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Online Financial Services

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Abstract

The Internet is an ideal medium for carrying out banking activities due to its cost savings potential and speed of information transmission. From a technological and cost-driven standpoint, it may seem quite logical for banks to shift as many banking activities online as possible thus giving rise to the beginning of electronic commerce and electronic banking.

E-commerce applications must have all the necessary building blocks (components) and must be easy to use. An evaluation of several E-commerce applications indicates that these applications have not yet integrated all of the different components. Analysis of these applications also suggests that they are rapidly adding new features and components.

E-banking is a delivery channel that replicates and in a certain way replaces many of the physical functions a bank currently performs. It is a virtual banking counter that individual and corporate customers use to carry out their regular activities. This paper looks at this technology and its application by analyzing the case of PostFinance Bank (Switzerland). It also looks at YellowBill Invoice; an application developed by the author and which generates XML files and creates PDF invoices.

This thesis aims to provide an integrated look at E-banking and E-commerce to further our understanding of the linkage among various disciplines, which are inherently connected with one another.

Keywords: E-banking, E-commerce, PostFinance, XML, E-payment.

1

Introduction

1.1 Description of the field

The Internet today is the digital bone for the new digital economy that is radically changing business models around the globe. At the turn of a new millennium, the business environment has undergone a rapid transformation with the Internet, making it possible for a large number of users to access vast amounts of information through a diverse array of technical tools and services. As a result, online shopping has continued to grow.

In April 2006, 75.7% of Swiss have access to internet compared to 15.1% in 1997 as shown in Figure 1. About 86% of young people use the internet [Swiss Federal Statistical Office, 2007].

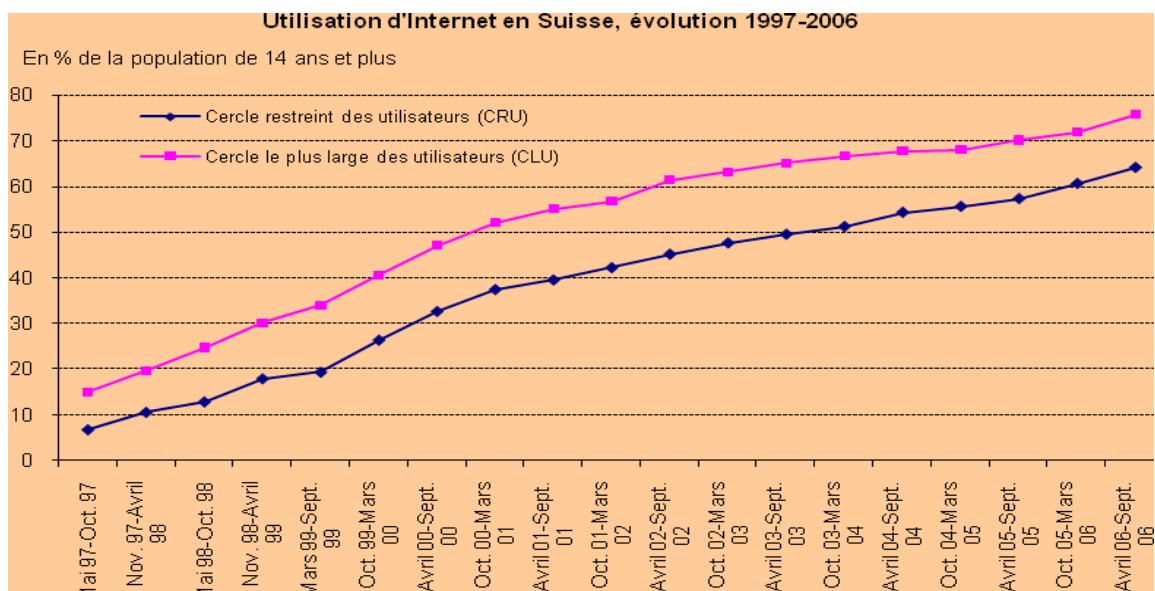


Figure 1 : Internet usage in Switzerland [Swiss Federal Statistical Office, 2007]

Between 1998 and 1999, business-to-consumer Internet sales in the United States grew by 120%, to approximately \$33.1 billion (Shop.org & Boston Consulting Group, 2000). In 2000, Forrester Research (2001) reported that online sales to consumers amounted to \$48.3 billion, representing an annual growth of 45.9%.

However, this rapid growth is not reflected in Switzerland. In 2004, 53% of internet users in Switzerland purchased travel tickets online (train or plane tickets, etc.); 42% use it for financial services and 36% buy products and services online, although 73% use it to find information on products and services. Only 4% use the internet to sell their products and services. Online sales to consumers amounted to about at least CHF 1 billion in 2004 [Swiss Federal Statistical Office, 2007].

In Switzerland, the number of customers registered for online banking is growing. Many organizations from different sectors have realized the opportunity of using the Internet as another channel for business operations. Banking is one of the sectors that are leveraging the powerful capability of the Internet.

The financial arm of Swiss Post, PostFinance, is active in the retail banking and payments sector. In 2006, it had operated 3.5 millions accounts, an increase of about 5% from the previous year. Its electronic account management service, E-Finance has seen an increase of 13% from 2005 to 2006. PostFinance operated 803 millions transactions in 2006, an increase of 0.3% from the previous year [PostFinance, 2007].

1.2 Objectives of this document

This thesis aims to provide an integrated look at E-banking and E-business to further our understanding of the linkage among various disciplines, which are inherently connected with one another in electronic commerce. This document presents insights into these relationships from the multiple perspectives of scholars in various disciplines, as well as through both theoretical treatment and empirical investigations of the topic using the Swiss banking institution as an example. It also introduces and describes YellowBill Invoice, an application developed by the author for PostFinance. YellowBill Invoice generates XML files and creates PDF invoices using data submitted through an HTML form.

The following questions will be addressed by the document:

- What is e-commerce?

The reply to this question will give us a general understanding of this field, which will prepare us for the next sections of the document. It would present a comprehensive description of E-commerce and conclude by relating it to the PostFinance framework.

- What is online banking?

The reply to this question will give us a general understanding of this field, which will prepare us for the next sections of the document.

- What are the technologies used in online banking and E-commerce?

This question will be of interest in that I would present us with the traditional technologies used realizing online transactions and how they have evolved. The most widespread used technologies and a detail description of each will be presented, including their mode of application. It would conclude by presenting the intrinsic link between online banking and e-commerce and how they complement each other.

- PostFinance and its E-Services in Business to Business interactions:

The response to this question and its sub-questions will introduce us to PostFinance and its activities. It would describe the different services offered by PostFinance and how they implement each other within the B2B framework.

- What is E-Finance and how does it work?
- What is E-Bill and how does it work?
- What is YellowBill and how does it work?
- What is E-Payment and how does it work?

- What is YellowBill Invoice?

- Architecture
- Usage

This section will take us through the process of using YellowBill Invoice to generate XML documents, which can be used to automate payment at PostFinance. It would first describe the

process and general architecture of the system. It would also present an example code used in the software application.

This document is addressed to a wide audience, not only application designers, technical architects and team leaders, but also to functional managers, research, corporate instructors and students. All these require to share a common understanding in order to make E-business a success.

1.3 Organization of the document

The first part of this thesis introduces the concepts of E-Banking and E-commerce and presents the technologies used to deploy these applications.

The second section of this work introduces the technologies used by PostFinance to deliver their online services to both consumers and enterprises.

The third section of this document focuses on the Business to Business interaction between enterprises using PostFinance as a transiting agent. Within this framework, companies use the PostFinance web interface to make and receive payments from other companies directly into their PostFinance accounts. It looks at various ways different enterprises with different web technologies have connected their online checkout pages to PostFinance E-Payment service. It also looks at the new system of managing online accounts introduced by PostFinance.

2

Principals of online transactions

2.1 Introduction

The purpose of this chapter is to explain the concepts of E-commerce and e-banking and how they can interact on the virtual market.

It begins by with an introduction to E-Commerce and E-banking and details the different phases of E-commerce. It also covers the different types of E-business and concludes with the convergence of B2B and B2C applications.

Key topics you learn in this chapter include:

1. E-commerce and E-business;
2. E-banking and different types;
3. Technologies used in online banking and E-commerce applications.

2.2 E-commerce and E-business

2.2.1 E-commerce

E-commerce focuses mainly on customer applications that allow transactions and interaction between a company and a customer over the internet. Turban et al. [2000] define E-commerce as “an emerging concept that describes the process of buying, selling or exchanging services and information via computer networks.” Choi et al. (as cited in [Turban et al., 2000]) draw a distinction between what they term pure E-commerce and partial-ecommerce. According to Choi et al., pure-E-commerce has a digital product, a digital process and a digital agent. All other transactions (including those that might have one or two of the three nominated by Choi et al.) are termed partial E-commerce. Raymond [2001] defines E-commerce as “function of

information exchange and commercial transaction support that operate on telecommunication networks linking business partners (typically customers and suppliers).” According to Schubert [2007], E-commerce is “a specific part of E-business and is focused on the selling of products and services. Ecommerce applications support sales processes, traditionally subdivided into information phase, agreement phase, and transaction phase.” For the purpose of this study, which examines digital transactions in which customers and suppliers exchange services and information, and its different phases, the definitions provided by Choi et al. and Schubert are used.

The global growth of E-commerce shows that people are becoming dependent on the Internet for communications and services. The field of E-commerce has become extremely prevalent within the past few years, and this new form of technology continues to grow and expand at a rapid pace.

E-commerce is not just another mechanism to sustain or enhance existing business practices. It is an entirely new pattern that is changing the traditional way businesses operate. As suggested by Treacy and Wiersema [Treacy, Wiersema, 1997], E-commerce transforms a company from one geared toward “production excellence” to one geared toward “customer intimacy.” E-commerce is not about technology but about a new way of treating customers and suppliers. Achrol and Kolter [Achrol, Kolter, 1999], in a discussion of marketing with a network economy, described this transformation as a shift from being an “agent of the seller” to being an “agent of the buyer.” Thus according to Lee [Lee, 2001], the biggest challenge for most organizations is not how to imitate or benchmark the best E-commerce model but how to fundamentally change the mind-set of management (owners and managers) away from operating as a traditional business.

However, the primary focus of most E-commerce applications is to generate revenue by selling goods and services.

The most recent statistics from the Swiss Federal Statistical Office indicate that online sales are growing rapidly. From 2001 to 2005, the online purchases have increased from 2.9% to 6.1%. During the same time period, online sales have increased 1.3% to 6.9% [Swiss Federal Statistical Office, 2007].

