Zheng Qin

Introduction to E-commerce

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With 98 figures

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Preface

E-commerce is a subject which researches how to use electronic and information technology to promote the traditional business process to change profoundly. The subject is still at its infant age and is fast developing. Its theoretical system is still being constructed and perfected. Under such circumstance, this book tries to choose the contents that are fixed, and closely related with E-commerce as the subject system of E-commerce. The architecture of E-commerce is as follows (Fig. 0.1).

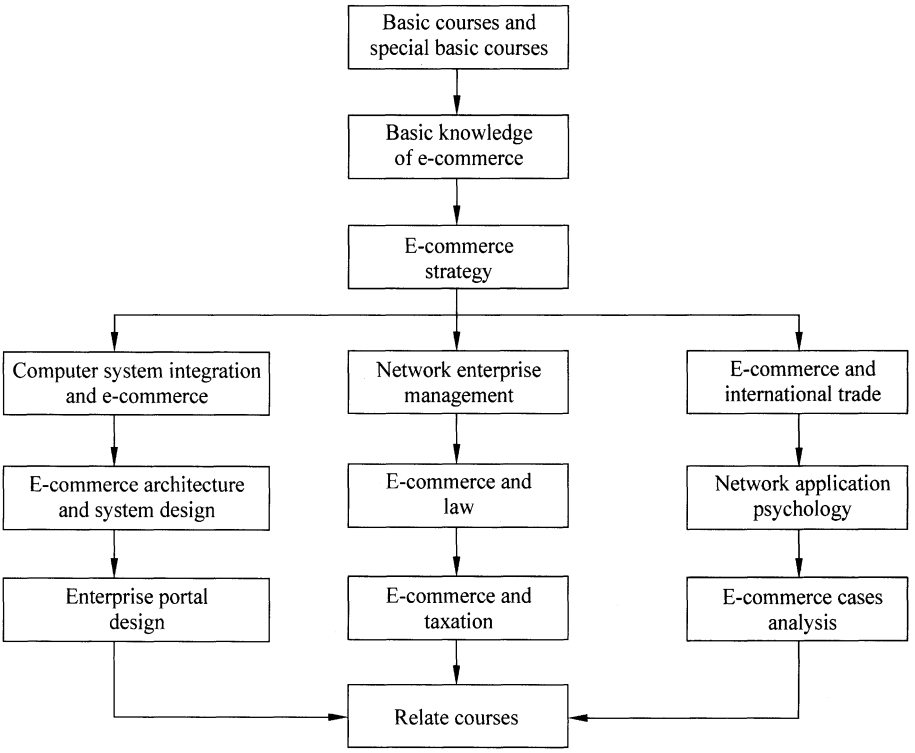

Figure 0.1

Prerequisite courses of E-commerce include some basic courses such as *Advanced Mathematics*, *Discrete Mathematics*, etc.; and some specialized courses such as *Computer Networks*, *Programming*, *Operating System*, *Database Management System*, *Management Engineering*, etc. With all these courses, one can study the subjects such as *Guide to Electronic Commerce*, *Introduction to Electronic Commerce*, *Electronic Commerce Strategies,* etc. The students with different study purposes and requirements can choose different courses respectively: the students majoring in electronic information, whose main goal of learning E-commerce is to design and implement E-commerce systems, can choose the courses such as *Computer System Integration and E-commerce*, *Systematic Structure and System Design of E-commerce and Enterprise Portal Website Design* etc to learn; the administrators aiming at enterprise administration should choose the courses such as *E-Commerce and Law, E-commerce and Tax Revenue*, *Network Business Administration* etc. to learn; while the students that take the E-commerce applications as their target should learn *E-commerce and International Trade*, *Network Application Psychology*, *E-commerce Case Study* etc. The knowledge they learn form these courses together with related knowledge can help them can help them to achieve their goal of learning E-commerce.

