Introduction to E-commerce

Zheng Qin
3.1 Online Bank

Online bank, also called network bank, e-bank, virtual bank, is actually the extension of bank business on the network. Online bank is based on the fast development of computer and network communication technologies. It uses the Internet that covers every corner of the world, makes a breakthrough in the traditional bank business, and gives up the traditional service that begins from the service hall. This new online bank includes home virtual bank, virtual finance, and the virtual financial world, which almost covers all the business of current bank and finance industry. And it represents the future of the finance industry.

Nowadays online banks exist in two forms. One is totally based on the Internet. This type of bank carries out all operations via the Internet, such as Security First Network Bank (SFNB). The other one develops the operations through the Internet on the basis of current business banks by opening electronic service windows online, which is called the e-bank system based on traditional banks. The online banks in our country belong to the latter one. From the day that online banks were born in the US, online banks have been developing rapidly. Now there are thousands of financial organizations in Europe alone that do the online banking business.

3.1.1 The Development of Online Banks

Ever since 1997, China Merchant Bank, Bank of China, China Construction Bank, and Industrial and Commercial Bank of China have opened their online banking business successively, and preliminarily realized online financial services. Now the latest version of online banking system is able to fulfill online exchange and online credit card, which brings great convenience to personal and enterprise customers. Bank of China uses the SET protocol, while others use SSL.

The online bank of China Merchant Bank began operation at the end of 1999, the function of which primarily includes personal banking system, online payment system, online securities system, online shopping system, etc. Until June 2000, the number of customers of China Merchant Bank “online enterprise bank” has reached 10078, and the total transaction amount has reached RMB 170 billion yuan. In Aug. 2000, the China Merchant Bank had its online banking system updated, adding new functions such as online financing, instant transfer and online letter of credit.

China Construction Bank also develops an online banking system which processes 1.3 million dealings every day, and allows 50 thousand customers to visit simultaneously. Bank of China has its online banking system combined with 1 million “Great Wall Card” to a series of online service including online payment. Industrial and Commercial Bank of China opens online banking services in 31 cities including Beijing, Tianjin, Shanghai and Guangzhou, providing 24-hour services.
In a short view, firstly, the services provided by the online banks in our country are generally fundamental in the online banking business, and are extension of traditional business and supplements of banks business, such as the account query, transfer between different card types and deposit books under the same user account, fund transfer between different user accounts, personal online payment. Secondly, the current services provided by domestic online banks are mainly B2C pattern. Furthermore, online banking is available in only a few cities in China. However, the trend of e-commerce is developing definitely and rapidly. The B2C service can be regarded as a kind of advertisements as well as a trial, which will serve as a basis for the impending B2B and B2G. Therefore, the domestic banks are trying hard to advertise their online banking for the sake of future market.

Online banking brings both opportunities and challenges to commercial banks, and it will encounter the following problems in the practical operation:

First of all, there is not a unified and authoritative CA (certificate center). Currently the online banks are depending on the self-built CA directly or indirectly. As far as normality is concerned, only a national and public CA can be neutral and authoritative. Although the People’s Bank sent out a bid in Apr 1999 to establish a unified CA, the progress is slow. This situation impedes the pace of the construction of e-bank. If the banks establish their own CA respectively, it results in cross certification, which will tremendously impede the efficiency and accuracy of online service, and incur redundant construction and resource waste.

Secondly, there are some legal problems. Now the rules performed by online banks are agreements contracted with clients, in which the rights and obligations are stated. If there are disputes, they can be submitted to arbitration. Because of the lack of relevant laws, it is difficult to deal with the complicated legal issues.

Thirdly, the network construction is important core of system. The fundamental requirements of online banking service are access to network and credit card, which narrow down the scope of business. Due to the restriction of network, the settlement speed differs as well: China Merchant Bank has been able to provide real-time service, known as the fastest, but Bank of China has to delay one day. In this way some services such as booking tickets will be seriously affected. For example, the booking of train tickets is exclusive; because of the delay, the ticket will be locked for one day correspondingly; if the customer gives up the ticket within the delay, the right of other customers to access to this ticket will be affected. Besides, once the network is crowded and slow; there are not many online shops, which restrict selection range; meanwhile direct display of advertisement cannot be enabled. These factors will affect the extension of online banking services.

