

2011 Citi Financial IT Application Competition

Project Interim Report

Project Title: iPay

Focus Area: Service Quality and Product Value

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School: Nanjing University

Organizing Committee of Citi Financial IT Application
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Project basic information

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Topic Area	Service Quality and Product Value			
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I . BRIEFLY STATE YOUR PROJECT'S GOALS, TOPIC AREA, BENEFITS AND APPLICABLE FUNCTIONS.

1. PURPOSE

(1) Nju-lpay links shopping with mobile payment, consumers can pay their bills directly using the function of scanning bar codes of their own mobile phone. This helps them a lot by keeping them from the trouble of standing in line and waiting for checkout, which decreases the time spent in the last part of shopping, and makes new shopping experience available with a significant reduction in shopping time costs to consumers.

(2) Nju-lpay helps consumers adjust their consumption patterns. Consumers will get the preservation of electronic invoices in our software after paying for purchases using mobile phones easily. Besides, consumers can view their consumer bills weekly or monthly through the preserved electronic invoices and receive messages of the balance and expenditure of their accounts regularly to enable consumption pattern adjustments in time.

(3) Based on the analysis of software users' consuming records, shopping malls can improved their services according to consumers' spending habits, propensity to consume and consumption, then promote personalized services through recommendations to consumers and other methods. At the same time, shopping malls may save much afford in making concerted recommendations and advertising their products for the sake of expanding sales. Also, shopping malls can adjust their arrangements of the purchase and inventory management according to the continuously updated consume records and regular demand analysis.

(4) Nju-lpay establishes cooperations between banks and shopping malls. Banks can analyze shopping malls' marketing conditions, and then decide lending policies; while bank take customer consumption records to infer the individual's spending capacity and further their solvency.

2. MAIN RESEARCH FIELD

We choose the second option: server quality and product value.

This innovation combines efficiency with fun in shopping, and integrates consuming and individual financial management as well, while tying mobile barcode scancer to checkout in shopping is realized. Breakthroughs are made in our shopping styles, and this contributes to lower time cost of shopping with higher service levels. Our prime purpose od designing this software is to provide users with a new shopping experience in the first place. Then based on this software, banks and shopping malls can build cooperation mechanisms, and this not

only helps the banks obtain stable deposits and attract new depositors, but also benefits shopping centers to improve efficiency and expand business scales.

3. FUNCTIONS EXPECTED TO ACHIEVE

Consumer client

- (1) GPS positioning search. Consumers can search for the name of the market or purchase that they want and find the nearest target before entering markets through the software which is connected to mobile phone GPS. (primary)
- (2) After entering the mall, consumers can view the information of the market and users themselves through the mobile client. Users can also look over the comments of the market and commodities so that they are able to make right consuming decisions. What's more, the homepage of the market will provide consumers featured products, promotion notices and the best recommendations.(primary)
- (3) Commodity search function. After consumers input the product name, the mobile client will provide them with target position so that consumers can find it as soon as possible.(secondary)
- (4) Barcode scanning recognition. This software helps users identify the products can by scanning its barcode. At the same time, consumers are also provided with the information and the comments of the product. Also, comparisons of products in the same style both in the very and other markets are provided, in order to help users make the decisions.(primary)
- (5) Consumers can easily view the goods they want to buy, and they can add or delete any purchases or change the number of goods at any time before payment affirmance.(primary)
- (6) Users can pay for the chosen goods directly through the software. Along with the payment, invoices can be saved, users can view and analyze the invoices at any time.(primary)
- (7) The software can be used to pay phone bills straightly. Bank account transfer and credit card repayment can also be completed on the platform.(secondary)
- (8) The software displays the amount of balance and spending periodically. So consumers can make reasonable arrangements of spendings accordingly.(primary)