There are narrow-sense E-commerce concept and wide-sense E-commerce concept which is also called as e-business. E-commerce researches how to use electronic and information technology to promote the traditional business process to change profoundly, while e-business researches how to use electronic and information technology to promote various social activities of human-beings to deeply change. E-commerce originated from EDI in the 1960's, and its concept formed in the 1990's. E-business originated even earlier, but its concept formed in about 2000. This book focuses on E-commerce, and the interrelationship of its main contents is illustrated as in Fig. 0.2.

This book assumes that most of the readers have no related experience or knowledge of E-commerce, so some basic knowledge of E-commerce will be introduced in chapter 1. E-commerce security plays an important role and is one of the crucial factors that affect the development of E-commerce. E-commerce security follows the basic knowledge. After having learnt former two chapters, readers with different goals can choose different contents to study according to their own goal. The students that want to master E-commerce technologies and want to use these technologies to establish E-commerce websites can go along the mainstream in the figure ignoring the branches at two sides. The students that are majoring in business administration can choose the left side branch to learn, while the students that focus on E-commerce applications should choose the right side branch to learn.

The first edition of this book, is chosen as textbook by universities such as Tsinghua University, Xi'an Jiaotong University, Beijing Normal University etc., and has established a good reputation among the teachers and students of these universities. It was republished for several times. Since the first edition was sent

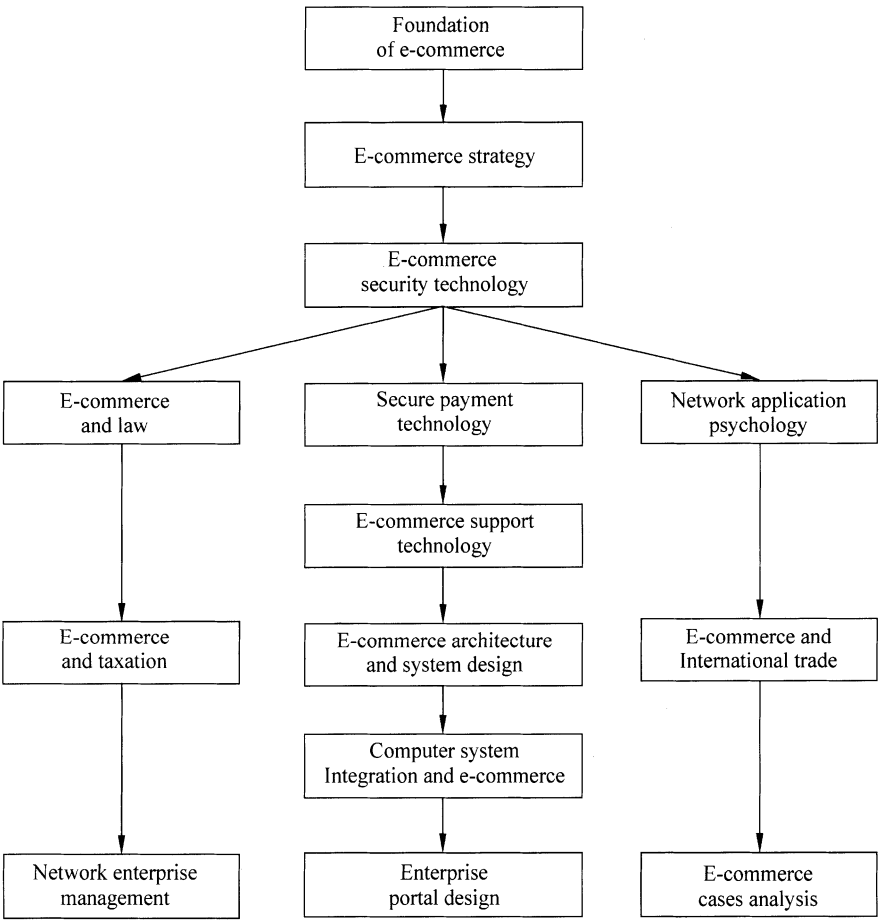

Figure 0.2

to press, E-commerce technologies have been rapidly developing, and the authors have been deepening their understanding of E-commerce. Some valuable feedbacks are also obtained from the teachers and students. To promptly reflect the technology development, our new understanding of E-commerce, taking into account of valuable feedback information, we greatly modify and update the content of the first edition forming the second edition. This edition consists of five parts which are basis, technology, management, practice and applications.