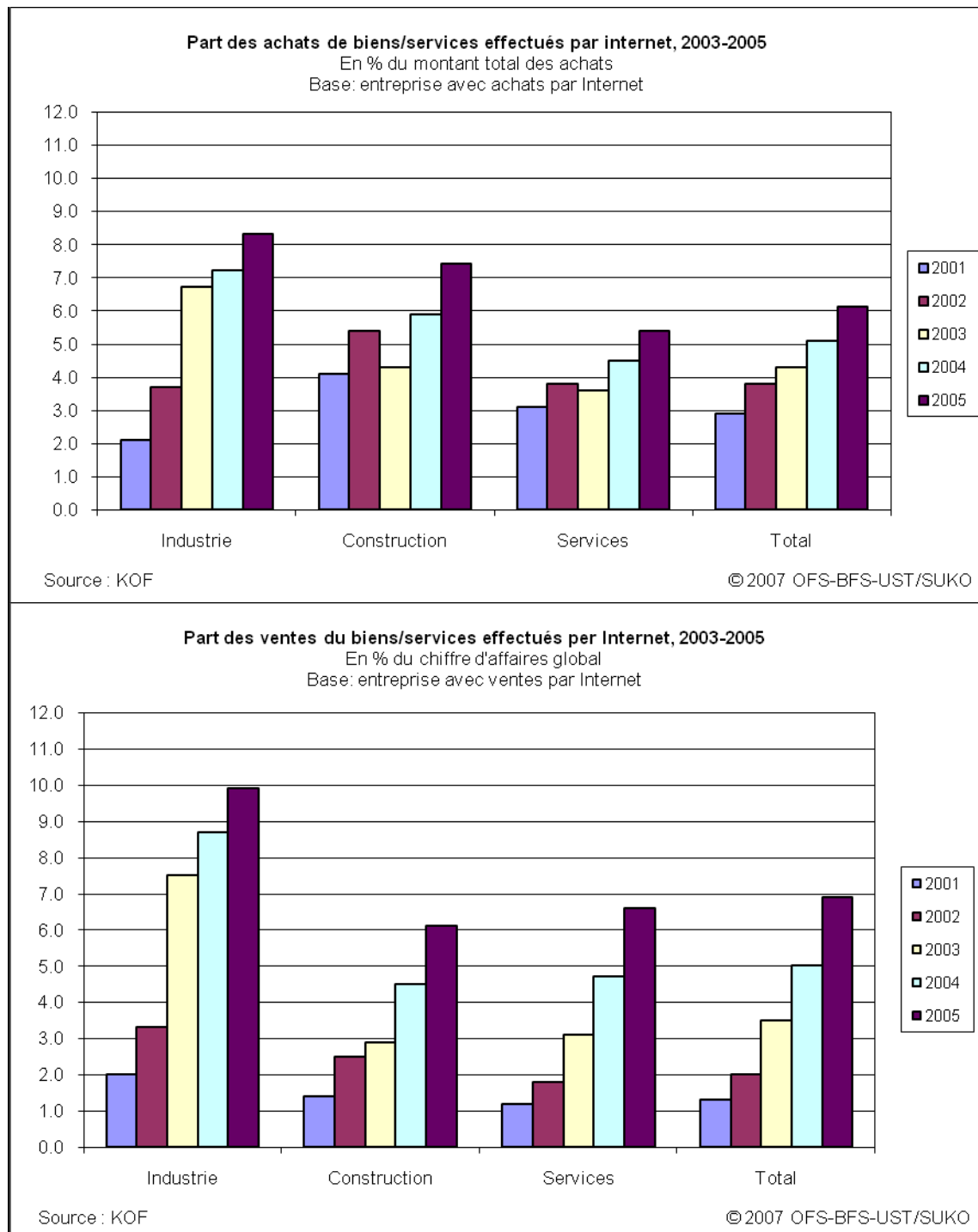


Figure 2 : Evolution of Internet sales and purchases in Switzerland

2.2.2 Phases of E-commerce

E-commerce has generally five well defined phases: the Motivation phase, Information phase, Agreement phase, Fulfillment phase, Loyalty phase [Schubert, 2007].

The 5 phases of the e-commerce customer cycle

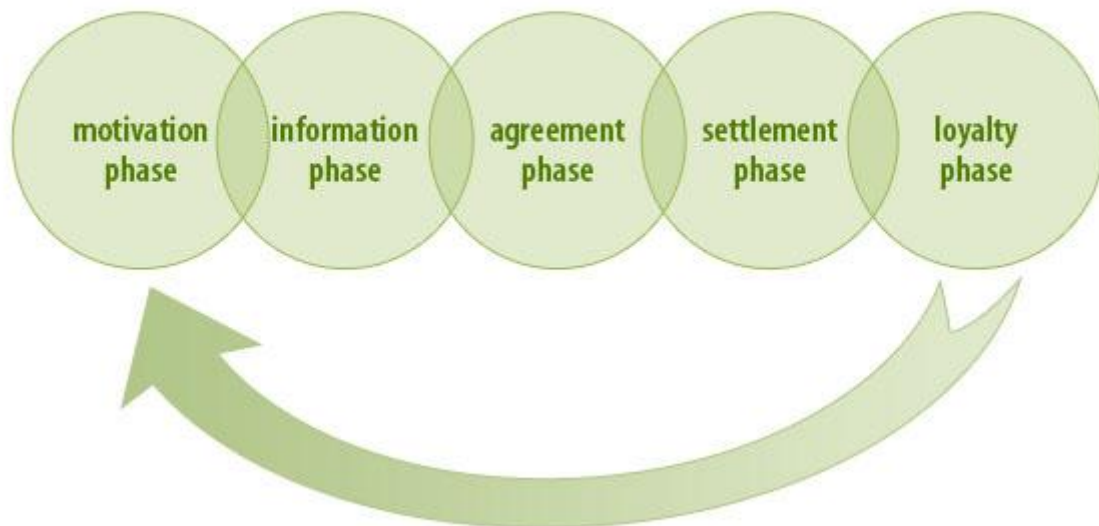


Figure 3 : *Phases of E-commerce [Schubert, 2007]*

The Motivation Phase:

The motivation phase is the first phase of the E-commerce cycle. In this phase, the potential buyer seeks products information provided by the vendor.

The buyer also seeks to get assurance that site is reliable and that his sensitive information will not be misused.

During this phase, the vendor tries to promote his website and products by proposing newsletters and special online sales advantages.

The Information Phase:

In this phase, the vendor:

- Presents all information needed by the buyer to make the purchase;
- Detects difficulties in the ordering process and eliminate them;
- Finds out how accessible his site is to potential buyers

As for the buyer, this phase is the decisional phase on whether to purchase the product or not. He gathers relevant information about the product such as the product description, price, vendor and shipping time. For example, on Dell's website, customizations of the product are made during this phase.

The agreement Phase:

During this phase, the seller and the buyer will negotiate the terms and conditions of the chosen product(s) including price, delivery and payment conditions. In a B2C setting, the buyer will:

- Select the product and add to the shopping card;
- Officially confirms his agreement to the terms and conditions; and
- Receive a confirmation of the purchase.

In a B2B setting, the buyer will:

- Electronically sign the agreement document ;

The Settlement Phase:

During this phase, the buyer pays for the products selected.

In return, the buyer receives from the vendor the products purchased.

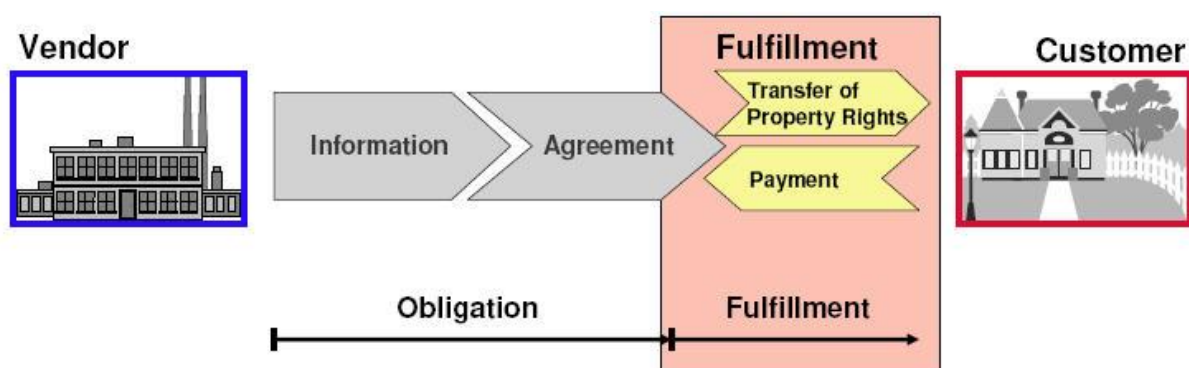


Figure 4 : E-Fulfillment during the Settlement phase

E-Fulfillment is the electronic support for the last step of the buying transaction. It involves the buyer settling the amount due and the seller transferring property rights to the buyer.

During the Settlement Phase, the buyers will be able to track and trace the products and change the order if necessary.

The Loyalty Phase:

The after sales services come into effect during this phase. The buyer can access the frequency asked questions section and procedures to follow if the product does not fulfill its purpose (return policy). The vendor tries to convert his knowledge about the customer into new products offer by presenting other similar products, etc.

2.2.3 The E-commerce process model: The DAVIC Wishlist

Electronic shopping does not stop with the definition of a virtual shop window. If we are going to create a complete shopping experience, we also need to consider how shoppers and virtual sales assistants can move through the store and interact with each other, the products and the transaction services that underpin everything. A more thoughtful approach has been worked out by the Digital Audio Visual Council (DAVIC), an industry body concerned with specifications for interactive television. DAVIC laid-down a specification (or at least, a wish-list) for a set of properties they expect from an on-line shopping service (Table 1). The specifications are intended to cover the most complex as well as the simpler teleshopping applications.

DAVIC specification of tele-shopping functionalities

1. The system should permit a content provider to create a virtual store
 2. The system should enable a content provider to determine the layout of the ‘virtual store’
 3. The content provider should be able to assign products to ‘virtual departments’
 4. The system should permit multiple items to be displayed simultaneously (e.g. for comparative choice)
 5. The user should be able to place selections in a ‘virtual shopping basket’ prior to committing to purchase these items, maintain a record of total cost, and be able to adjust
-

contents as better alternatives are found in other 'stores' or 'departments'

6. The system should enable a transaction to take place between a user and a product supplier
 7. A user, within a tele-shopping environment, should be able to request exchange or return of goods
 8. The user should be able to store/readily retrieve product information from one 'store' for comparison with offers found elsewhere (a virtual shopping list)
 9. The user should be able to commit to purchase items in a 'virtual shopping basket' using a choice of methods of payment
 10. The user should be able to amend an order already placed, or enquire of the status of an existing order
 11. The system should enable an order placed by a user to be processed, and for the status of the order to be reported
 12. The system should permit collaborative (group) shopping
 13. The system should facilitate the use of intelligent agents (aware of user preferences and parameters) to locate items matching needs
-

Table 1: *DAVIC specification*

2.2.4 Benefits and disadvantages of E-commerce

Changes in institutional policies associated with E-commerce have provided both positive and negative effects.

Benefits of adopting E-commerce strategy:

1. A global presence presenting customers with a global choice
2. Temporal freedom: operational 24 h/7 day
3. Improved competitiveness
4. Mass customization presenting customers with personalized products and services

5. Collaboration in distributed enterprises
6. Low transaction costs for payments

Personalization is always targeted to the fulfillment of a specific requirement. It can be aimed at shoppers or organizational roles in a company. It can be an important component for the success of an E-commerce application because it allows both parties to make smart choices inputting relatively less time and less effort.

1. A shortening of supply chain providing rapid response to customers needs
2. The disadvantages include:
3. Opportunities for fraud

2.2.5 E-banking

E-business entails the support of enterprise relationships and processes among business partners, customers, and employees by means of electronic media [Schubert, 2007]. It is the use of the Internet as a remote delivery channel for banking services. These services focus mainly on business-to-business applications that allow transactions and interactions between a company and its business customers and partners over the internet.

E-business was preceded by the growth of the Internet in two phases: the Communication Phase and the Information Phase. The Communication Phase (1993 to 1997) can be defined by the rapid adoption of e-mail.

As online communication grew, so did the desire to provide information, and so was born the Information Phase. Websites that provided primarily organization and contact information — was the hallmark of the Information Phase. From surveys to shopping carts, e-mail lists and chat services, websites became a way to interact with site visitors. Many tools were designed to gather demographic data to help build the dotcom revenue model. Fueled by growing demand for rapidity and quality, business spent billions to transact on the Internet.

The Web is the only global channel that can communicate to customers, deliver product and service customers 24/7/365 and therefore was the most realistic way of responding to this demand. The Internet delivers "digital" product, whether it is information that someone pays for — a mailing list, a report, an online course— or content —e-books, e-tickets for planes and movies, software, games, music such as the new iTunes service launched by Apple. For

some companies and their customers, the Internet is the entire channel and the whole relationship exists over the Web. The supply chain and selling chain are integrated into one mega-channel.

E-business has happened entirely because of a conjunction of this demand and the improvements in technologies and has yet to reach full speed and realize its potential. These technologies are, at the highest level, only two in number: more powerful computers and faster communication links.

E-banking services include traditional services, such as opening a deposit account or transferring funds among different accounts, and new banking services, such as electronic bill presentation and payment, which allow customers to receive and pay bills over a bank's Web site.

