

6. E-Payment Systems

6.1 Introduction

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.

As technology is developing, the range of devices and processes to transact electronically continues to increase while the percentage of cash and check transactions continues to decrease.

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Electronic Payment Systems (EPS)

An **e-commerce payment system** facilitates the acceptance of electronic payment for online transactions.

The main objectives of EPS are to increase efficiency, improve security, and enhance customer convenience and ease of use.

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Payments

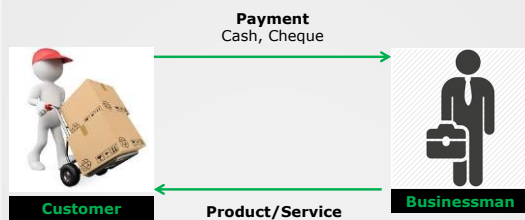


Fig. Traditional Payment System

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Payments

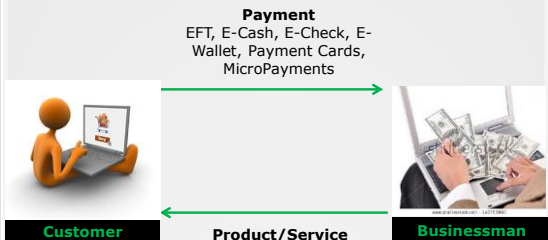


Fig. Electronic Payment System

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Mobile Payment Volume to Increase Tenfold by 2021

Estimated mobile payment transaction volume in the United States



Estimates as of November 2016
Source: Statista Digital Market Outlook

TREND ONE statista

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Electronic funds transfer (EFT):

EFT involves electronic transfer of money by financial institutions.

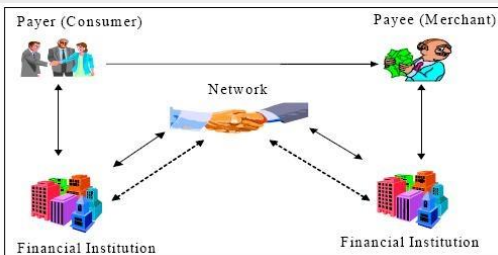
It is the electronic transfer of money from one bank account to another, either within a single financial institution or across multiple institutions, through computer-based systems and without the direct intervention of bank staff.

One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited straight into an employee's bank account.

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Electronic funds transfer (EFT):



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Electronic funds transfer (EFT):

EFT is the groundwork of the cash-less and check-less culture where paper bills, checks, envelopes, stamps are eliminated.

The advantages of EFT contain the following:

- Simplified accounting
- Improved efficiency
- Reduced administrative costs
- Improved security

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Payment cards :

A **payment card** is a device—usually an embossed plastic card—that allows its owner (the cardholder) to make an electronic payment

They contain stored financial value that can be transferred from the customer's computer to the businessman's computer.

Eg - Credit cards, debit cards, charge cards, smart cards are payment cards.



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Credit cards :

They are the most popular method used in EPSs and are used by charging against the customer credit.

Payment using credit card is one of most common mode of electronic payment. Credit card is small plastic card with a unique number attached with an account. It has also a magnetic strip embedded in it which is used to read credit card via card readers. When a customer purchases a product via credit card, credit card issuer bank pays on behalf of the customer and customer has a certain time period after which he/she can pay the credit card bill. It is usually credit card monthly payment cycle.¹⁰

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Credit cards :

There can be two types of credit cards on the market today:

Credit cards issued by credit card companies (e.g., MasterCard, Visa Card) and major banks.

Credit cards issued by department stores and oil companies.

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Credit cards issued by credit card companies (e.g., MasterCard, Visa Card) and major banks.

Credit cards are issued based on the customer's income level, credit history, and total wealth.

The customer uses these cards to buy goods and services or get cash from the participating financial institutions.

The customer is supposed to pay his or her debts during the payment period; otherwise interest will accumulate.

Two limitations of credit cards are their unsuitability for very small or very large payments.

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Credit cards issued by department stores and oil companies.

Businesses extremely benefit from these company cards and they are cheaper to operate.

They are widely issued to and used by a broad range of customers.

