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NAME: Mr. Pornanan Udomthavornsuk

THIS THESIS HAS BEEN ACCEPTED BY

THESIS ADVISOR

(Mr. Pornthep Anusornnitisarn, Ph.D.)

THESIS CO-ADVISOR

(Associate Professor Kongkiti Phusavat, Ph.D.)

DEPARTMENT HEAD

(Associate Professor Kongkiti Phusavat, Ph.D.)

APPROVED BY THE GRADUATE SCHOOL ON _____

DEAN

(Associate Professor Gunjana Theeragool, D.Agr.)

THESIS

DEVELOPMENT OF A WEB-BASED ROSETTANET AUTOMATED ENABLE APPLICATION FOR SMES

PORNANAN UDOMTHAVORNSUK

A Thesis Submitted in Partial Fulfillment of
the Requirements for the Degree of
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The RosettaNet standard is standard processes for the sharing of business information among business partners in the value chain. The standard is widely spread in the global semiconductor Industry, electronic components, consumer electronics, telecommunications, logistics and continue to be adopted in many industries. However, most companies which already adopted the RosettaNet standard usually have a complex information technology such as the enterprise resource planning system (ERP) and information technical staffs available at their companies.

Unlike, the well-established organization, many small and medium enterprises (SMEs), especially the start-ups, can not afford the cost of complex information system. The proposed web-based RosettaNet automated enable application aims to assist the SMEs to connect and communicate with theirs international customers without high installation, operation and maintenance cost.

However, the information system alone is not able to make the SMEs become competitive. This study also provides enterprise resource planning (ERP) functions for SMEs to improve their business process.

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Student's signature Thesis Advisor's Signature

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INTRODUCTION

Introduction to RosettaNet

Due to the globalization, improving operation performance becomes unavoidable mission for business organization to stay competitive (Voss, 1997). With small financial capital and sale volume, improving operational performance is critical to SMEs than for large business organizations.

Before Internet era, the Electronic Data Interchange (EDI) was first developed to support communication between business enterprises (Housley, 1999). EDI had become popular and had been offered as business service by many telecommunication companies. As a result, there are many EDI communication standards and data formats between trading partners (Bakos, 1991). To address this problem, later, EDI has been combined with XML technology (Webber, 1998) (XML/EDI Group, 2003) to be a standard trading message structure which is used by many firms over the internet.

In contrast to typical XML/EDI, RosettaNet provides coordination protocol that assists and automates activity which allows two or more companies automatically perform business transactions e.g. purchasing over XML/EDI standard trading exchange message. RosettaNet is developed by a consortium of major Computer and Consumer Electronics, Electronic Components, Semiconductor Manufacturing, Telecommunications and Logistics companies to create and implement industry-wide, open e-business process standards.

As a result, RosettaNet becomes a tool to enable automatic coordination among business partners in complex supply network. For many companies and industries that implement RosettaNet, automatic coordination in purchasing is only a small part of RosettaNet capabilities. By integrating with company management information system like ERP (Chen, 2001), the company can tremendously improve its operational performance.

Although there are many advantages in adopting RosettaNet, expensive infrastructure (i.e. hardware, software, middleware and high availability internet

connection), initial implementation learning curve and need for specialized IT resources (RosettaNet Engineering Penang, 2003) are barriers of RosettaNet implementation for SMEs.

To reduce the initial barriers and investment, RosettaNet Automated Enablement (RAE) (RosettaNet Engineering Penang, 2003) is the low-cost RosettaNet communication software designed for SMEs. With ability to translate between machine-readable RosettaNet communication messages (PIP) into human-readable PDF forms, RAE enables few-employees SME to communicate with RosettaNet trading partners.

Problem Statement

As mentioned before, communication functions are only small parts of RosettaNet capabilities. When using only RAE, SME users can gain only small part of RosettaNet capabilities. To help SME users to access more capacities of RosettaNet, we must have the solution to coordinate business internal information management system with RosettaNet communication functions.

Before designing the system, we need to categorize Thai SMEs into 2 categories.

1) Currently using enterprise resource planning (ERP) system
2) Currently NOT using enterprise resource planning (ERP) system

In this research, if we design to choose SMEs who currently use enterprise resource planning system, we need to develop various versions of coordination system to support various types of ERP system.

So, in this research, we choose SMEs who is NOT currently using ERP system as target group.

According to the target group, the solution we need to create in this research must provide both ERP and RosettaNet communication functions as its basic features.

Enterprise Resource Planning (ERP) normally is large and complex software used to control information flow in business organization. Fortunately, there are many free opensource ERP softwares available for anyone who wants to download and implement for processing business information. With opensource characteristic, it is

possible to develop a plug-in to improve whole system functions of the opensource ERP system.

So, in this research, we will search available free opensource ERP software system, develop RosettaNet communication plug-in and publish plug-in as opensource for anyone to download and implement for their organization.

OBJECTIVES

The objective of this thesis is to develop RosettaNet communication plug-in for selected free opensource ERP system software and publish newly developed plug-in as free opensource for anyone to download and implement for their organizations.

In this thesis, it can be devided into 2 main parts.

1) Study and select free opensource ERP software to be development base
2) Study and develop RosettaNet communication Plug-in into selected base

1. Study and select opensource ERP to be development base

When searching for free opensource ERP system software in the internet, we found many of free opensource ERP software systems from many providers to be used. All of them have different design of features, architectures and structures. To select the most suitable one, we need to develop criteria to evaluate and choose one of them to be our development base.

The criteria that we developed to choose opensource ERP system consists of 2 factors as below.

1.1 Completion of desired functions

From the objective to help coordinating between ERP system and RosettaNet communication functions, the function that we desired to use from is inventory control system.

1.2 Availability of knowledge management

From the second part of objective to develop RosettaNet communication plug-in, plug-in or module development manual should be available from software knowledge management system.

After designed criteria of selecting opensource ERP software system, we applied our designed criteria to free opensource ERP software system that we have found in the internet to select the most suitable one to be our development base.

2 Study and develop RosettaNet communication Plug-in into selected base

After selected development base, we need to develop RosettaNet system plug-in for selected development base. The process of plug-in development can be described as below.

2.1 Study architecture of RosettaNet system

To develop RosettaNet communication plug-in, the understanding of RosettaNet system architecture is really necessary. Studying architecture of RosettaNet system will let us know communication structure, protocol and sequence of servers can clients in the system.

2.2 Study communication message of RosettaNet system

This study will enable us to understand structure and sequence of message used in RosettaNet system. This understanding will be used in plug-in programming.

2.3 Study architecture of selected development base

Before develop any plug-ins in the development base, it is necessary to understand architecture and structure of the system. This study will also enable us to understand how to set up the system in the real situation.

2.4 Study plug-in development of selected development base

This study is detailed study of developing the plug-in for the system. This study includes studying programming language used in plug-in development.

2.5 Develop plug-in for RosettaNet communication for selected development base

This section is to combining all of the studies above and developing software plug-in for the development base.

LITERATURE REVIEW

In this section, we will describe the impact of each literature to our research decision making.

1. Study and select opensource ERP as development base

Using google.com search with keyword “opensource erp” will give us a number of web site links containing the keyword “opensource erp”. From google.com indexing algorithm that mostly gives higher rank for web site links that have more visitors and referrers.

