MAKERERE UNIVERSITY BUSINESS SCHOOL

FACULTY OF COMPUTING AND INFORMATICS

DEPARTMENT OF INFORMATION SYSTEMS

E-COMMERCE

BENT III

Topic VIII: E-payments

Introduction

Along with the internet development, pioneer online payment services started to operate in the first half of the 90s. In 1994 Stanford Federal Credit Union was established – the first financial institution which offered online internet banking services to all of its members. However, first online payment systems weren't user-friendly at all and required specialized knowledge of encryption or data transfer protocol. What is more, the systems weren't adapted to constant changing of users' number and their transactions. In the beginning, the main players on the e-payment market were Millicent (founded in 1995), E-Cash orCyber Coin (both in 1996). The majority of the first online services were using micropayment systems and their common attribute was the attempt to implement the electronic cash alternatives (such as e- money, digital cash or tokens). Moreover, in 1994, the Amazon is founded (one of the e-commerce pioneers) and Pizza Hut starts accepting online food ordering. The first online delivery system was one step ahead of all Pizza Hut's competitors. Most of the modern payment systems are easy to use with the payment process minimized to just a few simple steps. They are website or app based, which means there is no need to install a distinct software or buy special equipment, which was the case few years ago. Nowadays systems are available from any device connected to the internet. Every year there are new solutions in e-payments' world that stimulate e-commerce growth. New players make electronic payments both easy to implement and convenient for users who pay online.

Electronic money. This begun around the end of 20th century. The paper tokens and metal coins were replaced by electronic representations of money made possible by progress in computing and networking technology. The disadvantages of Cash money led to the emergence of Electronic money.

What is E Payment?

E payment is a subset of an e-commerce transaction to include electronic payment for buying and selling goods or services offered through the Internet. Generally we think of electronic payments as referring to online transactions on the internet, there are actually many forms of electronic payments.

The term ***'electronic payment'*** is a collective phrase for the many different kinds of electronic payment methods available (also meaning online payment), and the processing of transactions and their application within online merchants and ecommerce websites.

7.0.2 Basic classification of e-payment systems

1. **Pre-paid, pay-now, or pay-later**

– Pre-paid: customer pays before the transaction (e.g., she buys electronic tokens, tickets,)
– Pay-now: the customer's account is checked and debited at the same time when the transaction takes place
– Pay-later (credit-based): customer pays after the transaction

2. **On-line or off-line**

– On-line: a third party (the bank) is involved in the transaction (e.g., it checks solvency of the user, double spending of a coin …) in real-time
– Off-line: the bank is not involved in real-time in the transactions

7.1 Types of E Payment

There are several payment methods (and organization) supporting electronic payments and ecommerce over the internet: That said, it is important to realize that new payment types are continual being discovered and there are additional methods that exist or are being developed continuously.

- Electronic payment cards (credit, debit, charge)
- E-wallets (or e-purses)
- Smart cards
- Electronic cash (several variations)
- Wireless payments
- Stored-value card payments
- Person-to-person payment methods

1. **Electronic Purses**

Electronic wallets being very useful for frequent online shoppers are commercially available for pocket, palm-sized, handheld, and desktop PCs. They offer a secure, convenient, and portable tool for online shopping. They store personal and financial information such as credit cards, passwords, PINs, and much more.

To facilitate the credit-card order process, many companies are introducing electronic wallet services. E-wallets allow you to keep track of your billing and shipping information so that it can be entered with

one click at participating merchants' sites. E-wallets can also store echecks, e-cash and your credit-card information for multiple cards. A popular example of an e-wallet on the market is Microsoft Wallet.

2. **Electronic funds transfer (EFT)**

Introduced in the late 1960s, uses the existing banking structure to support a wide variety of payments. For example, consumers can establish monthly checking account deductions for utility bills, and banks can transfer millions of dollars. Electronic funds transfer is one of the oldest electronic paymentsystems.

EFT is the groundwork of the cash-less and check-less culture where and paper bills, checks, envelopes, stamps are eliminated. EFT is used for transferring money from one bank account directly to another without any paper money changing hands. The most popular application of EFT is that instead of gettinga paycheck and putting it into a bank account, the money is deposited to an account electronically. EFTis considered to be a safe, reliable, and convenient way to conduct business.