Businesses offer incentives to attract customers to open an account and get one of these cards.

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Debit cards:

Debit card, like credit card, is a small plastic card with a unique number mapped with the bank account number. It is required to have a bank account before getting a debit card from the bank. The major difference between a debit card and a credit card is that in case of payment through debit card, the amount gets deducted from the card's bank account immediately and there should be sufficient balance in the bank account for the transaction to get completed; whereas in case of a credit card transaction, there is no such compulsion.

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Debit cards:

For 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.

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Charge Cards

Charge cards are similar to credit cards except they have no revolving credit line, so the balance must be paid off every month.

A credit card is different from a charge card: a charge card requires the balance to be paid in full each month. In contrast, credit cards allow the consumers a continuing balance of debt, subject to interest being charged.

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Smart cards:

They include stored financial value and other important personal and financial information used for online payments.

A smart card is about the size of a credit card, made of a plastic with an embedded microprocessor chip that holds important financial and personal information.

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Smart cards:

The money on the card is saved in an encrypted form and is protected by a password to ensure the security of the smart card solution.

In order to pay via smart card it is necessary to introduce the card into a hardware terminal, which requires a special key from the issuing bank to start a money transfer in either direction.

Smart cards can be disposable or rechargeable.

A popular example of a disposable smart card is the one issued by telephone companies.

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Smart cards:

Smart-card technology can be used to hold information on health care, transportation, identification, retail, loyalty programs and banking, to name a few.

Smart cards are broadly classified into two groups:

Contact: This type of smart card must be inserted into a special card reader to be read and updated.

Contact-less: This type of smart card can be read from a short distance using radio frequency.

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Electronic money (e-money/e-cash):

This is standard money converted into an electronic format to pay for online purchases.

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 participating merchants and vending machines.

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E-Payment Systems

Electronic money (e-money/e-cash):

E-cash usually operates on a smart card, which includes an embedded microprocessor chip that stores cash value and the security features that make electronic transactions secure.

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Electronic money (e-money/e-cash):

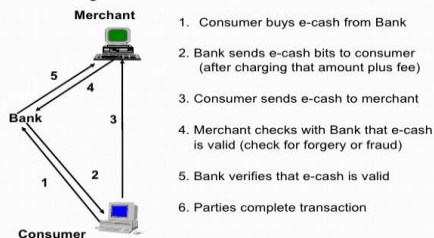
Another form of electronic money is network money, software that allows the transfer of value on computer networks, particularly the internet

E-cash is transferred directly from the customer's desktop to the merchant's site, so e-cash transactions usually require no remote authorization or personal identification number (PIN) codes at the point of sale.

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E-Cash Processing



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E-Payment Systems

Electronic money (e-money/e-cash):

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.

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E-Payment Systems

Electronic money (e-money/e-cash):

When the customer accepts the payment request after any purchase from the merchant, 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.

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Cheque Payment Systems on the Internet Magnetic Ink Character Recognition (MICR)

MICR code is a character-recognition technology used mainly by the banking industry to ease the processing and clearance of cheques and other documents.

In the MICR, data are printed at the bottom of cheques in magnetic ink that typically includes the document-type indicator, bank code, bank account number, cheque number, and a control indicator.

The technology allows MICR readers to scan and read the information directly into a data-collection device. Unlike barcodes and similar technologies, MICR characters can be read easily by humans.

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Cheque Payment Systems on the Internet Electronic Checks

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, here, it replaces the handwritten signatures with digital signature.

It is a new payment instrument that combines high-security, speed, convenience, and processing efficiencies for online transactions.

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PaySimple

800-466-0992

Accept eCheck payments.
Save money on processing costs.

Accept check payments without a paper check

- ▶ Never have to reconcile paper checks with customer accounts again
- ▶ Never worry about carrying paper checks before deposit
- ▶ Enable eCheck processing for recurring billing, electronic invoicing, and online payment forms
- ▶ Send automatic emailed receipts
- ▶ Get real-time updates on the transaction status

Choose a payment method

☐ Credit card ☒ echeck (ACH)

Bank name*:

Bank routing number (ABA):

Bank account number (DDA):

Account type*:

Set as default account: ☐

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Electronic wallets (e-wallets) :

They are similar to smart cards as they include stored financial value for online payments.

