

CHAPTER 9

INTRODUCTION TO ELECTRONIC COMMERCE

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Learning Objectives

The learning objectives of the chapter are to:

- describe in detail, the concept of e-commerce,
- describe the various e-commerce business models and how they operate,
- state the security requirements for the initiation and operations of a successful e-commerce business,
- know the available Internet and cloud computing infrastructures they can use to build e-commerce business, and
- describe in detail, the various types of online payment methods for e-commerce.

Introduction

This chapter introduces the student to the concept of electronic commerce, its types and operation. Electronic commerce often abbreviated as eCommerce, e-commerce can be simply seen as the trading of goods and services over the Internet using information technology infrastructures. Due to the Internet boom, e-commerce has become the prominent platform for conducting businesses. Initially it began by serving as an complementary platform to the traditional brick and mortar trading method but gradually it is taking the central role for business operations and some businesses are built entirely on e-commerce.

In this chapter, the definition and history of e-commerce is given in section 1. Section 2 discusses the features, pros and cons of e-commerce. E-commerce business models are presented in section 3. E-commerce requires instant payment media. The electronic payments methods that can used in e-commerce are discussed in section 4. Section 5 presents

platforms that can be used to develop online businesses. The security requirements of e-commerce and the computational measures for implementing measures for preventing security threats are presented in section 6. Some exercises are given at the end of the chapter.

1. Definition and History of E-Commerce

As earlier stated, the term electronic commerce or e-commerce entails trading using the Internet and other information technology infrastructures as a platform instead of the traditional brick and mortar approach. Several definitions of e-commerce have been given. However, the common denominator of all the definitions is that it is the use of the Internet to carry out trade. A notable definition is:

"Sharing business information, maintaining business relationship and conducting business transaction using computers connected to telecommunication network is called e-commerce".

The history of e-commerce can be traced to mid twentieth century, 1948-1949, when orders and invoices are exchanged between suppliers and customers using telex. This system of communication was called the Electronic Data Interchange (EDI). EDI involve the development of standards for the exchange of business instruments and transactions and their automatic processing. It entails the exchange of data/information and documents internally between the departments/units in an organisation or externally with other businesses or organisations. This exchange of documents require the standardized format that can be transmitted through the network, understood and processed by Computers. Communicating departments/units and organisations must agree to the standard format for the exchange of documents. There are two main standards for EDI: the **X.12** developed by the American National Standard Institute (ANSI), and the **EDIFACT** developed by the UN's ECE, a working party for the facilitation of international trade procedure. EDI has been applied in international trade, interbank electronic fund transfer, healthcare insurance, manufacturing and retail procurements.

With the advent and proliferation of the Internet and the world wide web (www) in the late twentieth century, 1991 - 1993, e-commerce has found a veritable medium of operation. The development of the Internet and other IT such as email services, smart and mobile devices, and cloud computing has empowered e-commerce and it wide adoption by businesses for more efficient and effective transaction processing. Notable businesses built on e-commerce models are Amazon, eBay, and Alibaba. The successes of these businesses are largely because of the e-commerce models they adopt.

2. Features of E-Commerce

E-Commerce provides the following features which make its adoption beneficial to the trading industry.

i Global reach

E-commerce leverages the Internet as a medium of communication between transacting parties. Thus, a business has the potential of reach all the nooks and cannies of the globe. Customers can access goods and services from around the world.

ii *Ubiquity*

Although the computer network or Internet becomes the marketplace in e-commerce, transacting parties can be located anywhere and can be done at any time. In other words, there is no time and place restrictions in e-commerce unlike in the traditional commerce where businesses and customers must meet at certain time and place to conduct trading activities.

iii *Cost reduction*

Consumers can compare prices of products and services from different businesses thereby enjoying discounts as incentives to buy from competing businesses. Also, there is a reduction in the cost of transportation since movement is reduced to only shipment in e-commerce. That is, buyers can be at the comfort of their homes and conduct transactions without having to move to the marketplace and have a physical fact-to-face transaction with sellers.

iv *Standardization*

Some level of uniformity in the way and manner transactions are created, accessed and processed is attained in e-commerce. This standardization facilitate easy creation and processing of transaction between parties.