The advantages of EFT contain the following: (a) Simplified accounting (b) Improved efficiency (c) Reduced administrative costs and (d) Improved security.

3. **Payment Cards**

Businesspeople often use the term payment card as a general term to describe all types of plastic cards that consumers (and some businesses) use to make purchases. The main categories of payment cards are credit cards, debit cards, and charge cards. Payment card is an Electronic card that contains information that can be used for payment purposes. Payment card describes all types of plastic cards used to make purchases**.**

Credit cards, debit cards and prepaid cards currently represent the most common form of electronic payments. For all 3 types of cards the consumer or the business most often uses a plastic card,commonly with a magnetic stripe. The cardholder gives his or her card or card number to a merchant who swipes the card through a terminal or enters the data to a PC.

The terminal transmits data to his or her bank, the acquirer. The acquirer transmits the data through a card association to the card issuer who makes a decision on the transaction and relays it back to the merchant, who gives goods or services to the cardholder. Funds flow later for settlement with creditcards and are debited immediately for debit or pre-paid cards.

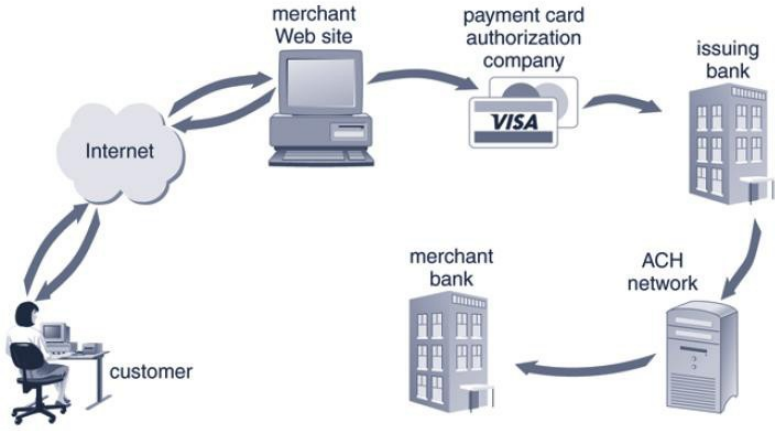
Payment Acceptance and Processing (Steps followed once a merchant receives a consumer’s payment card information)

1. Merchant authenticates payment card
2. Merchant checks with payment card issuer
3. To ensure that credit or funds are available
4. Puts a hold on the credit line or the funds needed to cover the charge

5. Settlement occurs

Merchant Accounts. To process payment cards for Internet transactions an online merchant must set up a merchant account. New merchant must supply (a) Business plan (b) Details about existing bank accounts and (c) Business and personal credit history.

Processing a Payment Card Transaction



I. Credit Card

The customer doesn't need to pay immediately, not even at the end of the monthly period. The bank doesn't count interest until the end of the monthly period. Currently, the main form of payment in business to consumer transactions in e-commerce is by credit card. A credit card, such as a Visa or a MasterCard, has a preset spending limit based on the user's credit limit. Credit card has a spending limit based on a user's credit history. This is the most expensive ePayment mechanism for instance MasterCard charges $0.29 + 2% of transaction value. It is currently the most convenient method. It has very dangerous security implications because a single number gives access to an account. However, the credit card companies have taken this risk to be competitive and numerous protocols have been developed (e.g., SSL) to help secure this medium.

Advantage: allows credit i.e. people can buy more than they can afford. The legal framework that regulates credit card transaction is well understood, provides good consumer protection and facilitates the worldwide use of credit cards

Disadvantages: It doesn't work for small amounts (too expensive) and also doesn't work for large amounts (too expensive)

II. Debit Card

Debit card; Removes an amount from a cardholder's bank account and transfers it to the seller's bank account. The customer must have a bank account associated with the card. The transaction is processed in real time: the customer's account is debited and the merchant's account is credited immediately.

The difference between credit cards and debit cards is that in order to pay with a debit card you need to know your personal identification number (PIN) and need a hardware device that is able to read the information that is stored in the magnetic strip on the back.