Banks offer Internet banking in two main ways. First, an existing bank with physical offices can establish a Web site and offer its customers Internet banking in addition to its traditional delivery channels. Second, a bank may be established as a "virtual," "branchless," or "Internetonly" bank, with a computer server at its heart that is housed in an office that serves as the bank's legal address or at some other location. Virtual banks may offer customers the ability to make deposits and withdraw funds at automated teller machines (ATMs) or other remote delivery channels owned by other institutions.

2.3 E-business

2.3.1 Basic technologies

There are two base-level technologies involved in supporting the E-business explosion: computing and communications. But it is reasonable to point out that these have been around for some decades and to ask why they should suddenly have become the engines of dramatic change. The answer is simple: both of them have quite recently 'turned the exponential' in terms of performance and reduction in cost. It is now well-known that performance per dollar in computing systems doubles every 18 months or so, has been doing so for two decades, and is likely to continue to do so for at least 15 years [W.S. Whyte, 2005].

By the end of this period, computers will be more than 1000 times as powerful as today's machines, for the same price. A similar trend in telecommunications is happening. Twenty

years ago, a single, heavy, rigid, expensive to install and maintain coaxial cable could carry a maximum of around 10,000 voice telephone calls or their equivalent in data over a few kilometres. Today, operational systems using individual tiny, flexible optical fibre carry orders of magnitude more, over intercontinental distances. Systems in the laboratory can carry many times more traffic on a single fibre than exists in the world today. The drop in cost is truly dramatic and we are only at the start. The message for business is simple: within a couple of decades, they will have wide access to affordable networks of effectively infinite carrying capacity and to computers with almost unimaginable processing power, and they must plan on this assumption.

2.3.2 Business to Consumer

B2C refers to online sales and distribution targeting individuals or enterprises that are the final consumers. It also refers to the emerging commerce model where businesses /companies and consumers interact electronically or digitally in some way.

In a B2C setting, flow of information between businesses and consumers is mainly channeled through the medium of Internet. This flow includes product orders/service requests from customers, product information, specifications, providing of services by Businesses and etc. In addition, it may also include, flow of tangibles (e.g. goods ordered from customer, documents transfers between businesses and customers, etc.)

Type	Examples	Revenues
Portal and Search Engines	Yahoo	Ads, subscriptions, fees, transactions
E-Tailer and “Clicks & Bricks”	Amazon WalMart	Sale of goods, web services
Content/Service Provider	CNN Weather.com	Ads, subscriptions, fees, sale of services/content
Transaction Broker	PayPal	Transaction fees
Market Maker	EBay	Transaction fees, subsidiary services

Community	Facebook	Subscriptions, matching services
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Table 2: *Examples of B2C powered websites*

Table 2 gives some examples of different types of services offered by B2C E-commerce site. Services include auction stores (e.g. www.ebay.com), online stores (e.g. www.amazon.com), online services (e.g. www.yahoo.com) and online communities (e.g. www.facebook.com).

2.3.3 Business to Business

B2B refers to buying and selling information, products and services via the Internet or through the use of private networks shared among business partners. These partners are usually not the final consumers of the product or service.

Type	Exemples	Revenues
E-Procurement	Ariba	Fees, software licenses
E-Marketplace Provider, Industry Consortia, Exchanges	Covisint	Fees and commissions on transactions
Hosted Services, E-Learning, E-CRM E-Accounting, etc	Triamun	Licenses, fees for hosted services
Internet Enablers, Hardware, software, Payment systems, etc	Cisco, Dell	Sale of goods, software licenses, fees
Web Services	IBM	Software, fees

Table 3: *Examples of B2B powered websites*

Table 3 gives some examples of different types of services offered by B2B E-commerce site. These services include E-Procurement (e.g. www.ariba.com), Web services (e.g. www.ibm.com) and Hardware providers (e.g. www.cisco.com).

2.3.4 The convergence of B2B and B2C

Despite the differences between B2B and B2C transactions, many of their functionalities are increasing beginning to converge. This is due to the rising number of small businesses and home workers.

Let consider PostFinance as an example. At the company's homepage, links lead to two different customer areas: "For private customers" and "For business customers."

Not surprisingly, this would lead to believing that the services provided by each category are unique. In fact, the similarities between these two categories in terms of products and services offered are significant. Both of these services provide services like E-Finance, E-Bill and Saldophone.

2.3.5 Next

In this chapter, we talked about E-commerce, E-business and E-banking technologies, how they can be implemented and gave examples of applications using these technologies.

In the next chapter, we focus on specific E-commerce applications and describe their functionalities.

3

E-commerce Applications

3.1 Overview

This chapter looks at specific E-commerce applications. It presents their functionalities and evaluates them using the DAVIC specification.

E-commerce applications are presented in two categories:

1. Built-in applications;
2. Online shop applications

3.2 Built-in applications

Built-in applications are applications in which an operator or owner propose a range of products to intermediary retailers who would in turn customize the products and sell them to their clients. Such applications are used by retailers who do not want to develop full E-commerce applications, but who would simply want sell a product for a specific period or event.

Built-in applications are used by sellers who do not want to go through the process of creating, configuring and deploying a full E-Commerce application. The operator is responsible to design a site, to setup the application, provide, sell and deliver the products to end users and set up a payment gateway and keeping stock of merchandise and shipping.

The intermediary retailer has to register with the operator, choose the products to sell and customize them.

3.2.1 CafePress Services

CafePress Services [CafePress, 2008] is an online built-in application that offers sellers complete E-commerce services to independently create and sell a wide variety of products, and offers buyers unique merchandise across virtually every topic. It allows Web users to create stores to sell personalized accessories like coffee mugs, T-shirts, etc.

3.2.2 Zlio

Zlio.com, which launched in France in 2006 and in January in the United States, allows creating and marketing of online stores [Zlio, 2008]. Users can choose a name, address and template for the store they want to create and then begin displaying their chosen products; say an iPod or a T-shirt.

Once signed up, a new shopkeeper can choose from more than 3 million products offered by 120 merchants. They can then invite friends, relatives and potential customers to shop.

Merchants share the revenue with Zlio and the seller based on the number of clicks and sales. Shopkeepers display products and can earn up to 10 percent commission through eBay's PayPal online payment service, either on every sale or on every click generated. They don't have to worry about shipping orders because the companies take care of it.

3.2.3 Evaluation using DAVIC specification

Table 4 evaluates both CafePress and Zlio applications using the DAVIC Specification. From this evaluation, we can conclude that Zlio has more functionalities than CafePress. Cafepress does not offer different layout options to its users while Zlio does.

Specifications	CafePress		Zlio	
	Yes	No	Yes	No
The system should permit a content provider to create a virtual store	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The system should enable a content provider to determine the layout of the 'virtual store'	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The content provider should be able to assign products to 'virtual departments'	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should permit multiple items to be displayed simultaneously (e.g. for comparative choice)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to place selections in a 'virtual shopping basket' prior to committing to purchase these items, maintain a record of total cost, and be able to adjust contents as better alternatives are found in other 'stores' or 'departments'	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The system should enable a transaction to take place between a user and a product supplier	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
A user, within a tele-shopping environment, should be able to request exchange or return of goods	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to store/readily retrieve product information from one 'store' for comparison with offers found elsewhere (a virtual shopping list)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The user should be able to commit to purchase items in a 'virtual shopping basket' using a choice of methods of payment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to amend an order already placed, or enquire of the status of an existing order	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should enable an order placed by a user to be processed, and for the status of the order to be reported	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should permit collaborative (group) shopping	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The system should facilitate the use of intelligent agents (aware of user preferences and parameters) to locate items matching needs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Score	9/13		10/13	

Table 4: Built-in applications evaluation using DAVIC specification

3.3 Online shop applications

Online shop applications are applications in which the operator has to go through the traditional E-commerce applications setup process. That is, the operator has to develop payment processors, Shopping Cart Software, delivery mechanism, after-sales support, maintenance, etc.

Generally, operators can build their shopping carts from scratch, but this is a costly endeavor. Instead, there are open source applications on the market that can be downloaded and installed. In addition, there are some relatively low cost applications that can be purchased

If the operator decides to use an open source application or to purchase a shopping cart, then the software must be downloaded and installed on a web server.

In this section, we will look at two open source applications and one priced application that are widely used to create online stores.

3.3.1 osCommerce

osCommerce is an online shop E-commerce solution that offers a wide range of out-of-the-box features that allows online stores to be setup fairly quickly with ease, and is available for free as an Open Source based solution released under the GNU General Public License [osCommerce, 2008].

The screenshot displays the osCommerce frontend interface. At the top, there is a navigation bar with links for 'Top > Catalog', 'My Account', 'Cart Contents', and 'Checkout'. The main content area is titled 'What's New Here?' and includes a welcome message for 'Guest!', a warning about the default setup, and a list of error messages. The left sidebar contains 'Categories' (Hardware, Software, DVD Movies), 'Manufacturers', 'What's New?' (featuring 'Below' for \$54.99), 'Quick Find', and 'Information'. The right sidebar includes 'Shipping Cart' (0 items), 'Destinations', 'Specials' (featuring 'Gauge Under Fire' for \$29.99), 'Reviews', 'Language' (English, German, Spanish), and 'Currencies' (US Dollar).

Figure 5 : osCommerce frontend

osCommerce is moving towards an E-commerce framework solution that not only remains easy to setup and maintain, but also making it easier for store administrators to present their stores to their customers with their own unique requirements.

3.3.2 Magento

Magento is a new professional open-source E-commerce solution offering unprecedented flexibility and control. It was designed with the notion that each E-commerce implementation has to be unique since no two businesses are alike.



Figure 6 : Magento's frontend

Magento's modular architecture puts the control back in the hands of the online merchant and places no constraints on business processes and flow [magento, 2008].

3.3.3 X-Cart

X-Cart is a complete E-commerce solution that provides all you need to build, operate and maintain an online store [X-Cart, 2008].

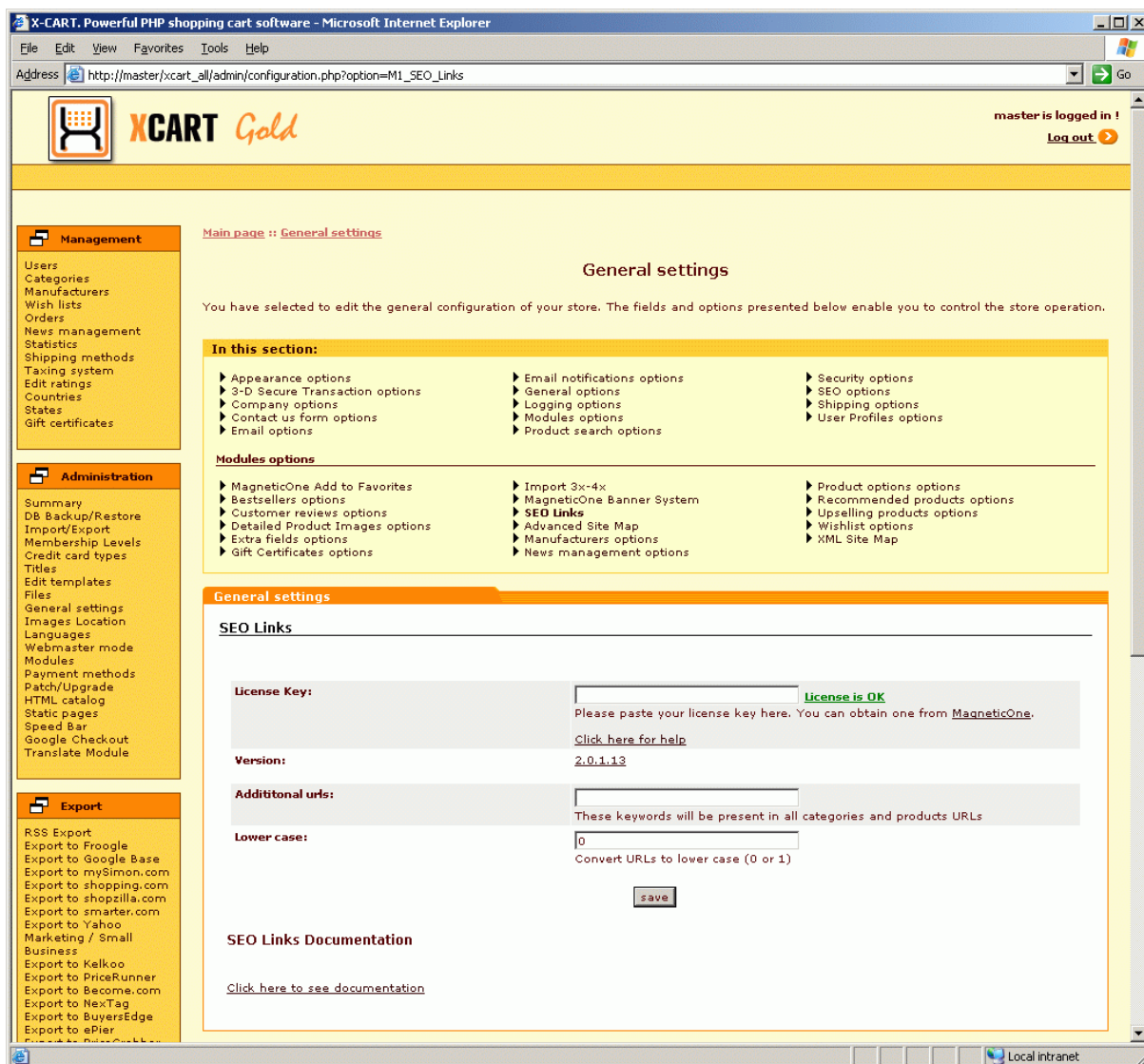


Figure 7 : X-Cart frontend

One of the most feature rich E-commerce solutions of today, X-Cart offers configuration flexibility and the industry’s leading environment for customization.