E-commerce as a mode of conducting trade, has enormous benefits for businesses, as well as some downsides. This section presents the advantages and disadvantages of e-commerce. The advantages of e-commerce can be grouped into three: advantages provided to businesses, to consumers, and to society.

2.1 *Advantages to business organisations:*

Business organisations benefit immensely from e-commerce, from wider business reach to efficient transaction processing. The advantages of e-commerce for businesses include:

i. Anywhere, anytime transaction

e-commerce enables business organisation to conduct business transaction at anytime of the day from anywhere consumers are located, unlike in the traditional commerce where there is a barrier of working/business hours outside which transactions cannot be carried out, and consumers must be physically present where the business is located.

ii. Worldwide reach for businesses

With e-commerce, geographical location is no more a barrier to access to potential consumers. The ubiquity of the Internet and IT has facilitated the availability of business everywhere around the globe. Businesses can be reached and relationships can be created from everywhere on the globe as long as there is Internet access.

iii. Efficient, easier, and cheaper management of supply chain

The cost of creating, exchanging and processing paper-based information is drastically reduced in the e-commerce mode of transaction. Transactions are wholly digital and are transmitted faster at the click of a button over the Internet to destinations. Business processes are simplified and become faster using digital technologies.

- iv Customer services are better rendered digitally. Consumers can reach customer care via electronic means faster and easier.
- v. E-commerce facilitates the improvement of the productivity of organisations. Organisations can easily expand their businesses and increase production and service rendering.
- vi. E-commerce entrenches paperless transactions.

2.2 Advantages to Consumers

Just like business organisations, consumers also benefit from the e-commerce business models. This includes:

- i Easy access to products and services
- ii Multiple options to choose from
- iii 24X7 support
- iv Access to other consumers' opinion on products and service.
- v Immediate access to information on products and services.
- vi Reduction in the prices and cost of goods and services due to the provision of discounts by businesses. E-commerce creates a medium of competition between business organisations. As a result, business organisations provide discounts to consumers to attract more transactions.

2.3 Advantages to Society

In addition to benefiting business organisations and their customers, e-commerce have some advantages for the society in general. These include:

- i Reduction of movement and thus, road traffic and air pollution.
- ii Dues to reduction in prices, less affluent citizens can afford to purchase or access products and services that would have been out of their reach.
- iii Rural areas can also have access to products and services due to availability of telecommunication networks providing Internet access.
- iv Government can deliver public services such as healthcare, education and social services at a reduced cost to citizens.

2.4 Disadvantages of e-commerce

Despite the benefits of e-commerce to businesses, consumers and even the society discussed above, it has some downsides that should be acknowledged so as to provide measures to mitigate them. Some of the notable disadvantages includes:

- i Security threats. The Internet is associated with security issues that keep evolving and getting sophisticated day by day.
- ii Initial cost of setup. Small and medium businesses may not be able to afford initiating and even maintaining e-commerce platforms for their businesses.
- iii Small and medium scale business cannot afford and maintain electronic data interchange (EDI) for their businesses.

3. E-commerce Business Models

Based on the transacting party and the direction of information flow, there are four types of business models of e-commerce. They are Business-to-Consumer, Business-to-Business, Consumer-to-Business, and Consumer-to-Consumer. The following subsections describe these business models.

3.1 Business-to-Business (B2B)

The B2B model entails the carrying out business transactions between businesses over computer network. In other words, this model involves companies selling and/or buying from other companies through computer network medium; consumers are not involved in this type of e-commerce business model. Transactions such as e-procurement, supply chain management, purchase negotiations. Figure 1. depict the B2B e-commerce model. Most often, this transaction is usually between a producing company and wholesalers who buy in bulk and keep inventory. The wholesaler in turn sells to the consumer. As depicted in the figure, orders are placed and processed through the e-commerce website. The producing company processes the order and ship the goods/services to the wholesale business which in turn sell to the consumer through retail outlet(s).