Shopping center server

- (1) This platform records the transactions through the software in order to facilitate users to analyze consumers' actual demand and potential demand. Accordingly, shopping malls can recommend products to users.(primary)
- (2) Users can look over consumer comments of any products and analyze the customer flows, so that they can improved relative services to keep customers.(secondary)
- (3) Users can update and view information of all products, merchandise sales records and the remaining quantity at any time. And then shopping malls can analyze consumers' demand for commodities to determine the supplement.(primary)
- (4) Uploading the goods information: featured products, traditional products and so on.(secondary)

Bank center server

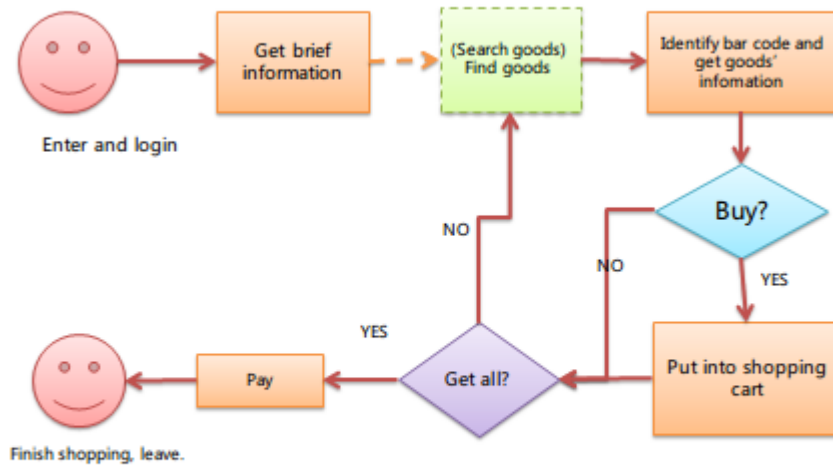
- (1) This server records users' transactions so that banks are able to analyze the users' levels of potential consumption and solvency and so on.(primary)
- (2) Banks can analyze the situation of malls' marketing and launch packages to meet customer needs with shopping centers. (secondary)
- (3) The server provides the clients with the payment and clearing interfaces and process to settle related business. (primary)
- (4) According to malls' operating conditions, deposit and lending rates, the degree of business cooperation with them, banks can develop reasonable loan intensity and cooperation projects.(secondary)

II. STATE THE APPLIED METHOD(S), TECHNOLOGY AND THE FEASIBILITY ANALYSIS OF THE PRODUCT.

1. SUMMARY

In general, we will combine C/S with B/S architecture in our project. (C/S majors on users who are going to pay for goods with our software, and B/S is used by the system administrators to analyze data). The whole architecture will comply with the MVC design pattern. Users run the client on their cell phones and backend server system is running on the service provider's (banks and supermarkets) "Tomcat". The functions of user client focus on realizing accesses to the products' information, identify the bar code and finish the payment. Besides, the server's mission is to realize data persistence and offer interfaces for payment and data analysis.

2. A BRIEF INTRODUCTION TO BUSINESS PROCESS



- (1) User enters the mall and logs in through the client;
- (2) User receives information about the market;
- (3) (This step is optional) User searches for goods with the help of client. As a result, the system sends a response if specific goods exist.
- (4) User finds goods and identifies the bar code of it. The system offers information such as producer, price, production date and so on. Besides, our software will provide other users comments on the goods.
- (5) User puts goods into shopping cart. Go back to step 3 until he get all things he want to buy.
- (6) User pays for goods through client.
- (7) User leaves the mall.

3. THE APPLIED METHOD(S) AND TECHNOLOGY

(1) Client on cell phone

According to the business process, client supports all the interactions with users. Client provides goods information, bar-code identification and payment for users. Here we choose

Android as the operating system our client based on. (We may have an iOS version someday.) The following technology may be used:

- a. Basic widgets on Android;
- b. Bar-code identification: Camera module, open source Java library ZXing;
- c. Network: JSON, https, MD5 encode;
- d. Local cache: SQLite;

(2) Server administration panel

Administrators in banks and markets can use browser to access server. Here we provide them with a web GUI of CRUD (Create, Read, Update and Delete) functions of some data (for example, account information, goods information).