3.3.4 Evaluation using DAVIC specification

Table 5 evaluates osCommerce, Magento and X-Cart applications using the DAVIC Specification.

	osCommerce		Magento		X-Cart	
Specifications	Yes	No	Yes	No	Yes	No

The system should permit a content provider to create a virtual store	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should enable a content provider to determine the layout of the 'virtual store'	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The content provider should be able to assign products to 'virtual departments'	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should permit multiple items to be displayed simultaneously (e.g. for comparative choice)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to place selections in a 'virtual shopping basket' prior to committing to purchase these items, maintain a record of total cost, and be able to adjust contents as better alternatives are found in other 'stores' or 'departments'	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should enable a transaction to take place	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

between a user and a product supplier						
A user, within a tele-shopping environment, should be able to request exchange or return of goods	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to store/readily retrieve product information from one 'store' for comparison with offers found elsewhere (a virtual shopping list)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The user should be able to commit to purchase items in a 'virtual shopping basket' using a choice of methods of payment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The user should be able to amend an order already placed, or enquire of the status of an existing order	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should enable an order placed by a user to be processed, and for the status of the order to be reported	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The system should permit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

collaborative (group) shopping						
The system should facilitate the use of intelligent agents (aware of user preferences and parameters) to locate items matching needs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Score	9/13		11/13		9/13	

Table 5: Online shop applications evaluation using DAVIC specification

From this evaluation, we can conclude that Magento has the most diverse set of functionalities as compare to the others in the list. In addition to other functionalities, it offers products comparison which the other applications lack. It also allows collaborative (group) shopping.

3.4 Next

In this chapter, we talked about E-commerce, E-business and E-banking technologies, how they can be implemented and gave examples of applications using these technologies.

In the next chapter, we will look at PostFinance as an E-banking service provider and the various E-services they have.

4

PostFinance

4.1 Overview

The Swiss Post unit PostFinance is a provider of payment transaction services. It is systematically expanding its standardized and modular services, particularly in the electronic environment, which allows customers to manage their accounts electronically. More than two million private customers use postal accounts and the PostFinance Card. It processes two to three millions transactions a day and 800 millions transactions every year [PostFinance, 2008].

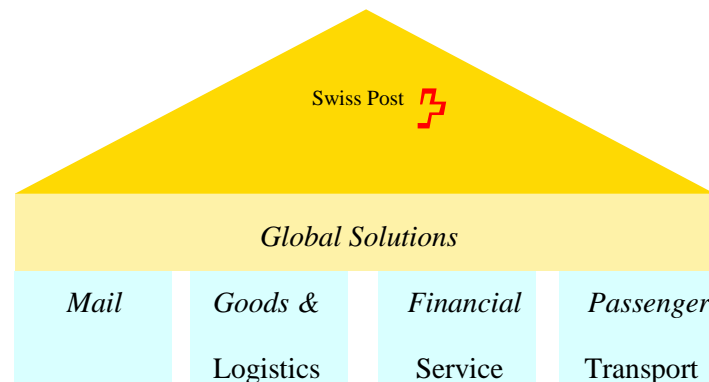


Figure 8 : *Swiss Post Group*

PostFinance has two set categories of customers: private customers and business customers. Private customers operate within the framework of B2C while business customers within the framework of B2B. It has many E-services, each delivering different services to each of these categories.

This chapter will focus mainly on the E-payment service provided and how business and private customers use it in the B2B framework. It will also briefly look at the other E-services provided by PostFinance.

Key topics you learn in this chapter include:

1. PostFinance and its E-Services in B2B transactions;

4.2 B2B transactions

PostFinance defines its operations in the B2B framework as an operation between two businesses in which it serves as an intermediary.

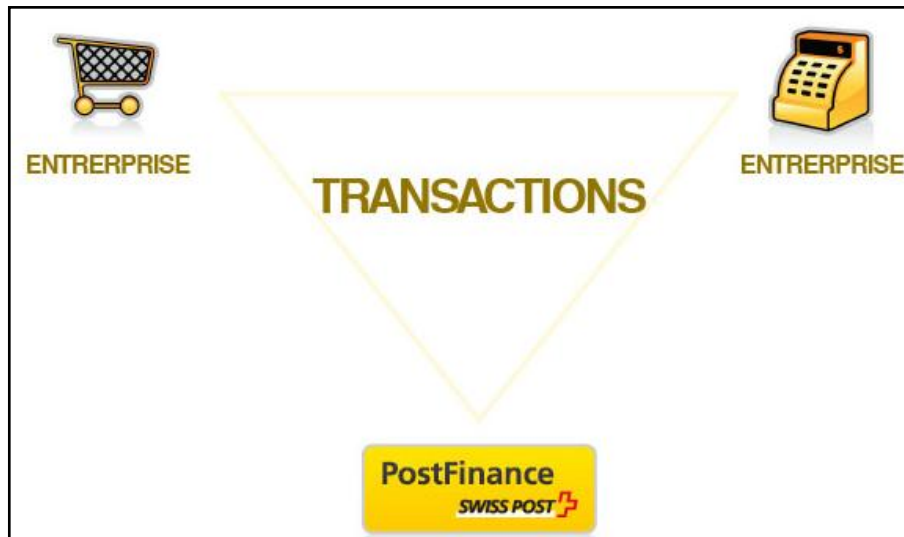


Figure 9 : PostFinance in a B2B environment

It has many different services (modules) which are designed to respond to individual needs of the business.

4.3 E-Services

E-service is the general name given to the set of online services offered by PostFinance. Each of these services represents a specific product in wide variety of online banking offers designed to respond to customers payment needs including payments, investments, financing and retirement planning. The following pages describe in details these different E-Services.



Figure 10 : *PostFinance E-Services*

4.3.1 E-Finance

E-Finance is the electronic medium through which customers exchange data with PostFinance. It is the generic term for describing all the different types of network connections offered by PostFinance. E-finance allows customers to handle their financial transactions online. For private customers, there is no difference between E-Finance and Internet banking. For commercial customers,

With E-Finance, clients can:

- Access all their accounts, transactions and fund portfolios online anytime, anywhere
- Effect domestic and international payments, manage standing orders, transfer money between accounts, pay e-bills
- Fast, secure processing of all financial transactions
- Differing access rights can be assigned to any number of users
- Manage several accounts under the same e-finance number (multi-client capability)

E-finance is available in two versions

- E-finance HTML gives you access from any location equipped with internet connection ;
- E-finance Java™ is installed directly on the computer

E-Finance Security

There are two types of security measures in e-Finance: secure access to products and services and data transfer security. All payment data are encrypted with at least 128-bit encryption and transmitted with a security certificate (SSL).

For access security, PostFinance uses a multi-level security system. The personal security elements are automatically sent to the client's address. These include an E-Finance number, the operator's username, password and a PostFinance Card ID and card reader. The E-Finance number identifies each customer and is unique. It is composed of 9 digits and is generated by the system during registration. The password is the personal identification and is composed of at least 4 characters.

For login, you have to enter a security code number in addition to your personal e-finance number and password.

The PostFinance Card generates a new code number for each login. For this purpose, a card reader is required, which is sent to the e-finance customer.

Identification PostFinance (ID)

In order to login to E-finance HTML version, the client needs to have the followings:

- A card reader and
- A card of PostFinance with ID function.

Logon to their webpage (Figure 11) using your E-Finance number and password and follow the instructions:

PostFinance **SWISS POST** Surpassing support. | de | fr | it | en | Home | Swiss Post | Contact | Sitemap | Private customers | Business customers | About us

Product | Customer Service | **E-finance** | E-trading

Demo version

E-finance login

Please enter your security data

E-finance Number

Password

→ [Forgotten your password ?](#)

As a customer with a user identification please enter your identification too

User identification

Customer Service

- [E-finance help](#)
- [Frequently asked questions](#)
- [about login](#)
- [Guided Tour](#)

Security tips

→ [Security on the Internet](#)

Become an online customer

E-finance

We offer you the most attractive conditions here. Handle your financial transactions securely online.

→ [Information on e-finance](#)

→ [Test the e-finance demo](#)

Legal disclaimer | Prices / Conditions / GTC | Publishing details | Copyright © 2007 by PostFinance. All rights reserved.

Figure 11 : *PostFinance login procedure*

Enter the code from the card reader in the code input field and click on Login. After logging in, the user will be directed to the overview of assets page.

4.3.2 E-Trading

E-trading is the electronic trading of financial products such as securities, stock exchanges or foreign currencies. It is a trading platform for anyone who trades in securities independently. With e-trading you can buy and sell shares in just a few mouse clicks. PostFinance's E-trading offers the following services:

1. Securities custody account with 3 accounts in CHF, USD and EUR ;
2. Buy and sell shares, bonds and derivatives ;
3. Access to the SWX Swiss Exchange and virt-x and the NASDAQ, NYSE and XETRA stock exchanges ;
4. Free chart analysis tool;
5. Stock and custody account management on the Internet;
6. Access to financial and business news;

7. Various options for comparing indices, stocks and currencies in graphic form

The E-trading service is only provided to private customers.

The Banque Cantonale de Vaud (BCV) [www.bcv.ch] manages all PostFinance e-trading custody accounts and accounts in its capacity as custodian bank and securities trader.

How does e-trading work?

Securities trading via the PostFinance online portal is supported by a number of additional functions. The choice of securities, the right time to buy or sell and the right mix of stocks in your portfolio cannot be handled automatically with e-trading, however.

Anyone wishing to use PostFinance’s e-trading service has to first complete a security procedure which comprises three elements: an e-trading user number, an individual password and an access card. Having logged on, you arrive at the overview page with the headings Overview of assets, Orders and Markets. The first heading is broken down further into Accounts, Custody account, Asset allocation and Documents. Here the e-trader will find detailed information about his or her financial options.