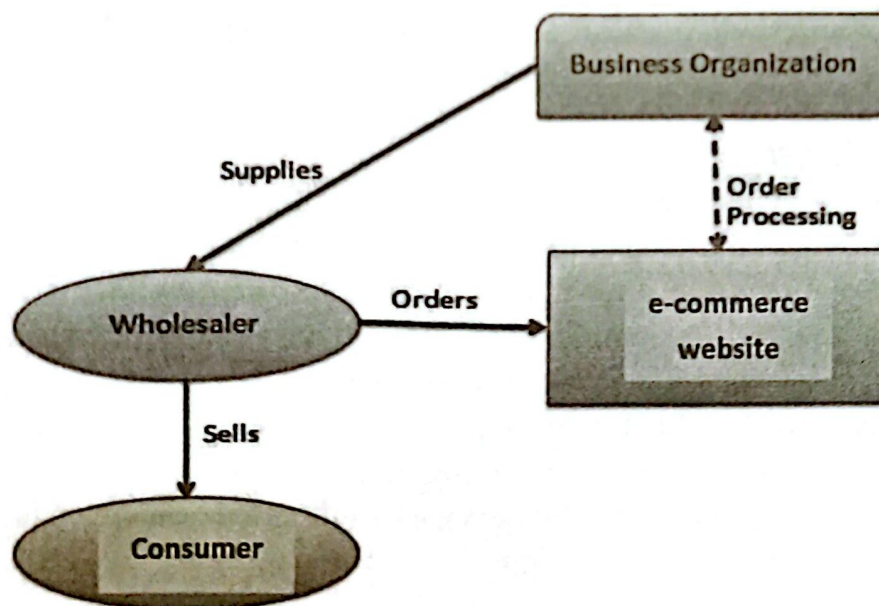


Figure 1. Business-to-Business (B2B) e-commerce business model

3.2 Business-to-Consumer (B2C)

The B2C model involves the direct transaction between businesses and their product consumers without any wholesale intermediary. The consumer orders are placed and processed on the e-commerce website and products/services are shipped directly by the business to the consumer as depicted in figure 2

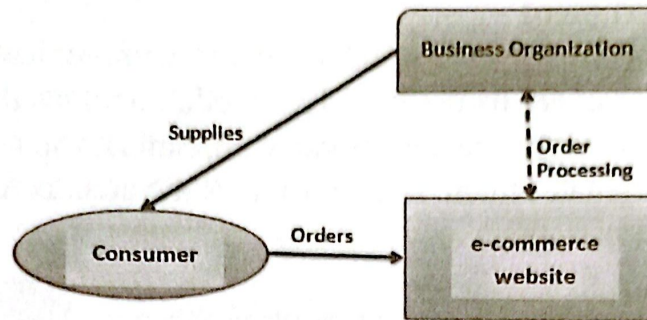


Figure 2: Business-to-Consumer (B2C) e-commerce business model

3.3 Consumer-to-Business (C2B)

This e-commerce business model, C2B, is the reverse of the B2C model and it involves the consumer posting their product and/or service for companies to bid, and in turn the consumer selects the company. Unlike in the B2C model, the transactions in the C2B model is at the instance of the consumer. Figure X.3 depicts this model.

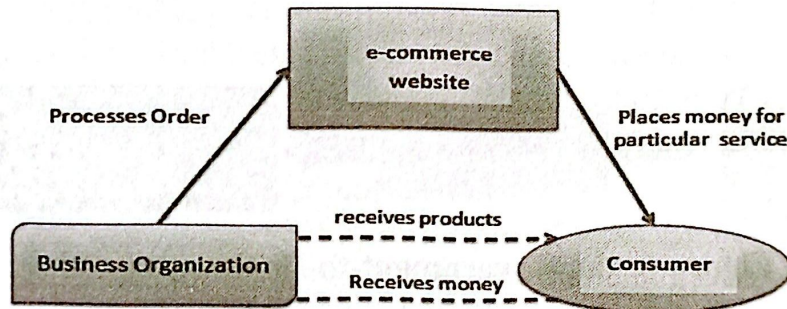


Figure 3: Consumer-to-Business (C2B) e-commerce business model

3.4 Consumer-to-Consumer (C2C)

The C2C model provides consumers the platform to conduct business transaction with another consumer. That is, consumers can post products for other consumers to buy. Figure 4 depicts this business model. Typically, consumers post products such as their assets, cars, houses, etc for any interested buyer.