Bank: Transaction records, accounts information and statistics;

Market: products' information, detailed records of every payment and other statistics;

Implemented technology:

- a. JavaScript library: jQuery.

(3) Server

Server majors on business logic processing and data persistence. The server program runs on a Tomcat server. It accepts client requests including cell phone client and browser and returns messages in response.

Bank: payment processing, account management.

Market: according to users' input, providing the specific information; providing goods management and account management.

Implemented technology

- a. J2EE Spring 3.x
- b. MySql
- c. Hibernate

(4) Network

- a. Protocol: HTTP

b. Data form: JSON

c. Security consideration: https and MD5 encode

4. THE FEASIBILITY ANALYSIS

Members and skills:

All the members of the group are well skilled. We have a good understanding of software engineering. Most of us manage Java well and have experience of Android and J2EE development. Although there may be some difficulties in the way to success, we will overcome them through learning more and helping each other.

Time

This project was launched in May 2011. We've got our idea fixed and finished basic requirements analysis. In July 2011, we started designing. There will be two months for us to produce our software, so we have ample time.

Technology Conditions

(1) Cell Phone Client

- a. The development of Android is becoming mature, and there are plenty of references and experiences. What's more, Android is an open source system which gives us more freedom, and its tightly coupled system with Google services (e.g. Google Map, Gmail) guarantee the development of our iPay client.
- b. Bar-code identification has been implemented on Android. There is an open source Java library ZXing available which saves much afford.
- c. Most Android devices have a good performance to support the missions such as barcode identification.

(2) Server Administration Panel

- a. As the most widely used framework of JavaScript, jQuery has been proved to be successful. Since it's compatible with both CSS3 and all kinds of Internet Explorers, jQuery facilitates HTML document traversing, event handling, animating, and also Ajax interactions for rapid web development.
- b. JQuery has comprehensive documents and applications, as well as plenty of mature plugins.

(3) Server

- a. The core features of the Spring Framework can be used by any Java application, but there are extensions for building web applications on top of the Java EE platform. Although the Spring Framework does not impose any specific programming model, it has become popular in the Java community as an alternative to, replacement for, or even addition to the Enterprise JavaBean (EJB) model.
- b. Hibernate is an object-relational mapping (ORM) library for the Java language, providing a framework for mapping an object-oriented domain model to a traditional relational database. Hibernate solves object-relational impedance mismatch problems by replacing direct persistence-related database accesses with high-level object handling functions.
- c. The MySQL database has become the world's most popular open source database because of its high performance, high reliability and ease of use. It is also the database of choice for a new generation of applications built on the LAMP stack.

(4) Network

Nowadays, most ISPs offer better networks than before and 3G mobile technology enhances the stability of mobile network. Besides, Wi-Fi covers more places. Therefore the implementation of our system is quite feasible.

III. STATE THE POSSIBLE APPLICATIONS OF THE PRODUCT, INCLUDING ITS CURRENT AND FUTURE APPLICATIONS IN LOCAL AND OVERSEAS MARKETS, POTENTIAL CUSTOMERS, PRODUCT'S PROFIT POTENTIAL AND SOCIAL IMPACT.

1. CURRENT APPLICATIONS AND ECONOMIC POTENTIAL IN LOCAL AND OVERSEAS MARKETS

(1) Existing developments and experiences in this field provide the basis for product innovation.

In the current society, mobile payment is not a new concept, and it has been developing in Europe and Japan for years. Also, "cellphone purse" and "cellphone wallet" are attracting more and more people's attention. In the United States, Google purse, a nearly-field communication (NFC) technology-based product, was launched recently, which brings

much more convenience to consumer payment. In the U.S., smart phone penetration rate has reached 28% until the third quarter of 2010. Up to now, the remained problems of the application of this type of technology is the shortage of smart mobile users and terminal charges, but this kind of product is still expected to promote after a few years.