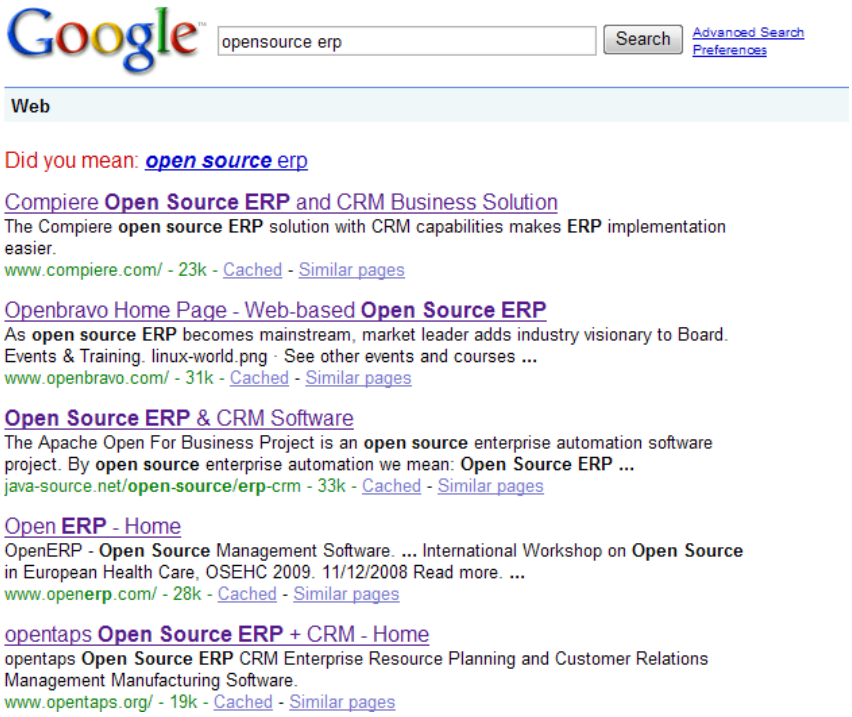

Figure 1 Google search page for keyword “opensource erp”

Top 5 of web site links form using “opensource erp” keyword are all web site of opensource ERP system software providers which are most visited and referred. So, we choose opensource ERP system software from these providers to be compared using our criteria to select our development based. Form web site link, we found list of opensource ERP and compared them with our criteria as table below.

Table 1 Free opensource ERP Software compared with criteria

Name	URL	Inventory control functions	Availability of KM
Compiere	http://www.compiere.com/	Yes	Yes
Openbravo	http://www.openbravo.com/	Yes	Yes
OpenERP	http://www.openerp.com/	Yes	Yes
OpenTaps	http://www.opentaps.org/	Yes	Yes

From table above, due to criteria comparison, we can see that any of them can be our development base. To select the best to be development base, we had to find secondary criteria for selection. In the real world, there are various business categories of ERP users that we need to serve. Different business categories require different function of ERP to support business activities. By this reason, we select our opensource ERP system by considering plug-in availability.

After browsing all sites listed in table above, we found that OpenERP contains most plug-in availability and documentation. So, in this section, we choose OpenERP to be our development base.

2. Study and develop RosettaNet communication Plug-in into selected base

Nina Malakooty (Malakooty, 2005) and Wikipedia (Wikipedia, 2009) help us to understand architecture, message structure and communication sequence of RosettaNet system. RosettaNet is a non-profit consortium aimed at establishing standard processes for the sharing of business information (B2B). RosettaNet is a consortium of major industries working to create and implement industry-wide, open e-business process standards. These standards form a common e-business language, aligning processes between supply chain partners on a global basis.

The RosettaNet standard is based on XML (Webber, 1998) (XML/EDI Group, 2003) and defines message guidelines, business processes interface and implementation frameworks for interactions between companies. Mostly addressed is the supply chain area, but also manufacturing, product and material data and service processes are in scope.

The common communication message containing business-process definitions used in RosettaNet standard is called “Partner Interface Processes (PIPs)”.

By now, we found that PIP is one of the most important parts of this research. We tried to find more information about RosettaNet PIP. Microsoft TechNet (Microsoft, 2003) helps us to understand more on PIP.

Each PIP specification provides a document type definition (DTD) file and a message guideline document. The DTD file defines the service-content message structure. The message-guideline document, which is a human-readable HTML file, specifies element-level constraints. Together, they provide a complete definition of the business process.

The purposed specifications of PIP are to describe public process, describe how to configure the public process and provide reference to the document exchange within PIP. According to the purposed specification, PIP structure contains three major parts as Business Operation View (BOV), Functional Service View (FSV) and Implementation Framework View (IFV).

Business Operation View (BOV) specifies the semantics of business data entities and the business process flow. It describes start and end states, and partner roles. It describes the interaction between roles, and details security, audit, and process controls. It specifies the business documents and business data entities.

Functional Service View (FSV) specifies network component services, agents, and interactions. It provides the network component design required to run the PIPs, and describes possible network component interactions.

Implementation Framework View (FSV) specifies the network-protocol message formats and communication requirements required to run the PIP

According to different three major parts, PIP can be divided to be many purposes and business activities. All created PIPs can be categorized as table below.

Table 2 PIP Clusters and Segments

Clusters	Segments
0: RosettaNet Support	0A: Administrative
	0C: Testing
1: Partner Product & Service Review	1A: Partner Review
	1B: Product & Service Review
2: Product Information	2A: Preparation for Distribution
	2B: Product Change Notification
	2C: Product Design Information
	2D: Collaborative Design & Engineering
3: Order Management	3A: Quote & Order Entry
	3B: Transportation & Distribution
	3C: Returns & Finance
	3D: Product Configuration

Table 2 (Continue)

Clusters	Segments
4: Inventory Management	4A: Collaborative Forecasting
	4B: Inventory Allocation
	4C: Inventory Reporting
	4D: Inventory Replenishment
	4E: Sales Reporting
	4F: Price Protection
5: Marketing Information Management	5A: Lead Opportunity Management
	5B: Marketing Campaign Management
6: Service and Support	6A: Provide and Administer Warranties, Service Packages, and Contract Services
	6B: Provide and Administer Asset Management (Merged with 6A)

Table 2 (Continue)

Clusters	Segments
	6C: Technical Support and Service Management
7: Manufacturing	7A: Design Transfer
	7B: Manage Manufacturing WO & WIP
	7C: Distribute Manufacturing Information

After understanding categories of PIP shown above, in this research, we will develop plug-in software only for PIP 3A family. In 3A family, there are additional numbers used to specify PIP message. For example, the 3A4 PIP is a part of the Order Management cluster (Cluster 3) and the Quote and Order Entry segment (Segment A of Cluster 3). This segment includes other related message PIPs as follows.

Cluster 3: Order Management

- Segment A: Quote and Order Entry
    - PIP 3A1: Request Quote
    - PIP 3A2: Request Price and Availability
    - PIP 3A3: Request Shopping Cart Transfer
    - PIP 3A4: Manage Purchase Order
    - PIP 3A5: Query Order Status
    - PIP 3A6: Distribute Order Status

With RosettaNet standard, many business organizations with different internal ERP system can be formed with each other in the supply chain as network. Inside the network, there are various kinds of PIP transmitting between the firms as we can see in the diagram below.

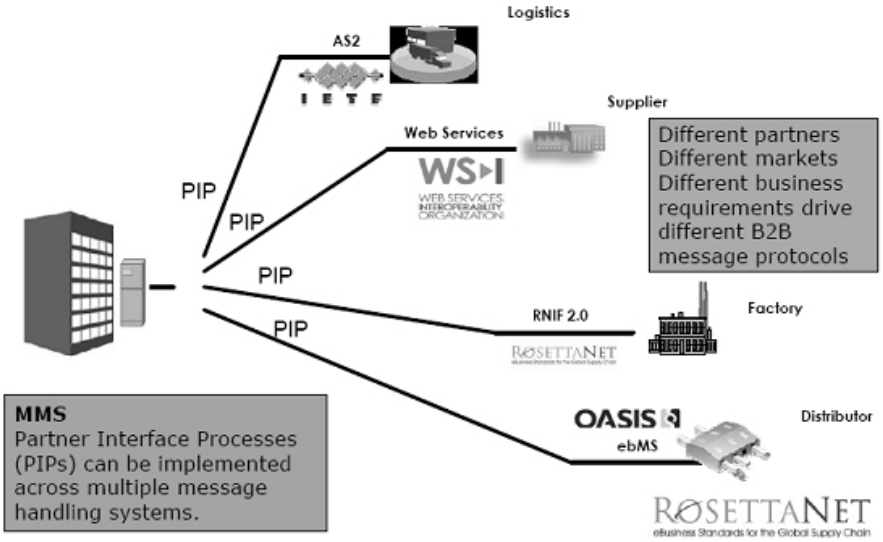

Figure 2 RosettaNet network using PIP

In real world, it is impossible to be done all of business process in single message. For complex business process, PIP can be used as sequence to perform single business process.

