native app for several devices.
- Target Windows 10 devices, It is the app development for devices that runs Windows 10 or Universal Windows Platform – UWP which are Windows Desktop, Windows Mobile, Xbox, IoT, etc. which can build the app from Template available in Visual Studio 2015.
- Build an app for Android, iOS, and Windows (HTML/JavaScript), It is the Cross-platform application development by using HTML, CSS, JavaScript or TypeScript for several devices. In this regard, the Apache Cordova must be installed as additional development tool.
- Build an app for Android and Windows (C++) , It is the Cross-platform application development by using Visual C++ that can develop the app from Template available in Visual Studio 2015.
- Build a cross-platform Game for Android, iOS, and Windows

#### E. Database and Processing

For this app development, the MS SQL Server 2016 is selected for the Database Server which is also the Microsoft product. For the Database operation regardless of any brand, it has to carried out 2 major tasks which are Database Accessing and Database Manipulating Database, that we referred as the Database Processing.

For the Database processing in Visual Studio 2015, it uses ADO.NET technology for Accessing through .NET Framework as for Data Providers provided.

For the Database Manipulating, it is carried out through the Dataset. Besides the ADO.NET supporting to the MS SQL Server which is RDBMS, it also supports co-operation with several brands and forms as follows: Thus, it can be seen that ADO.NET in Visual Studio that works together with .NET Framework, can be developed for uses together with several brands and forms, therefore it is very useful for further app development for Homehub Builder Portal in the future.

#### F. System Architecture

According to the System Architecture the operations divided into 2 parts comprises:

1) Back Office operation which is the part that the administration determines the Master Data for Front Office to call.

2) Front Office operation that the Project owner or Interior designer, Contractor and seller of material/equipment uses for data recording.

The project creation of the Project owner/Interior designer has the following procedures:

1. User records the project information.
2. User selects goods from the Electronic Catalog through the system.
3. Select the required system to invite contractors for bidding.
4. System sends bidding invitation to the specified contractor.
5. Contractor express intention to join the bidding.
6. Contractor submits the offer.

Upon the schedule, the Project owner/interior designer will consider choosing the winner and proceed with the project.

Operation model and functions of the contractor consists of:

1. Contractor chooses the winning project or creates new project. Once the project existed the contractor can choose other functions comprises creation of project cost plan, money receipt, RFQ, and purchasing.

2. In case, the contractor selects to create the project cost plan, the contractor can add the following information: create project cost plan and create project income plan

3. In case, the contractor selects to create the money receipt, the contractor can add the following information:

3.1 Creates an invoice according to the income plan. The system will automatically create an invoice according to the plan and allows correction of the information in such invoice.

3.2 Creates an invoice that the contractor which the information recording can be made.

4. In case, the contractor selects RFQ, the contractor can add the following information:

4.1 Creates the RFQ, once the project has been selected the system will retrieve the BOQ list, created at the project cost plan creation procedure, for the contractor to select in order to send to the seller by which many RFQ can be created for each project.

4.2 The RFQ created can be send to more than one seller.

4.3 System will display the list of RFQ for seller acknowledgement.

4.4 The seller checks the RFQ list and quotes by item.

5. In case, the contractor selects purchasing, the contractor can add the following information:

5.1 System will display the purchased items previously prepared and the purchased items that have been created upon seller selection in price comparing step.

5.2 Can click to amend the purchase order if such order has not been approved yet.

5.3 Can create the purchase order.

5.4 Once such purchase order has been approved it will be display in the order list of the seller side.

5.5 Once the seller clicks on Order button the system will update the order status automatically.

6. In case, the contractor selects goods receipt, the contractor can add the following information:

6.1 System will display the purchased items previously prepared

6.2 User input the quantity of goods have been received.

6.3 Once the seller clicks on goods receipt button the system will save the order.

### III. SYSTEM DESIGN ACCORDING TO THE BUSINESS PROCESS

#### A. Related Business Process

The related business process is divided into 2 processes in accordance with the user group functions whereby the user group comprises, administrator group, seller (material/equipment) group, project owner/interior designer group, and contractor group.

#### B. Overview Processes (System Administrator)

Procedures of the overview processes (System administrator)

1. Conducts the member registration process.
2. Conducts fundamental system information management.
3. Conducts receiving of the RFQ.
4. Conducts the quotation information management.
5. Conducts receiving of the purchase order.
6. Conducts reporting management.

#### C. Overview Processes (Seller)

Procedures of the overview processes (seller (material/equipment) group)

1. Conducts the member registration process.
2. Conducts receiving of the RFQ.
3. Conducts the quotation information management.
4. Conducts receiving of the purchase order.
5. Conducts reporting management.

