ELECTRONIC BILL PRESENTMENT AND PAYMENT (EBPP): THE CASE AT HONG KONG SHANGHAI COMMERCIAL (HSBC) BANK

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ABSTRACT

Electronic Bill Presentment and Payment (EBPP) allows bills, such as, telephone, water, etc., to be presented and paid electronically via Internet or other channels, for example, mobile phones. While payers could avoid handling hardcopy of bills or mailing of checks, merchants on the other end made considerable savings from paper bill generation, mailing, and processing of the payment that received. In this paper, we present a case of EBPP that implemented at one of the largest banks in the world - Hong Kong Shanghai Commercial (HSBC) Bank. The first step of this research was an interview with the senior management and conducted a survey for the key factors to the provision of such service. Based on the interview and a survey we proposed a framework of adoption and diffusion of EBPP services. The results indicated that Incentives to the Banks; Incentives to the Individual Customers; Incentives to the Corporate Consumers; Governance and Legal Framework, and Security are the most important. Based on the framework, we studied in-depth the managerial, technical, security, legal, and financial aspects of HSBC's implementation and operation of EBPP. We also compared the EBPP service with the other similar services in Hong Kong, such as, Payment by Phone Services (PPS) (www.ppshk.com) to predict its future.

Keywords: EBPP, BSP, Biller Direct, Consumer Consolidation, Legal Compliance

1. INTRODUCTION

With the development of Internet and security technologies, traditional billing and payment industry has undergone a significant change over the past few years [9]. During such period, US and European countries made tremendous investments on Internet, security, and information technologies. Major Banks and Telcos (Telecom Companies) have been aggressively in the development of Electronic Bill Presentment and Payment (EBPP) or Electronic Invoice Presentment and Payment (EIPP) either to increase their revenue or to improve the efficiency and effectiveness of their billing and payment services. According to Gartner Group Inc., ten percent of total annual transactions in 2001 made using such services and over 40 percent of bills in US will be presented electronically. "For the world-wide, EBPP and EIPP will account for 13 percent of all bills by 2006 with critical mass building in the next few years" [4].

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Compared with the other developed countries, the United States had higher checks usage. Humphrey stated that Americans wrote 20 checks per month, which equaled 2.8 times more than the combination of other countries, such as Canada, France, and the United Kingdom [8]. TowerGroup's research in year 2000 indicated that while the U.S. will maintain its leading position in EBPP transaction volume through 2005. Markets in both the European Union (EU) and Asia-Pacific regions will make significant gains also by 2005 [12]. This research pointed out that, in 2001, consumers worldwide received a total of more than 103.7 billion bills, while their business counterparts received nearly 49.6 billion bills and invoices. Generating, mailing, and processing of paper-based bills, invoices, and checks are very expensive not only financially but also in terms of time. For example, in this study, it is found that the turn-around time of a manual based process - from sending an invoice till receiving the payment - is 55 days on average, which indicates that such delay might be a source of cash flow problem to many firms.

By the end of 2001, approximately 88 percent of global "roundtrip" electronic billing transactions

have been conducted in the US, which made it a key in the introduction, delivery, and diffusion of such services in the world [12]. North America and European Union together generated 62 percent of the world's business bills and invoices. Such high concentration of volume contributed to the acceleration in EIPP in the B2B arena at an overall rate that was higher than that of EBPP for business-to-consumer (B2C). Global B2B EIPP volume has been forecasted to exceed B2C EBPP by the year of 2010. Outside North America, broader and higher penetration of mobile phones and services (between 50 percent and 80 percent in the EU and some Asia-Pacific countries) has led Internet Service Providers (ISPs) and Mobile Service Providers (MSPs) to provide EBPP or MBPP (Mobile Bill Presentment and Payment) services, where such services are considered as major revenue sources in the near future. Since revenue and profits of providing EBPP or EIPP are significant, both Financial Institutions and Telcos, which include both ISPs and MSPs, will face a fierce battle about how to divide the big pie. How to form strategic alliances is an interesting and important decision that challenges the decision makers.

While the United States is leading the world in both the development of computer technology and usage of Internet systems, Americans still heavily depend on checks for most of payments. Why? What are barriers to delay the adoption of EBPP or EIPP? How about promoting such services in Hong Kong or other Asian countries? What are the issues or lessons that we can learn from the past? To answer these questions, we studied traditional bill presentment and payment and analyzed the potential processes of EBPP. EBPP basically has two models: Biller-Direct and Consolidation. Moreover, alternative consolidate models can be easily generated by differentiating or emphasizing roles of certain players in the processing cycle, for example, Biller Service Provider (BSP) or Customer Service Provider (CSP). By analyzing these models, the advantages and disadvantages of both EBPP and EIPP can be identified and issues that hindered their wide adoption can be identified.

With EBPP technologies, the once costly and labor-intensive processing of sending invoices to customers as well as receiving and processing payment has been changed significantly [13]. Costs of producing and sending invoices dropped significantly through reduction of usages of labor, paper, and postage. In addition, the human errors, cycle time, and cash turn-around time can be significantly reduced. In this paper, we will discuss these issues with numerical evidence from the case of HSBC. Also, such benefits are shared and enjoyed by the customers - either corporate or individual consumers. Benefits to corporate including: reducing billing errors, improving cash flow, providing better customer service, and obtaining more timely and accurate data to support, for example, customer relationship management (CRM).

Previous research in [1] and [6] focused on analyzing the adoption of EBPP services and exploring the possible B2C value positions that banks may undertake. However, their frameworks and models could be extended through the information that we received from our study on HSBC. In this paper, we provide an in-depth study on HSBC and then we proposed a framework for adoption and diffusion of EBPP. The rest of the paper is organized as follows: Section 2 describes the characteristics of EBPP and some EBPP models. Section 3 discusses the interview we conducted with the senior management of HSBC and introduces a framework proposed to guide the provision of EBPP. Section 4 provides a detailed discussion about the EBPP project at HSBC. This paper is concluded with Discussions and Future Research.