Debit cards task similar to checks in that the charges will be taken from the customer's checking account. The benefit for the customer is the easiness of use and convenience. These cards also keep the customer under his or her budget because they do not allow the customer to go beyond his or her resources. The advantage to the merchant is the speed at which the merchant collects these charges.

III. Charge card

The customer doesn't need to pay immediately but only at the end of the monthly period. If she has a bank account, it is debited automatically otherwise; she needs to transfer money directly to the card association. Carries no spending limit. Amount charged is due at the end of the billing period. A charge card, such as one from American Express, carries no preset spending limit. Charge cards are similar to credit cards except they have no revolving credit line, so the balance must be paid off every month. Credit, debit, and charge card methods of payments have been successfully utilized in the pre-Internet period, and they are often used in the e-commerce world as well. Some of the reasons for their popularity in the e-commerce world are their availability (most customers own one of these cards), ease of use, and acceptance.

To use these cards as an online payment system, a well-defined process is followed. To accept payment cards payments, a merchant must have a merchant account with a bank. The buyer will be required to submit their credit-card number, expiration date and shipping and billing information when making a purchase online using a payment card. A customer using his/her browser clicks on a product on the merchant's web site and adds it to an electronic shopping cart. The customer provides the shipping instructions and payment card information. This information is sent securely over the Internet to the merchant's commerce site.

(Step 1). The server software adds the merchant identification to the information transmitted. The merchant then submits this information to the acquiring bank with which the merchant holds an account (Step 2). The merchant bank transmits this information to the customer's bank for authorization. Then, the buyer's account information is verified. This involves the issuing bank from which the buyer obtained the credit card, and the credit-card association (Step 3). Verification is received by the acquiring bank (Step 4) and is passed on to the merchant (Step 5) who then ships the product (Step 6). Payment cannot be issued to the merchant until the product has been shipped. This entire process (not including shipment) takes approximately less than 30 seconds .

IV. Stored-Value Cards;

A stored-value card can be an elaborate smart card or a simple plastic card with a magnetic strip that records the currency balance. A smart card is better suited for Internet payment transactions because it has limited processing capability. Carries no spending limit and amount charged is due at the end of the billing period. A card that has monetary value loaded onto it and that is usually rechargeable. Today, most people carry a number of plastic cards - credit cards, debit cards, charge cards, driver's license, health insurance card, employee or student identification card, and others. One solution that could reduce all those cards to a single plastic card is called a stored-value card.

A stored-value card can be an elaborate smart card with a microchip or a plastic card with a magnetic strip that records the currency balance. The main difference is that a smart card can store larger amounts of information and includes a processor chip on the card. The card readers needed for smart cards are different, too. Common stored-value cards include prepaid phone, copy, subway, and bus cards.

V. Smart Card

An electronic card containing an embedded microchip that enables predefined operations or the addition, deletion, or manipulation of information on the card. A smart card is a plastic card with an embedded microchip containing information about you. A smart card contains private user information such as financial facts, private encryption keys, account information, credit card numbers, health insurance information, etc.

Applications of Smart Cards

- **e-purse or e-wallet**; Smart card application that loads money from a card holder's bank account onto the smart card's chip
- **Transit Fares**; To eliminate the inconvenience of multiple types of tickets used in public transportation, most major transit operators in the United States are implementing smart card fare-ticketing systems
- **E-Identification**; Because they have the capability to store personal information, including pictures, biometric identifiers, digital signatures, and private security keys, smart cards are being used in a variety of identification, access control, and authentication applications
- **Health Care**; Storing vital medical information in case of emergencies. Prevents patients from obtaining multiple prescriptions from different physicians. Verifies a patient's identity and insurance coverage. Speeding up the hospital or emergency room admissions process.
- ***Mondex*** is a smart card that holds and dispenses electronic cash. Mondex requires special equipment such as card reader to process. Containing a microcomputer chip, Mondex cards can accept electronic cash directly from a user's bank account.

Pros and Cons of Payment cards

Advantages

- Worldwide acceptance

– security of checks (no need to carry cash in pocket)

– solvency of the customer can be verified before payment is accepted

Disadvantages

– needs infrastructure to be deployed at merchants e.g., card reader, network connection, etc.