Fourthly, there are still some other problems. Taking the receipt problem as an example, Online banking is not able to provide invoices or other receipts. Then consumption concept is another problem. Applying for a credit card to overconsume
is against the traditional concept of China, and it needs various sponsorship; online purchase does not have discounts, and customers will have to bear commission charge and postage like EMS; they also have to worry about the merchandise. All these problems indicate that there are still quite a lot of thorny problems that e-banking in China has to face.

E-commerce and e-banking are closely related systems with interactions. Meanwhile, they are not independent of the real world. Their development needs the social identity, well built network, sound law system and powerful government support. Since there are many problems with the e-banking system, we have to develop a sound atmosphere for the e-commerce and e-banking. First, strengthen the construction of the network infrastructure; second, improve the risk prevention mechanism, and speed up the formulation of e-commerce-related standards and laws; third, boost the information development; fourth, nurture more practitioners in this area; fifth, strengthen communications with government for policy support. Of course, these measures are beyond the control of commercial banks. In order to promote the development of e-commerce in our country, commercial banks should make improvements in the following aspects:

Firstly, in the business system, banks should try to be more innovative and attentive to services, and provide supermarket-like services. Under the pressure from capital and technology, traditional banks should reconstruct their business system, using the Internet as a channel for product marketing, and more as a platform for cooperation with financial enterprises engaged in stocks, insurance and funds, which lays solid foundation for a comprehensive business model.

Secondly, in operation models, banking business should combine traditional marketing channels with network marketing channel. On the one hand, while financial products are more and more diversified and personalized and the face-to-face interaction between customers and salesmen is becoming indispensable, highly efficient and standardized online banks are playing a more and more important role. On the other hand, the development of “multi-channel” sales pattern can maintain the original customer sources and facilitates the development of network banks. It has been proved that traditional banks without online services will certainly face difficulties, but pure online banks are not optimal choices either.

Thirdly, as to operational concept, banking business should alter their concept from “product oriented” to “customer oriented”. The core operational concept of traditional commercial banks is “quantity first” and “product driven”, which is marked by extending the terminals and batch production to reduce the cost. However, under the circumstances of network economy, as customers are expecting personalized services, commercial banks are forced to take the customer needs into consideration, and provide “personalized” financial products and services. To realize this change, banks have to attach great importance to client relationship management and understand, analyze, predict, guide and even create the client need using the Internet. They should provide the fittest financial products for the clients to obtain added value from the services.
Fourthly, as to strategic orientation, the banking business has to coordinate the relationship with other financial organizations, trying to become the gateway of network economy. The network economy poses the requirement to integrate and coordinate financial services to share resources and raise efficiency. The financial gateway is the combination of services by multiple financial organizations, which has direct connections with various financial transaction systems. On one hand, it serves to package numerous financial services; on the other hand, it collects client information to share among the members. The process in which its establishment and operation transform the interrelation between various financial organizations from collision to coordination is quite significant in transforming China financial industry.

### 3.1.2 The Function of Online Bank

Judged from the current operation of online banks, the services provided by online banks can be divided into three categories: first, to provide real-time query, such as balance, currency quotation, gold price and interest of deposit; second, conduct general banking transactions, such as client relation, saving, transfer between deposit accounts, applying for checkbooks; third, handle the procedure of online transactions. The services include the following types:

1. Basic check business
2. Interest check account
3. Credit card service
4. Basic deposit account
5. Money market account
6. Deposit receipt
7. Macro market financial information service

Online banking not only carries out some traditional commercial banking transactions, but also has very important online payment function, and some new domains of services.

### 1. Commercial banking business

Online bank can provide 24-hour real-time online services for the clients. First, traditional transactions can be made online, for example, transfer, settlement, exchange, agency fund (water, electricity, gas and telephone etc.), salary payment, and query for personal accounts. When e-commerce is highly developed and currency is electronically used, the clients can deposit and withdraw money without being outdoors. Furthermore, the banks can have more business with the help of the Internet, such as securities settlement (among Securities Company and stock exchanges, and liquidation between financial accounts and saving accounts), foreign exchange business, information consultation, consumption loan, etc.
2. Online payment

It will become the most important part of the financial services of online bank. All the online transactions will be paid by e-banks, including retails such as purchases, booking tickets, stock trading under B2C pattern, bulk transactions under B2B pattern, and capital financing and liquidation among financial organizations.

3. New business domain

Since information can be transmitted online rapidly and conveniently, online banks could open multiple new businesses. For example, group client can enquire the account balance and trade information of its branches through online banks; fund transfer is enabled inside the enterprise on the basis of multilateral agreements (since the transfer is almost real-time, the utilization rate of capital in the enterprise can be greatly improved); financial information query and account management service are provided; international balance of payment can be declared online; issuing electronic letter of credit and making data statistics are also enabled.