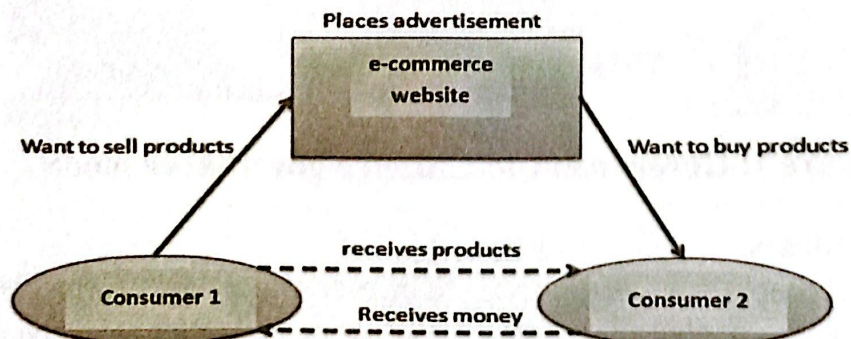


Figure 4: Consumer-to-Consumer (C2C) e-commerce business model

Besides trading, e-commerce also encompasses the use of electronic media such as the Internet by governments to provide services to its citizens and businesses. This approach to governance is known as e-governance. The following are the models for e-governance.

3.5 Business-to-Government

This is a variant of the B2B business model but the communicating parties here are government and businesses under its domain. This model involves the use of government approved platforms through which businesses can communicate and carry out transactions with government which regulates them. Figure 5 shows the architecture of the B2G model for business-government transactions.

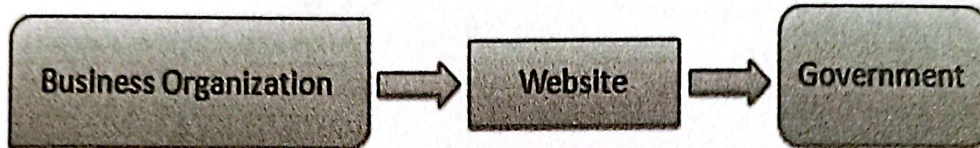


Figure 5: The Business-to-Government business model

3.6 Government-to-Business (G2B)

This is like the B2G model except that the initiation of the communication is the government which regulates the businesses within its domain. Figure 6 shows the G2B model architecture.

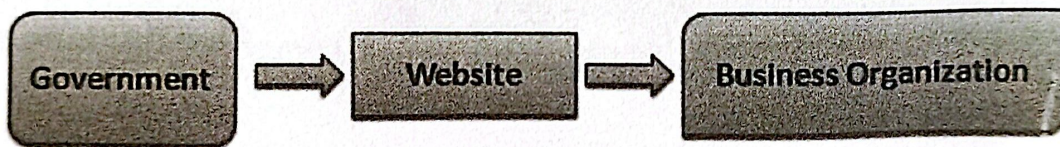


Figure 6: the Government-to-Business model

3.7 Government-to-Citizen (G2C)

This model is designed for government to provide services to its citizens. It involves the use of websites designed for providing governance to citizens. Services such as registration of business, issuance of passports, birth, marriage and death certificates. This model is used to reduce the time required for citizens to access government services. Figure 7 depicts this model.



Figure 7: Government-to-Citizen e-governance model

4. Payment Systems

For a successful and comprehensive transactions on e-commerce platforms, remote payment for goods and services is an integral requirement. Buyers and sellers must be able to pay and receive payments as soon as orders are placed via the Internet or computer network. This can only be achieved through electronic payment which involves sending and receiving money through the Internet. There are several methods through which electronic payments can be made for the completion of e-commerce transactions. These methods include electronic fund transfer (EFT), electronic cash (e-cash), credit card, debit card and smart card.

4.1 Electronic Fund Transfer (EFT)

The electronic fund transfer is one of the most popular methods of making payment in e-commerce. It involves the electronic transfer of money from one bank account to another. The bank accounts can be in the same bank or different banks. The transfer of money can be done via the use of Internet banking, computer, or mobile devices. A payer using banking application will supply the receiver's bank detail and the amount to be transferred. The banking application instantly makes the transfer through some inter-bank interface operation to the receiver's bank. EFT can also be conducted through the use of automatic teller machine (ATM). The payer requires a card that identifies the payer and the access to the payer's bank account(s). through an ATM, the payer selects the account to be debited and the supplies the detail of the receiver's bank account to be credited. Instantly, the money is electronically transferred between the accounts.