– transaction cost are covered by merchants

- paying with cards is not worth for very low value transactions (below 2$)

4. Intermediaries

A peer-to-peer payment service allows the transfer of digital cash (e-Cash) via e-mail between two people who have accounts at e-Cash-enabled banks. Peer-to peer transactions allow online financial transfers between consumers. One example of peer-to-peer payment service is PayPal .

Transactions through PayPal are immediate, the service is free for individuals sending money to one another and the payee is not required to enter any credit-card information. Businesses pay a small transaction fee. PayPal allows a user to send money to anyone with an e-mail address, regardless of whatbank either person uses, or whether or not the recipient is pre-registered with the service.

People wishing to send money to others can log on to PayPal to open an account and register the amount to be sent. That amount is hilled to the person's credit card, Payment notification is sent to the recipient, and an account is established in the recipient's name. When the person to whom the payment is sent receives the e-mail notification, he or she simply registers with PayPal and has access to an account containing the payment. The funds in this account can he transferred to the recipient's bank account by direct deposit or mailed by check from PayPal. The Paypal system can also be used to enable credit-card payment for auction items in real time. Credit card information is checked before a transaction is initiated. This means that the transaction begins processing immediately after it is initiated, reducing the risk of fraud or overdrawn accounts. The buyer or the seller can initiate the service. If one referssomeone to PayPal the person will receive a small monetary reward.

PayPal instructs to Pay anyone, anywhere via email. It draws funds from user’s bank account, places credit hold on credit card for guarantee. PayPal has 16 million users in America and Accounts are insured up to $100,000. It is based on automated clearinghouse. Withdraw funds anytime, or send to someone else. Weakness: suffers from relatively high levels of fraud

5. Electronic cash

Although credit cards dominate online payments today, electronic cash shows promise for the future. Electronic cash (also called e-cash or digital cash) is a general term that describes any value storage and exchange system created by a private (nongovernmental) entity that does not use paper documents or coins and that can serve as a substitute for government-issued physical currency. Attractive in two arenas; Sale of goods and services of less than $10 and Sale of higher-priced goods and services to thosewithout credit cards.

Similar to regular cash, e-cash enables transactions between customers without the need for banks or other third parties. When used, e-cash is transferred directly and immediately to the participatingmerchants and vending machines. Electronic cash is a secure and convenient alternative to bills and coins. This payment system complements credit, debit, and charge cards and adds additional convenience and control to everyday customer cash transactions. E-cash usually operates on a smart card, which includes an embedded microprocessor chip. The microprocessor chip stores cash value and the security features that make electronic transactions secure. Mondex, a subsidiary of MasterCard (Mondex Canada Association) is a good example of e-cash.

E-cash is transferred directly from the customer's desktop to the merchant's site. Therefore, e-cash transactions usually require no remote authorization or personal identification number (PIN) codes at the point of sale. E-cash can be transferred over a telephone line or over the Web. The microprocessor chip embedded onto the card keeps track of the e-cash transactions. Using e-cash the customer has two options: a stand-alone card containing e-cash or a combination card that incorporates both e-cash and debit.

How a typical e-cash system works

A customer or merchant signs up with one of the participating banks or financial institutions. The customer receives specific software to install on his or her computer. The software allows the customer

to download “electronic coins” to his or her desktop. The software manages the electronic coins. The initial purchase of coins is charged against the customer's bank account or against a credit card. When buying goods or services from a web site that accepts e-cash, the customer simply clicks the “Pay with e-cash” button. The merchant's software generates a payment request, describing the item(s) purchased, price, and the time and date. The customer can then accept or reject this request. When the customer accepts the payment request, the software residing on the customer's desktop subtracts the payment amount from the balance and creates a payment that is sent to the bank or the financial institution of the merchant, and then is deposited to the merchant's account. The attractive feature of the entire process is its turnaround time which is a few seconds. The merchant is notified and in turn ships the goods.