2. EBPP SERVICES

In this Section, we will first discuss the definition of EBPP, and then various models of EBPP will be presented.

2.1 What is an EBPP?

An EBPP can be defined as follows: The electronic presentation of statements, bills, invoices and related information sent by a company to its customers, and corresponding payment for goods or services can also be collected electronically. In other words, rather than using traditional paper-based billing methods, EBPP is the process of presenting bills to the payer and accepting payment over the Internet or other channels electronically. The whole payment-cycle of EBPP is quite different from the five major steps in traditional paper-based billing process - Bill/Invoice Preparation, Bill/Invoice Delivery or Presentment, Dispute Handling, Payment Delivery, and Clearing of Payment. Table 1 summarizes the differences.

2.2 EBPP Models

Two primary EBPP models include Bill-Direct and Consolidation. There are a number of variations of the consolidation model that can be generated from these two basic models [1].

2.2.1 Biller Direct

In this model, the Biller produces electronic versions of their bills at their Biller Service Provider (BSP) and no other organization's bills are kept there. The consumer accesses BSP in order to view and pay bills. In the Biller-Direct model, the biller controls all aspects of the electronic bill presentment and payment process, except the actual financial debits

and credits. The BSP, Customer Service Provider (CSP), and Customer Payment Provider (CPP) entities are assembled as a single unit and deployed at the biller's website. Alternatively, the biller can use an external service provider (application service provider or ASP) who will deploy these entities on their behalf. Either way, the model does not change. The client accesses a service that is completely branded as belonging to the biller.

Table 1: Paper billing vs. electronic billing

Step or Activity	Paper Billing	Electronic Billing
Bill/Invoice Preparation	Biller prints invoices or sends data to outsourced billing service for printing	Biller generates electronic billing data from their accounting system
Bill/Invoice Delivery or Presentment	Bills are packaged and mailed to customer	Account data is reformatted and transmitted to biller's Web site, consolidator Web server or customer's desktop PC via Web push technology
Dispute Handling	Customer contacts customer service officer through phone calls or mailing	Customer sends e-mail or clicks on a button on EBPP homepage to enter their challenge
Bill Payment	Customer opens mail, reviews bill and writes or prints a cheque that is mailed back	Customer reviews online invoice and selects items to pay and method of payment to settle bill electronically
Bill Clearing	Cheque is presented to bank and funds clear for deposit into biller's account	Automated Clearing House (ACH) or credit card transactions created and authorized, and electronic funds transfer to biller's bank account

Advantages of Biller-Direct model include:

- Biller maintains direct control of their customers' experience and of all the information of bills. In which technologies, such as, data mining and CRM can be used to process the such information to generate useful information to support decision making.
- Biller has direction contact with customers so that certain marketing or sales strategies, such as, cross-sell or bundle other services, can become possible.

However, it requires a biller to implement extensive IT infrastructure and customers must access the biller's site directly. Another disadvantage of such model is that if a customer makes extensive use of electronic bill payments, then he/she is forced to "hop" from on site to another to pay multiple bills.

2.2.2 Consolidation Models

In Consolidation model, the electronic bills of multiple billers are consolidated at a single destination. Consumers go to one site to pay multiple bills. "Thin" or "Thick" designs refer to the location of the summary and details of bills.

Thick Consolidation: The summary and details of bills are kept at the site of a consolidator and the consumers accesses a CSP, which does not necessarily to be owned by the biller (although there is no reason why the biller cannot provide a CSP service while using a consolidator to house the billing information). In general, however, consumers will use a CSP that is also operated by the consolidator, or one that is completely independent to both.

Advantages of thick consolidation model include:

- It costs less for billers because of economies of scale.
- Billers send bills or bill summary to the consolidator and consumers go to the consolidator to pay the bills. Therefore, operation can be outsourced and the biller can offload responsibility for managing the CSP relationships for bill presentment;
- Consumers like going to one location to pick up multiple bills. This can lead to faster consumer adoption.

Disadvantages are:

- Biller/consumer relationship is less direct, making it difficult for the individual biller to market directly and effectively
- Biller/consumer relationship risks being lost, the biller's branding may be diluted, as they may lose control of the look and feel of the bill/screen
- Biller also loses the key benefits of electronic billing: "late due" notification, and ability to customize a specific marketing/catalog push
- The consolidator website is probably not a location which customers already visit. To pick up bills, consumers still have to make a "special" trip there.

Thin Consolidation: The bill summary is stored at the consolidator, but the bill detail is hosted by the biller itself or an external service provider working on behalf of the biller. When a Consumer wishes to see a bill's details, a request is passed back to the systems and site of the biller or external service provider. The Consumer is then taken to that site to see the details.

At this point, the biller has the same opportunities to provide Consumer service and engage in targeted one-to-one marketing as are available under the biller direct model.

Advantages of thin consolidation model include: consolidator provides "one-stop" summary presentment and payment for multiple bills—but by retaining control of the bill details, the biller maintains a relationship with the consumer, the consolidator site facilitates this relationship as a value-added service for its clients; It is more convenient, if consumers like going to one location to pick up multiple bills, it can lead to faster consumer adoption; It is least expensive to implement when the biller employs an external service provider to host the bill details on its behalf; It allows the biller to preserve a direct relationship with the customer. However, if the consolidator or other service provider website is not a location which customers already visit as a matter of course, consumers still have to make a "special" trip there.

Consumer Consolidation: In the consumer consolidation model, electronic bills are delivered directly to the customer's desktop. The biller maintains control of bill details until delivery to the customer is complete. The customer is then able to control and store bills and integrate them into offline programs, such as personal financial management software. Payment may be made via check, ACH, credit, or debit card payment.

The major advantage is that the consumer is able to work offline, one of its less attractive feature is consumers are required to download or purchase special software to view bills rather then using a standard browser. A Comparison between three models is summarized in Table 2. Many companies have launched EBPP services and Table 3 lists some of such services.