The first part includes two chapters. The first chapter largely expands and updates the corresponding content of the first edition, and adds the introduction to mobile E-commerce. The first chapter is a sketch of this book, which provides the readers a complete picture of E-commerce. In the second part, introduction to fundamental technologies that are related to E-commerce security is added, and in order to enhance the requirements of E-commerce security, E-commerce security technologies are also added. Part three adds the E-commerce tax revenue

administration and the brief introduction of *The Electronic Signature Law of PRC*. The *network application psychology* is added in part five. Meanwhile, most contents of the first edition are updated so that they can reflect the development of E-commerce technologies.

The content of this book is chosen and organized by Professor Qin Zheng. Qin Zheng, Li Shundong, Han Yi write some parts of this book respectively. Yan Lixiang and Dong Jinchun read the manuscript and propose some valuable suggestions. Qin Jun reads the manuscript and polishes the text. Li Shundong finishes the total book.

This book can be used either as a textbook or reference book for four-year and three-year college students that are specialized in E-commerce, electronic information, information management and business administration, and postgraduates. The whole book can be used for teaching postgraduates. Some chapters with an asterisk can be excluded for four-year college students and some with two asterisks can also be excluded for three-year college students. Any opinions from readers about this book are appreciated.

The authors

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Part 1 Fundamentals

1 Fundamentals of E-commerce

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Abstract E-commerce is the core technology of knowledge economy. Developing e-commerce is an inevitable choice for Chinese economy to enter into the world market, participate in and ultimately penetrate the global market, and bring about a great rejuvenation of the Chinese nation. We must grasp this business opportunity and further extend its strength by consciously studying, applying and developing e-commerce; allowing e-commerce to serve better in society's economic development. Before we can start developing e-commerce, we have to understand the background, the basic principle and the evolution and development history of e-commerce. This enables us to have a thoughtful understanding on this new technology, hence, helping to predict the trend of e-commerce in the near future. This chapter introduces some basic knowledge regarding to e-commerce, which includes, the needs of society, development of e-commerce, basic e-commerce concepts, and couples of other information which closely related to the development of e-commerce.

Key Words e-commerce, m-commerce, electronic data interchange (EDI), Internet, business to business (B2B), business to consumer (B2C), business to governments (B2G), consumers to consumers (C2C), governments to governments (G2G), international trade.

This chapter is an outline of e-commerce, which contains the origin and development of e-commerce, the impact of relevant disciplines on e-commerce, the basic concepts, the platforms, fundamental patterns and the major compositions of e-commerce.

1.1 The Origin and Development of E-commerce

Internet has created a new world beyond the real world—a "virtual network world" or "The sixth continent" called by Lu Yongxiang, the academician of Chinese Academy of Science. E-commerce brought about by Internet is one of the most significant scientific accomplishments. In business, the prosperous e-commerce technology gives rise to a revolution in the circulation system. It breaks the boundary of time and space, alters the trade pattern, improves the circulation of merchandize, capital and information, and makes enterprises have an edge over others as well by reducing the cost of production effectively. In short, e-commerce has enabled the traditional business to achieve greater, faster, better and more economical results. The influence of the e-commerce will go beyond the business activity. It will make a profound impact on each aspect of human society, such as production and employment, government function, working talent, law systems and education etc. It permeates into every profile: industries, logistics, finance, media, governments, enterprises, research organizations and even traditional agricultures. With the development of the e-commerce, it will influence and impact to a larger extent every aspect of our society with each passing day. A new economic revolution on the basis of digitalization and Internet has set in. We can say without exaggeration that the electronic commerce is the most significant industrial revolution since Industrial Revolution, with deeper influence on mankind than the former two industrial revolutions, because it not only can raise greatly productivity, efficiency of economic operations, lower the economy operation cost, and make many originally impossible things possible, but also influence people's life styles and every social aspect and therefore change their world outlook and methodology. In the new century, participation of the third revolution exerts the influence, to a large degree, on economy in China, especially in shortening the gap between the western developed countries and catching up with and surpassing them. Therefore, it is inevitable for us to develop e-commerce, to join the world market, participate in the globalization competition and rejuvenate China. So the book will cover the following aspects of e-commerce: its coming into being development, its composition, its nature, the guidelines for e-commerce system design, difficulties and respective solutions in e-commerce, methods of designing a good website, the relation between e-commerce and international trade, the legal problems brought by e-commerce, the methods of dealing with and analyzing how to deal with and analyze e-commerce cases. In conclusion, all the above will be touched upon in this book, relevant philosophy problems about social overall influence on mankind are beyond the scope of this book.