Advantages of Electronic cash

- Transactions are more efficient and less costly than other methods.
- The distance that an electronic transaction must travel does not affect cost.
- The fixed cost of hardware to handle electronic cash is nearly zero.
- Electronic cash does not require that one party have any special authorization

Disadvantages of Electronic cash

- The concept of an Internet tax poses many problems and questions.
- Because true electronic cash is not traceable, money laundering is a problem.
- Electronic cash is susceptible to forgery.
- Electronic cash is, so far, a commercial flop.

6. E-check

A legally valid electronic version or representation of a paper check. An e-check is a new payment instrument combining the security, speed and processing efficiencies of all-electronic transactions with the familiar and well-developed legal infrastructure and business processes associated with paper checks. E-check is the first and only electronic payment mechanism chosen by the United StatesTreasury to make high-value payments over the public Internet.

Automated Clearing House (ACH) Network is a nationwide batch-oriented electronic funds transfer system that provides for the interbank clearing of electronic payments for participating financial institutions. This is the simplest scheme. Each check is numbered to prevent duplication. For each check, you need a key that the bank does not recognize.

E-check is the result of cooperation among several banks, government entities, technology companies, and e-commerce organizations. An e-check uses the same legal and business protocols associated with traditional paper checks. It is a new payment instrument that combines high-security, speed, convenience, and processing efficiencies for online transactions. It shares the speed and processing efficiencies of all-electronic payments. An e-check can be used by large and small organizations, even

where other electronic payment solutions are too risky or not appropriate. The key advantages of e- checks are as follows:

- Secure and quick settlement of financial obligations
- Fast check processing
- Very low transaction cost easily understood by bank customers
- Easy to use and easy to process

Benefits of e-check processing

- Reduces the merchant's administrative costs by providing faster and less paper-intensive collection of funds
- Improves the efficiency of the deposit process for merchants and financial institutions
- Speeds the checkout process for consumers
- Provides consumers with more information about their purchases on their account statements
- Reduces the float period and the number of checks that bounce because of insufficient funds (NSFs)

7. E-Micropayments

Merchants must pay a fee for each credit-card transaction that they process; this can become costly when customers purchase inexpensive items. The cost of some items could actually be lower than the standard transaction fees, causing merchants to incur losses. Micro-payments are used for small payments on the Web. The process is similar to e-wallet technology where the customer transfers some money into the wallet on his or her desktop and then pays for digital products by using this wallet. Using micro- payment one will be able to pay for one article from a professional journal, a chapter from a scientific book, or one song from a CD on the Web.

There are many vendors involved in micro-payment systems. IBM offers micropayment wallets and servers. IBM micro-payment systems allow vendors and merchants to sell content, information, and services over the Web. It provides universal acceptance and offers comprehensive security. This micro-payment system can be used for billing by banks and financial institutions, Internet service providers (ISPs), content providers (offering games, entertainment, archives, etc.), telecommunications, service providers (offering fax, e-mail, or phone services over the Web), and by premium search engines and specialized databases. Internet payments for items costing from a few cents to approximately $10 are called micropayments.

However micropayment schemes are not very successful so far because the people are used to get these kind of things for free and if they have to pay, they prefer the subscription model

8. Mobile Commerce (m-commerce) and Mobile Payments

Mobile commerce or m-commerce is defined as a process of buying and selling of goods or services through wireless technology. Most common representative in this category is of cause mobile phone. Biggest benefit of m-commerce is, that terminal is portable and there is radio coverage in major cities. There is also increasing amount of services available in m-commerce sector for example; Data or Information services, which cover for example automatic or manual delivery of sport news, weather information, stock market updates to a mobile device

Mobile phones are currently used for a limited number of electronic transactions. However, the percentage seems likely to increase as mobile phone manufacturers enable the chip and software in the phone for easier electronic commerce.

Mobile Payment Models (Additive and Transformational)

Mobile payments are payments initiated through a mobile device, could be via SMS, WAP, or a device-specific application.

Additive models are those in which the mobile phone is merely another channel to an existing bank account. A*dditive approaches*, primarily target existing banked customers, and which offer the mobile channel as an additional channel, alongside or as part of others (such as internet) such as mobile banking applications

Transformational models are those in which the financial product linked to the use of the phone is targeted at the unbanked, who are largely low income people. *Transformational approaches*, intentionally reach out to markets beyond the existing banked groups, through a product offering which meets the known needs of the unbanked groups such as MTN momo, airtel Pay and m-pesa. Unbanked people, by far the majority in most developing countries, are in fact a heterogeneous group, including people who may have adequate incomes but from an informal source, as well as poor, rural dwellers.