Electronic wallets(or Digital 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 can also store personal and financial information such as credit cards, passwords, PINs, e-checks, e-cash and much more. ²⁹



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Electronic wallets (e-wallets) :

Consumers are not required to fill out order forms on each site when they purchase an item because the information has already been stored and is automatically updated and entered into the order fields across merchant sites when using a digital wallet.

Digital Wallets allow shoppers to link credit cards or other alternative payment methods to a virtual wallet. Their information is encrypted or protected by a private software code. ³⁰

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Electronic wallets (e-wallets) :

Some examples are

Google Wallet

Apple's Passbook

Lemon Wallet

etc...

Write notes on these e-Wallets

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Micro-payment systems :

Merchants must pay a fee for each credit-card transaction that they process; this can become costly when customers purchase inexpensive items.

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. ³²

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E-Payment Systems

Micro-payment systems :

IBM offers micro-payment 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.

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Micro-payment systems :

It can be used for billing by banks and financial institutions, 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.

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6. E-Payment Systems

Digital Payment

Payments systems have evolved out of the barter economy, and has empowered buyers and sellers with the development of money as a medium of exchange and now to the digital systems for payment.



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Digital Payment Requirements

Any digital payment system require some criteria to be satisfied.

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Digital Payment Requirements

Criteria	Need for the criteria
Acceptability	Payment infrastructure needs to be widely accepted.
Anonymity	Identity of the customers should be protected
Convertibility	Digital money should be convertible to any type of fund.
Efficiency	Cost per transaction should be near zero.
Integration	Interfaces should be created to support the existing system

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6. E-Payment Systems

Digital Payment Requirements

Criteria	Need for the criteria
Scalability	Infrastructure should not breakdown if new customers and merchants join
Security	Should allow financial transactions over open networks
Reliability	Should avoid single points of failure
Usability	Payment should be as easy as in the real world

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6. E-Payment Systems

Online Payment Categories

Criteria	Need for the criteria
Micropayment	Transaction value less than 5 euros or dollars. Transaction costs are nearly zero
Customer Payments	Transaction value between 5 and 500 euros or dollars. Payments are executed by credit card transaction.
Business Payments	Transaction value more than 500 euros or dollars. Debit cards or invoices are appropriate solutions in this system

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Online Payment Categories

With invent of many digital infrastructure and technology, the online payment systems have advanced to many other efficient, reliable and convenient systems as EFT, Smart Cards, Charge cards, Digital Wallets, e-cash, e-check and so on...

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Digital Token-based E-payment Systems

Charge cards were introduced in the early 1900s, beginning with western union in 1914, but were limited to the local market or in store use.

In 1958, Bank of America introduced credit card. With credit cards, consumer was not tied to one merchant or product, but was now free to make credit purchases at a wide range of outlets.

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6. E-Payment Systems

Digital Token-based E-payment Systems

During mid-1970s, global joint venture eventually developed as visa card, which could be used anywhere in the world.

In 1990s, the electronic payments was broadened; **Debit cards** – Debit cards, a popular “pay now” product, allowed consumers to access funds in a demand deposit account to conduct transaction at the point of sale.

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6. E-Payment Systems

Digital Token-based E-payment Systems

Later, broad experimentation was made to migrate electronic payment functions into consumer devices such as mobile phones, PDAs(Personal Digital Assistants), and other popular electronic products.

Visa described this new range payment choices as “u-commerce” or “universal commerce” – the ability to conduct commerce anywhere, anytime, or any way.

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6. E-Payment Systems

Digital Token-based E-payment Systems

The digital token based payment system is thus a new form of electronic payment system based on electronic tokens rather than e-cheque or e-cash.

The electronic tokens are generated by the bank or some financial institutions. Hence we can say that the electronic tokens are equivalent to the cash which are to be made by the bank.

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6. E-Payment Systems

Digital Token-based E-payment Systems

Benefits to Buyers

Convenience of global acceptance, a wide range of payment options, and enhanced financial management tools.

Enhanced security and reduced liability for stolen or misused cards.