(2) There are huge market potential user groups.

Mobile payment has a rapidly growing large global market. According to foreign researches, it is predicted that the global mobile payment users will grow from 32.9 million in 2008 to 130 million in 2011. The amount of users with a mobile phone with wallet functions will rise from the current 50 million to 700 million in 2013, and by then, the capacity of e-banking, business transactions and accounts transfers through the global mobile devices will be \$ 110 billion in total.

In the worldwide, in Asia-Pacific mobile payment is applied more relatively, among which the number of Japanese and South Korean users increase rapidly. In 2009, the amount of mobile phone users in China reached 747 million, while the number of people who use mobilephone payment was 82 million, which meaned mobile payment market penetration rate was only 10%. As to iResearch predicted, by 2013, Chinese mobile phone users will be 996 million, and there will be 410 million mobile payment users, including 169 million users of mobile phone near-field payment.

Visibly, mobile payment in China has a vast market, and also, in the Asia-Pacific region, there is still much room for development. Drawing on existing technology and marketing experience, our product from innovative transformation, Nju-lpay, a mobile payment software, which is based on the mobile barcode scanning, will have a very substantial market potential.

2. POTENTIAL USERS

(1) Consumers

According to the survey of consumer satisfaction, shopping malls and supermarkets generally do better with hardware than soft environment, and one of the main reasons is queuing problem. Statistics reflect that, the customer's average willing waiting time is 0.11 hours during 7 am to 19 pm, while from 19 am to 21 pm, is 0.13 hours. However, on weekends, holidays and other prime time for shopping, waiting time is often too long, resulting in a lot of consumer dissatisfaction.

Given the increasing penetration of mobile payment and mobile bar code scanners popularity, faced with people's growing dislike to wait in this high-speed society, mobile

payment software supported by barcode scanning which saves waiting time when shopping will win the consumers' welcome, and have a huge number of potential users.

According our actual market survey, we can draw some inclusions from different perspectives. First take the ages of view, potential users of this product are mainly concentrated among people who are 20 to 40 years old; while from the profession point of view, a large number of potential users will be in the industries with less flexibility in timing, such as financial and IT industry. These people are just the ones who are willing to try new things, and also urge to improve the efficiency of purchase. This product will win this group of users firstly. And as technology develops and user makes propagation effects, the product will win a larger market.

(2) Stores

Stores (especially large-scale shopping malls, supermarkets) can use this software to shorten the time on cash register to improve service quality and efficiency. This helps them win higher customer satisfaction and then more income. In addition, the store can utilise this service to obtain a higher reputation and promote their products and goods better.

Stores have built up relationships with banks on the credit card business for long, so it won't bring much difficulty to implement further cooperation with banks in this innovative product. Besides, this more stable relationship with banks provides them more financial exchanges, which creates a solid financial backing for their own operations.

(3) Banks

First, through the development of this business, banks provide their clients improved high-quality services, and then established reputation on this will attract more customers. Secondly, the cooperation with large businesses brings more deposits. More opportunities of increasing their working capital and bringing more profits are created by setting up business relationship with large merchants. Again, the service platform sends information promptly and effectively, which brings the catalytic effects to banks' other business operation. Finally, referring to the information of actual market collected from this platform, banks could better handle their own business development and direction of investment.

In summary, in all the three platforms including consumers, stores and banks, our product can provide its motivation to the users, in other words, has great potential customer bases, so it is of great value to develop.

3. MARKET OUTLOOK

(1) Actual survey reflected that our product is generally accepted by people.