Obviously, online bank tends to provide more convenient services to attract more customers, make profit in intermediary business. Moreover, the expenses are reduced greatly in online banking, except the costs for network development, construction and maintenance. Besides, as the Internet and e-commerce become popular, online bank services will be more and more extensive and complete, and enable all participants involved in the transaction to complete payment indoors.

3.1.3 Online Banking Technologies

Payment gateway is the interface between financial system and the Internet, like a device transforming the data to the financial organizations, or instructions to process the payment information. Payment gateway can ensure the safe transmission of transactions between Internet users and transaction processors, without any modifications on the original system. It can process all the conversion of Internet payment protocols, Internet-specific security protocols, message and protocol and local authorization and liquidation. In addition, it can set configurations to satisfy specific transaction processing systems. Without payment gateway, the e-payment function would not be realized. The banks use payment gateway to implement the following functions:

1. Configure the Internet to realize payment capacity.
2. Avoid modifications to current host computer system.
3. Exercise system management with GUI.
4. Adapt to e-payment means such as e-check and e-cash.
(5) Ensure the security of network transactions by means of RSA public key encryption and SET protocol.

(6) Provide complete payment processing function, including authorization, data capture and balance, verification of account.

(7) Monitor the online activities through online transaction report and track.

(8) Make the online payment process compatible with current business model, ensure the information consistency, and provide opportunities for enterprises to enter online transaction.

As the network market grows, online transaction will become an indispensable function of every payment system. Nowadays enterprises are usually inefficient in data transmission, for they are using fax, or storing data to the system off the Internet. With payment gateway, this problem could be effectively dealt with, which will make banks and transaction processors retain high efficiency under the circumstance that transaction amount swells up continuously.

On May 13 1998, BOC Credit Card (International) Limited and IBM (H.K.) declared to establish the first secure payment gateway in Hong Kong. This payment gateway uses the SET standard, which provides a secure environment to enable enterprises in Hong Kong to carry out e-commerce. As the payment gateway of Bank of China got started in late 1998, it is believed that e-commerce will be introduced to more and more firms in Hong Kong, which will make them more competitive in the market. SET payment gateway established in Hong Kong will surely promote the status of Hong Kong in the international community and effectively meet the needs of local market.

The greatest concern of online banks is security issue. Traditional security measure is to use firewall; but its weakness still exists when the financial transaction is made online. The firewall is a kind of network security product, which ensures the security by supervising network protocols (TCP/IP, HTTP, IPX etc.), communication packets, network services and websites. It actually acts as a watchman to stop inappropriate information and intruders. However, the network is an open environment. Anyone who has applied for a bank account could enter legally. In addition, the firewall could not prevent the insiders from intruding. A research of 428 cases by Computer Security Institute in 1995 indicates that 46.8% of the intruders come from the inside. Moreover, since attacks are executed directly to the latent flaws of operating systems, Web Server and network applications, the firewall could not provide sufficient protection as it belongs to the application. In this aspect, SFNB uses HP Virtual Vault, an application level security system which can offsets the disadvantages of the firewall.

The system security of SFNB consists of two parts, namely, information server and the bank. The client obtains the information about the bank and its service from the information server. If the client decides to open an account in SFNB, they have to fill out a security register form, which is encrypted and sent to the bank server. When the bank receives the application from the client for a new
account, it will send a confirmation mail through US Mail to the client, which contains the password. Then the client establishes connection with the bank through the www browser, and all the communications between the client and the bank are encrypted with public keys.

The bank server of SFNB is running on the security operating system of CMW+, which has multi-layer security platform, providing authorization. The security OS substitutes the root account on UNIX; with corresponding authorization mechanism, it enables the users and processes to be authorized by need, consequently avoiding authorization abuse. There is also information break-off mechanism in this OS, which sets up a wall between the network environment and the inside of the bank. The network receives the requests from the users and verifies the identity, and then a secure forwarding application forwards these requests to the bank environment for inside process. Thanks to the protection, the outside processes could not access to the operations inside the bank. CMW+ also has a sound audit mechanism, which records all suspicious activities, including illegal use of authorization and access.