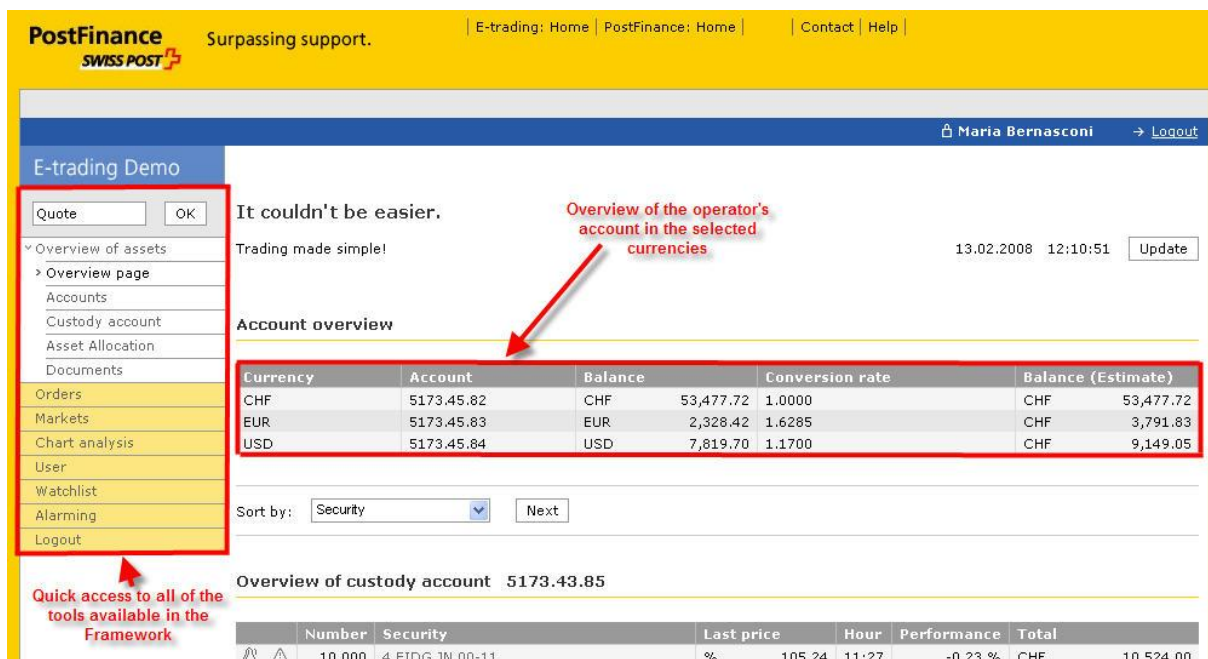


Figure 12 : PostFinance’s E-Finance Homepage

4.3.3 E-Bill

E-Bill improves the bill payment process by allowing users to electronically send and receive bill and payment information using convenient, cost effective, and secure technology.

PostFinance’s E-Bill provides a solution for electronic bill presentment and payment (EBPP) based on the consolidator model, called YellowBill. Its purpose is electronic transmission of bills and it is based on the ISR orange with reference number. In this document, invoices/bills, billing data and data are understood to mean bills and credit slips.

YellowBill provides a platform that enables billers to send their customers CHF and EUR bills electronically without media fragmentation, i.e. eliminating data re-entry.

Bill recipients can either process electronic bills via an e-banking application or import them into their own finance software via the business interface/web services (https portal) or FTP for further processing. YellowBill is therefore to be seen primarily as a transport system for bill data.

There are two participating parties in an E-Bill transaction: YellowBill for billers and YellowBill for bill recipients. The main purpose of YellowBill is fully automated data processing on both sides with the resulting higher data quality thanks to the continuity of the electronic data flow (no media fragmentation). This would mean substantial efficiency improvements with considerable savings potential for both billers and bill recipients.

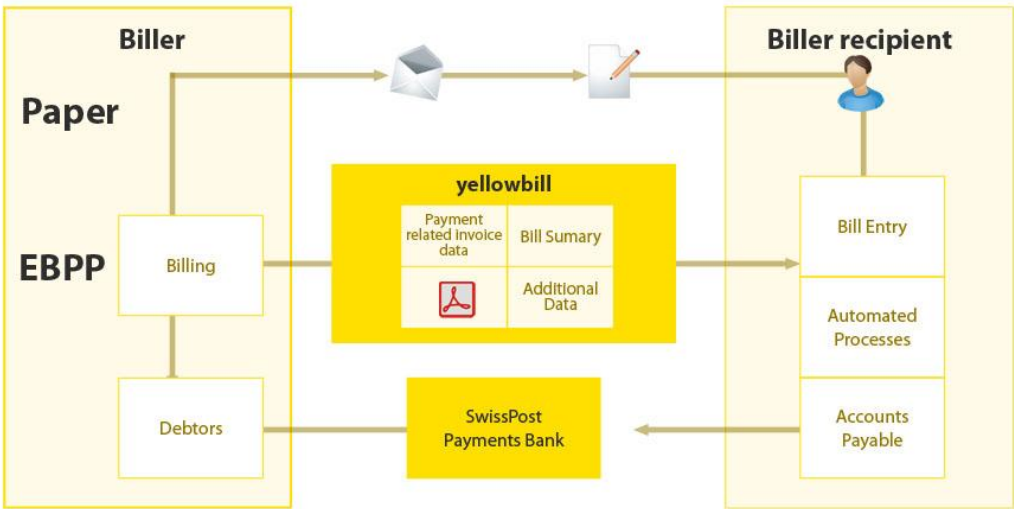


Figure 13 : PostFinance’s YellowBill

YellowBill operational sequence in short

1. For a bill recipient to be able to receive electronic bills via YellowBill, he must first obtain an e-bill account number (electronic postbox for bills). This is either done via a function of the CSP or, if the business interface/web services or FTP is used, yellowworld assigns this number manually.
2. Next, the bill recipient must be registered with the bill issuer, i.e. send his e-bill account number to the bill issuer, similar to effecting an address change. YellowBill provides billers with tools for this, which can be used via the respective CSP or the business interface.
3. Once the biller has stored the e-bill account number in his customer database, he can start sending electronic bills to YellowBill.
4. Presentment of bill details can be done directly on the YellowBill system, by the biller himself or by a biller service provider.
5. The ISR credits are booked according to the process defined by the biller.

4.3.4 YellowBill for billers

YellowBill allows billers to send invoices electronically to private and business customers, without any media discontinuity and without incurring printing and postage costs.

A biller is the provider of a service who issues a bill for this service. Billers create the source data of the bills delivered to YellowBill. These can be delivered either directly or via a BSP.

Service to billers

The service to billers includes the following:

- Customer administration, particularly also the registration of bill recipients in the YellowBill system and the provision of a tool that supports the registration or cancellation of bill recipients with the bill issuer.
- Receipt of the data delivered by the bill issuer and provision of a processing protocol.
- The option of automated data delivery via web services.

- Possibility of automatically downloading registration or cancellation data, processing records and signed invoices via web services.
- Processing of the delivered data as described in this manual and in individual specifications in the application form.
- Forwarding data to network partners.
- Provision of the bill data to the bill recipients as per separate agreement with them.
- Digital signature of the bill data according to legal regulations, EIDI-V in particular, and delivery of these data to the bill issuer and bill recipient, if the bill issuer has authorized Swiss Post or an affiliated network partner accordingly.

4.3.5 YellowBill for bill recipients

YellowBill allows bill recipients to receive and pay bills in e-finance and to choose the execution date.

Bill recipients receive services from billers and are billed for this. They can either collect bills via a CSP, business interface/web services or FTP at YellowBill.

Service to bill recipients

The service to bill recipients via business interface includes the following:

- A function enabling bill recipients to register or cancel their registrations with billers.
- The provision of digitally signed bills and unsigned bill data which can be transferred to the bill recipient's finance software for further processing.
- The option of automated data delivery via web services.
- The provision of a tool for the legally required signature checks and viewing the digitally signed data.

In order to receive bills from billers, the bill recipient must:

- Register with the billers of their choice directly in e-finance
- Call up the electronic bill directly in e-finance
- Decide when and via which account they wish to pay the bill

- Accept or change the execution date
- Pay the bill with three mouse clicks
- If required: save or print out the slip with all the details

4.3.6 Roles

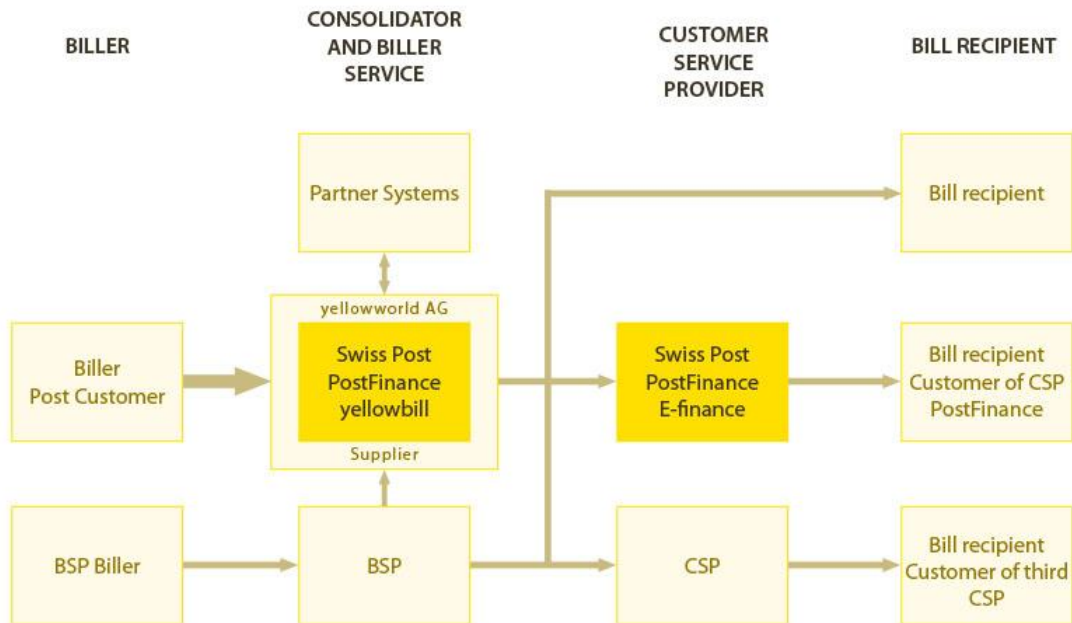


Figure 14 : Overview of role allocation in YellowBill

Figure 14 describes roles allocation of various participants in a transaction through YellowBill. The following sections describe each of the participants.

Yellowworld AG

Yellowworld AG is a Swiss Post subsidiary that operates YellowBill on behalf of PostFinance. It is responsible for the operation of the Swiss Post BSP functions, the YellowBill consolidator, including its interface to the YellowBill partners, and the business interface. Yellowworld is also responsible for providing support to billers, bill recipients using signed data and partners on behalf of PostFinance.

Biller

A biller is the provider of a service who issues a bill for this service. Billers create the source data of the bills delivered to YellowBill. These can be delivered either directly or via a BSP.

Biller Service Provider (BSP)

A BSP is a contract partner for billers who use YellowBill via BSP. BSPs offer their own billing or EBPP services and can send electronic bill data to YellowBill. BSPs are responsible for product management, marketing, consulting and sales of their EBPP services as well as system operation and 1st level support for BSP billers.

Alternatively, BSPs can also act as data providers on behalf of billers who have a contract with PostFinance.

Customer Service Provider (CSP)

A CSP is a contract partner for bill recipients who use YellowBill via CSP. CSPs are also responsible for product management, marketing, consulting and sales of their EBPP services as well as system operation and 1st level support for CSP customers. CSPs are usually operators of e-banking applications.

Bill recipient

Bill recipients receive services from billers and are billed for this. They can either collect bills via a CSP, business interface/web services or FTP at YellowBill.

Partner systems

PostFinance works together with partners that offer equivalent EBPP services. The latter forward billing data of their customers, destined for recipients at YellowBill, to PostFinance. On the other hand, the recipient identification shows PostFinance with which partner the recipient is registered and forwards the billing data to the corresponding partner system.