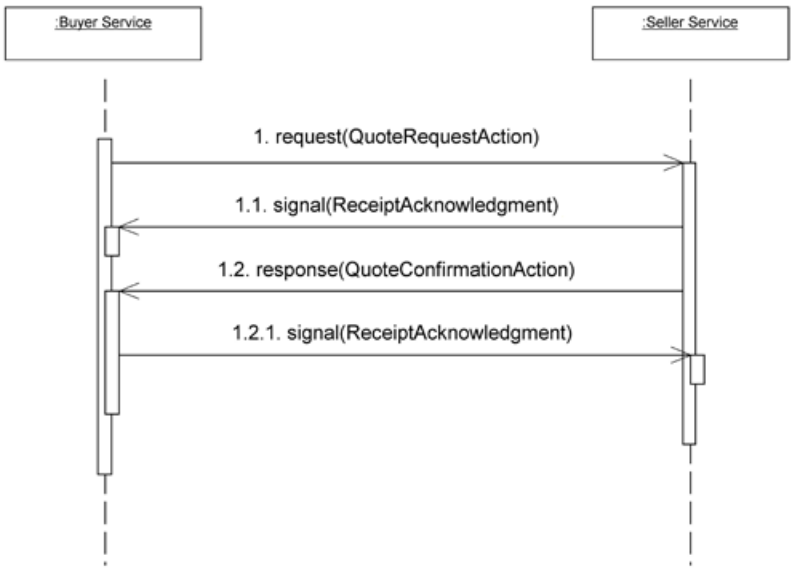

Figure 3 Business process dialog using sequence of PIP

After understanding overview of RosettaNet system, we began to find detailed information of RosettaNet Automated Enablement (RAE).

RosettaNet Engineering Penang (RosettaNet Engineering Penang, 2003) helps us to understand more on RAE system. RAE is a low-cost software RosettaNet implementation for SMEs. RAE is normally software to translate machine readable PIP into human readable PDF form sent by E-Mail to SMEs. To avoid human error on form filling, TPIR-PIP schema had been added to RAE system. TPIR-PIP is a schema to validate input data from human readable form (TPIR-PF) before convert to machine readable PIP and send to partners.

Figure 4 RAE input and output

RAE system is software installed on Multi-National Company (MNC), who implements standard RosettaNet system, or third party server side. We can see the flow of the software as follows.

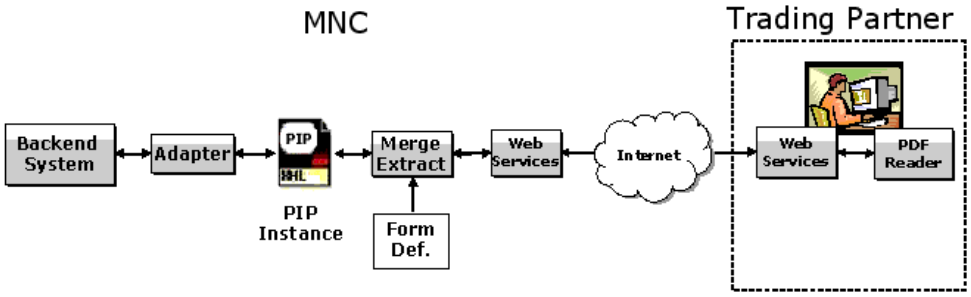

Figure 5 Working diagram of RAE

After understanding architecture and working sequence of RAE, we found that there is no coordination between RAE and internal ERP of organization (SMEs side). Observing from Kasetsart University Business Incubation Center (KUBIC), we found that business flow process that SME is currently involving is in diagram shown below.

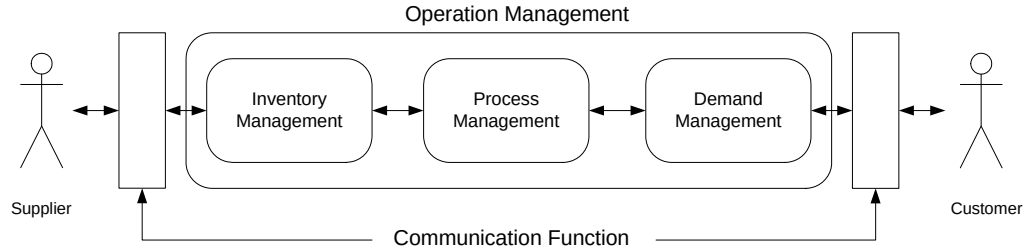

Figure 6 SME business flow diagram

From the diagram, we can see that RAE can help SME only on communication function. There is still a room of improvement on operation management part of SME business process. This room will be fulfilled by integrating RosettaNet communication function with ERP system.

Focused on operation management, we closer look at SME business flow diagram. We can analyze the structure of operation management as shown below.

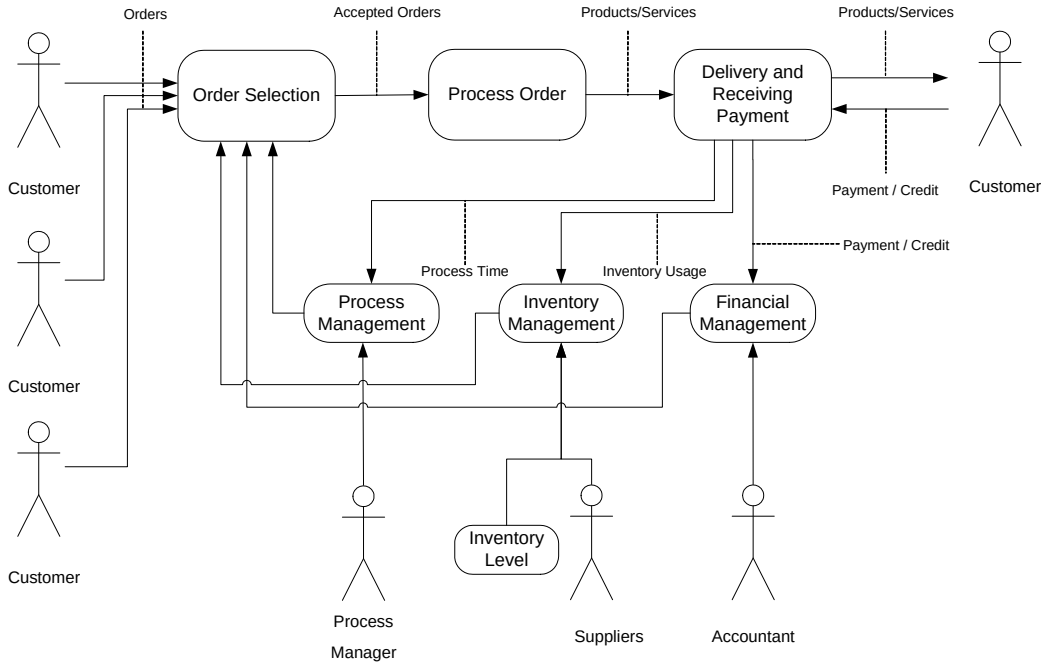

Figure 7 SME detailed business diagram

From detailed business diagram show above, we found that, for almost SME business owners, all processes are implemented as one complex process by only one or two staffs. The problem is that they cannot distribute any tasks in the process to other staffs when they want to increase capacity of the process, and we cannot map the features of OpenERP to match with that one complex process.