Table 2: Comparison of three models

	Biller Direct	**Biller Consolidation**	**Consumer Consolidation**
Enrollment responsibilities	Various - controlled by individual billers	Single - controlled by bank or portal	Single - controlled by consumer service provider (CSP)
Biller control over bill or embedded messages	Tight	Varies based on consolidator software	Same as paper billing, except inserts are discarded
Points of distribution	Biller web site	Numerous banks/portals	CSP/portal sites
Integration with customer bank account	Little to none	Can be extensive, based on bank/portal online banking software	Must employ screen-scraping techniques
Control over payment methods	Biller (ACH, credit card)	Consolidator (paper, ACH, EFT) ? may include good or guaranteed funds availability	CSP (paper, ACH, credit card)
Customer service ownership	Biller	Shared biller/ consolidator/bank	Shared CSP/biller
Pricing model	Biller software license/ installation fees	Biller set-up fee, bank transaction fee, consumer subscriber fee	Consumer subscriber fee

3. DEVELOPMENT OF A FRAMEWORK FOR LAUNCHING OF EBPP SERVICES

In this section, we will first discuss our interview with the senior management at HSBC, in which insights and issues of hindering of launching EBPP service at HSBC were provided. Then we propose a framework to discuss the critical successful factors (CSFs) in launching EBPP service.

3.1 Interview with Top Management of HSBC

As an important step in this research, we had to obtain the first-hand information for the insights and key factors of how HSBC launched their EBPP process. We conducted an interview with one of the kick-starters of EBPP service in HSBC. HSBC was the First EBPP Initiator in Hong Kong SAR, which dated back to 2000. The mjor incentives were cost reduction for both merchants and clients, and providing add-on services to attract Internet Banking customers. The Competitive advantages of HSBC to provide such service included:

Table 3: Some e-billing products and services in the market

Vendor	Product	Web Site
International Billing Services	Direct Access	www.billing.com
CheckFree Corp.	e-bill	www.checkfree.com
Edocs	BillDirect	www.edocs.com
BlueGill Technologies	1 to 1 Server	www.bluegill.com
Pitney Bowes Inc.	Digital Document Delivery (D3)	www.pitneybowes.com
NetScape Communications Corp.	BillerXpert	Home.netscape.com
Oracle Corp.	Internet Bill & Pay (IB&P)	www.oracle.com
Open Financial Exchange	Data Interchange standard	www.ofx.net
TransPoint	Biller Integration System	www.transpoint.com
CyberCash Inc.	CyberCash Interactive Billing and Payment (IBP)	www.cybercash.com
Echarge Corp.	Echarge	www.echarge.com
Hong Kong Shanghai Commercial (HSBC) Bank	e-bills	www.hsbc.com.hk

1. Its neutral position - not as a competitor of biller, for example, PCCW, which is a Telco that may become a competitor to other billers by controlling the bill or invoice delivery channel.
2. Its large customer base of Internet banking is global which include customers (over 30 percent of individual customers) and merchants (over 60 percent of merchants are HSBC's customers).

Meet HSBC's multi-channel strategy - Many customers are demanding 'multi-channel' access to bank's service, i.e., access anytime, any place, anywhere, from any access device. For example, they may want to open accounts in branch, and close the accounts through online banking. Another example is that, they may want to register bills through ATM, and pay bills through online banking.

In order to improve customer relationships and retain customers, HSBC has developed a multi-channel strategy. For bill payment service, paper bills have already been supported by both ATM and online banking. E-bill is now supported by online banking. Automated access devices provided by HSBC include ATM, Instant balance terminals, Instant deposit machines, COPUT, automated phone banking, and also online@HSBC service. By analyzing the numbers in Table 4, you can see that customers' demand on accessing bank's service through a wide range of access devices/facilities really exists.

HSBC's internal research conducted revealed that EBPP would be a killer application that would fly and their revenue model will be discussed later. The EBPP "View and Pay Bill" service in online@hsbc was launched in 2001. Unfortunately, at the beginning, the Market Penetration did not meet the expectation. There was only one biller signed up to use their EBPP service at the beginning - People Communications, which was a local telecommunications company, and only 0.1 percent of HSBC's customers used such services. The main difficulties that HSBC encountered at the beginning stage included:

Table 4: Automated banking facilities usage

Access Devices	No. of terminals (as of July 2001)	No. of transactions on a peak day
ATM	612	563,000
Instant Balance Terminals	181	181,000
COPUT	271	160,000
Instant Deposit Machines	182	49,000
Automated Phone banking	-	2,183,000
online@HSBC	-	180,000

1. Merchants were reluctant to be the first mover to be a biller. Even HSBC provided incentives to early birds by giving prize, they were afraid of an increase in operation cost and they were lack of the needed technical expertise.
2. Market was not yet ready. Local customers were not yet educated to use and trust the online bill payment. Dotcom and e-Commerce hype cooled down that merchants started to cut cost.
3. Competitions in EBPP market. There was a strong competition from PPS, which had more competitive advantage by its neutral company nature and open platform. Also, friendly competitions from other banks such as JetCO and Citibank. However, these banks would not have large impact on market competition because they also served their subsidiary clients only.

3.2 Framework of Adoption and Diffusion of EBPP Services

The interview with the senior management of HSBC only provided us a rough picture of what

HSBC, individual customers, and corporate customers cared. In order to identify a set of more complete Critical Successful Factors of EBPP services, based on the results of interview with HSBC, we also surveyed earlier literature. In [2], shortened transaction cycles and accelerated revenue cycles, improved cash flow management, increased marketing opportunities, improved productivity, reduced direct costs, such as, postage and printing, and enhanced customer service were reported as the major motivations to migrate toward EBPP and EIPP. Protection of consumers and customers by the design and implementing the needed legal framework has been consider the most important factor to the adoption of e-finance [4]. A complete framework of e-finance service also provided in [4], which include major players, such as, electronic enablers, financial products, financial institutions, and aggregators. Some factors about the usage of EBPP also reported in [10], in which included the number of billers that customers could access and the flexibility.