SFNB also sets up firewall and filtering routers between the Internet and interior of banks. The filtering router checks every packet that is sent to the bank, including its source and destination, and rejects any packet that illegally uses the network service. So the outside users can access the bank server only with http. The working mechanism of the firewall is similar to that of filtering router, that it checks every packet that is sent through the Internet to the service network. All information that passes the firewall has to undergo a mail proxy mechanism to remove all suspicious information. This proxy mechanism changes the IP address of the packet to appropriate intranet address so as to avoid direct access to the interior address.

On the Internet, SFNB uses multi-layer technology to guarantee the security of transactions. The browsers use SSL protocol of the Netscape, providing security service between the information bank servers. Through all these security mechanisms, the online banking transactions of SFNB are technologically guaranteed. In addition, SFNB promises to compensate its clients 100% for all unauthorized fund loss caused by SFNB. This shows the courage of SFNB, and also proves the sound security performance of SFNB.

We should always have been clearly aware of the security problems of online banks. “Security First” is always the top priority of online banks. So we should take this issue into consideration since the construction of online bank is initiated rather than make supplementations after the construction. We have to make the most of advanced and mature technologies to enhance the security of online banks. We have to establish security protocols and backup mechanisms for online banks, as well as corresponding security standard and regulations. We also need to introduce different encryption methods in different situations to cope with hackers from all over the world.
3.2 E-payment Tools

Online financial service is a part of e-commerce, which has already been provided all over the world. Online financial service includes online purchase, home banking, personal financing, online investment and online insurance. These financial services are characterized by timely electronic payment and settlement through online payment tools. In its broad sense, online payment is a kind of money exchange occurring online. Now users can see all kinds of products/services through the Internet. The online payment is developed on the basis of paying means, such as credit card, e-check, digital cash and intelligent card, which may be extensively accepted by customers, businessmen and banks. Since the payment is carried out online, the payment information is subject to hacker attack, so the security of payment tools has to be guaranteed.

E-payment is a vital part of e-commerce. The advantage of e-commerce, compared with that of traditional commerce is becoming the driving force that stimulates more and more vendors and people to make online purchase and other consumptions. But how to securely perform transactions online is the top priority people have to consider when they decide an online transaction. We will have a further discussion of the concept, the features and tools of e-payment in the following parts.

3.2.1 E-payment System

As more and more companies are planning to bring their business into a new era of e-commerce, the payment issue is becoming very prominent: how to solve the payment problem in e-commerce all over the world? How to deal with millions of payment problems generated everyday by the network? The answer is e-payment. E-payment is defined as follows: the parties of e-transaction, including customers, vendors and financial institutions, use secure and electronic means to make payment or money circulation. Compared with traditional payment means, e-payment has the following features:

(1) E-payment introduces digital circulation to realize information transmission, so all means of e-payment are all digitalized; but traditional payment is realized through physical circulation such as cash circulation, bill transfer and bank exchange.

(2) The working environment of e-payment is based on an open system platform (namely, the Internet); while traditional payment is operated in a relatively closed system.

(3) E-payment uses the most advanced communication means, such as the Internet and extranet, while traditional payment uses traditional communication media. E-payment has a very high requirement for both software and hardware facilities, generally including online terminals, relevant software and some other
supporting facilities; while traditional payment does not have such a high requirement.

(4) E-payment enjoys advantages for it is convenient, fast, efficient and economic. As long as the user has a computer connecting to the Internet, he will be able to stay indoors and complete the whole payment within a very short time. The cost is even less than one percent of that of the traditional way.

E-payment is based on electronic financial network, and uses various apparatus and cards as media, computer and communication technologies as means to realize circulation and payment by making use of binary data stored in the bank computer systems.

From the definition above we can conclude that e-payment has the following features:

(1) Supported by computer technologies, it realizes storage, payment and circulation.
(2) Multiple functions are integrated together, including deposit, loan and non-cash settlement.
(3) It is widely applied to such areas as production, exchange, distribution and consumption.
(4) It is simple, secure, fast and reliable.
(5) E-payment is usually accomplished through exclusive network for banks.

There are five forms to carry out e-payment, representing the five different phases in the development of e-payment.

First: the bank uses computers to process the business and settlement between banks;
Second: the computers of the bank make settlement with other organizations, such as paying salaries;
Third: network terminals are used to provide banking services for clients, for example, clients could withdraw and deposit money on ATM;
Fourth: POS terminals are used to provide automatic deduction services for clients, which are the principal means of e-payment nowadays;
Fifth: it is the latest phase, in which e-payment enables direct transfer and settlement through network at any place and any time, thus bringing into existence of e-commerce environment. This is a developing phase, which will also be the principal means of e-payment in this century. E-payment in this phase is also called online payment, and the online payment tools include credit card, digital cash, e-check and intelligent card.