We need to observe and extract sub-process from one complex process and find this diagram. After that, we went back to look at our selected opensource ERP software, OpenERP, to find support function for this diagram.

OpenERP official web site (OpenERP, 2009) helps us to understand basic features of OpenERP. One of most necessary features is module development. Module is a term responsible for plug-in. Module (plug-in) is a part of software developed to increate basic function of whole system.

OpenERP helps module developer to create their custom modules using framework called “OpenObject”. Framework is a term responsible for basic function to use for integrating new programming code and core programming code. At present, there are more than 500 modules published in Global Module Index page on OpenERP official web site including Accounting Module (for financial management), Product Module (for inventory management), Process Module (for process management) and EDI Module (for partner integration). These modules are all necessary module that we need to improve for our system.

Architecture article on OpenERP official web site helps us to understand more on OpenERP architecture. OpenERP (former called TinyERP) architecture is a client-server system. The system consists of server application and client application communicating to each other by using XML-RPC or NET-RPC protocol.

Client application of OpenERP can be Windows application, Linux application, MacOS application and Web application.

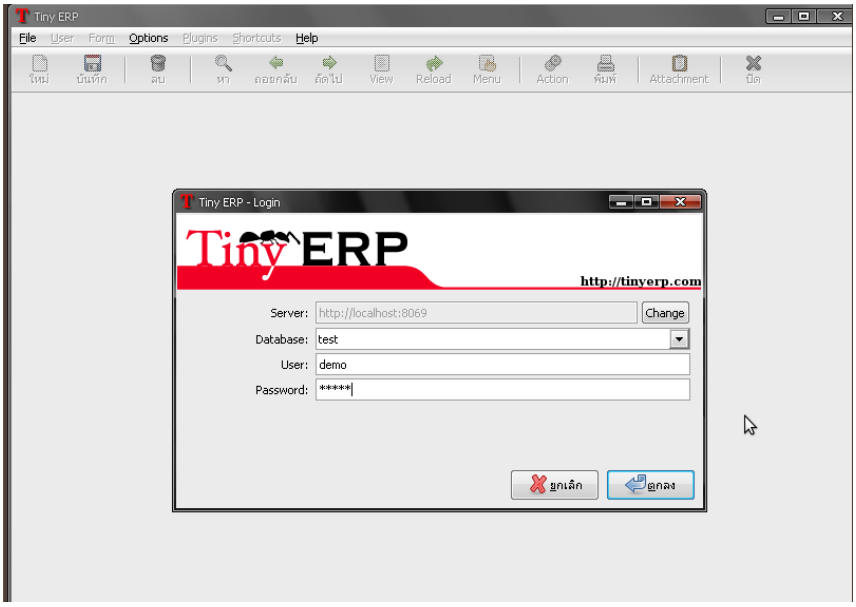

Figure 9 OpenERP Windows client application

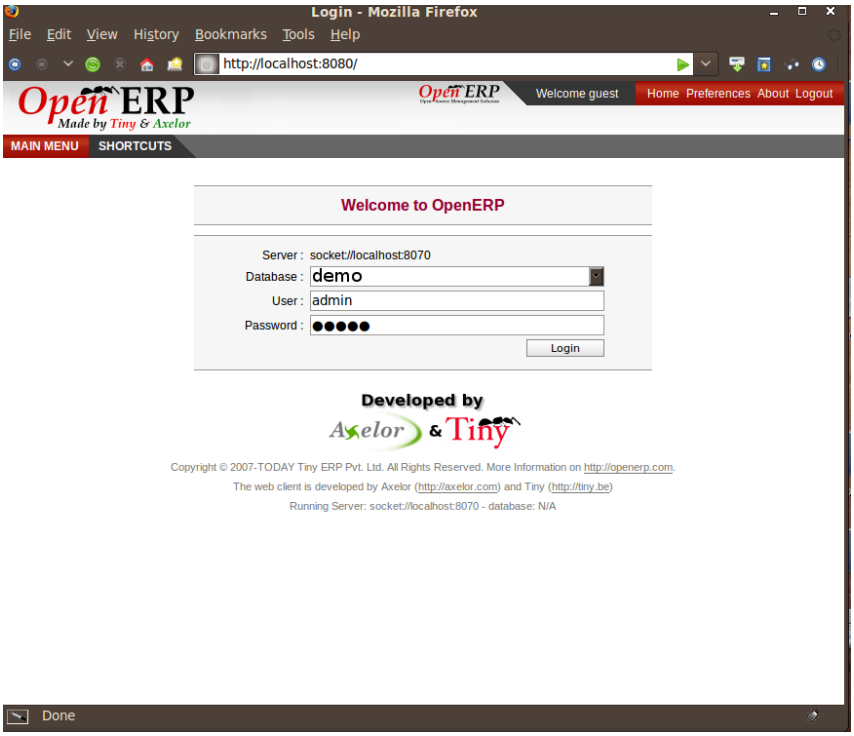

Figure 9 OpenERP Web client application

Server application can be run on every platform (Linux, Windows and MacOS). OpenERP architecture diagram can be drawn as below.

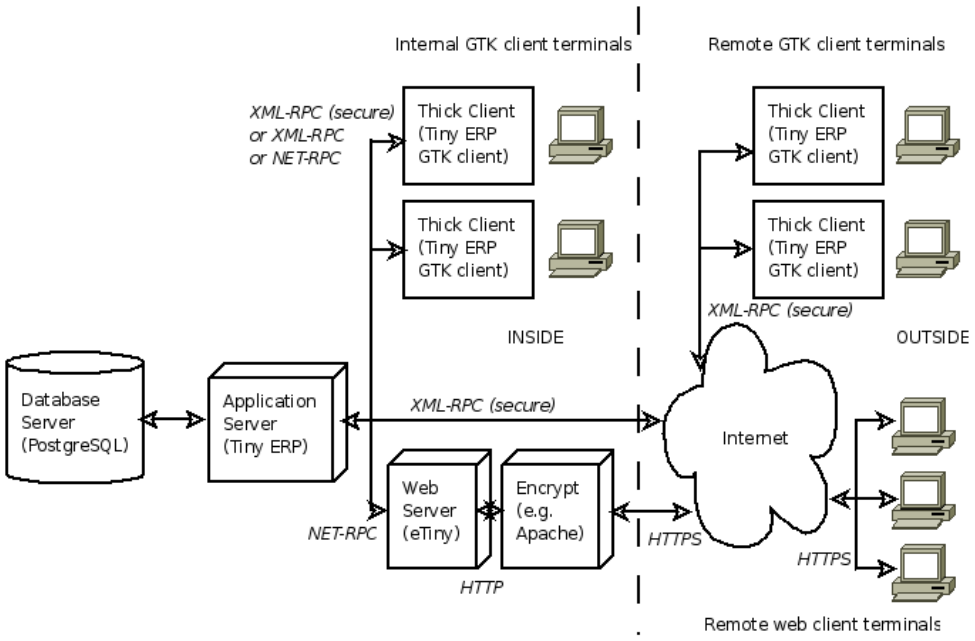

Figure 10 OpenERP architecture diagram

After understanding overall OpenERP architecture, we found that OpenERP can be installed as Web-based application. Web-based application is easier to use in real world because it does not need to install client program on client site. This feature will benefit much for SME users who are not specialized in IT.