What Is Cryptocurrency?

Cryptocurrency is decentralized digital money that's based on blockchain technology. You may be familiar with the most popular versions, Bitcoin and Ethereum, but there are more than 9,000 different cryptocurrencies in circulation.

How Does Cryptocurrency Work?

A cryptocurrency is a digital, encrypted, and decentralized medium of exchange. Unlike the U.S. Dollar or the Euro, there is no central authority that manages and maintains the value of a cryptocurrency. Instead, these tasks are broadly distributed among a cryptocurrency's users via the internet.

You can use crypto to buy regular goods and services, although most people invest in cryptocurrencies as they would in other assets, like stocks or precious metals. While cryptocurrency is a novel and exciting asset class, purchasing it can be risky as you must take on a fair amount of research to understand how each system works fully.

Bitcoin was the first cryptocurrency, first outlined in principle by Satoshi Nakamoto in a 2008 paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System." Nakamoto described the project as "an electronic payment system based on cryptographic proof instead of trust."

That cryptographic proof comes in the form of transactions that are verified and recorded on a blockchain.

What Is a Blockchain?

A blockchain is an open, distributed ledger that records transactions in code. In practice, it's a little like a checkbook that's distributed across countless computers around the world. Transactions are recorded in "blocks" that are then linked together on a "chain" of previous cryptocurrency transactions.

"Imagine a book where you write down everything you spend money on each day," says Buchi Okoro, CEO and co-founder of African cryptocurrency exchange Quidax. "Each page is similar to a block, and the entire book, a group of pages, is a blockchain."

With a blockchain, everyone who uses a cryptocurrency has their own copy of this book to create a unified transaction record. Each new transaction as it happens is logged, and every copy of the blockchain is updated simultaneously with the new information, keeping all records identical and accurate.

To prevent fraud, each transaction is checked using a validation technique, such as proof of work or proof of stake.

Question for private study: How can one use cryptocurrency for secure transactions?

What Is Fintech?

Fintech is a portmanteau for "financial technology." It's a catch-all term for technology used to augment, streamline, digitize or disrupt traditional financial services.

Fintech refers to software, algorithms and applications for both desktop and mobile. In some cases, it includes hardware, too—like internet-connected piggy banks. Fintech platforms enable run-of-the-mill tasks like depositing checks, moving money between accounts, paying bills or applying for financial aid. They also facilitate technically intricate concepts, including peer-to-peer lending and crypto exchanges.

Businesses rely upon fintech for payment processing, e-commerce transactions and accounting. In the wake of the Covid-19 pandemic, more and more businesses are turning to fintech to accept contactless payments or adopt other tech-fueled advancements.

What Is Fintech Banking?

Banks use fintech for back-end processes—behind-the-scenes monitoring of account activity, for instance—and consumer-facing solutions, like the app you use to check your account balance. Banks also use fintech to underwrite loans. Individuals use fintech to access many bank services, including paying for

purchases with a smartphone and receiving investing advice on their home computers.

How Does Fintech Work?

Fintech provides people and businesses with access to traditional financial services in innovative ways that previously weren't available. For instance, many conventional banks' mobile apps now offer customers on-the-go access to bank services, including the ability to view your balance, transfer funds or deposit a check. Meanwhile, robo-advisors like Betterment are less costly and more convenient than in-person investment advice from a financial advisor.

Fintech also automates many services businesses use, such as loan underwriting and real estate appraisals. Artificial intelligence combined with massive troves of consumer data helps fintech businesses understand their customers and powers their marketing campaigns, product development and underwriting.

Benefits of fintech

The financial services sector isn't typically synonymous with nimbleness. But today, adaptability and quick iteration (not to mention instant gratification) are precisely what consumers and business owners expect—and, increasingly, need.

Fintech helps expedite processes that once took days, weeks or even months.

Fintech also holds the potential to improve financial inclusion: In some parts of the world, where governmental or institutional support is lacking, fintech fills needs for the unbanked.