For the global adoption of EBPP, TowerGroup research also shows global acceptance of EBPP continued to progress as the European Union and Asia-Pacific markets make noteworthy gains; and wireless devices create a significant EBPP channel in areas under serviced by PC and landline phone systems. Streamlining business-to-business (B2B) interaction and costs reduction have been considered the key factors in producing strong incentives for using EBPP [12]. Based on the interview and our literature review, we proposed a framework that includes the five key elements or success of EBPP depends on the following: Incentives to the Banks (1); Incentives to the Individual Customers (2); Incentives to the Corporate Customers (3); Governance and Legal Framework (4), as well as Security (5). Then each element also determined by other factors. A complete model is given in Figure 1.

3.2.1 Incentives to the Banks

As mentioned in [2], the benefits of EBPP to corporate customers include shortened transaction cycles and accelerated revenue cycles, improved cash flow management, increased marketing opportunities, improved productivity, reduced direct costs, such as, postage and printing, and enhanced customer services. EBPP extremely benefits companies having multiple roles in the business, such as banks. In B2B, banks act as billers they bill for their own products and services, such as corporate financing and lending; they also act as biller service providers (BSPs), or bill publishers, both to internal billers and on behalf of business customers. Moreover, banks act as business customers (payers) when dealing with their own vendors. As a biller, the new B2B EBPP model allows banks to Reduce Costs (1.1), Increase Revenue (1.2), and Improve Cash Turn-around (1.3), such as, Days Sales Outstanding (DSO). Improve Customer Service (1.4), by, for example, reducing dispute handling, EBPP eliminates costly dispute phone calls for billers, as well as time-consuming dispute research. With all billing information at their fingertips, billers can quickly and easily resolve disputes – without picking up a phone or leaving their desks. Moreover, by deploying a B2B EBPP solution, billers can improve invoice reconciliation, perform detailed invoice analysis at an affordable cost, deliver targeted marketing messages to customers, reduce delinquent invoices, and ultimately, improve overall customer satisfaction.

In addition, offering an EBPP service represents a significant in Improving Market Growth Opportunity (1.5) for attracting new customers. In the case of wholesale banks, entering the EBPP market can be a significant source of revenue growth. These service bureaus can offer EBPP service in conjunction with other services and utilize EBPP as a key component of its portfolio of businesses.

Improve Bank Image (1.6) and Increase Value of Banks (1.7) - the value for banks as business customers (payers) is also significant. B2B EBPP results in more efficient workflow and approval, which saves time and money, and reduces errors. Similar to billers, payers can cut the costs associated with dispute resolution. In addition, they can capture payment terms, reduce late charges, improve payment accuracy, provide better invoice analysis and improve employee satisfaction.

3.2.2 Incentives to the Individual Customers

EBPP advantages for individual consumers are prominent. Cost Saving (2.1) - there is no initial investment required and for individual customers, costs are saved on reducing checks, postage, and envelopes. Convenience (2.2) - EBPP is convenient to use, viewing and paying the bills is just a click away. No more time-consuming writing out of checks and credit slips, finding stamps and posting; or needing to go to the bank to pay over the counter. As mentioned above, consumers can view and pay the bills with home PC, office desktop and even mobile phones.

The third advantage is Flexibility (2.3), where consumers are allowed to look at the bill and pay them from office desktop, home PC, digital TV or mobile phone. These channels have high market penetration and consumers can use them without additional investment. Such geographic and device independence, customers do not need to go to the bank or stores to pay for the bill. The payment can even be done outside the country as long as there are accesses to the Internet with a browser. EBPP allows consumers to see online what they owe, anywhere, at any time, 24-hours a day.