3.2.2 Intelligent Card

The earliest intelligent card came into existence in France. In the 70s of 20\textsuperscript{th} century, the Moreno Company of France first successfully developed the IC
memory card by installing embedded memory chips on a plastic card as big as a credit card. After 20 years’ development, the real intelligent card, which namely, IC card with embedded microchips installed on plastic card, has been successfully co-developed by Motorola and Bull HN in 1997.

The structure of intelligent card primarily includes three parts:

(1) The program generator that establishes the intelligent card. In the process of developing intelligent card, the program generator is used primarily to initialize the card and create all the personal data.

(2) The agent to process the operating system of intelligent card, which includes the accessories to the interface between intelligent card OS and its applications. This agent is highly transplantable, which enables it to be integrated on chip card reader or PC and C/S systems.

(3) The agent of application interface of intelligent card. The agent is the interface between application and intelligent card. It provides help for management of different intelligent cards and independent interface for applications.

The intelligent card, into which the embedded microchip is installed, can store and process data. The value contained in the card is protected by personal identity number (PIN), so only the user could have access to it. Multifunctional intelligent card with high-performance CPU embedded and independent OS installed can have its functions configured as a PC. This intelligent card also has “self explosion” function, if intruder wants to open the card to access the information illegally, the content of the card will disappear.

The working process of intelligent card is described below: firstly, start the browser on a machine such as PC or a terminal telephone; secondly, use the IC card to login onto the website of the user’s bank through the card reader installed on a PC, and IC card will automatically inform the bank the user’s account number, and the password along with all the encrypted information. After these two steps, user can transfer fund from the IC card to the vendor’s account, or transfer fund from his bank account to the card. For example, if the user would like to buy a flower worth 20 dollars, he inserted his IC card to the computer of the flower store, and logged in the bank that issues the card, entered the password and the account number of the flower store. Then after several seconds, the account of the store will have 20 dollars more, and the account of the user will deduct 20. Of course, the user got the flower.

In e-commerce transaction, the application of IC card is similar to the actual transaction process. The only difference is that after the user chooses the commodity on the computer, he would enter the password and the account number of the online store to complete the transaction process.

IC card generally stores the following kinds of information:

(1) The user’s identity.

(2) Absolute location of the user.

(3) Relative location of the user and his geographical location in relation to other apparatus.
Introduction to E-commerce

(4) Particular environmental parameters, such as light, noise, heat and humidity.
(5) User’s physiological status and other biological statistical information.
(6) Specialized timing parameter, such as the frequency of a certain event or the time that it takes for the user to complete a certain action.
(7) Specialized movement parameters, such as velocity, acceleration, physical stance and tracking information.
(8) Information of currency that the user holds.

The application range of IC card covers:
(1) E-payment, such as paying a telephone bill, substituting of credit card.
(2) Digital identification, such as control over access to the chambers or a system, like computers or POS.
(3) Digital storage, as is applied to realize real-time storing and retrieving of data, like case history, tracking information or authentication information.

For example, Olivetti active badge system uses location data to find a staffman inside a building, to execute the functions such as informing who is using a certain room. As another example, ATM can be re-configured to make the user’s interface adapt to personal use. With this interface replacing password entry, the user can offer what is required when he is on the movement. The transport system can know the user’s identity and the destination and all the user has to do is to get a ride, for example, a kind of “e-ticket”. And it knows where the user gets aboard, and then charges the user accordingly.

For users, IC card provides a convenient method. It eliminates disadvantages that application systems may cause to the users, and it can “memorize” some information for the user and provide the information on behalf of the user. The application itself can also be configured according to the need of a certain user, who should not be asked to learn and adapt to the application. Using IC card means that one does not need to remember PIN or password, for instance, to make a call, withdraw money, or make payments. It is of a great advantage.

IC card reduces the probability of cash payment and being defrauded, and affords excellent secrecy as a result. Users does not need to carry a lot of cash with them to accomplish all that can be dealt with a credit card, and it enables higher confidentiality than credit cards do. Therefore it plays the most significant role in the online payment system.

IC card as an online payment tool has the following standards:
(1) Open Card Frame Work standard. This is a standard based on network computer supported by IBM, Oracle, SUN, Netscape.
(2) Java Card API standard. It was proposed by SUN, and is supported by CitiBank, Visa first United Bank, and VeriFone.