4.2 E-Cash

E-Cash is the payment system that mimics the traditional and physical method of making payments using government approved currencies. It involves the creations of value storages and exchange system on which electronic cash can be transferred between transacting parties. E-cash is based in a type of information security measure called digital signature. Digital signature is a cryptographic system of information security involves the use of two numeric keys: one for encoding and the other for decoding.

The e-cash storage can be either online or offline. In online storage, a trusted third party holds customers cash accounts and maintain the transactions on the e-cash, while in the offline storage, the customer holds cash on smart cards or electronic wallets. Customers can purchase e-cash from the third party or banks by establishing an account and funding the account for purchases. The customer's PC or device holds the digitally signed electronic cash and can spend the cash anywhere it is acceptable. Figure 8 depicts the architecture of e-cash system.

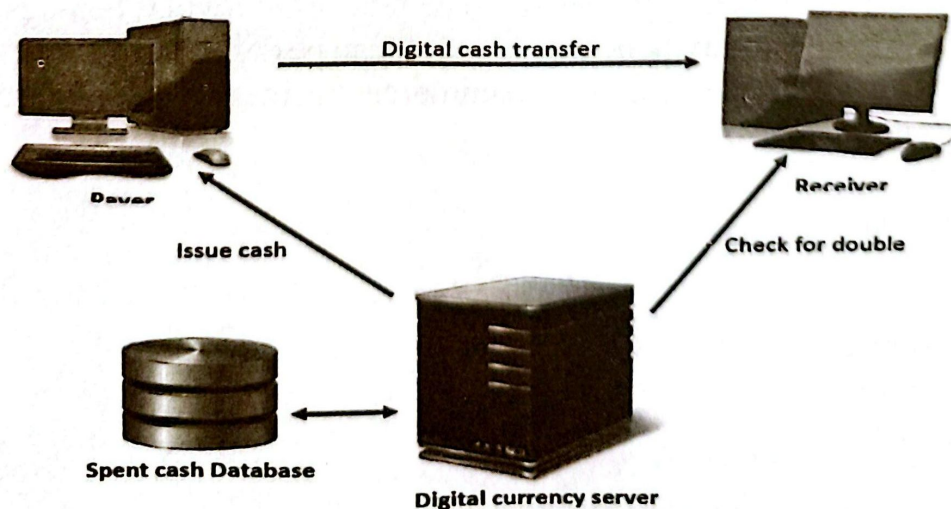


Figure 8: E-Cash System Architecture

4.3 Credit Card

A credit card is a small plastic card that carries a unique number and an embedded magnetic strip containing some account information that can be read by card reader. The unique number is mapped to the bank account of its owner. When the owner (customer) purchases product(s), the issuer of the credit card, i.e. the owner's bank, pays on behalf of the customer. The customer pays the bank within an agreed period which is usually monthly. Note that the owner can make purchases irrespective of the availability or nonavailability of fund in the bank account mapped to the credit card. This is the main difference between the credit card method of payment and the debit card method.

4.4 Debit Card

A debit card is similar to the credit card in that it is also a small plastic card that carries a unique number attached to a bank account, and there is an embedded magnetic strip on it. Unlike with the credit card, the debit card requires that the bank account attached to it has sufficient funds for the customer to use. In other words, the debit card limits the amount the customer can spend to the amount available in the bank account. Also, it has a daily limit that can be drawn by the customer. This placed a control on the customer's daily spending.

4.5 Smart Card

The smart card is also similar to the credit and debit cards discussed above in that it has a unique number but instead of a magnetic strip, the smart card has an embedded small microprocessor chip and has the capacity to store personal data/information of its owner. This implies that apart from the ability to make payments with it, it can be used for other functions such as access control and authentication.