1.1.1 The Origin and Development of E-commerce

E-commerce is the necessity of international business, vice verse, international

business boosts e-commerce. The development of computer science and communications sciences has laid a solid foundation for e-commerce. The development of information security makes e-commerce proceed in a secure way; the laws concerning this field also provide legal guarantees for e-commerce. The origin and development of e-commerce is illustrated in Fig. 1.1. It has been through three phases.

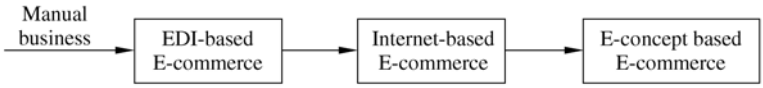

Figure 1.1 The development of e-commerce

Phase One: E-commerce based on EDI (Electronic Data Interchange)

EDI (Electronic Data Interchange): The EDI originated in the 60s of the 20th century. The large-scaled business enterprise in the developed countries carried out the EDI basically in the 80s. The EDI of our country began from the 80s in 20 centuries. EDI is a kind of teleportation method to transmit business documents from one computer to another. Because EDI reduces the paper note greatly, people vividly call it as "trade without paper" or "bargain without paper". From the perspective of technology, the EDI includes both hardware (mainly the network) and software (mainly software and standard of EDI). For the sake of safety, most EDI were not transmitted by network until the 90s of 20c, but by VAN (the value-Added Network) of exclusive use. What EDI needs is a standard software to translate information in the customer databases into the EDI-standard so as to deliver. Because the business enterprise of different professions adopt different format on the basis of their own business characteristics, therefore when transmitting documents, they must be translated into the EDI standard format. Before EDI, the primary stage of e-commerce, becomes universal in China, electronic commerce has developed quickly to the second stage.

Phase Two: E-commerce based on Internet

EDI enjoys advantages and tremendous strength in decreasing enormously the intensity, mistakes and cost to make and handle documents on the one hand, and in improving efficiency to a large extent on the other hand. Therefore, it speeds up the development of international business. However, the high cost of VAN and EDI communication system hinder the expansion of e-commerce based on EDI. Moreover, EDI is only suitable for large-scaled transnational corporation rather than medium and small-sized ones, for it does not take information share into account. Since both the increasing large-scaled transnational corporations and many a medium and small-sized enterprise thirst for information sharing, the establishment of a new electronic information exchange system of low cost is on the agenda to realize the information sharing.

In the middle and late 90s of the 20th Century, owing to the prompt popularity of Internet, from universities to enterprises, and then even to common people's

families, Internet functions from the information sharing to a popular mass media. After 1991, business that has always been outside of Internet came into the realm and made e-commerce a big hit in Internet, which gives impetus to the rapid development of Internet. Many enterprises made a big success by online direct marketing such as Dell Company, distinguished for direct online selling, online book store Amazon, Yahoo Internet search engine, Baidu Internet search engine, Sina, Sohu, and Ebay. Such websites are up to 424,000 in 1998, comparatively only 2,000 in 1995. By 2001, Internet has become the largest network in the world and covered up to 150 areas and countries, linking more than 25,000 networks and 520,000 mainframe computers. Vint Cerf, "Father of Intel" predicted in 1996 that there would be a hundred million Internet users by 2003. However, he was shocked by the flourisher of Internet, with 150,000,000 Internet users by the end of 1999, trice than that of 1997. According to the latest statistic reports released by CNNIC in July, 2007, there has been over 10,000,000 Internet users, 622,000 registered domain names and 677,000 websites in China. The flourishing of Internet makes flood of enterprises unable to resist the temptation to start e-commerce. The reason why e-commerce based on Internet is so attractive to enterprises is that e-commerce enjoys several evident advantages over e-commerce based on EDI: 1) low in cost. The expense of Internet is low, no more than 1/10 of VAN in general. 2) wide in overlaying. Internet spreads all over the world, by which trade partners can conveniently send commercial information and documents with common telephone wires. 3) complete in function. Internet can help different users to carry out their targets of different levels, such as issuing electronic commercial information negotiating on line and setting up virtual department stores and online banks etc. 4) flexible in use. E-commerce based on Internet is not confined to agreement of special data exchange. Any commercial document can be formed by filing the screen documents that are identical with the current paper documents. Such documents can be understood and used directly by anyone without any translation.