3.2.3 E-check

E-check is a form of e-payment that transfers money from one account to another
through the network connecting users and banks. Most e-checks use public key or PIN instead of hand-written signature. The transaction cost of e-check is low, and banks could provide standardized capital information for vendors that take part in e-commerce, thus it is one of the most efficient payment means.

Using e-check to pay, clients can send the e-check to the vendor’s e-mail box. At the same time the e-payment notification will be sent to the bank, which then transfers the money to the vendor’s account. This process only takes several seconds. However, here is a problem: how to authenticate the e-check and the user? So there should be a specialized authority to make authentication, meanwhile this institution should authenticate the identity and credit of the vendors like CA.

E-check transaction can be divided into the following steps:
(1) Client and vendor agree to use e-check payment.
(2) Client sends the e-check to the vendor and a payment notification to the bank.
(3) The vendor has the e-check authenticated through the CA, and then cashes the check after that.
(4) The bank verifies the check through the CA, and then makes fund transfer or cash the check after verification.

In 1996, the USA passed the “improve debt repayment Method”, which became an important promotion to the use of e-check in the US. This Act stipulate that since Jan. 1999 most of the government’s debt would be paid off in electronic means. On Jan. 1st 1998, FSTC which was composed of the The United State Department of Defense, banks and technology vendors, paid an e-check through by United State Treasury’s financial management services to demonstrate the security of the system.

Recently, PaymentNet, which provides back-end payment and processing services, was planning to deal with e-checks. PaymentNet adopts SSL standard to guarantee the transaction security. Telecheck, the biggest company of check verification, will verify the purchaser’s identity through the personal information and risk reliability stored in the database.

Although e-check could greatly reduce the cost of processing, people still take prudent altitudes to online checks. The extension of e-check still has a long way to go.

3.2.4 E-wallet

E-wallet is a commonly used payment tool in e-commerce. It is a new type of wallet to pay small purchases.

The Mondex e-wallet developed by the National-Westminster Bank was the first e-wallet system in the world, and first introduced to Swindon, the “British silicon valley” in Jul., 1995. Initially, it was not well-known until it made a breakthrough in Swindon, and it was widely used in supermarkets, bars, jewelry
stores, pet stores, restaurants, parking lots, food stores, telephone booths and buses. The use of e-wallet is quite simple, and all that one need to do is to insert the Mondex card into the terminal. After 3–5 seconds, the card will complete payment from the terminal, which will then produce the receipt. When a transaction is completed, the card reader will deduct the expense of this transaction from the Mondex card. In addition, Mondex card has most of the properties of ready money, such as a measure of commodity, saving, exchange and payment. The money on one card can be transferred to another card through a special terminal. Moreover, once the money in the card is depleted, or the card is stolen or lost, the value of Mondex card cannot be recovered, namely, the cardholder has to be responsible for the card. Some cards can be used by others who happen to access to them, while others written with password are only by the cardholder, and it is safer than the cash. When Mondex card is damaged, the cardholder can declare to the issuer, and will be given a replacement card by the issuer after verification.

Terminal payment of Mondex card is only the early application of e-wallet, which looks very similar to the intelligent card. But today e-wallet has taken no physical form and turned into a real virtual wallet.

Online purchase using e-wallet needs to take place in the e-wallet service system. In e-commerce, the software is generally free of charge. The user can use the e-wallet software from the system server connected with his bank account, or other software on the Internet through an encrypted means. Today there are two primary e-wallet service systems in the world, Visa Cash and Mondex; other systems include MasterCard Cash, Clip of EurlPay and Proton in Belgium.

The clients of e-wallet usually have to open accounts at banks. When using e-wallet, the client has to install the software connecting to the server of e-commerce, and input the data of various e-money and e-card to the service system. If the client needs to pay by credit card such as Visa card or Mondex card when the transaction is being processed, all that he has to do is to click the corresponding item or icon. This way is called click-payment.

Only e-currency can be stored in e-wallet, namely e-cash, e-change, electronic credit card, online currency, and digital currency. All these e-payment tools support click-payment.

The management module set up in e-commerce service system for e-money and e-wallet is called e-wallet administration. Clients could use it to change password or check the bank account. The service system also contains transaction recorder, through which the clients could know the commodities and the amount they have bought. They can also print the query result.

Online purchase using e-wallet usually includes the following steps:

1. The client uses a browser to search the commodities on the vendor’s website, and chooses the ones that he would like to buy.