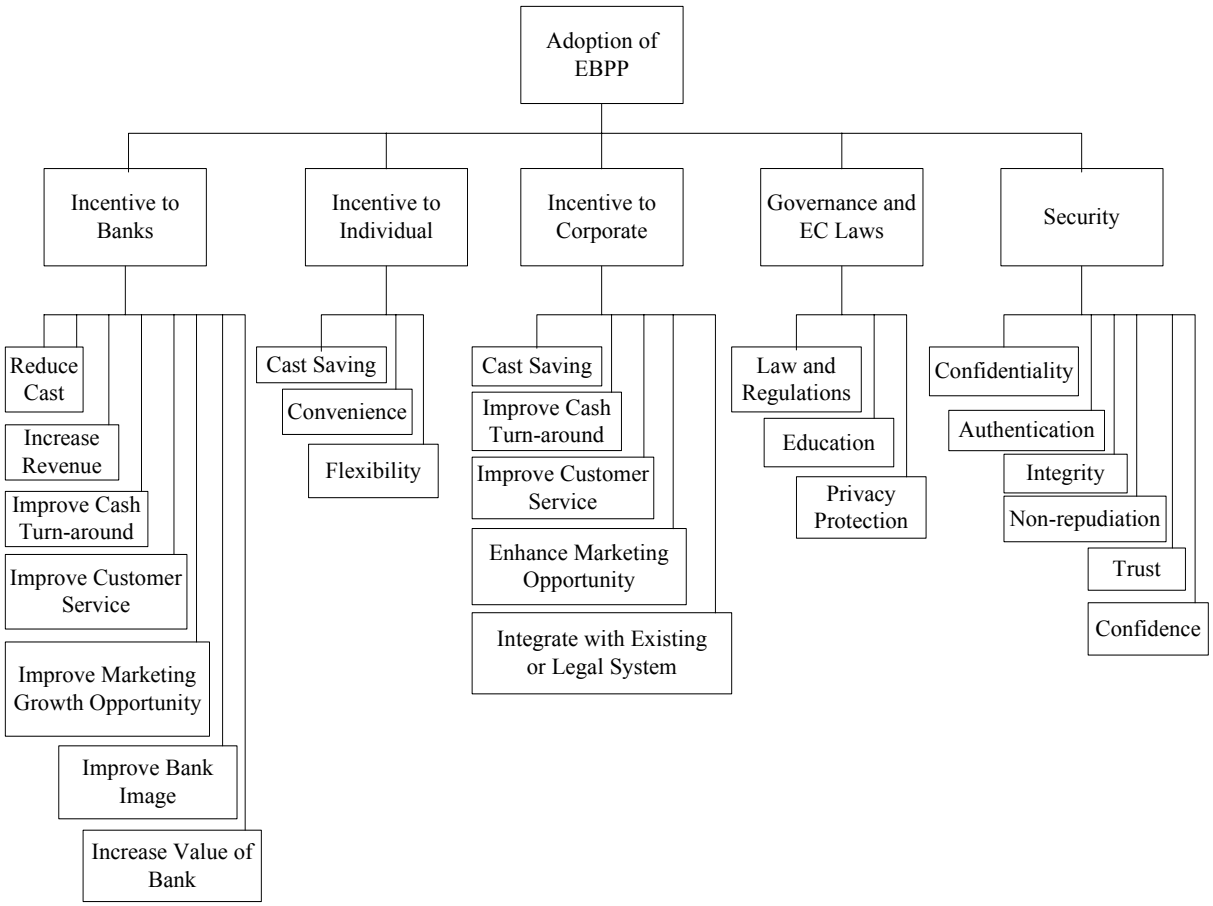

Figure 1: Model for adoption of EBPP

3.2.3 Incentives to the Corporate Customers

The prominent benefit is Cost Saving (3.1). For companies with large volumes of bills to post to their customers on a regular basis, cost such as printing, postage, envelopes and paper, can be saved with online presentment. At the mean time, billers do not have to wait for checks "in the post" - and the straight through processing of payment, from consumer to biller account, leads to fewer errors and improved cash flow. Shorten the payment collection time to Improve Cash Turn-around (3.2).

There are significant costs involved in resolving disputed bills, including the cost of staffing a customer call center and the elapsed time involved in recovering the money owed. On average, the cost of several telephone conversations to resolve the dispute would induce a cost of US$17 per call. EBPP can reduce these costs in a number of ways. For example, a proportion of the dispute resolution can take place over the Internet using rules-based processes, reducing the need for large numbers of call centre agents. Because billers can provide more billing information online than they can on paper, disputed transactions can be pinpointed more effectively, speeding the resolution process. Consumers can be offered the facility to pay the undisputed part of the bill, withholding only the disputed amount until the problem has been resolved.

Improve Customer Relationship (3.3) can be improved. EBPP brings greater efficiency to the billing process and generates stronger customer loyalty by providing better service. As a primary customer interaction vehicle, the paper-based bill is purely one way – from the company to the payer. The nature of the Internet is interactive, and EBPP facilitates a dialogue between the company and the payer. Companies are now able to receive and respond to customer inquiries directly from the bill web page, as well as provide online archives for "self-service" inquiries. EBPP solutions are being designed to answer routine billing questions by providing payment history and billing details on demand. Coupled with customer care services, EBPP can offer customers a vehicle for submitting bill disputes and specific questions, helping free the customer service staff from time-consuming, telephone-based support of non-strategic issues. Customers receive email responses to their questions, while the customer care staff deploys its time more efficiently by handling more urgent and complex issues. For this reason, many companies are implementing EBPP initiatives to tie into their CRM (Customer Relationship Management) Programs.

EBPP can also Enhance Corporate Marketing Opportunities (3.4). EBPP offers a biller the opportunity to gather market intelligence about customers in real time. Based on customer profiles,

companies can deliver graphics and customize "enclosures" and other dynamically generated promotional content for their customers. Marketing programs can be tailored to an individual's preference to provide one-to-one marketing.

Integrate with Existing or Legacy System (3.5) - Traditionally, large companies have employed proprietary Electronic Data Interchange (EDI) invoicing with large business customers. These EDI solutions have required expensive customized software and additional hardware to be installed, maintained and upgraded at each user's site. The expense of these EDI systems has been too great for most customers, leaving them to grapple with less efficient processes. Now with simple web access to EBPP, the high level of service that large customers have enjoyed from EDI solutions can be extended to smaller business customers, and at a lower cost. Even large customers can take advantage of additional services offered with EBPP without modification to their current EDI systems.

3.2.4 Governance and EC Laws

Laws and Regulations (4.1) set up by various authorities with the local government and companies provide compliance for the local electronic banking systems is extremely important. For example, how the users or service providers of EBPP can be protected by the legal and regulatory frameworks is extremely important to gain their confidence and trusts. Education (4.2) of the end users the related laws is also important in improving their confidence and trust in using EBPP. In Hong Kong, the related laws or regulations include, for example, Hong Kong Electronic Transaction Ordinance, Consumer Protection Act, Privacy Protection Act, and Guidelines from HKMA, are quite complete, but, the education or promotion to the general public seemed to be inadequate.

Privacy Protection (4.3): Privacy protection for customers is a major issue to customer and the Bank. According to the Disclaimer and Internet Privacy Statement of HSBC and also the report [4] the following are the privacy concerns of online banking:

- Customers' Privacy Matters to the Bank
- Internet Privacy Policy Statement and Personal Information Collection
- Use of Information and Materials
- Copyright, Trade Marks
- No Warranties
- Linked Websites
- Internet Communications
- Notice to Customers Relating to the Personal Data (Privacy) Ordinance
- The Data Protection Officer

3.2.5 Security

Security is the most critical issue in EBPP, including secure protocols, authentication, cryptography, protection of personal data, firewall, audit control, etc. There are several approaches to classify the security. For example, based on the infrastructure, then it can be decomposed into Web Security, Application Security, Network Security, and Physical Security. However, such categorization may not be easy for the users, such as, individual users to distinguish one from the other. Therefore, based on the breach types, we classify the security into: Confidentiality (5.1), Authentication (5.2), Integrity (5.3), and Non-repudiation (5.4).