Internet meets the demands of medium and small-sized enterprises to exchange electronic data by overcoming the shortage of EDI. Internet, lower in cost, wider in coverage and better in service, will certainly replace VAN as the hardware carrier of EDI. Electronic information exchange system with the characteristics of being both lower in cost and able to share information makes itself popular among all enterprises. EDI based on Internet enjoys the advantages of both EDI and Internet, therefore, EDI realized by means of Internet is directly called as "Internet EDI".

In e-commerce based on Internet, at first, people mainly make daily "business correspondences" by e-mails, and then release information by Internet. Since 1995, enterprises have gradually turned to Internet to release information. Therefore, the public can directly access to the enterprise information, goods and services by Internet, which leads to the exploration of information issuing system represented by the technology of Web and becomes the principal application of Internet. *E-commerce Demonstration Law*, passed by United Nations Commission

on International Trade Law on June 14, 1996, symbolized the beginning of real e-commerce. And the sonorous advertisement of IBM in 1998 *Are You Ready for e-commerce* set up the upsurge of e-commerce all over the world.

Phase Three: E-concept e-commerce

Since early 2000, people's understanding has developed from e-commerce to higher e-concept e-commerce, and it is realized that e-commerce is in fact the combination of information technology and commerce applications. Apart from business, electronic information technology can be applied in many other fields, such as medical treatment, education, hygiene, military, administration and so on, to form e-concept in the fields. For instance, electronic education—remote education, the combination of electronic information technology and education; electronic treatment—remote treatment, the combination of technology and treatment; electronic administration, the combination of technology and administration; electronic command, the combination of technology and command; online banks, the combination of technology and finance; virtual enterprises, the combination of technology and business organizations and so forth. Various patterns of e-commerce such as E-B, E-C, E-G etc., have come into being by applying e-conept. With the development of electronic information technology and the increasing need of the society, more and more e-concepts will emerge and the genuine e-times will advene.

1.1.2 The Definitions of E-commerce

As the term suggests, e-commerce refers to various online commercial activities focusing on commodity exchanges by electronic means, Internet in particular, by companies, factories, enterprises, industrial undertakings and consumers. A large number of well-known organizations and corporations also have their own definitions on e-commerce. For example, ISO defines e-commerce as: it is the general term for exchange of information among enterprise and between enterprise and customers; the Global Information Infrastructure Committee defines it as the economical activities using electrical communications, with which people can purchase products, advertise goods and settle.

The following are definitions given by transnational corporations Intel, IBM and HP respectively.

Intel: E-commerce = electronic market + electronic trade + electronic service

IBM: E-commerce = information technology + web + business

HP: E-commerce is to accomplish commercial business by electronic means.

Since e-commerce is a brand new science, it is not at all surprising that there are various definitions about it. In addition, a premature uniform definition of e-commerce may slow the development of e-commerce. E-commerce shall be social, economic activities between social principal parts by taking advantages of computers and network.

The implication of e-commerce: it refers to commercial trade activities carried out by electronic methods, the electronicization of traditional trades. The electronic means refer to electronic technologys, tools, equipments and systems, including telephone, telegram, television, facsimile, E-mail, electronic data interchange, computer, the communication network, credit card, electronic money and Internets. Commercial activities comprise inquiry, offer, negotiation, contract signing, contract fulfillment, payment. In a narrow sense, e-commerce refers to various online commercial activities focusing on commodity exchanges by electronic methods, computer network in particular, by companies, factories, enterprises, industrial undertaking and consumers. In a broad sense, electronic business (EB) refers to the electronicization of all business among all industries (including governments, enterprises, and institutional units), such as electronic government, electronic command, electronic education, electronic public business, electronic household etc.