2. The client fills out order forms, including item list, prices, total price, freight charge and tax.
3  Payment Technologies for E-commerce

(3) Order forms can be transmitted electronically, or created by the client’s software. Some online shops allow the clients to bargain with vendors (for example, to demonstrate the certificate of old customer, or offer the price information of the competitors).

(4) After confirmation, the client chooses to pay by e-wallet. He installs the e-wallet to the system, clicks the corresponding item or icon of the wallet, and then the wallet is open. In that case, he has to enter his password and confirm the wallet before he can pay by a credit card chosen from the wallet.

(5) The server of e-commerce will encrypt the credit card number and send it to the corresponding bank, meanwhile the store will receive the encrypted order, and then the store adds the order and returns it to the server. The credit card number is invisible to the store, and the store has no access to the money in it. After the server verifies the validity of the client, it will send the verification to the credit card company and the commercial bank. There will be data exchange about payment and financial data between the credit card company and the bank. The credit card company will process the request and resend it to the bank for confirmation with authorization made meanwhile; the bank will confirm and authorize it before sending it back to the credit card company.

(6) If the bank denies the request, it means that the client’s card is under-funded or overdraft. After the denial, the client can re-open the e-wallet to access to another credit card and repeat the above-mentioned operations.

(7) If the bank has verified the credit card and give authorization, the store can then make delivery. Meanwhile the store will keep all the data generated in the whole transaction, and send a copy of them to the client.

(8) After the transaction is complete, the store will deliver the commodity to the client according to the order form that the client previously provided.

Although there are several processes of identity verification, bank authorization, and financial data exchange involved in this process, all these are completed in a very short time. Actually, it only takes 5 – 20 seconds from filling the order form to receiving the electronic receipt. This kind of purchase is simple and fast. Moreover, the whole process is secure. During the process, the client can use any browser to browse and check the information. Since the information in the client’s credit card is invisible, it is secure and reliable when the transaction is processed. In addition, it is guaranteed that the client will not be defrauded by the store because of the secure means of e-commerce.

In a word, this purchase procedure has completely changed the traditional face-to-face purchase pattern, and it is a highly efficient and secure process that is quite different from the traditional way.

Ever since the e-wallet came out in Jul. 1995, e-wallet has been tried out in a couple of countries and areas including Swindon of UK, Hong Kong, Toronto and New Zealand. In 1998 Mondex was on trial in New York, and would be experimented in other cities in the form of a franchised chain, and the participant banks including Manhattan Bank, Chicago Bank and Fagobi Bank. National
Australian Bank aimed to introduce Mondex in 1998, and so did South Africa and Israel. In US there is not only Mondex. Actually there are still other e-currencies developed in different technological systems; for example, Visa Card Company issued 200 intelligent cards (valuing $10, $20, $50, $100) during the 1996 Atlanta Olympic Games, and had 2300 franchised stores, with 200,000 payments amounting to 1.1 million dollars. In Japan many organizations were willing to introduce e-wallet, but they did not implement as planned. The reason is that Japan has a financial network different from other countries. If the e-wallet is to be applied, Japan has to invest billions of yens to reconstruct the existing financial network. Such a huge investment is obviously a heavy burden to a country like Japan that is tortured by economic crisis. All the evidences show that the competition on e-payment is just starting. However, e-wallet is much better than other types of e-currency that emerged in the past several years.

3.2.5 E-cash

E-check, e-draft, e-wallet and credit card offer great convenience to the online payments during e-commerce, but all these could not take the place of cash, for they all have the audit trailing function. Using these payment tools will reveal where the money goes. So there may be possibility of leaking your privacy. Sometimes the client hopes to pay online just like paying cash in real life in order to avoid trailing and privacy leakage. So e-cash comes into being.

E-cash is a kind of currency that exists in the form of digits. It transforms the cash amount to a series of encrypted numbers, representing the currency value by the serial numbers. After the client opens an account and deposit money in the bank that provides e-cash service, he will be able to go shopping in stores that accept e-cash.

When the client dials into online bank using a password and PIN to identify himself, and downloads packages of small-valued e-coins, e-cash comes into effect. Then, these e-cash are stored in the client’s hardware until he uses them to do online shopping. In order to guarantee the transaction security, each coin is assigned a random serial number and this number is hidden in an encrypted envelope. In this way nobody will know who withdraws or uses the e-cash. Such a shopping mode can conceal the buyer’s identity, so it is popular with people who have privacy concerns.