5 E-commerce Platforms and Companies

5.1 E-Commerce Platforms

An e-commerce platform provides the necessary software and infrastructure for building and managing online e-commerce businesses. The platform provides features for inventory management, marketing, and payment processing. It can be described as a one-stop-shop for the development and management of e-commerce business. Some of the notable e-commerce platforms includes:

- i WooCommerce
- ii Wix
- iii Shopify
- iv Adobe Commerce
- v BigCommerce
- vi Squarespace

5.2 E-commerce Companies

Many successful companies have been established using the e-commerce business models. Some of these companies include:

i	eBay
ii	Walmart
iii	Amazon
iv	Alibaba
v	Shopify
vi	Target
vii	Jiji
viii	Jumia
ix	Konga
x	Payporte

6 Security in E-commerce

6.1 Security Threats and Requirements

Security is one of the critical requirements for the operation of e-commerce. Information and cyber security are very important for the smooth operation of end-to-end communication on e-commerce platforms. The notable security threats to e-commerce include:

I Malicious codes

Computer viruses, worms and trojan horses are computer programs that carry out malicious tasks and havoc on infected computer programs and systems. Computer viruses and worms can replicate themselves and spread through programs and files in computer systems. These malicious codes can be used to disrupt the operations of e-commerce on the web when they infect computer systems used in e-commerce.

ii Confidentiality threat

This is the unauthorised disclosure of data/information via the internet. Data/information and documents are transmitted through the computer network or Internet from one end to another. These data/information and documents can be tapped by an eavesdropper and such information can be leaked and used for malicious purposes.

iii. Integrity threat

This threat entails the alteration of data/information and causing data inconsistencies and discrepancies in databases. Data/information integrity can be intentionally compromised by a malicious party or unintentionally during its transmission from one point to another through communication channels.

iv. Availability threat

This is also known as denial of service, and it involves the act of rendering web servers unreachable or delay in reaching servers thereby making the services provided by the servers unavailable to customers. This type of threat causes potential buyers to seek alternative services thereby moving to buy from competitions.

For a successful conduct of transactions on e-commerce, security measures are put in place to prevent the security threats. The security requirements for e-commerce are discussed as follows.

i Authentication

Authentication is the verification of the identity of a system or user. Communicating parties on the web need to be authenticated to verify that they are who they claim to be. This is to prevent imposters and hackers from having unauthorised access to services or data/information which could be used for malicious intents.

ii Authorization

Authorization is ensuring that a system or user is assigned and allowed to perform some given role and associated tasks. Usually, authorization is conducted when a system or user need to access some information or carry out some functions, and it is conducted after the system or user has been authenticated to verify its identity.

iii Confidentiality

Confidentiality involves preventing unauthorized access to the communication between parties on computer networks. The data/information being passed between communicating parties must be known only to the parties who are authorized to have access to the data/information.

iv Integrity

Data/information passed and stored must not be intentionally or intentionally altered or tempered with in a malicious or unauthorized manner.

v Non-repudiation

Non-repudiation is the ability not to deny the authorization or conduct of a task or function by a user or system. In other words, once a user or system performs an operation or function, it should not be able to deny it.

The prevention of security threats and implementation of the security requirements is achieved using cryptography and firewall.

6.2 Cryptography

Cryptography entails the securing of data by transforming it to an unreadable form that can only be transformed back to its original form by the party with the secret key required for the transformation. The transformation of a readable data to an unreadable form is referred to as encryption while the reverse transformation from unreadable to readable form is referred to as decryption. The readable data is referred to as plaintext and the unreadable form is referred to as the ciphertext.

Several computer algorithms have been developed for performing cryptography. There are two main categories of cryptography algorithms. They are Symmetric and Asymmetric algorithms.

I Symmetric algorithm: this is type of cryptographic algorithm that requires a single secret key for both encryption and decryption. In other words, the key used to transform data from readable to unreadable form is also required for the transformation of the unreadable form to its equivalent readable form. Figure 9 depicts how symmetric cryptography works using symmetric algorithm.