Providing sound business services are not enough for EBPP, it needs to develop a comprehensive approach to handle the security and control issues as well. EBPP trademark will be harmed once there is a security failure. Which would destroy the Trust (5.5) and Confidence (5.6) of the users In next section, we will provide some details about the standard applications or programming technologies, e.g. Secure Socket Layer (SSL), RSA, SHA-1, which used by EBPP to handle the security and control access.

4. EBPP AT HONG KONG SHANGHAI COMMERCIAL (HSBC) BANK

In this section, we will discuss the case of implementation of EBPP at Hong Kong Shanghai Commercial Bank (HSBC), which is one of the largest financial institutions in the world.

4.1 Background of HSBC

The Hong Kong and Shanghai Banking Corporation (HSBC) is the founding member of the HSBC Group. It is the Group's flagship in the Asia-Pacific region and the largest bank incorporated in Hong Kong. The bank is also one of the Hong Kong SAR's three note-issuing banks, accounting for more than 62.6 percent of its banknotes. The bank and its subsidiaries have some 590 branches and offices in 20 countries and territories in Asia-Pacific and 20 in six other countries around the world. They employ some 40,700 people.

The HSBC Group maintains one of the world's largest private data communication networks and has, in recent years, been reconfiguring its business for the e-age. Its rapidly growing e-commerce capabilities include the use of the Internet, PC banking over a private network, interactive TV, and fixed and mobile (including WAP-enabled) telephones.

HSBC provides a full range of personal financial and wealth management services in Hong Kong. These include HKD/USD current and multicurrency savings accounts, integrated accounts,

mortgage finance, personal credit services, hire purchase and leasing for motor vehicles, term deposits and credit/debit cards, financial planning, investment services such as unit trusts, bonds and certificates of deposit and local and overseas securities, broking services, Mandatory Provident Fund investment options, and insurance. Services are distributed through channels such as HSBC's ATM network, Internet banking service, 24-hour phone-banking centre, more than 20 Mortgage Advice Centers providing customized advice seven days a week and a network of over 190 branches and offices. At end March 2003, online@hsbc, HSBC's Internet banking service, was being used by 514,000 customers.

4.2 HSBC EBPP Initiatives

There are basically two reasons for HSBC to grab the EBPP market.

Firstly, e-bill market is expected to grow exponentially in the next few years. In 2000, about 1.5 million e-bills were generated in US, it is estimated that more than 5 million bills would be generated in 2002 [10]. Secondly, EBPP can lower HSBC's operation costs. A research by Goldman Sachs shows that, if a customer does a transaction through branch, the cost per transaction is more than US$1, while doing such a transaction through online banking just costs less than 10 cents. Different transaction costs of banks through different transaction media have been reported in [4], in which Internet and PC banking were the lowest, then the ATM payment. The highest is the face-to-face banking in a branch, in which it was 15 times higher than an Internet based banking.

Payment services are important to HSBC's revenue as for each bill payment transaction, HSBC can earn transaction fee from billers. With the emerging of Internet, the barrier of providing EBPP services is lowered. Currently, large portals and content services provider are competing with banks to become consolidator, as entry barrier of EBPP is not high. [4] provides a summary of recent developments in financial products and services along two dimensions: ease of commoditization and existence of entry barriers.

Facing potential competitions and in order to improve customer relationships and retain customers, HSBC developed a multi-channel strategy, which is aimed to support customers access to HSBC's service at anytime, any place, and from any access device. E-bill is now supported by online banking; automated access devices provided by HSBC include ATM, Instant balance terminals, Instant deposit machines, COPUT, automated phone banking, and also online@HSBC service. Actually, HSBC's multi-channel strategy is a way to achieve another long-term aim: providing a completed vertical e-financial service structure. Actually HSBC's multi-channel strategy is away to achieve another long-term goal, which is to provide a completely vertical e-financial service structure, in which it includes Access Devices, Portal Distribution, Aggregator of Bills and Accounts, Financial Institutions, Infrastructure Providers, Regulation, and Security Technology Providers. Which is very similar to the e-finance framework as reported in [4].

4.3 Revenue Model

Here we will present some indicative figures on the EBPP model. The detailed pricing schemes are confidential and subject to change by the business. Table 5 shows the cost of each EBPP payment transaction and the respective charge. Please note that the charge applies to the billers only as the service is free of charge to the customers.

Table 5: Comparison of transaction costs of different payment services

Payment Channel	Cost (in HKD)	Charge per transaction (in HKD)
EBPP	**0.4**	**1.6**
ATM	1.8	1.82
Phone banking (VRS)	0.84	1.6
PPS/ PPS on internet	NA	1.52
JETCO	NA	0.75
AutoPay	0.15	0.35

The relatively large difference between the cost and charge of each transaction is due to the fact that certain amount of commission is paid to the IT solution provider which works jointly with HSBC to provide the EBPP service. As a result, a rough estimation of the revenue made for each bill payment transaction is about 20 cents. The charge of each bill presentment transaction is roughly about 60 cents, while the revenue for HSBC is about 30 cents.In view of the fierce competition from Phone Payment Service (PPS), Table 6 provides a comparison of competitive advantages of PPS against HSBC in year 2001.

In comparing with PPS, the only competitive advantage of HSBC was the global market scope. After conducting post implementation review, they foresaw the urge of changing their Business Model from Business-to-Client (B2C) to Business-to-Business (B2B). A global shipping company, P&O Nedlloyd, had already signed up a contract with HSBC to use EBPP service to deliver online bill/invoice presentment and payment to customers globally. They aimed at easing their bill logistics management, cash flow and cost reduction on bill printing, mailing and handling.