Components of e-commerce are illustrated in Fig. 1.2.

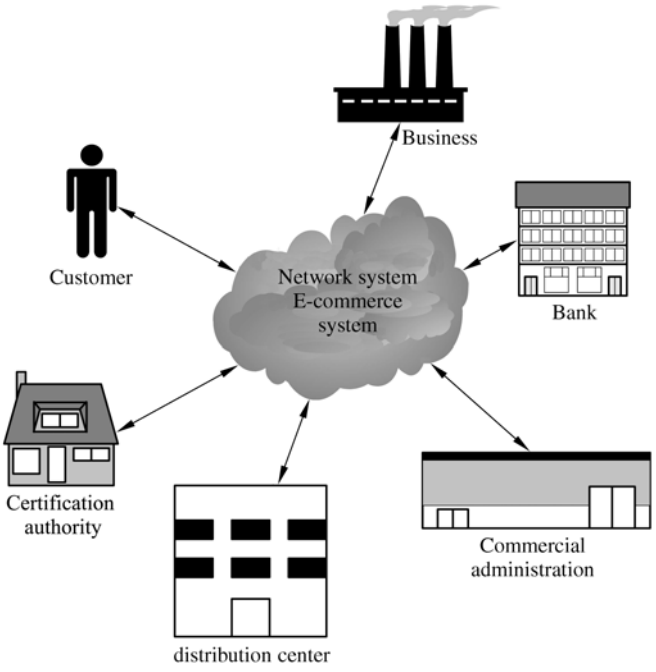

Figure 1.2 Components of e-commerce

(1) Network: It includes Internet, Intranet, and Extranet. Internet is the foundation of e-commerce and the carrier of commercial business information. As to Intranet, it means for enterprises to carry out internal affairs. With regard to Extranet, it is the link between enterprises and users to carry out commercial activities.

(2) E-commerce user. It includes personal consumers and business consumers. The business consumer scientifically manages staff, wealth, goods, production,

supply and sales by Intranet, Extranet and MIS. Personal consumer has access to information and purchases goods by connecting Internet with browsers, set-top boxes, PDA (the personal digital assistance), Visual TV etc.

(3) Authentication Authority: The authentication Authority (CA), the authority recognized by law, is responsible for issuing, managing digital certificates and facilitating parties involved in online sales to identify each other.

(4) Distribution center. It is in charge of sending goods that cannot be delivered on line to consumers and keeping track of goods flow.

(5) Online bank. It provides the sellers and buyers the traditional bank business, such as settlement, and round-the-clock service.

(6) The administration of the commercial activity. It consists mainly of departments of industry, customs, tax and trade.

The Significance of e-concept

E-mail, called the Internet Killer User, attracts people to pay attention to the existence of the network, and sparks the rush of network gradually. E-mail transforms from receiving and sending e-mails to commercial use and becomes one of the principal tools for people to communicate on line. The e-wallet and e-cash etc. basically make it possible for people transfer fund on line and accordingly makes network and real life fuse further. The e-commerce has on a large scale began to impact the traditional pattern of trade and brought about intense changes of life style. It can be predicted that in future new concepts will spring up and the combination of electronic technologys and other ideas will give rise to new things, because electronic technology based on Internet is advancing continuously. “e-concept”, proposed in early 2000, is accepted and spreads quickly. That is to say, e-concept is a new thing taking electronic and network technology as foundation, other technologies and ideas as platform of upper level. After double integration with other technologies and ideas, e-concept will exert a great impact on social life style. In this sense, e-commerce is just a subset of e-concept.

E-commerce gives impetus to the development of society and provides broad space for future, though it is merely a subset of e-concept. The development of e-commerce may transform the whole social operation regulations, so the e-concept will exert much more influence on the society, no matter in depth or in scope.