Assistance without human interaction; Part of the reason fintech can streamline traditionally clunky processes is because it's based on ones and zeros rather than human skills and opinions. While many fintech platforms include elements of both traditional brokers/advisors and algorithms, others help users navigate financially complex tasks without interacting with a human at all.

Today's consumers can bypass traditional bank branches for things like applying for a loan or even a mortgage. Casual investors no longer need to meet face-to-face with financial experts to painstakingly go over the ins and outs of their portfolios—they can peruse their options online or even enlist the help of chatbots to make decisions.

Automated advisory services through technologies like robo-advisors. These digital platforms provide automated, algorithm-informed investment suggestions and financial planning advice with little-to-no human oversight.

Ultimately, the answer to the question of the benefits of fintech is a case-by-case matter. Outside of tasks like online account monitoring, which has become ingrained into day-to-day banking, the impact of fintech is dictated by how many services one chooses to interact with. (visit the hyperlinks to gain more knowlege)

7.2 Factors essential for e-payment systems

Electronic cash should have two important characteristics in common with real currency: It must be possible to spend electronic cash only once and electronic cash ought to be anonymous

- Independence; some e-payment systems require specialized software or hardware to make payment
- Interoperability and portability
- Security
- Anonymity
- Divisibility
- Ease of use
- Transaction fees
- Regulations

7.3.2 Business Issues and Implications of Electronic Payments

- High Cost of Transaction.
- Need third party Intermediate
- Dependent on the Internet Connectivity
- Dependent on Electricity
- Fraudulent mails
- Hackers involving in transactions
- Depends completely on electricity
- Special Features required in EPS
- Ease of Automated Processing:
- Immediacy of result
- Openness and accessibility
- Loss of collateral information

- Globalization
- New business models

Challenges of E-payments in developing countries

1. Payment habits of customers (Prefer cash payment and lack of trust in online payment)
2. Low E-transaction security
3. Limited E-payment systems
4. Incomplete law system of E-payment (Tax calculation)
5. Lack of technology & expertise
6. Social environment and business practices are not compatible

7.3

Concerns of electronic payments and security include

- The near-anonymous electronic nature of transactions taking place between the networked computer systems of buyers and sellers, and the security issues involved.
- Electronic payment process is complex because of the wide variety of debit and credit alternatives and financial institutions and intermediaries that may be part of the process.
- Varieties of electronic payment systems have evolved. New payment systems are being developed and tested to meet the security and technical challenges of electronic commerce over the Internet.
- The financial system is increasingly dependent on the Internet for communication and data transfer. Hence, attacks on the Internet can affect the financial system All sorts of entities—not just financial institutions—transfer money electronically.

7.4.2 Main security requirements for e-payment

1. Authorization. A payment must always be authorized by the payer and needs payer authentication (physical, PIN, or digital signature). A payment may also need to be authorized by thebank

2. Data confidentiality and authenticity. Transaction data should be authentic and external parties should not have access to data. Some data need to be hidden even from participants of the transaction. The merchant does not need to know customer account information and also the bank doesn't need to know what the customer bought

3. Availability and reliability. Payment infrastructure should always be available; centralized systems should be designed with care and critical components need replication and higher level of protection

4. Atomicity of transactions. All or nothing principle: either the whole transaction is executed successfully or the state of the system doesn't change. in practice, transactions can be interrupted (e.g., due to communication failure) .It must be possible to detect and recover from interruptions (e.g., to undo already executed steps)

5. Privacy (anonymity and untraceability). Customers should be able to control how their personal data is used by the other parties. Sometimes, the best way to ensure that personal data will not be misused is to hide it. Anonymity means that the customer hides her identity from the merchant and untraceability means that not even the bank can keep track of which transactions the customer is engaged in.