4.3.7 Western Union

Western Union service allows private customers to transfer money within minutes to over 200 countries and regions. The money can be collected within minutes from one of 250,000 Western Union agencies worldwide. The amount and the transaction fees are debited directly from the account of the sender. Out payment is done as follow:

- The beneficiary is notified by the sender
- The cash is ready for collection at the destination within minutes
- The beneficiary receives the money against presentation of ID without having to pay a fee
- In emergencies, the money can also be paid to persons without ID

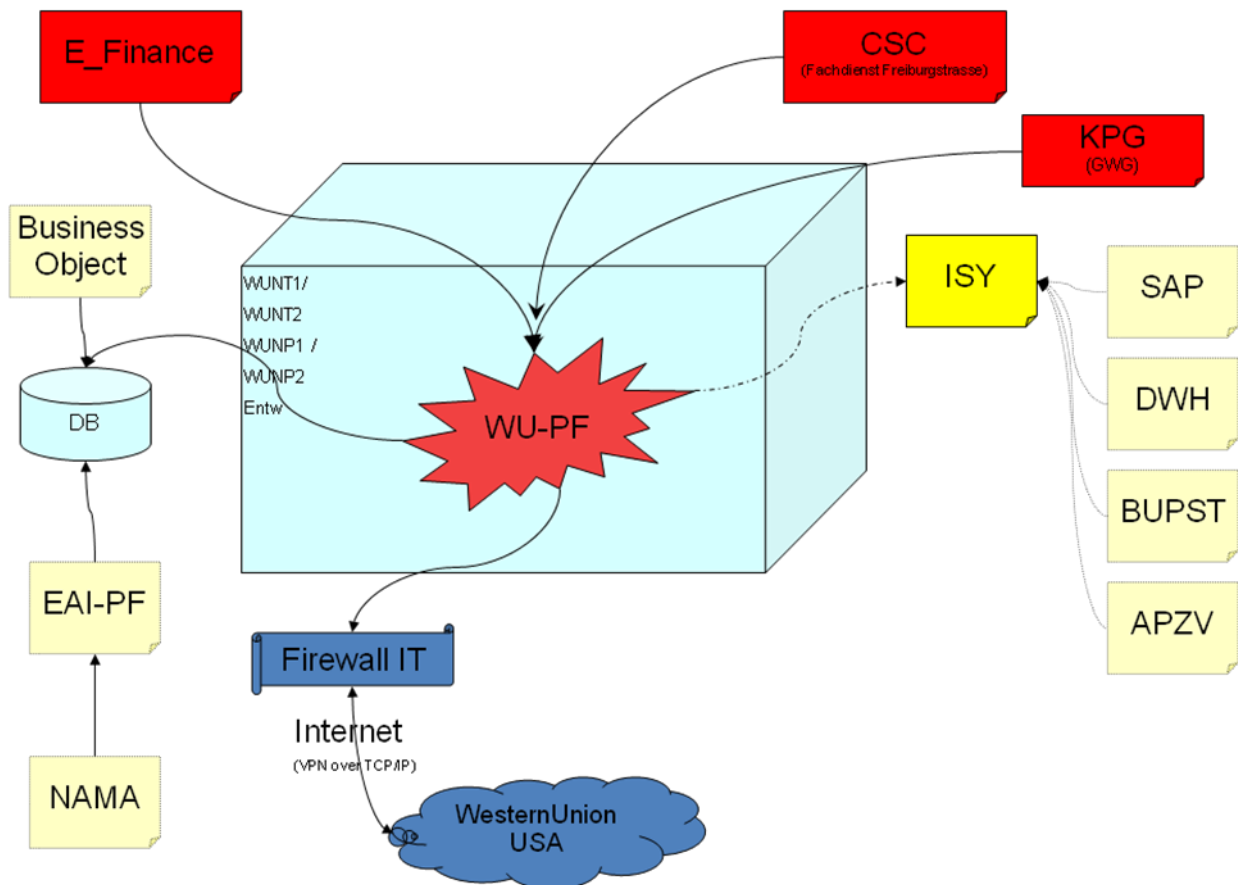


Figure 15 : Description of the Western Union Service

The Western Union PostFinance (WU-PF) is a module designed by the PostFinance team which links to the main Western Union servers in the USA. The connection uses a firewall and a Virtual Private Network (VPN) to secure the transfer of data.

A Firewall is a system designed to prevent unauthorized access to or from a private network.

A virtual private network (VPN) is a communications network tunneled through another network, and dedicated for a specific network. It is used to establish secure communications between networks (e.g. the public Internet) with strong security features; using explicit security features, such as authentication or content encryption.

When an E-Finance customer transfers money through Western Union using E-Finance's interface, the WU-PF receives the data and forwards them to a Western Union server. The server then returns a confirmation to Wu-PF which in turns forwards it to the client's E-Finance account.

WU-PF also interacts with other services in order to archive and to verify transactions and provide online help to customers [Figure 15].

4.3.8 E-Payment

Payment is at the heart of any commerce platform. E-payment is the electronic payment for goods/services on the Internet. It streamlines the process of collecting, presenting and paying repetitive charges. To support a wide variety of payment methods, more than just a software component is needed. An involvement of financial institution, third party brokers, credit card vendors, issuing banks and online payment service providers is needed. The PostFinance YellowBill and yellownet serve in this capacity as online payment service providers.

Merchants with external payment service providers can have the PostFinance Debit Direct, PostFinance yellownet and PostFinance YellowBill payment methods activated if their payment service provider offers this service. All merchants who have one of the above payment methods activated via an external payment service provider are designated as e-payment merchants.

How e-payment works?

- The customer places an order in the online shop and selects a payment method
- The PostFinance server automatically creates an encrypted connection with the customer
- The customer enters his/her ID elements in the payment interface from his/her PC or mobile phone
- The data are transmitted to PostFinance in encrypted form
- The bill amount is debited from the customer's postal account and credited to the merchant's account

Requirements

- For e-payment the merchant needs an interface to the e-payment system, which is integrated via a payment service provider (PostFinance as a Payment Service Provider)
- One or more payment methods may be selected (depends on the payment service provider's offering):
- An agreement with the corresponding payment service provider and a credit account are required for each payment method, in addition to the acquirer agreement.

4.3.9 Yellowpay

The yellowpay service allows merchants whose main sales territory is Switzerland to accept cashless payments in the web shop (online shop) and can be used as an “electronic cash register”. It comprises the most common payment methods in Switzerland and is also an ideal and cost-effective entry solution for merchants with low turnover. PostFinance Debit Direct and PostFinance yellownet payments are subject to transaction-related fees only. Flat fees are not incurred unless credit cards are used.

Thanks to credit cards and foreign currencies – euro and US dollar (depending on the credit card acquirer) – yellowpay is also suitable for sales abroad. However, no country-specific payment methods will be offered (e.g. ec-direct debits in Germany) unless they reach a certain level in the Swiss market. The merchant can evaluate the entire shop turnover and manage payments in the web-based back office for payment data administration. The merchant does not know the identification elements that the shopper enters in the yellowpay payment interface.

Yellowpay is a standard product and limited to settling payments in the online shop. It is very easy to integrate yellowpay into a shop. The parameters are passed to a PostFinance URL, thus eliminating the need to install software in the web shop. The merchant can activate additional payment methods without any additional outlay via a payment interface which he launches only once. Yellowpay meets the security requirements of the payment providers (e.g. MasterCard Secure Code/Verified by Visa).

4.3.10 Online shop operators

Online shop refers to marketing of a company's products through the web. It may be done either to promote the company and its products and services or to actually sell the products/services through this virtual store. One of the best examples of an e-store is Amazon.com, which started selling books online and gradually extended to other product categories.

With a PostFinance account, customers of online shop operators can pay for their purchases directly from their computer or mobile phone. Payments methods include PostFinance Debit Direct, PostFinance e-finance or e-bill. The amount paid is debited from the customer's postal account and credited to the merchant's account.

<i>Methods</i>	<i>Features</i>	<i>Requirements</i>
PostFinance Debit Direct	<p>With this payment method you can exploit the entire PostFinance customer portal of 3 million customers with PostFinance Card.</p> <ul style="list-style-type: none"> • Currency: CHF • 30 days right of objection for the customer • Amount reservation 2 days • For payment guarantee delivery of payment data by merchant within 24 hours <p>Possible cards</p> <ul style="list-style-type: none"> • PostFinance Card Direct • PostFinance Card Direct Ticket 	<ul style="list-style-type: none"> • PostFinance Card • PostFinance Card Ticket • Account number • Card number

PostFinance e-finance	<ul style="list-style-type: none"> • 800,000 potential customers • PostFinance guarantees the amount • Immediate credit possible 	<ul style="list-style-type: none"> • E-finance agreement • E-finance security elements
Micropayment	<ul style="list-style-type: none"> • For amounts up to CHF 10 with PostFinance Debit Direct and PostFinance e-finance • Automatic calculation of merchant micropayment transaction fees 	<ul style="list-style-type: none"> • PostFinance Card • PostFinance Card Ticket • Card number • Account number <p>or</p> <ul style="list-style-type: none"> • E-finance agreement • E-finance security elements
PostFinance E-bill	<ul style="list-style-type: none"> • Paperless invoicing • Save on printing and post-age costs 	<ul style="list-style-type: none"> • User name for e-bill • E-bill password

Table 6: *E-payment payment methods*

4.3.11 Online shopping

With a private account from PostFinance, customers can pay conveniently, securely and free of charge in numerous online shops. The amount is debited directly from their account.

The customer must have either a PostFinance account or a credit card (e.g. MasterCard, visa, etc.). The online shop owner must have a PostFinance account and must have registered with PostFinance's online payment service.

A customer who wishes to pay using PostFinance E-Payment service must first add the products desired to the shopping cart. Shopping carts allow a buyer to choose goods and services from a catalog offering and put them into a virtual basket that ultimately gets checked out after the buyer chooses an appropriate payment method. After checking, the customer will be directed to PostFinance's payment page where the payment order can be executed.

4.4 Security standards

Security at PostFinance is used to prevent unauthorized access to the different services provided. All PostFinance's services are grouped into four security zones:

Access Zone

The Access Zone is the least secured zone. It houses applications that are less sensitive. It is the gateway to accessing the internet and external applications interacting with PostFinance first have to cross this zone. It is protected by a Firewall.

Application Zone

The Application Zone is the next to the Access Zone. This zone houses test servers and applications. It is protected by a Secure Sockets Layer (SSL).

SSL is a commonly-used protocol for managing the security of a message transmission on the Internet. It uses a program layer located between the Internet's Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers. SSL uses the public-and-private key encryption system from RSA (an Internet encryption and authentication system that uses an algorithm developed in 1977 by Ron Rivest, Adi Shamir, and Leonard Adleman.), which also includes the use of a digital certificate.

Secure Zone

The Secure Zone is the most secured zone in the PostFinance Application. It contains the most sensitive services and applications. The databases are found in this zone.

PostNetz Zone

The PostNetz Zone also hosts the databases and uses a SSL for security.

4.5 Next

In this chapter, we looked at PostFinance and its different online services called E-services. We focused particularly on the E-payment service and both E-commerce applications and online shoppers can use it to make transactions. We also introduced you to the other services provided by PostFinance.

In the next chapter, we focus on a specific E-commerce application and describe its functionalities.

5

PostFinance Technologies

5.1 E-finance Technologies

The E-Finance service makes use of a wide range of technologies. These technologies can be categorized by storage applications, static and dynamic web application tools.

PL/SQL

Procedural Language/Structured Query Language (PL/SQL) was developed by Oracle Corporation and was designed specifically to enhance the capabilities of SQL. It is a combination of SQL along with the procedural features of programming languages. It provides specific syntax for this purpose and supports exactly the same datatypes as SQL. It supports arrays, conditions, exceptions, loops and variables. The major datatypes in PL/SQL include NUMBER, INTEGER, CHAR, VARCHAR2, DATE, TIMESTAMP, TEXT etc.

Each PL/SQL program consists of SQL and PL/SQL statements which form a PL/SQL block.

A PL/SQL Block consists of three sections:

- The Declaration section (optional).
- The Execution section (mandatory).
- The Exception (or Error) Handling section (optional).

```
1 DECLARE
2     Variable declaration
3 BEGIN
4     Program Execution
5 EXCEPTION
6     Exception handling
7 END;
```

Code 1: Example of a PL/SQL block

Declaration Section:

The Declaration section of a PL/SQL Block starts with the reserved keyword DECLARE. This section is optional and is used to declare any placeholders like variables, constants, records and cursors, which are used to manipulate data in the execution section.

Execution Section:

The Execution section of a PL/SQL Block starts with the reserved keyword BEGIN and ends with END. This section is mandatory and is where the program logic is written to perform any task. The programmatic constructs like loops, conditional statement and SQL statements form the part of execution section.