#### D. Overview Processes (Project Owner/Interior Designer Group)

Procedures of the overview processes (project owner/interior designer group)

1. Conducts the member registration process.
2. Conducts project information recording which are:
  - Recording the project information
  - Recording the BOQ
3. Conducts the process of procurement for material/equipment by selecting the goods from the Electronic Catalog.
4. Conducts the process of invitation for the contractor to join the bid.
5. Select the bidding winner, the system will send an email to inform bidding result to the contractors who participated the bidding

#### E. Overview Processes (Contractor)

Procedures of the Overview Processes (Contractor)

1. Contractor proceeds to the member registration process.
2. Contractor proceeds to project information recording.
3. Contractor proceeds to the BOQ recording.
4. Contractor proceeds to the income plan recording.
5. Contractor proceeds to the RFQ preparation.
6. Contractor proceeds to the goods price comparing.
7. Contractor selects the seller to be sent the RFQ.
8. Contractor proceeds to the goods ordering form the selected seller.
9. Contractor records the goods receipt as delivered.
10. Contractor records the income.
11. Contractor prepares summary report of project operation results.

### IV. TECHNICAL ARCHITECTURE FOR DEVELOPMENT ENVIRONMENT AND PRODUCTION ENVIRONMENT

Technical Architecture of the B2B software research and development project for Homehub Builder Portal shown as follows: Authors and Affiliations\

The diagram shows the architecture and environment of the system to be developed which consists of 2 servers, one for Application Server and another one for Database Server that connected to the fixed IP type Access GB Switch Hub. In the first phase of the Development Environment, both Application Server and Database Server work and connected together in 2 Tiers Servers connection model, and after the development and testing completion and ready for production environment deployment it will gradually increase in resources such as in-cabinet memory, RAM, Hard disk storage, and/or increasing of servers' tiers.

#### Blockchain:

Blockchain is another tool implemented in this system. A block chain is a set of data that is connected by a chain or a linked list. Each data group is called a Block. To link the data into a chain, use each entry and decoding technique. Cryptographic hash (pointer) pointing to the previous block and having time stamp with transaction data by design Blogs will have features that make data editing difficult but if done, it can be detected, so the Blockchain is a multi-discrete data logbook that can effectively record the sand sandstone which can be checked and stored permanently.

B2B Trading in the modern digital age is a national or 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: Building trust between B2B buyers and sellers; Untrustworthy of the intermediary agent; Increased transparency since in this system all transactions were kept through cryptographic hash into the blockchain for distributed validation by buyers and sellers. Figure 2 shows the structure of the B2B Portal with blockchain.

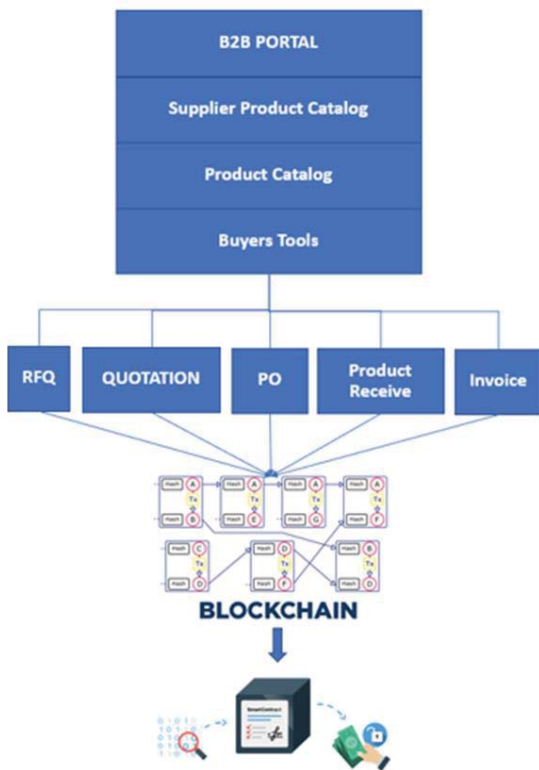


Figure 2. The Homehub Builder Portal

## V. CONCLUSION

The architecture of the B2B portal supporting business to business operation in the distribution model. The evaluation of this system is reported in [14]. The system supports a number of B2B tools including RDQ, Quotation, PO, Product Receive, Invoice, Blockchain, and other tools such as Bid/Offer, Community, Time Management, Cost Code. 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 blockchain is used as a tool to store all the transactions for future resolution of disputes.

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