The significance of e-concept lies in that it makes people grasp not only radical changes of new things but also the root of all changes brought by e-concept in e-times so as to promote greater social changes.

1.1.3 E-commerce in China

Though computers have been widely used in our country over the past 50 years, e-commerce is only with a history of 10 years. The first e-mail sent in Sep., 20, 1987 crossed the Great Wall to the world marked the prelude to Internet in China.

E-commerce in China can be divided into 4 phases:

1. E-commerce based on EDI (1990—1993)

The application of EDI has been carried out in China since the 1990's Since then, State Planning Commission and National Science and Technology Commission of China have put the application of EDI into the list of "the 8th Five" national science and technology promotion project. As the result, a series of EDI systems come into application, such as the import and export license EDI system of original Ministry of Foreign Trade and Economic Cooperation, PRC, Ocean/ Airway shipment management EDI system of China National Foreign Trade Transportation (Group) Corporation, the EDI system of financial affairs, petroleum, and rubber trade of China National Chemical Import and Export Corporation, the EDI system of Shandong Artex Import and Export Corporation et al. In September, 1991. The Electronic Information System Promotion and Application Office of State Council leads and coordinates original State Planning Commission, National Science and Technology Commission of China, Ministry of Foreign Trade and Economic Cooperation, PRC, Ministry of Communication of the PRC, Ministry of Post and Telecommunication of the PRC, Ministry of Electronic Industry of the PRC, The State Bureau of Quality and Technical Supervision, State Administration of Foreign Exchange, China Commodity Inspection Bureau, China Customs, Bank of China, Industrial Commercial Bank of China, People's Insurance Company of China, State Administration of Taxation, China Council for the Promotion of International Trade etc, originating to establish the Coordination Group of EDI Application and Promotion. Meanwhile, the EDI/FACT Commission of China established in October 1991 became the member of Asia EDI/FACT Council. EDI has been widely used in sectors such as trade, communication, bank etc.

2. "Three Golden Projects" carried out by governments in 1993—1997 establish, the foundation of e-commerce

The National Economy Informationization Joint Conference and its office coming into being in 1993 with the vice premier of the State Council as president, carried out "Three Goldens"(Golden Customs, Golden Card, and Golden Bridge) project and made great progress. "Beijing E-commerce International Forum" hosted by People's Bank of China, Ministry of Electronics and Global Information Infrastructure Committee (GIIC) in Beijing in May. 1994 attracted up to 700 participators from the United States, Great Britain, France, Germany, Japan, Australia, Egypt, and Canada etc. The "Asian and Pacific E-commerce Seminar" in Beijing in Sep., 1994 brought about the spread of e-concept in China. In 1995, China Internet became commercialized and network companies began to rise.

State Council National Informationization Team was set up in Jan. 1996 with the vice president as the group leader and more than 20 ministries as its members

to lead the construction of information. And it is in 1996 that China got Internet connected.

National Information Office organized some departments involved to draft and draw up the program of China informationization. National informationization working conference was held in Shenzhen in Apr., 1997 and soon after informationization executives of different provinces, cities and areas began to come into being and carried out informationization construction programs, including construction of e-commerce. Advertising companies began to make advertisement on line. China Goods Ordering System (CGOS) has been put into practice since Apr., 1997.

3. E-commerce based on Internet since 1998

The first Internet transaction in China succeeded in Mar., 1998. China Commodity Trading Market was declared to come into being in Jul., 1998, which was called "Never Closed China Export Commodities Fair (Guangzhou Fair)". China Commodity Spot Transaction Market was the first spot transaction market for e-commerce with transaction volume up to ¥200 billion in 1999. China's first e-commerce application system based on SET security standard was released by Bank of China and Teledata Bureau with the Bank of China in Hunan Province as its experimental unit. Committee of Economy and Trade and Ministry of Information Industry declared to start the "Golden Trade Project" centering on e-commerce, a large-scale experimental project to popularize the application of Internet and to carry out e-commerce in commercial and trade circulation domain. Beijing, Shanghai and many other cities have started to e-commerce Engineering, opened the experimental units of electronic shopping center, electronic shopping market, online shopping and transaction, built up financial and non-financial certification authority, made corresponding laws and regulations to lay a foundation for future e-commerce. Medical e-commerce network was put into operation in 1998, in which ten thousand enterprises and public institutions in medical and health industry got connected and information of over thousands of Chinese Traditional medicine and Western medicine was provided. National reconciling inventory network, national online construction and real state online promotion and many others have opened up.