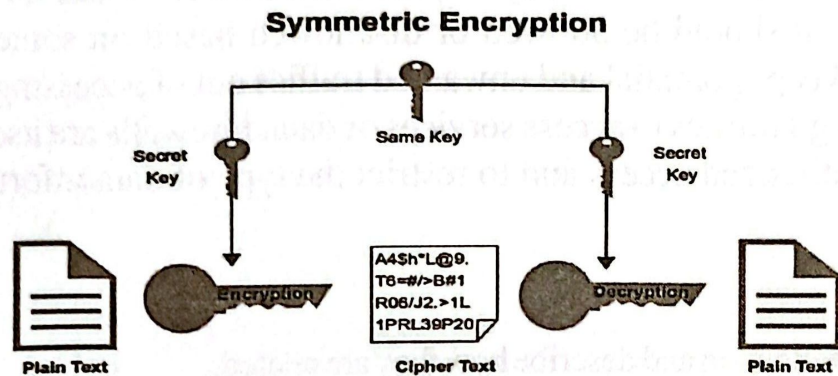


Figure 9: Symmetric Cryptography

The notable symmetric algorithms in use today are DES (Data Encryption Standard) and Triple DES, AES (Advanced Encryption Standard), Blowfish, and RC4.

ii Asymmetric algorithm

Asymmetric cryptography involves the use of different keys for encryption and decryption. That is, a key is used for the encoding of data and another key is required for the decoding of the data. The two keys have a mathematical relationship such that the ciphertext generated by one key can only be decrypted using the other key, and it is mathematically impossible to derive one key from the other. Asymmetric cryptography is also known as the public key cryptography. The two keys required for asymmetric cryptography are referred to as private key and public key. Data encrypted using the public key can only be decrypted using the private key which is always kept secret. The public key is not kept secret, and when used for encryption, only the owner of the corresponding private key can decrypt the ciphertext. Figure X.10 depicts the mechanism of asymmetric cryptography.

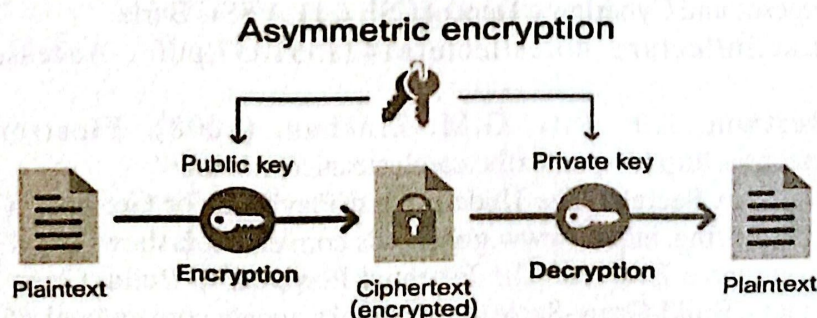


Figure 10: Asymmetric Cryptography

The typical examples of asymmetric algorithms include RSA (Rivest Shamir Adleman), Elliptic Curve Cryptography (ECC), ElGamal, and Digital Signature.

Cryptographic algorithms also known as ciphers are used to implement the security requirements discussed in section X.6.1. authentication and confidentiality can be implemented using symmetric or asymmetric encryption algorithms. Digital signature is also useful for authentication, integrity, and non-repudiation.

6.3 Firewall

Firewall is a network traffic control system that determines which incoming and outgoing network traffics that should be allowed or disallowed based on some predefined rules. It forms a filter that keeps potential and unwanted traffics out of accessing services or data and allows valid and legit traffics to access services or data. Firewalls are used for protecting web servers from unauthorized access and to restrict the type of data/information that the server serves its clients.

Exercises

1. Define the following and describe how they are related.
 - (i) e-commerce
 - (ii) Internet
 - (iii) World wide web
2. What is EDI and how is it related to e-commerce.
3. Give a brief history of e-commerce and highlight the notable milestones in the development and adoption of e-commerce.
4. Discuss the typical features of e-commerce that differentiates it from traditional commerce.
5. List and describe the different business models of e-commerce.
6. Internet and information security is a critical factor in the implementation of a successful e-commerce.
7. Write short notes on the following:
 - (i) Cryptography
 - (ii) Encryption and decryption
 - (iii) Firewall
8. An e-commerce business requires electronic means of making and accepting payments. Why? Describe the e-payment systems that can be used in e-commerce.

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