Table 6: Comparison of competitive advantages of PPS against HSBC

	PPS	HSBC
Company Nature	Neutral Service Provider	Bank
Customer Base	Larger, due to customer from all bank using EPS	Smaller, only HSBC and subsidiary bank's clients
Bill Payment	Yes (80 billers)	Yes (~22 institutions)
Bill Presentment	No	Yes (People Communication)
Forward Payment	No	Yes
Market Scope	Hong Kong	Global
EBPP Model	Thin Consolidator	Thin Consolidator

No major plan on EBPP promotion in the near future. It may become an essential service of the online@hsbc. For better interoperability, Internet email notification and SMS alert to mobile users would enhance the usability. For the integration with Business Internet Banking (BIB), more functional requirements will be added on to EBPP service including:

- Invoice presentment
- Partial payment: Many business trade by partial payment and based on lading, that means the invoice need to support partial payment rather than full payment.
- Credit period for payment: Credit Period is essential for business dealing, the invoice settlement need to support credit payment rather than inter-account transfer.
- Customer profiling: Different user profile can view different part of the bill or invoice

4.4 Technical Design

The following shows the features of HSBC's implementation:

- EBPP is incorporated with existing Internet Banking Service.
- Thin consolidator EBPP model is adopted. That means bill summaries are stored at HSBC and bill details are stored at the merchant (payee) side.
- Both online and off-line registration is supported. It depends on biller's implementation.
- Batch mode summary update. Bill summaries at HSBC are updated periodically (one or twice a week) using file transfer from billers

Figure 2 illustrates the simplified steps of accessing HSBC's EBPP system:

- As EBPP is incorporated with existing Internet Banking Service, customer first need to logon HSBC online as usual. After entering user ID and password, a process called Single-Sign On (SSO) is performed. The e-banking server will, on behalf of the customer, communicate with the EBPP Thin Consolidator (TC server). Although both servers are resided in HSBC's data centre, messages are passed between them using digital signatures as to achieve the highest security.
- Customer can then click on the e-bill functions in the Internet Banking web page, such as 'e-bill registration' and 'view bills'. If customer click the 'view bills' to view bill summary, the TC server will extract the information from the backend database and present it to customer through the web page.
- If a customer wants to view bill details and click further on the 'bill detail' button, the TC server will communicate with the merchant (payee) server which stored all the bill details. As the merchant server is resided outside HSBC's data centre. The TC server will first send back a secure token to the customer browser with the customer's encrypted information. The customer browser will then redirect the token to the merchant server automatically.
- After the merchant server verified the customer's token, it will then show the customer the corresponding bill details in the return web page.

Techniques involved are summarized in Table 7.

4.5 Legal and Regulatory Frameworks

4.5.1 HKMA Guidelines to Electronic Banking

HKMA is the government authority in Hong Kong responsible for maintaining monetary and banking stability. Starting from 1997, the study group of electronic banking was established. It keeps abreast of industry and technological developments in e-banking and assists in the development of appropriate policy and regulatory responses to such developments with HKMA in Hong Kong. All electronic banking services are required to compliance with these guidelines [7]. Ordinances include:

- No. 15.1 - Electronic Banking (Jul 1997)
- Authorization of Virtual Banks (May 2000)
- Risk Management
- No. 15.2 - Basle Committee on Banking Supervision's Paper on 'Risk Management for Electronic Banking and Electronic Money Activities' (Apr 1998)
- Guidance Note on Management of Security Risks in Electronic Banking Services (6 July 2000)
- Security
- No. 15.1.1 - Security of Banking Transactions over the Internet (Nov 1997)
- No. 15.3 - Public Key Infrastructure and Legal Environment for Development of Internet Banking (Oct 1998)

- Guidance Note on Independent Assessment of Security Aspects of Transactional E-banking Services (26 September 2000).

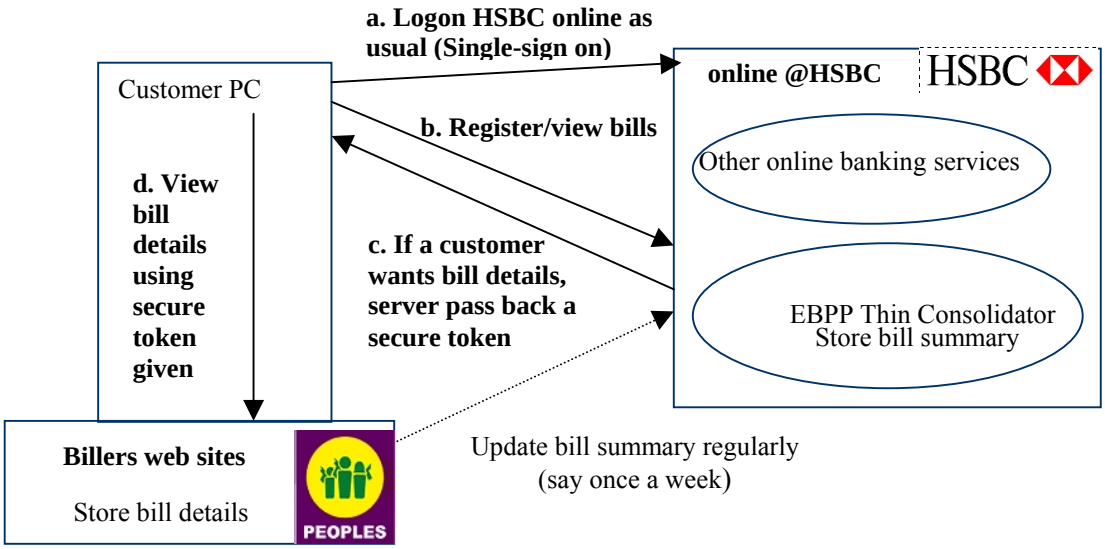

Figure 2: Steps of HSBC's EBPP process

Table 7: Techniques involved

Technique used	Purpose
Single Sign-On (SSO)	For customer convenience. Customer just needs to logon once and access several servers.
SSL and 3DES encryption	For confidentiality during data transmission.
Signed message (digital signature)	For customer and server authentication
Timestamps	To prevent replay attack by hackers

4.5.2 Three-Tier of EBPP Legal Compliance

Generally, EBPP is a service on top of an Internet site, which is operated by a corporation. This service involves the corporation (i.e. the financial aggregator, such as a Bank or a virtual Bank), the billers and customers.