Exception Section:

The Exception section starts with the reserved keyword EXCEPTION. This section is optional. Any errors in the program can be handled in this section, so that the PL/SQL Blocks terminates gracefully. If the PL/SQL Block contains exceptions that cannot be handled, the Block terminates abruptly with errors.

```
1  DECLARE
2      Var_emp employee.Salary%TYPE;
3  BEGIN
4      CREATE TABLE employee (
5          Id INT(5) NOT NULL,
6          Name CHAR(100) NOT NULL,
7          Salary INT(100) NOT NULL;
8      )
9      INSERT INTO employee VALUES (6, 'Muaz Cisse', 10000);
10     UPDATE employee SET Salary = Salary + 5000 WHERE Id = 6;
11     SELECT Salary INTO Var_emp FROM employee WHERE Id = 6;
12     DELETE FROM employee WHERE ID = 6;
13     COMMIT;
14     END;
```

Code 2: *Exemple PL/SQL code*

Java

Java is an object-oriented programming language with a built-in application programming interface (API) that can handle graphics and user interfaces and that can be used to create applications or applets. Because of its rich set of API's and its platform independence, Java can also be thought of as a platform in itself. Java also has standard libraries for doing mathematics. Java files must have a java file extension.

Applications are programs that perform the same functions as those written in other programming languages and applets are programs that can be embedded in a Web page and accessed over the Internet. When a program is compiled, a byte code is produced that can be read and executed by any platform that can run Java.

In java, every object has to be in a class. The keyword “class” is used to create a class. A class groups objects with similar properties.

```
1 public class HelloWorld {
2     /**
3      * @param args
4      */
5     public static void main(String[] args) {
6         System.out.println("Hello world!");
7     }
8 }
```

Code 3: Java Code source for the class "Hello World"

Java-Script

JavaScript is a client side scripting language that was designed to add interactivity to HTML pages. It is usually embedded directly into HTML pages. JavaScript files must have a js file extension.

```
1 <html>
2 <body>
3 <script type="text/javascript">
4     document.write("Hello World!");
5 </script>
6 </body>
7 </html>
```

Code 4: JavaScript Code source for "Hello World"

C Programming Language

C programming language is a simple text file containing program statements called the source program. It is used to write applications ranging from operating systems to database systems. C files must have a c file extension.

Once the program is written, it must be compiled. The source program is compiled by a special program called a compiler, whose task is to convert the statements in the source code

to either an intermediate format (called an object file), or an executable format which can be run on the computer.

```
1  #include <stdio.h>
2  main()
3  {
4      printf("Hello World\n");
5  }
```

Code 5: C Code source for "Hello World"

HTML

A Hyper Text Markup Language (HTML) is a computer language devised to allow website creation. An HTML file is a text file containing small markup tags which tell the Web browser how to display the page. It is used to create hyper text documents and is a standard of W3C, the organization charged with designing and maintaining the language. An HTML file must have an htm or html file extension

```
1  <html>
2  <head>
3  <title>Title of page</title>
4  </head>
5  <body>
6  Hello World
7  </body>
8  </html>
```

Code 6: HTML Code source for "Hello World"

XML

EXtensible Markup Language (XML) is a markup language for documents containing structured information. Structured information dictates the flow of information in a given document.

XML helps identify structures in a document by means of a tag naming system.

```

1    <?xml version="1.0" encoding="utf-8"?>
2    <?xml-stylesheet type="text/xsl" href="simple.xsl"?>
3    <Messages>
4    <email>
5    <to>Muaz</to>
6    <from>Jean</from>
7    <heading>Reminder</heading>
8    <body>Don't forget me this weekend!</body>
9    </email>
10   </messages>

```

Code 7: Example XML markup document

XML is defined by a number of related specifications:

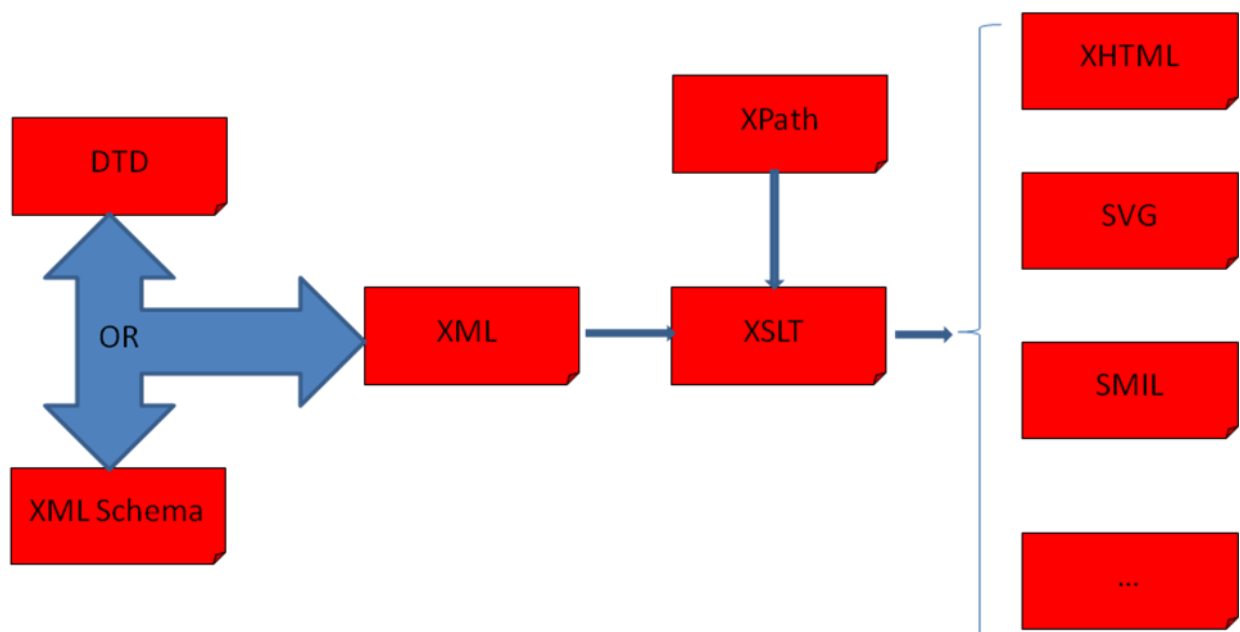


Figure 16 : XML and related technologies

DTD

The purpose of a DTD (Document Type Definition) is to define the legal building blocks of an XML document. It defines the document structure with a list of legal elements and attributes. It helps render the XML document valid in accordance with a specific set of rules.

```

1    <!ELEMENT messages (email)*>
2    <!ELEMENT email (to,from,heading,body*)>
3    <!ELEMENT to (#PCDATA)>
4    <!ELEMENT from (#PCDATA)>
5    <!ELEMENT heading (#PCDATA)>
6    <!ELEMENT body (#PCDATA)>

```

Code 8: DTD specification

XML Schema

XML Schema is an XML-based alternative to DTDs. XML Schema describes the structure of an XML document. XML Schemas are more powerful than DTDs in that they are flexible in manipulating XML documents.

```
1    <?xml version="1.0"?>
2    <xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
3    elementFormDefault="qualified">
4    <xsd:element name="messages">
5    <xsd:complexType>
6    <xsd:sequence>
7    <xsd:element name="email" type="xsd:string" minOccurs="0"
8    maxOccurs="unbounded">
9    <xsd:complexType>
10   <xsd:sequence>
11   <xsd:element name="to" type="xsd:string"/>
12   <xsd:element name="from" type="xsd:string"/>
13   <xsd:element name="heading" type="xsd:string"/>
14   <xsd:element name="body" type="xsd:string"/>
15   </xsd:sequence>
16 </xsd:complexType>
17 </xsd:element>
18 </xsd:sequence>
19 </xsd:complexType>
20 </xsd:element>
21 </xsd:schema>
```

Code 9: XML Schema specification

XSLT

EXtensible Stylesheet Language Transformations (XSLT) is an XML-based style sheet language developed by The World Wide Web Consortium (W3C). It is used to format the output of XML documents. The output document can be an XHTML document, a SVG document, a SMIL document, a simple text document and etc.

```
1 <?xml version="1.0" encoding="ISO-8859-1"?>
2 <xsl:stylesheet                                version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
3 <xsl:template match="messages">
4 <xsl:element name="html">
5 <xsl:element name="head">
6 <xsl:element name="title"></xsl:element>
7 </xsl:element>
8 <xsl:element name="body">
9   <xsl:element name="h2">Messages</xsl:element>
10  <xsl:element name="table">
11    <xsl:attribute name="border">2</xsl:attribute>
12  </xsl:element>
13    <xsl:element name="tr">
14      <th align="left">To</th>
15      <th align="left">From</th>
16      <th align="left">Heading</th>
17      <th align="left">Body</th>
18    </xsl:element>
19    <xsl:for-each select="//email">
20      <xsl:element name="tr">
21        <td><xsl:value-of select="to"/></td>
22        <td><xsl:value-of select="from"/></td>
23        <td><xsl:value-of select="heading"/></td>
24        <td><xsl:value-of select="body"/></td>
25      </xsl:element>
26    </xsl:for-each>
27  </xsl:element>
28 </xsl:element>
29 </xsl:element>
30 </xsl:template>
31 </xsl:stylesheet>
```

Code 10: XSLT Stylesheet example

XPath

XPath is a language for finding information in an XML document. XPath is used to navigate through elements and attributes in an XML document. It is used by a XSLT document to find nodes in a document structure. It is based on the tree search algorithm.

XQuery and XPointer are both built on XPath expressions.

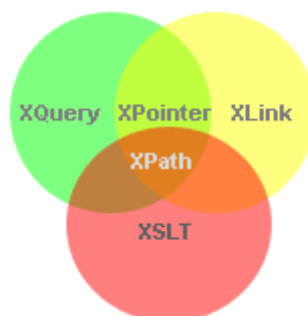


Figure 17 : *XPath in XML technologies [W3Schools, 2008]*

5.1.1 E-finance yellownet products

Oracle 10g Database

Oracle 10g Database is a product of Oracle Corporation which provides features to easily manage the most demanding transaction processing, business intelligence, and content management applications. Other features include data warehousing, online analytic processing, and data mining. These features can be used web development purpose as well as the development of other offline applications.

Oracle 9iAS (Applications server)

Oracle 9iAS makes it easy to consolidate multiple Web sites, applications, and portlets into portals. It offers a declarative environment for building, deploying, and maintaining enterprise portals.

ClearCase

ClearCase is a product of IBM and it is a Software Configuration Management (SCM) system. It offers solutions that provide version control, workspace management, parallel development support and supports integration with other design, development, build, test and deployment tools.

Eclipse

Eclipse is a comprehensive framework that deploys many advanced and modern software design and implementation techniques. It is an integrated development environment which provides features for coding, debugging, refactoring, unit testing, and etc. Eclipse also has code completion, code templates, and integrated support for refactoring, Ant, CVS, and JUnit.

6

YellowBill Invoice

6.1.1 Introduction

PostFinance's YellowBill provides a web services which enable clients to upload or download files which contain payment details. You can implement your client in any programming language you wish as long as the XML requests correspond to the SOAP specifications with the WS-Security extension. This document describes the client implementation of the YellowBill web services in PHP in an application called YellowBill Invoice. YellowBill Invoice was developed by the author of the document at the request of PostFinance's software team.

6.1.2 Preparation for implementation in PHP

If the client application has to be implemented in PHP, you will need a PHP server with PHP version 5 or higher installed. The XML module must be also be activated. For this application, you do not require a MYSQL installed. You will also need your favorite editor. Now you have all the necessary tools to create this application.

6.1.3 Technical specifications

YellowBill is based primarily on XML and XML related technologies. Billers send XML-Files to the YellowBill-plattform in YellowBill Invoice format with a bill detail in PDF as attachment. One bill is always formed with two files (1 XML and 1 PDF). The PDF-File can be placed in the XML-File.

B2C (Business to consumer)

The XML file can be send to PostFinance to be presented in E-banking application such as E-finance from PostFinance (e-finance.postfinance.ch). The bill receiver can then pay the bill in his E-banking application without typing any reference code or account numbers.