The Digicash Company headquartering Holland is the only company that provides real e-cash system for commercial purposes. And CyberCash and DEC follow suit. Digicash began their trial of an e-cash system named CyberBucks in Oct. 1995 at Mark Twain Bank. Currently about 50 Internet vendors and 3000 clients are using this kind of e-cash. The vice president and market supervisor Frank Trottert said: “The first phase is commercial retail system, but the real
potential lies in the second phase, in which there will be a global commercial payment network.” He added that clients felt this e-cash very convenient. Nowadays there are more than 10 banks using this system to issue e-cash, including well-known banks such as Mark Twain, Eunet, Deutsche, and Advance. Mini-Pay system developed by IBM provides another mode of e-cash. It uses the RSA public key with digital signature. The parties of the transaction complete identity verification through certificates, which is valid only for the same day. This product is primarily used in small transactions.

The payment process using e-cash includes four steps:

First, the client opens an account at the bank that issues e-cash, and buys e-cash certificates with the money deposited in the cash server account. Then the e-cash gets value, and is divided into packages of “coins”, which can be circulated in the commercial world.

Second, the client withdraws a certain amount of e-cash, usually less than 100 dollars, from the bank with the terminal software and stores it on the hard disk.

Third, the client bargains with the vendor that accepts e-cash, fills the order form and uses e-cash to pay for the commodities purchased.

Fourth, the vendor and the bank make settlement, and the bank will pay the money to the vendor.

E-cash has the following features:

1. The banks and vendors should have authorization agreements.
2. The client, vendor and bank all have to use the e-cash software.
3. The bank takes charge of the fund transfer between client and vendor.
4. Identity verification is completed by e-cash itself. Digital signature is used when the bank issues e-cash. The vendor sends e-cash to the bank in each transaction, and the bank verifies the validity (counterfeited or used) of e-cash issued by the bank.
5. Anonymousness.
6. It has the features of cash, subject to operations like withdrawing, depositing, transfer, and therefore it is suitable for small transactions.

However, e-cash payment also has some problems: the minority of vendors are willing to accept e-cash, only a few of the banks provide e-cash service; high cost; high requirements for both hardware and software; a large database is needed to store the completed transactions and e-cash serial numbers to avoid repeated payment; currency exchange problem. Since e-coin is still based on traditional currency system, German banks can issue e-cash only in Marks, French banks can issue e-cash only in Francs. So, international trades have to use specific exchange software, which means a big risk. If the hard disk of the client is damaged, then e-cash stored on it is lost and cannot recovered, which is a risk many consumers are not willing to bear. Another bigger concern is the existence of counterfeited e-cash. Peter Ledingham of US Federal Reserve Bank said in his “policies of e-payment implementation”: “it is probable that the issuer of e-cash
will be trapped by counterfeited e-cash. With some technologies, it is probable that the receiver of e-cash, even the issuer, will not be able to test the counterfeited e-cash. Although the complicated security means lowest probability of counterfeited e-cash, the probability cannot be ignored for it may bring rather high rewards. Once counterfeited e-cash is successful, the price that issuers and some of the clients have to pay will be disastrous.”

Despite various problems, the use of e-cash is still on the rise. As much safer e-cash solutions come out, e-cash will become a convenient means for online transaction in the future as predicted.

3.3 Summary

E-payment, based on the network of electronic finance, has made full use of digital devices for commerce, various transaction cards for trade and computer and communication technologies to realize the circulation and payment by transferring digital information stored in the computer network system. This chapter focuses on the function, structure and development of online banks, and then introduces the primary tools and technologies in e-payment, including e-payment system, e-cash and e-wallet.

Compared with traditional payment mode, e-payment has the following features:

(1) E-payment accomplishes information transmission with digital circulation, and all means of payment are digitalized.

(2) The working environment is based on an open system platform while traditional payment is functioning in a relatively closed system.

(3) E-payment uses the most advanced communication methods, such as the Internet and extranet, while traditional payment uses traditional communication media. E-payment has a very high requirement for both software and hardware facilities, generally including online terminals, relevant software and some other supporting facilities; while traditional payment does not have such a high requirement.

(4) E-payment enjoys advantages for it is convenient, fast, efficient and economic. As long as the user has to own a computer connecting to the Internet, he will be able to stay indoors and complete the whole payment within a very short time. The cost is even less than one percent of that of the traditional way.

References


3 Payment Technologies for E-commerce


Introduction to E-commerce


[34] http://www.gnuchina.org


[38] http://www.omg.org