When you make an online purchase on the Internet, your credit card information is vulnerable to interception by network sniffers, software that easily recognizes credit card number formats. Several basic security measures are being used to solve this security problem. They include:

- Encrypt (code and scramble) the data passing between the customer and merchant
- Encrypt the data passing between the customer and the company authorizing the credit card transaction
- Take sensitive information offline

7.4.3 Security methods developed for secure ecommerce transaction include;

1. Digital Wallet - you add security software add-on modules to your web browser. This enables your browser to encrypt your credit card data in such a way that only the bank that authorizes credit card transactions for the merchant can see it.
2. Secure Socket Layer (SSL) - automatically encrypts data passing between your web browser and a merchant's server.
3. Secure Electronic Transaction (SET) - software encrypts a digital envelope of digital certificates specifying the payment details for each transaction. SET is expected to become the dominant standard for secure electronic payments on the Internet.
4. Secure Hypertext Transfer Protocol (S-HTTP)- transmits individual messages securely over the web.

1. Secure Electronic Transaction Protocol

Secure Electronic Transaction (SET) is a system for ensuring the security of financial transactions on the Internet and was supported initially by Mastercard, Visa, Microsoft, Netscape, and others. SET provides

secure communications channel among involved parties and has Parties privacy where parties will receive only the information that they are intended to receive. SET made possible the work of information integration, verification of all financing data and coding of sensitive data. It realized the financing payment safety work of attesting cardholders, supplier, payment request, paymentauthorization and records of payment by use of advanced technology like data coding and digital signature.

SET Protocol is designed to provide security for card payments as they travel on the Internet. This system means that your entire credit card number is never travelling across the net- rather pieces of it areand that no human eye sees the entire card number. Contrasted with Secure Socket Layers (SSL) protocol, SET validates consumers and merchants in addition to providing secure transmissions. SET uses public key cryptography and digital certificates for validating both consumers and merchants. Provides privacy, data integrity, user and merchant authentication, and consumer non-repudiation

SET supports electronic commerce security based on Certificate Authority (CA). With SET, a user is given an electronic wallet (***digital certificate***) and a transaction is conducted and verified using a combination of digital certificates and ***digital signatures***

A ***digital certificate*** is an electronic "credit card" that establishes your credentials when doing businessor other transactions on the Web. It is issued by a certification authority (CA). It contains your name, a serial number, expiration dates, a copy of the certificate holder's public key (used for encryptingmessages and digital signatures), and the digital signature of the certificate-issuing authority so that a recipient can verify that the certificate is real.

A ***digital signature*** (not to be confused with a digital certificate) is an electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged. Theyprotect data exchanged online from theft or tampering.

2. SSL Communication

SSL (Secure Sockets Layer), developed by Netscape Communications Corporation, is the standard for web browser and server authentication and secure data exchange on the web. SSL (Secure Socket Layer) cryptographically protects messages traveling over the Internet. It protects against forgery, modification, and eavesdropping (sniffing). A digital certificate verifies the identity of the e-commerce server. The server provides a symmetric key for the duration of the session.

SSL is a communications protocol layer which can be placed between TCP/IP and HTTP. It intercepts web traffic and provides security between browser and server. Encryption is used to guarantee secure communication in an insecure environment. All security operations are transparent at both ends of the communication. SSL uses public-key cryptography

Secure Sockets Layer transmits private documents via the Internet . SSL uses a cryptographic system that uses two keys to encrypt data - a public key known to everyone and a private or secret key known only to the recipient of the message. It operates between the transport and the application layers in the network stack and uses both public and private key cryptography. By convention, URLs that require an SSL connection start with https: instead of http. All the major web server vendors, including Microsoft (Internet Explorer) and Netscape (Netscape Navigator), support SSL.

3. Secure Hypertext Transfer Protocol (S-HTTP)

Another protocol for transmitting data securely over the World Wide Web is Secure HTTP (S-HTTP) . Whereas SSL creates a secure connection between a client and a server , over which any amount of data can be sent securely, SHTTP is designed to transmit individual messages securely. SSL and S-HTTP, therefore, can be seen as complementary rather than competing technologies. Both protocols have been approved by the Internet Engineering Task Force (IETF) as a standard.

Although it may be surprising to some, cash is still the most prevalent consumer payment instrument even after thirty years of continuous developments in electronic payment systems. Cash remains the dominant form of payment for three reasons:

1. Lack of trust in the banking system.
2. Inefficient clearing and settlement of non-cash transactions.
3. Negative real interest rates paid on bank deposits.

Reference

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