B2B (Business to business)

For companies which must pay VAT must obtain signed data from PostFinance in order to prove the data-integrity. The bill-data are therefore signed by PostFinance after delivery and transmitted to payer companies which want to import the bill-data in their ERP-system.

You can implement the client in any programming language as long as the XML requests correspond to the SOAP specifications with the WS-Security extension. SOAP web services is used to allow bills to be uploaded and downloaded through an automated interface. Web services make it possible to organize automatic incoming and outgoing delivery of bills. For security reasons the web services must be implemented on the basis of WS-Security.

YellowBill Invoice 1.2.3 is an application which allows enterprises to generate XML files as well as invoices in a PDF format, from inputs from a web form. Files must be then submitted to PostFinance with an HTTP-upload (see above). It was designed by the author of the document. YellowBill Invoice 1.2.3 does not assist the web services.

Companies wishing to generate the XML first have to complete a web form with the necessary information pertaining to the bill and payment such as amount, payment date, etc. After submitting the form, two files are generated:

1. An XML file which contains information relative to the bill and which can then be forwarded to PostFinance;
2. An invoice in PDF format.

An explanation of the YellowBill Invoice web service functionalities (features) follows:

1. Fields validation: validates data entered into each field of the form to match its corresponding XML entry;
2. Tooltips: each field has a tooltip which explains it and gives an example;
3. New fields can be added dynamically;


4. The possibility of previewing the invoice before generating the XML file;
5. File can be either downloaded or emailed depending on the user's choice;
6. Interface in several languages;

The XML and PDF generated will be automatically deleted after a specified interval;

6.1.4 YellowBill Invoice Design Architecture

The application is designed to convert information obtained from a web form to XML format. It also generates a PDF invoice from the information.

YELLOWBILL INVOICE 1.2.3

Complete the form to create an XML-Bill 

Delivery Info

Biller ID* <input type="text" value="4110000000002256"/>	Delivery ID <input type="text" value="1234567891"/>
Delivery Date* <input type="text" value="2008-06-23"/>	Transaction ID* <input type="text" value="F1919153"/>

Bill

Document Type* <input type="text" value="BILL"/>	Document ID* <input type="text" value="Bill no. 527-45"/>
Document Sub Type* <input type="text" value="FINAL"/>	Document Date* <input type="text" value="2008-06-23"/>

Sender Party

Customer ID <input type="text" value="Q1002B00895"/>	Company Division <input type="text" value="Muster Elementbau"/>
Company Name* <input type="text" value="Muster Holding AG"/>	Title <input type="text" value="Frau"/>
Family Name <input type="text" value="Muller"/>	Given Name <input type="text" value="Eliane"/>

Address

<input type="text" value="Musterstrasse 57"/>	Family Name Last name of biller's contact person. e.g. Müller	
---	--	--

Figure 18 : YellowBill Invoice

Figure 18 shows the application which accepts users input.

The final output of the application is a zip file containing the XML and PDF files. The zip file can either be downloaded by the user or emailed to an address specified by the user.

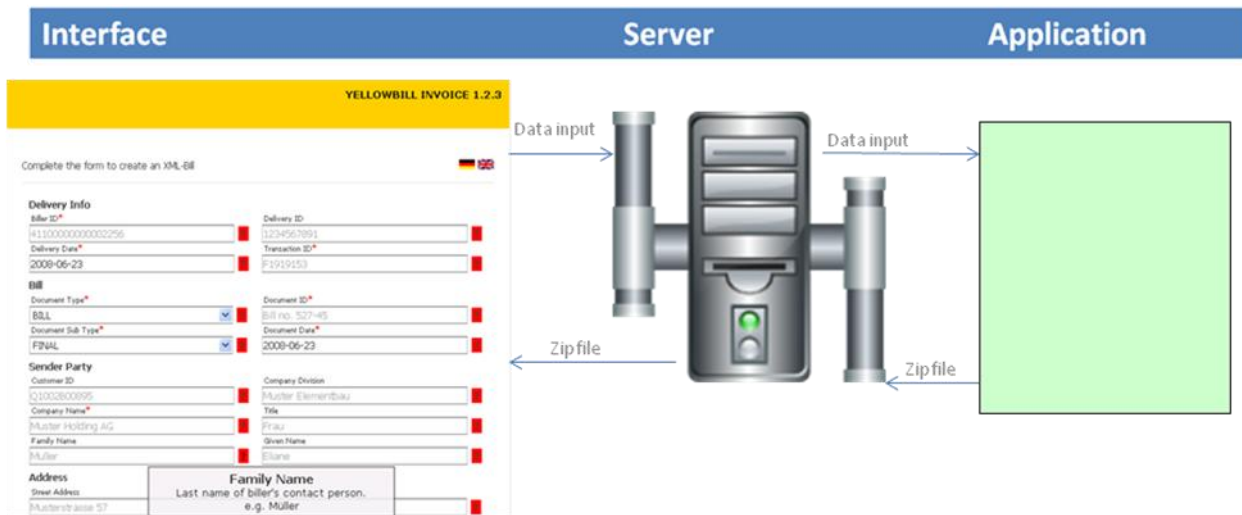


Figure 19 : *YellowBill Invoice*

A user uses the interface to submit data input to the server which is then transmitted to the application. The application processes the data and returns a zip file to the server which is in turn returned to the client. Figure 19 shows the process.

6.1.5 Functions / Classes

The application contains several classes which perform various operations. These include classes which generate the XML file. Another class sends an email to an address specified by the user.

File

This class creates a file and stores it in a given directory. It uses the following functions:

write

This function writes data to a file. The interface is as follows:

```
1 write ($data, $append=false)
```

The function expects the data parameter, which is the data to be written, to be passed. The result is returned as a file with the new data inserted.

getContents

This function gets the content of a file and returns it. The interface is as follows:

```
1 getContents ()
```

The function expects the file parameter to be passed. The result is the data in the file displayed on the screen.

Other functions include:

`getFileName`: Returns the name of the file.

`getTimeLastModified`: Return the time this file was last modified

`getAge`: Return the age of the file

`getSize`: Return the filesize of this file

`getPathInfo`: Return path info

`rename`: Rename the file

`delete`: Remove the file

XmlWriter_revised

This class writes the XML data to the file created using the File class above. It uses the following functions:

```
1 class XmlWriter_revised {
2     public $xml;
3     public $indent;
4     public $stack = array();
5     function XmlWriter_revised($indent = ' ') {
6         $this->indent = $indent;
7         $this->xml = '<?xml version="1.0" encoding="utf-
8"?>'. "\n";
9     }
10
11     function _indent() {
12         for ($i = 0, $j = count($this->stack); $i < $j; $i++)
13         {
14             $this->xml .= $this->indent;
15         }
16     }
17
18     function push($element, $attributes = array()) {
19         $this->_indent();
20         $this->xml .= '<'. $element;
21         foreach ($attributes as $key => $value) {
22             $this->xml .= ' ' . $key . '="' . htmlentities($value) . '"';
23         }
24         $this->xml .= ">\n";
25         $this->stack[] = $element;
26     }
27 }
```

```
25     function element($element, $content, $attributes =
array()) {
26         if ($content == ""){
27
28         } else {
29
30         $this->_indent();
31
32         $this->xml .= '<'.$element;
33         foreach ($attributes as $key => $value) {
34             $this->xml.='
35             '.$key.'="'.htmlentities($value).'"';
36         }
37         $this->xml.
38         = '>'.htmlentities($content).'</'.$element.'>'. "\n";
39     }

40     function emptyelement($element, $attributes = array()) {
41         $this->_indent();
42         $this->xml .= '<'.$element;
43         foreach ($attributes as $key => $value) {
44             $this->xml.
45             = ' '.$key.'="'.htmlentities($value).'"';
46         }
47         $this->xml .= " />\n";
48     }
49     function pop() {
50         $element = array pop($this->stack);
51         $this->_indent();
52         $this->xml .= "</$element>\n";
53     }

53     function getXml() {
54         return $this->xml;
55     }
56 }
57 ?>
```

Code 11: XML generating class

The class contained in Code 11 generates an XML file. The function push is used to create a parent element while the function element creates an element. Finally, the function pop closes the parent element.

domPDF

Dompdf is pdf generating class written by The Digital Junkies [Junkies]. For more information, please visit their website listed in the bibliography.

ZipArchive

This class zips the XML and PDF files generated into a single file. It uses the ZipArchive module developed in PHP.

sendMail

This class sends the zip file created to the user's email address. It first validates the user's email address, then attaches the files and finally sends them to the address. After successfully sending the email, it deletes the message from its memory.

6.1.6 SWOT

<i>Strengths</i>	<i>Weaknesses</i>
<ul style="list-style-type: none"> • Easy to install: the application can be deployed by placing all the files in a directory and changing access right to some folders; • The XML file generated is valid when validated against the XML schema provided: the XML Schema is provided by PostFinance and the XML file generated is valid. • Uses object oriented programming: the code in the application is grouped in classes and functions; • Functions are assigned to modules thus making it easy to extend; • Interface is easy to understand: the website interface has tool tips which help to explain the different fields and it uses standard web presentation interface; 	<ul style="list-style-type: none"> • HTML file is huge: this is due to number of fields in the form and the code to collect the data from the entire form; • The Application is a prototype which can be developed.

<ul style="list-style-type: none">• Most scripts are generated dynamically: most scripts are generated from a single function and any modification will affect generated script. There is only one point of access. This help to eliminated unwanted bugs and makes the modification process easier;• It is an open source. The code source is public and anyone can adapt it to his needs;	
<p><i>Opportunities</i></p> <ul style="list-style-type: none">• The application was requested by PostFinance and thus responds to a specific demand;• PostFinance will refer clients to use the application;	<p><i>Threats</i></p>

7

Conclusion

7.1 Result of the thesis

This thesis contributes to the discussion about the value of modern technologies to companies. The objective of this thesis was to develop an in-depth understanding of E-commerce and E-banking technologies and their intertwined relationship. It analyzes the main criteria for successful internet-bank strategy and brings out benefits of E-banking from the point of view of banks, their clients and the economy in general.

Clearly, E-banking is impressive for achieving fast, cheap and reliable banking services. Participating parties will gain competitive advantage if they embrace and fully integrate the various technologies and techniques of E-banking. These technologies continue to transform the banking sector in fundamental, powerful and fundamental ways.

It started by introducing and studying the various technologies used in this sector. It then presented concrete examples of the implementation of these technologies. The DAVIC specification was used to evaluate different E-commerce technologies. According to it, these technologies are rapidly growing but none has so far met all the requirements set out by the specification.

Finally, it presented an application developed to help automate payment transactions.

7.2 Personal experiences

This field is of great interest to me. Writing this thesis has helped me discover lots of new ideas and the experience of developing a program has enriched my understanding of this field.

I experienced some difficulties in programming certain functionalities like converting HTML data into PDF format. However, finding a solution was more fun because while I was able to solve a problem, I learned at the same time something new.

I also experienced some difficulties in choosing a practical application to develop. The initial idea was to develop a plugin for online shops using open source E-commerce application to easily connect to Yellowpay. That idea was later abandoned after realizing that yellowpay was going to be replaced by another application.

7.3 Future perspective

Through this study, it was clear that the driving force behind the adoption of these technologies is demand. An overwhelming number of SMEs are planning to invest considerable sums in their e-commerce solutions in the next few years and many users are opting for online services.

One of the main advantages of E-banking is that it allows rapidity and full mobility. Using these services requires access to a computer. As demand for more mobile devices increases and as more sophisticated mobile device enter the market, the banking sector will focus more on mobile phone-based services, such as account balance inquires by SMS, and payments via mobile phone (Mobile payments).

PostFinance has already introduced the idea of Mobile banking, which will see a rapid development in the future.

A

CD resources

The CD will contain the code of YellowBill Invoice 1.2.3 developed for PostFinance as well as the following software programs cited in the document:

- Magento E-commerce platform;
- osCommerce E-commerce platform;
- X-Cart E-commerce Platform.

It will also contain an electronic copy of this document.

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