Through questionnaires and Internet voting, we found that generally people had a great interest in using their phones to pay for purchases and related functions. However, when mentioned specific functions, people of different ages have different focuses. Updated information of commodities, especially some promotion notices, provided by Ipay are concerned more among the interviewees who are over 35 years old, while consumers under the age of 35 focus more on efficiency and convenience mobile payment function would bring to them. This shows that the potential demand of our product is prevalent among consumers of all ages, thus it has great market space to develop. Praise and doubt both exist, but we believe the good points overwhelm the drawbacks. Most of the interviewees think that it is a good use of existing resources to combine mobile barcode scanner with payment, and they are ready to consider trying this software. Among the interviewees who are unwilling to use this technology, most people suspect security. They worried property damages when the risk of losing phones which are tied with the accounts exists indeed. Visibly, this innovative mobile payment method has a great market demand, but security is one of the obstacles in the way of complete acceptance among consumers. Overall, the vast majority of consumers are willing to adopt such consumer guide and co-payments mobile phone software.

(2) In the perspective of social conditions and economic environment, our products will lead the development of payment methods.

In the worldwide, people's concept of consuming has changed, and the use of electronic payment methods and related systems has become increasingly common. At the same time, as the society calls for high-efficiency, people's aversion to wait is also on the rise. This software combines payment with mobile bar code scanning, realizes that users finish payment all through single software away from lining up for cash register. Users just load in this system first, then scan the barcode of the purchase, click the key of payment and other related processes for security, then finish shopping. So, this software ensures users get whatever they want conveniently and effectively, prevents time waste. Meanwhile, the functions of purchase evaluation, regularly balance information, electronic invoices preservation and other features help consumers choose appropriate products and better financial management.

According to the survey, people still doubt the security of the software. But we believe that through further research and improvement on security issues, software in the same or similar style will generally reduce and finally eliminate consumer worries about safety.

Overall, people's acceptance of this software is very high, the market prospects are bright.

4. ECONOMIC BENEFITS

(1) From the bank point of view

Firstly, the bank which develops this business is a technology leader in this field, and this enables the bank priority to capture the market share and profitability from innovation. Secondly, by setting up this business with shopping malls, supermarkets and other merchants, the bank can absorb a large number of deposits to ensure sufficient funds and stable operation, as well as increasing the size of working capital to expand scales and enhance revenue. Again, this convenient service will attract more consumers to establish business accounts in the banks, and this contributes to the expanded banking customer base. So the bank can enhance the status in the industry with a better image from a more comprehensive quality service.

(2) From the consumers point of view

Using our system, consumers will be kept from the pain of waiting in the line for checkout in the shopping malls, which makes shopping more convenient and efficient. Besides, our Ipay helps consumers handle their accounts and make arrangement expenses better by offering information of investment as well as account balance regularly.

(3) From the merchant point of view

Firstly, merchants establish long term business relationship with banks brings them the access to preferential loans which help decrease financing costs. Secondly, shopping centers can enhance their levels of service and management efficiency through this convenient service. Based on the analysis of the data recorded by our system, businesses can infer the demand of old and new consumers then make decisions and improvements to increase its operating income. Again, the service promotes operators' running management of business and saves human capital. At the same time, increased sales also lead to higher asset liquidity, lower inventory costs and greater profits.

(4) From the system developers point of view

Such systems are innovative products on the market currently, and it offers opportunities to the developers to seize market share and gain benefits. And advertising for the merchants to publish special offers also brings benefits to the developers.

5. SOCIAL ROLE

(1) With the development of society, people pay attention to efficiency in every aspect. Our product improves the efficiency of shopping, meets the people's needs to adapt to the times.

(2) Our product provides innovative ideas and methods for both store operations and banking businesses, and it plays an inspiring role in innovations and developments of social services.

(3) Product design focuses on controlling customer account and improving security, aiming at reducing the frequency of malignant social events as well as damages to property.

(4) With the popularity of such products, higher-quality market behaviors of consumers and operators will be required. Also, strengthening supervision, paying more attention to integrity and enhancing the people's quality will become a necessity. These effects are all in line with the spirit of the civilized and healthy social trend.

IV OTHERS

(No)