OpenERP system is created by using Python computer language which is widely-used in opensource development. We can find many of Python documentations in the internet especially on Python.org.

For OpenERP module development, we have search in Rapid Application Development (OpenERP, 2009) article in Openerp.org (OpenERP, 2009). Development framework of OpenERP (OpenObject) is created by using Model-View-Controller architecture.

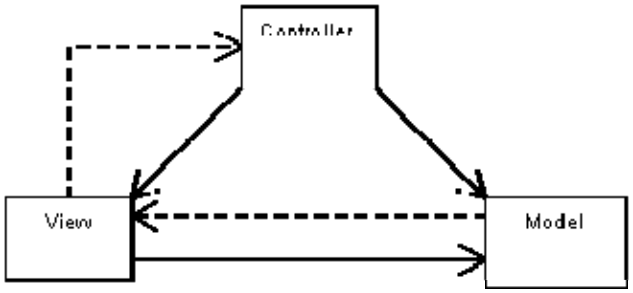

Figure 11 Model-View-Controller Architecture

In complex computer applications that present lots of data to the user, one often wishes to separate data (model) and user interface (view) concerns. So, the changes of the user interface do not impact the data handling, and that the data can be reorganized without changing the user interface. The model-view-controller solves this problem by decoupling data access and business logic from data presentation and user interaction, by introducing an intermediate component, the controller.

This architecture is the key that OpenERP can provide flexibility user interface from Windows, MacOS, Linux and Web client application.

For module development, it is unavoidable for developer to design user interface, internal mechanism and database handling. For OpenERP, developer can design user interface using XML tags, design internal mechanism by using Python script and design database handling by using SQL script.

After understanding module development of OpenERP system, we can start to implement our research.

MATERIALS AND METHODS

Place and Duration

This thesis was done at Kasetsart University, Bangkhean, Bangkok and Sarapanka Company Limited, Room 505, Floor 5, Research & Development Building, 50, Paholyothin Road, Ladyao, Chatuchak, Bangkok, 10900

The duration was from September 2008 through February 2009.

Materials

Most of the literatures are downloaded from Kasetsart University campus internet service using Google.com search engine. Personal computer, Asus A8N, 1.8GHz Turion64 X2, RAM 1GB, Harddrive 120 GB with software as follows

1. Microsoft Windows XP as operating system
2. OpenERP for Windows All-In-One package as development base
3. Python 2.5 as Python complier for module development
4. PostgreSQL 8.3 as OpenERP database support
5. Netbeans 6.5 as Python Scripting Editor
6. Dia UML Modeler as UML Modeler for Python development
7. Microsoft Office Word 2007 for report writing

Methods

Research Plan

1. Selecting opensource ERP software to be development base

    1.1 Observe and study SME business process
    1.2 Develop criteria to select opensource ERP to be development base
    1.3 Searching opensource ERP list to be candidate
    1.4 Choose most suitable opensource ERP to be development base

2. Develop RosettaNet communication plug-in on selected development base

2.1 Study RosettaNet system architecture
2.2 Study RosettaNet communication message
2.3 Study selected development base software architecture
2.4 Study plug-in development on selected development base
2.5 Implement RosettaNet communication Plug-in for selected development base

3. Writing thesis paper

Contribution

This research will contribute followings;

1. Free opensource ERP software system with RosettaNet communication functions for SME
2. Knowledge in installing and using opensource ERP software system
3. Knowledge in plug-in development for opensource ERP software system

Financial Source

“International Graduate Program Scholarship”

RESULTS

This chapter provides research concept, software architecture and software usage detail.

1. Software Concept

Concept of this research is to develop module (plug-in) for RosettaNet communication into free opensource ERP software, OpenErp. According to modular architecture of OpenErp, there are several modules providing different functions embedded in the system.

To develop RosettaNet communication module, we need to study and select related modules to fulfill business process. The modules that we have selected are as follows.

1.1 Partner Module

As one of base module given with OpenERP, partner module provides data structures and functions for collecting company information of all trading partners and user itself.

1.2 Process Module

Process module is the module that manages the business process. This module also provides basic process management functions to other modules.

1.3 Product Module

Product module is designed to provide all data structures and functions related to product of the firm. By cooperating with partner and process module, product module can manage all of product information for all of trading partners and user.

1.4 Stock Module

Extended from product module, stock module provides inventory control ability user’s products.

1.5 Account Module

Account module provides ability of financial management of the firm. Using with stock module, user can easily manage inventory control of the firm with ability of financial management.

1.6 MRP Module

MRP is responsible for material resource planning. MRP module is the module for managing material resource used in the firms especially manufacturing firms.

1.7 Human Resource Module

Human resource module is the module designed for employees' tasks management. This module can assign task description and trace employees' working performance.

1.8 Sale Module

Sale module is the module for sale document management. When using with stock and account module, the firm can completely manage sale documents, inventories and finances.

1.9 Purchase Module

Opposite of sale module described above, purchase module is the module designed for procurement document management. It can also work with stock and account module.

From described module characteristics, our RosettaNet communication module will mainly cooperate with sale and purchase module. By adding ability to translate sale and purchase documents into RosettaNet message (PIPs), we can sketch the data flow diagram of our module as below.

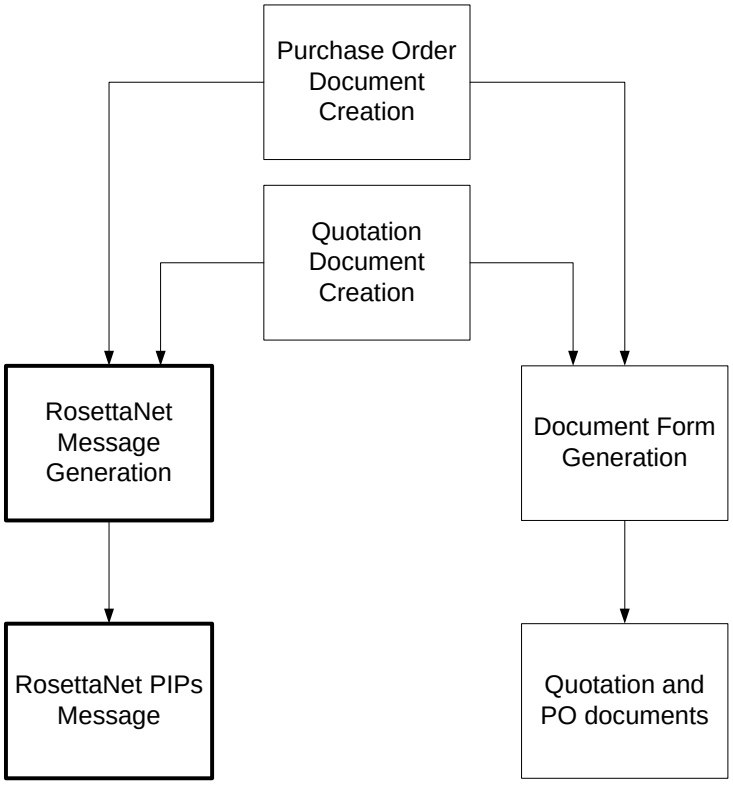

Figure 12 Outgoing data flow diagram

The diagram sketched above is the conceptual diagram for outgoing message. The incoming message diagram is described as below.