In view of these, there are three tiers of legal compliance applicable to an EBPP system - service level, Internet level and corporate level. A corporation acquires a valid legal entity, such as a Banking License or a virtual bank authorization. To compliment on the service provision, the financial aggregator and the merchant need to agree on a contract agreement. In terms of customers, privacy protection is an utmost concern for every registration and transaction, which should obey the Personal Data (Privacy) Ordinance of Hong Kong. Since 1997, a study group for electronic transaction has been set up by Hong Kong Monetary Authority to provide supervision and guidelines on electronic banking in Hong Kong. The guidelines are mainly concerned with security and risk management. Table 8 lists the 3-tiers legal compliance of HSBC's EBPP system.

Firstly, Terms and Conditions of EBPP@HSBC [11] declared the legal consensus among the bank, merchant and customers and defines the role and operation of EBPP in online@hsbc; Secondly, Terms and Conditions of online@hsbc mentioned that the Bank provides online Service through this Internet Site to allow customers to conduct banking; Thirdly, Hong Kong Monetary Authority has granted a banking license to HSBC Bank pl. under the Banking Ordinance, which become the foundation off the legal entity of HSBC.

Table 8: 3-Tier Legal compliance of HSBC's EBPP system

HSBC Service	Application	Legal Compliance
EBPP@HSBC	Service	Customer: Privacy Protection Business: Contract Agreement
online@hsbc	Internet Site	Internet/E-Banking: Guidelines from HKMA regarding Security & Risk Management
HSBC	Legal Entity	Legal Entity : Bank

There is a common confusion about the legal entity of online banking with a virtual bank. According to the guidelines of Authorization of Virtual Banks (May 2000) from HKMA, "A 'virtual bank' is defined as a company which delivers banking services primarily, if not entirely, through the internet or other electronic delivery channels. It does not refer to existing licensed banks which make use of the internet or other electronic means as an alternative channel to deliver their products or services to customers. Nevertheless, some of principles set out in this Guideline, particularly those relating to risk management of electronic banking activities, will also be relevant to such banks." [7] Therefore, HSBC utilizes online banking to deliver banking service based on her Banking license, instead of a virtual bank authorization.

4.6 Security Measures

For all banking services, all possible control measures are required to be adopted for compliance with requirements from HKMA (Hong Kong Monetary Authority) and HSBC's auditing requirements. The following security controls are implemented on EBPP as well as all other Internet services provided by HSBC:

- SSL Connection: All web contents of Thin Consolidator Payer module, Bank Admin, Biller Administration and Biller web servers are full SSL (128-bits) protected. Therefore, viewing bill online, registration/deregistration from the biller web-site is all under SSL protected.
- Single Sign on Protection: This is a server to server authentication mechanism that allows the biller to use the billing service once they have logged in the Internet banking service. Hence, the biller is no need to repeatedly log in but yet access authorized part of the service. This mechanism is based on the Digital Signature architecture and the mutual trusted relationship among the servers that support this technology.
- Session Control in TC: Every session will have a session ID. The id is used to control the internal session. The session will be allowed to be visit only if the event bearing the corresponding session id. Besides, session id is also involved in the implementation of timeout session checking. The server will invalidate the session when the session has been unused for a certain period of time. Thus, the session will be destroyed if the biller has walked away for a period of time. Hence, other unauthenticated parties could not use the billing service of that biller.
- Protection of Data Passing between IFS, TC and Biller Web Application: Besides the SSL protection, the billing application is supposed to "POST" sensitive data such as billing amount to the TC server through hidden field such that the user won't see the details in the URL link. After receiving the data, the session id (stored in Cookies) will be regenerated and the new one will be used to prevent the replay attack.
- Access Control of Bank Admin and Biller Admin: It adopts the common policy on controlling the password, which includes account being locked for three consecutive unsuccessful logons; Billers are reminded to changed password for every 90 days; Strong password policy Couldn't only contain alphabetical, include some numbers and capital letter); Displaying the details of logon information (whether success or not), and denying the access to deactivated accounts.

4.7 Lessons Learned

EBPP is a new way of how to present the bills to the customers and how to collect the payment from the customers. From our study of the EBPP service at HSBC, we learned the following:

1. For individual customers, the number of billers B of an EBPP site is critically important and, similarly, for corporate customers, the number of individual customers C that it can reach at an EBPP service site is important. Also, the value of total services that an individual customer be able to received V is also important to all the three parties involved. Therefore, the value of an EBPP service, EV, equals $f(B, C, S)$ and the simplest format is $EV \approx B \times C \times S$.
2. We also found that corporate or billers with their own websites tend to favor biller-direct model or thin-consolidation model, so that they could maintain direct connections with their customers. For thick consolidation, the most important is the value-added services for the billers, however, it was not the intention for HSBC to provide such services.
3. Security is extremely important and so does the legal and privacy protection. With such measure, it was impossible to generate trust and confidence, which are the most important factors in deciding the future of any payment services.

5. CONCLUSION AND FUTURE RESEARCH

In this paper, we introduced Electronic Bill Presentment and Payment (EBPP) and presented a case of an EBPP system implemented in Hong Kong Shanghai Commercial (HSBC) Bank. With EBPP Technology, the once costly and labor-intensive processing of sending invoices to customers as well as receiving and processing payment has been greatly improved. Firstly, we provided an overview of two primary EBPP models and some of their variations, and discussed the advantages and disadvantages of each model. Then based on the interview with the top management of HSBC, we developed a framework for the adoption of EBPP services. We summarized

the key elements for adoption and diffusion of EBPP and provide a discussion of each element. We also discuss the potential benefits of launching such services. Based on the framework, the case of HSBC's EBPP service was studied and analyzed from managerial, technical, security legal and financial aspects. We also compared HSBC's EBPP system with Phone Payment Service (PPS). We found that for a company like HSBC, which has global market presence and night market share in Hong Kong, EBPP is important in not only retaining their customers, but also attracting new customers.

Future research may include studies in comparing EBPP with other similar services in Hong Kong, for better predicting its future. Also, a large scale survey will be conducted to validate the model we proposed.

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