Consumer protection through an established system of dispute resolution.

Convenient and immediate access to funds on deposit via debit cards.

Accessibility to immediate credit.

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6. E-Payment Systems

Digital Token-based E-payment Systems

Benefits to Sellers

Speed and security of the transaction processing chain from verification and authorization to clearing and settlement.

Freedom from more costly labor, materials and accounting services that are required in paper based processing

Better management of cash flow, inventory and financial planning due to swift bank payment.

Incremental purchasing power on the part of the consumer

Cost and risk savings by eliminating the need to run an in-house credit facility.

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6. E-Payment Systems

6.2 Classification of New Payment Systems

New payment systems can be divided into 2 groups; one using **Smart Cards**, and the other using **Internet**.

Traditional payment methods such as cash, cheques, credit cards, EFT, though are convenient and ease in circulation, but have high handling costs.

So the new payment systems supplements the payment instruments with the use of networks and electronics

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6. E-Payment Systems

6.2 Classification of New Payment Systems

The methods used by the new payment systems can be classified as

1. Cash Substitution
2. Cheque Substitution
3. Credit card Substitution
4. Account transfer Substitution system

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6. E-Payment Systems

6.2 Classification of New Payment Systems

Technology	Substitution	Circulation within the banking system	Circulation outside the banking system
Smart Card	Cash	Visa International: Visa Cash Electronic Payment Services: SmartCash	Mondex International: Mondex
	Cash	CyberCash: CyberCoin	Digicash: e-cash
	Cheque	Checkfree: CheckFree Payment Services	

Mondex is an electronic low value payment system introduced by NatWest Bank, Britain

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6. E-Payment Systems

6.2 Classification of New Payment Systems

DigiCash Inc. was an electronic money corporation founded by David Chaum in 1990. DigiCash transactions were unique in that they were anonymous due to a number of cryptographic protocols developed by its founder. *DigiCash declared bankruptcy in 1998, and subsequently sold its assets to eCash Technologies, another digital currency company, which was acquired by InfoSpace on Feb. 19, 2002.*

Ref : <https://en.wikipedia.org/wiki/DigiCash>



Mondex is a smart card electronic cash system, implemented as a Stored-value card. Conceived by Tim Jones and Graham Higgins of the National Westminster Bank (now part of the RBS Group) in the United Kingdom.

Ref : <https://en.wikipedia.org/wiki/Mondex>



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6. E-Payment Systems

6.2 Classification of New Payment Systems

Technology	Substitution	Circulation within the banking system	Circulation outside the banking system
Internet	Credit Card	Cybercash: Credit Card Service First Virtual Holdings: Internet Payment System	
	EFT	Intuit: Quicken Microsoft: Money Mech Software: Managing Your Money Cardinal Bancshares: Security First Network Bank	

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6. E-Payment Systems

6.3 Risk factor in E-payment System

Operational Risk

E-Payment systems may not be easily operational as due to limit on

- the time over which a given electronic money is valid,
- the amount that can be stored on and transferred by e-money, and
- the number of exchanges transactions that can be made during a given period of time

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6. E-Payment Systems

6.3 Risk factor in E-payment System

Risk on Privacy

Users expect trustworthiness of a secure system and privacy on the personal information whereas, information stored on the cards or the electronic means have possibilities to be exposed to the outsiders while making transactions

Security Risk

Though the e-payment systems go through layers of security measures, there are still possibilities for fraudulent activities that might crack the user authentication and validation thus leading to security risks.

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6. E-Payment Systems

6.3 Risk factor in E-payment System

Risk of Reliability

Transactions may require hardware tools/interface such as smart cards and the card reader, and many times dependency on such tools may fail to serve which reduces reliability on such transactions.

Risk of Usability

The e-payment system might require technical infrastructures and authorization procedures which all users may not be aware of and thus may result into less usage of it. Also these systems may not be available for rural areas.

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6. E-Payment Systems

6.3 Risk factor in E-payment System

Physical Risk

Loss of the cards may result into loss of money

Risk of Trust

E-Payments have a long history of fraud, misuse, and low reliability which has always threatened users to practice internet based purchases.

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