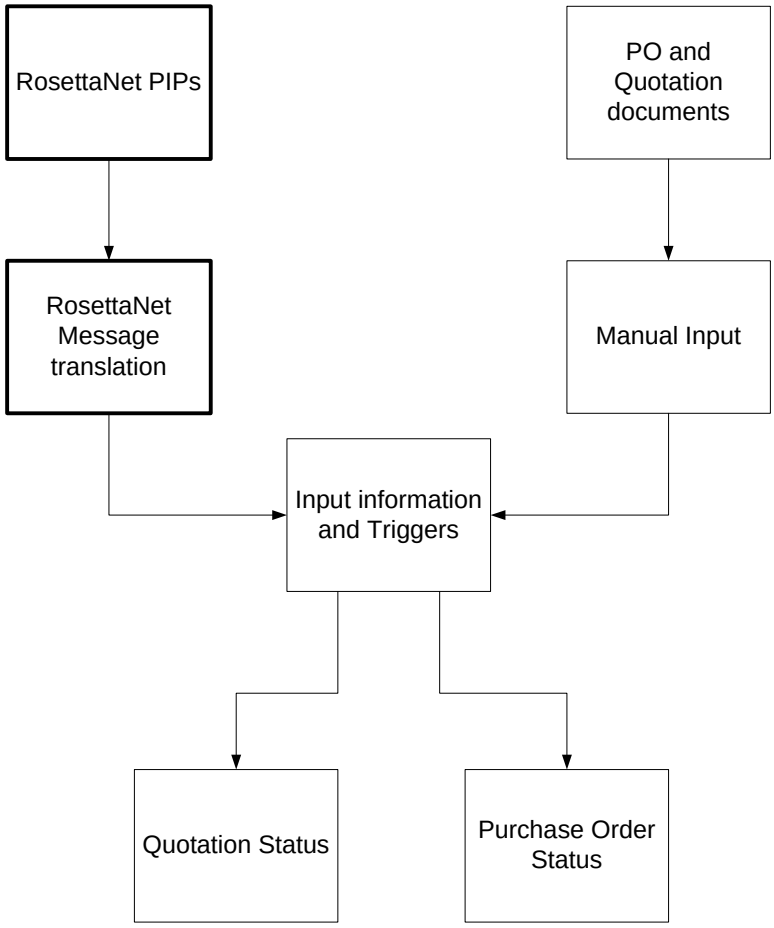

Figure 13 Incoming data flow diagram

After getting this conceptual design, we can analyze the module existing module and design the software architecture.

2. Software Architecture

Before designing newly developed module architecture, we need to study structure and relationship of selected existing modules. By searching literature from the internet and analyzing the modules' source code. We can map selected existing modules as diagram below.

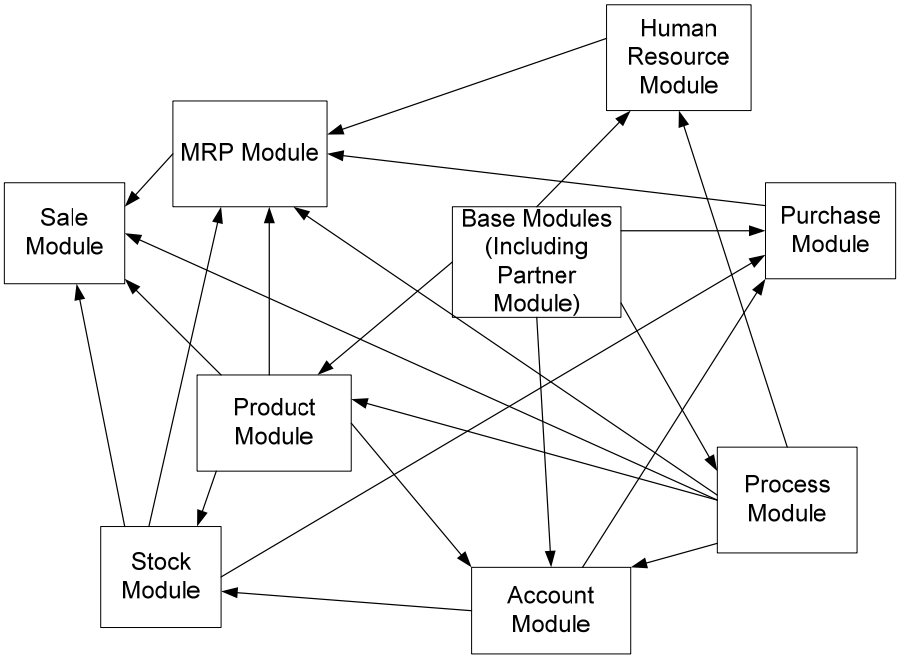

Figure 14 Existing modules structure and relationship

Due to the conceptual designs and structure diagram above, it is not necessary for RosettaNet communication module to create relationship with all modules listed in the diagram to fulfill all of designed functions. To fulfill all of designed functions, we can borrow the existing relationships among existing modules to be data flow path. We can design new module relationship as follow.

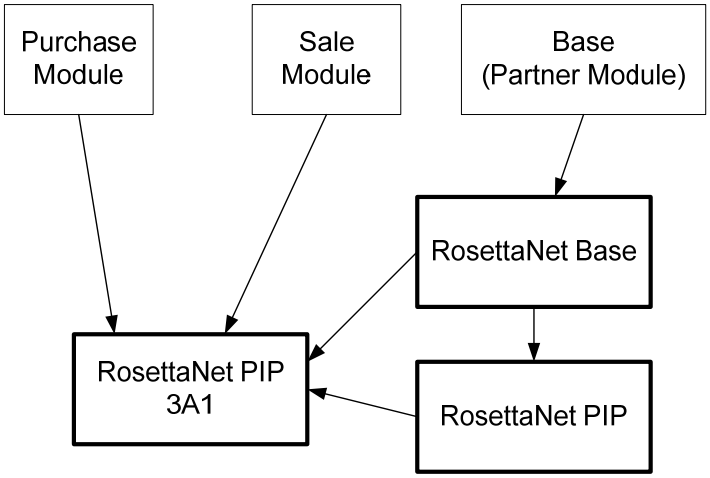

Figure 15 RosettaNet modules with relationship

From diagram above, we designed to develop 3 different modules for RosettaNet PIPs development and future research. The modules can be explained as follows.

2.1 RosettaNet Base Module

The module is designed for managing partner information and RosettaNet configuration information. Partner information is the trading partner information commonly required by every RosettaNet PIP message. Configuration information is global defined information used in RosettaNet PIPs, such as country code, partner classification code, partner role classification code, etc.

2.2 RosettaNet PIP Module

This module is the basic module for PIP development. The purpose of developing this module is to embed basic PIP handling functions into this module. For future development, developers can use functions in this module to handle new PIP message that they want to develop. This module will help new developers to develop new PIP handling modules.

2.3 RosettaNet PIP 3A1 Module

This module is PIP 3A1 handling module developed for users to request and response quotation using PIP message. This module is also developed as sample PIP handling module for other developers to study.

PIP 3A1 (Quote Request) is a PIP in 3A PIP family. PIP 3A1 is consisting of 2 parts, Request and Confirmation.

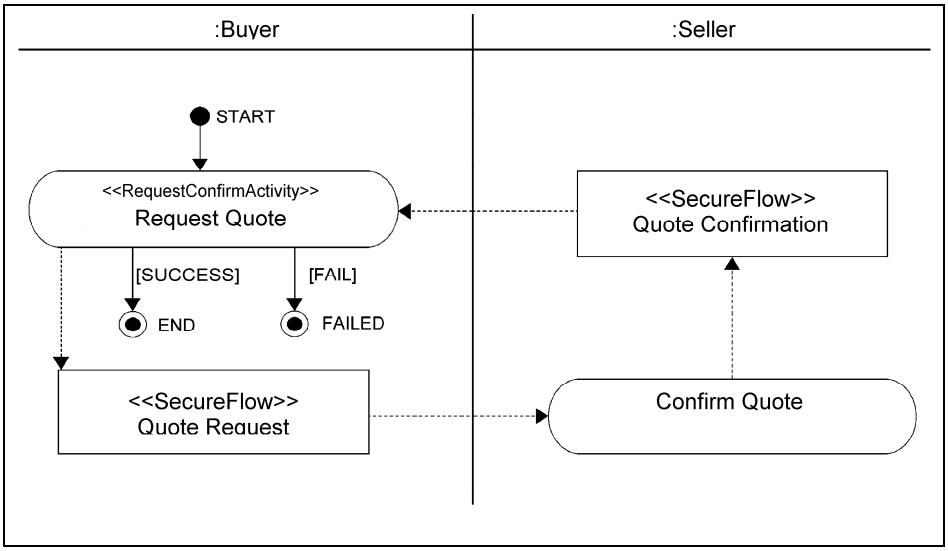

Figure 16 PIP 3A State chart diagram

From diagram above, we need to develop our communication module to support both Request and Confirmation activities. In Request side, we can only translate quotation request information into RosettaNet PIP message and send to trading partner using XML-RPC protocol.

In Confirmation side, to enhance business process of users, we need to develop decision making logic helping users in quotation confirmation. The decision making logic can be described as follows.

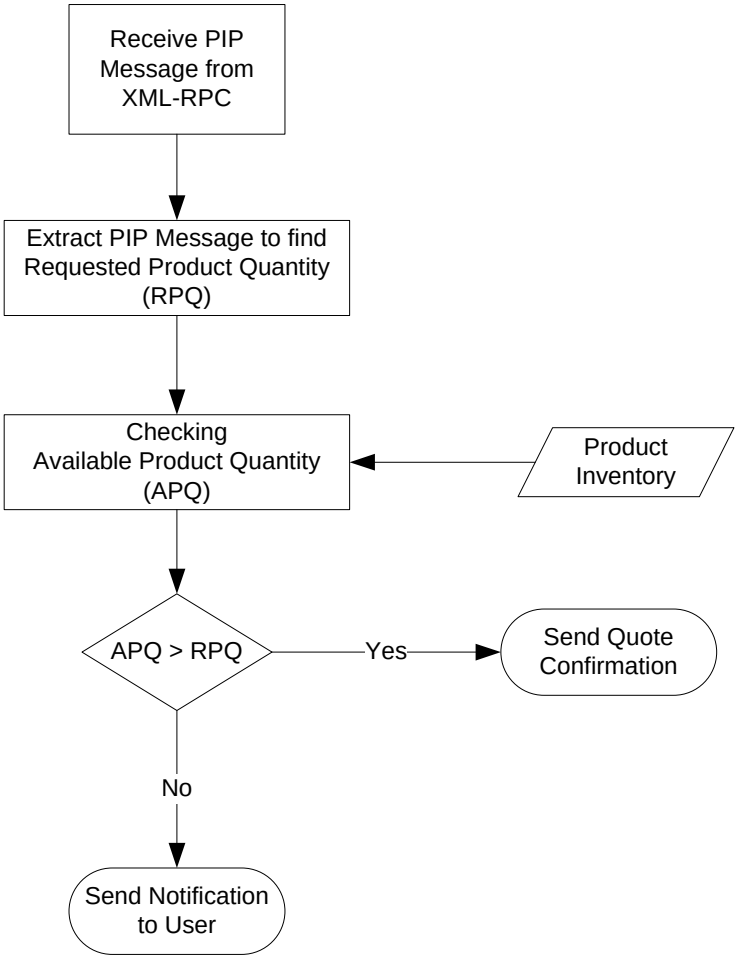

Figure 17 PIP 3A1 Confirmation side decision logic

From the logic diagram described above, if user has enough inventories, the system will automatically create quotation and send back to trading partner. This decision making will help user in maintaining fast response time with trading partners. On the other hand, if the inventories are not enough, the system will send notification e-mail to user for decision making.

3. Software Detail

In this section, we will see the user interface of the developed software with its functions. The software is based on OpenERP web-based mode as we can see its login page in literature review section.

After login, we will see the main menu screen.

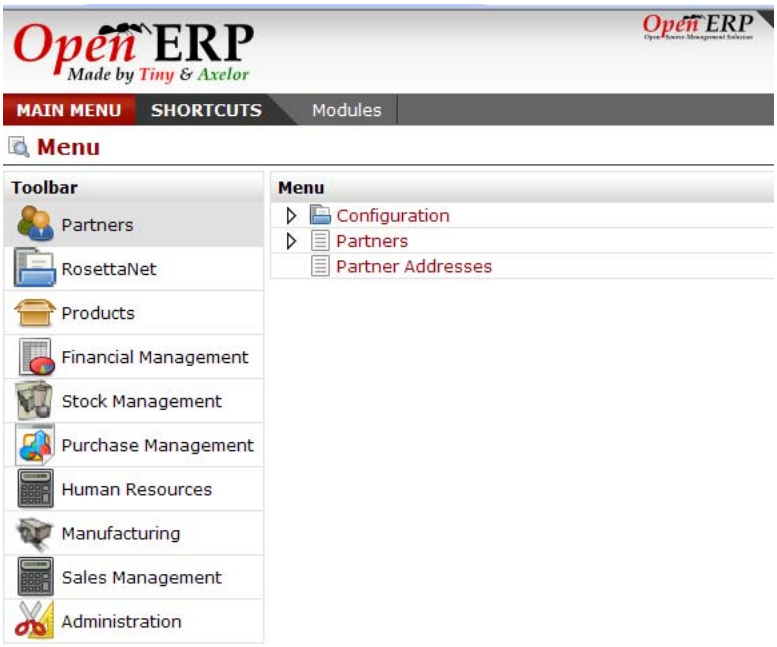

Figure 18 OpenERP main menu screen

From screen above, we can see the main menu at the left side. Main menu consists of several submenus and functions. For using RosettaNet communication functions, there are only few menus to use.

3.1 RosettaNet Menu

After clicking “RosettaNet” menu on the left screen, we will see the screen for RosettaNet general configuration.

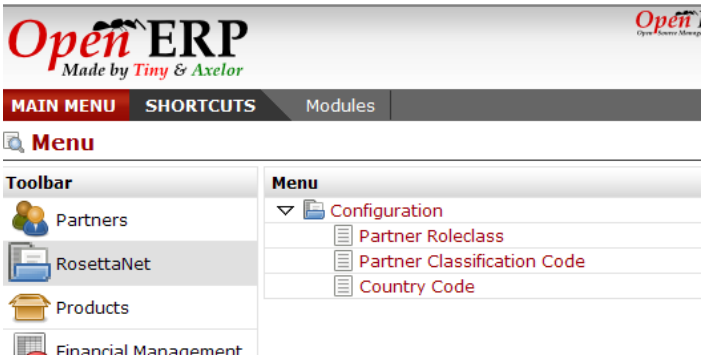

Figure 19 OpenERP RosettaNet menu screen

The configuration submenu under “RosettaNet” provides configuration of 3 main parts Partner Roleclass, Partner Classification Code and Country Code. Partner Roclass and Partner Classification Code are codes defined by RosettaNet standard used for classifying trading partners.

3.2 Partners Menu

In partner menu, there are few submenus Configuration, Partners and Partner Addresses.

Figure 20 OpenERP Partners menu screen

After entering “Partners” submenu at the right side, we will find the list of partners of the firm.

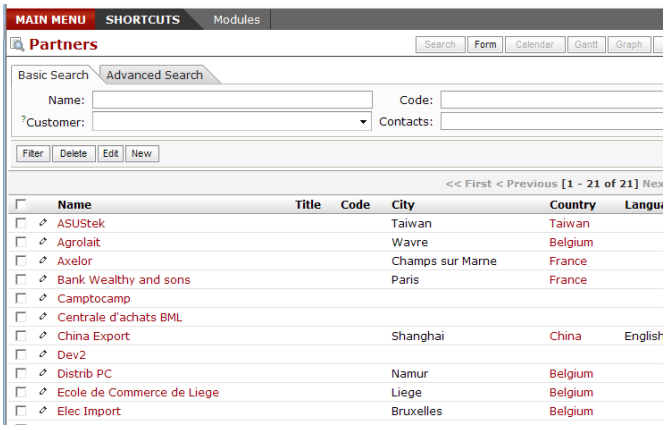

Figure 21 OpenERP Partners list

If clicking at the partner's name, we can see the partner information page. In the page, we will see "RosettaNet Information" tab. This tab will provide RosettaNet partner information form to fulfill.

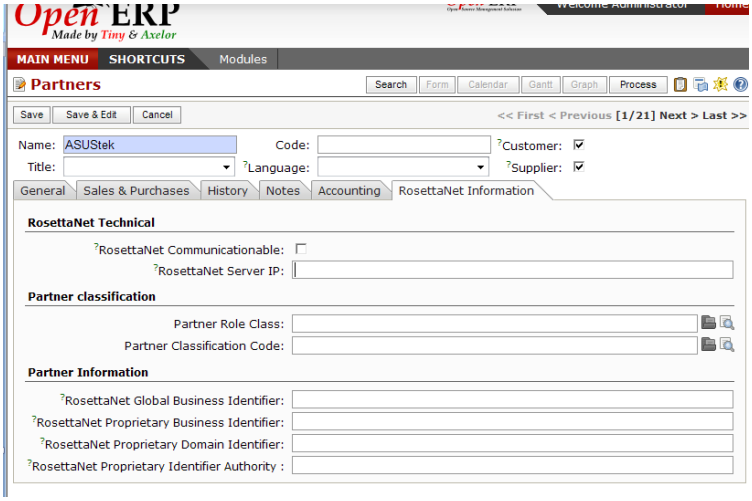

Figure 22 RosettaNet information screen

User needs to fulfill the form of trading partners before they can communicate with user using RosettaNet standard.

3.3 Purchase Management Menu

In this menu, user can normally create quotation request and purchase order documents. After install RosettaNet communication module, user can gain more function to send PIP 3A1 requesting for quotation from trading partner.

To send PIP 3A1 for requesting quotation, user need to create quotation request document entering "Purchase Orders" and "Request For Quotations" submenu.

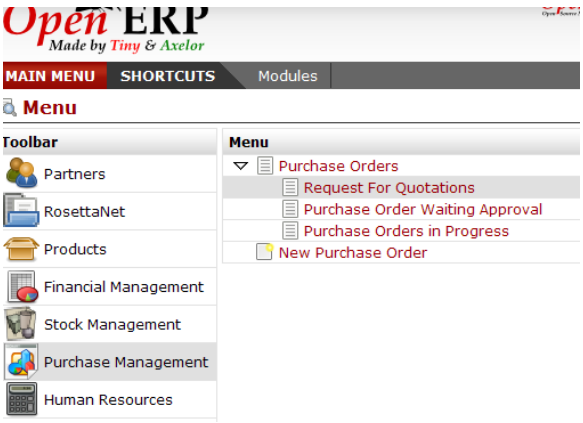

Figure 23 OpenERP Request For Quotations submenu

After entering “Request For Quotation” submenu, we will find request for quotation menu. We can click “New” button to create new quotation request. In the creation form, we will find “Send Quotation Request (PIP 3A1)” button. If we click this button, the software will transform newly created document into PIP 3A1 and send to specified trading partner.

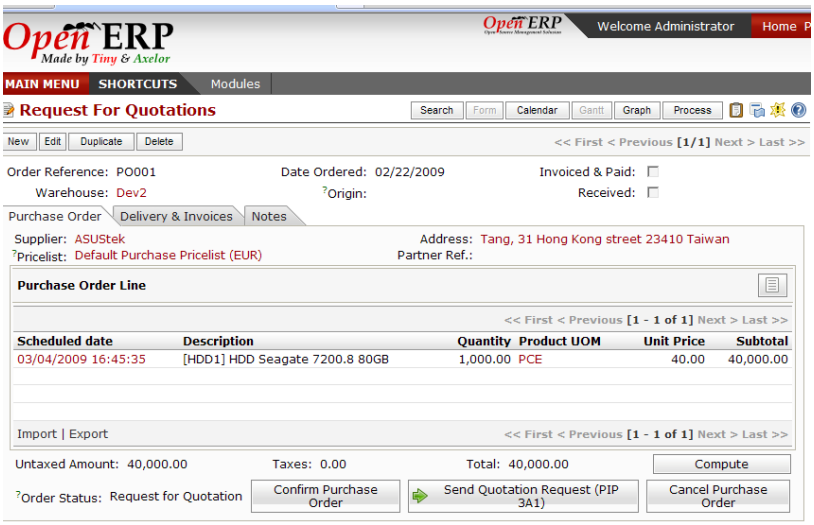

Figure 24 OpenERP Quotation Request form

All information described in this section is the concept, architecture and detail of newly develop RosettaNet communication module. By using this software, users will be benefit from its abilities to manage business process and communication functions.

DISCUSSION

Before moving to opensource ERP system, we had a plan to develop RosettaNet communication plug-in for Drupal which is one of widest used opensource content management system (CMS).

Later, we had changed the plan because, normally, CMS is not designed for used as ERP system. The architecture and structure are not much support business transaction handling, and there is no supported module for using as general ERP system. SME users who implement this system will not have a chance to install other ERP modules that they need for their business.

Moving development base to OpenERP is benefit in three ways.

Firstly, OpenERP is designed to be ERP system. Its architecture and data structure are designed for supporting and handling high-load business transaction.

Secondly, there are plenty of free downloadable ERP related modules. SME users can download and install module that support their organization business.

Finally, OpenERP is widely used in real-world application. The provider of OpenERP will continuously develop and upgrade both core system and new plug-in modules to be more effective and flexible in the future. SME users can benefit from its continuously development.

In this research, the developed RosettaNet communication plug-in has been tested only in peer-to-peer communication between 2 servers installing the same plug-in. Because there is no actual RosettaNet server for testing this time, we have never tested this plug-in with actual RosettaNet server. However, by using developed plug-in, SME users can communicate with partner who installed the same system.

In this research, the developed RosettaNet communication plug-in is supported only PIP 3A1.

CONCLUSION

This research mainly contributes on finding the problem and finding basic system for solution. There are still rooms of improvement to gain more stability and functions.

We can specify future work of this research into 3 ways as followings.

1. Stability improvement

In this topic, the system need to be tested communicating with actual RosettaNet server with high-load transactions. The goal is to improve the system to be stable enough to use for real-world high-load business transactions.

2. Functional improvement

In this version, the system supports only PIP 3A1. To be used as trading partner software in RosettaNet network, More PIP communication functions have to be added into the system.

3. Decision making logic improvement

In this version, we implemented simple decision making logic to improve response time of users business. However, simple decision making logic cannot help much in business process improvement. For future work, decision making logic is one of necessary topic for improvement.

Although having several rooms of improvement, this research contributes basic software for improving business processes and RosettaNet standard communication functions. This research also contributes development framework for advance business process improvement and RosettaNet communication software.

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CURRICULUM VITE

NAME : Mr. Pornanan Udomthavornsuk

BIRTH DATE : December 25, 1982

BIRTH PLACE : Khon Kaen, Thailand

EDUCATION :

YEAR	INSTITUTE	DEGREE/DIPLOMA
2003	Kasetsart Univ.	B.Eng. (Electrical Engineering)
2009	Kasetsart Univ.	M.Eng. (Industrial Engineering)

POSITION/TITLE : Managing Director

WORK PLACE : Sarapanka Company Limited