The B2C websites such as 8848 formally opened in Mar., 1999, which shows that online shopping has come into application stage, such as the presence of online governments, online enterprises, online taxation, online education (online universities of Hunan University and Zhejiang University), and remote diagnosis (many large hospitals in Beijing and Shanghai).

4. The pragmatic development phase in 2000

E-commerce focuses on the traditional B2B. E-commerce service providers have turned to reality market from venture capital market and some successful businesses

have emerged. E-commerce software and solutions developed by domestic enterprises or domestic enterprise-oriented have dominated the market with the perfection of exterior environments such as infrastructures; the perfection of application methods of e-commerce; the maturity of market for e-commerce; and the rapid localization of e-commerce software and solutions. The e-commerce in China has taken its initial shape.

E-government has come into the overall implementation stage in 2002. National government procurement investment of 35 billion (hardware 25 bilion, software 4.5 billion, and information service 5.5 billion) has increased by 25% compared with the corresponding period of the former year. *Instructional Advice on China's e-government* given out by National Information Office in Jul., 2002 proposed the following three measures: ① Construct two universal e-government network platforms, the interior for official business and the exterior for different business enterprise sectors, enterprises and public. ② forge ahead the "12 Golden projects" construction (golden taxation, golden customs, golden financial affairs, golden audit etc.). ③ speed up strategic data base construction (information data bases of population and agriculture etc.). Domain names applied by government departments at all levels in China increased to over 7796 in Dec., 2002 from 4615 Jan., 2001. In the developed coastal provinces, the rural governments have got Internet connected. Governments at all levels have released governmental information in the Internet and opened channels for public communication and service. Many a local government has set up the masses-oriented information release inquiry systems and "Mayor Mailbox" and "Government Mailbox" to facilitate the public's participating in the management of state affairs. The overall implementation of e-government forcefully speeds up the development of e-commerce. The gradual perfection of the e-commerce environments (network infrastructure construction, legal environment, market environment, online payment, information security, certification authority construction etc.) and the constitution of national corresponding polices, laws and regulations on e-commerce have provided the fundamental conditions for the development of e-commerce. Network bandwidth has increased. The international export gross aggregate bandwidth reached 82.6G in Jun., 2005; the number of wide band access users has reached 53,000,000, exceeding the number of user surfing the net by dialing-up for the first time. National modern credit system has made material progress. Real-time payment system for a large amount of cash in Beijing, Wuhan was successfully put into practice on Oct. 8, 2002, which have been popularized in economically advanced cities such as Shanghai, Tianjin, Jinan, Shenyang, Chengdu, Xi'an, Shenzhen, and Haikou etc. Moreover, a national cross-banks, cross-areas information exchange network of credit cards had taken its initial shape by the end of Feb., 2003. Great achievements have been made in distribution. For example, China Post, the most powerful network transfer in China, joined the e-commerce, and some professional distribution enterprises for e-commerce projects came into existence one after another.

China government attaches much importance to the security related the application and development of e-commerce. For example, industry security CA has been organized with Telecom, Customs, and People's Bank of China as initiators. CA'S have come into existence in Shanghai, Guangzhou, and many other cities. Much attention has been paid to the development of corresponding core technologies of security standard, electronic signature and password system, and investment in such fields has been intensified. Corresponding laws and regulations have driven to maturity stage and many laws are in embryo. For example, in 2005 electronic signature law was put into practice.

Current situation of e-commerce in China is as the following:

(1) E-commerce in China is still in its initial stage.

(2) The application of e-commerce in China is still of its primary level. Most e-commerce is non-payable, that is, online sales and offline payment; a small part is paying, that is online sales and online payment; some even make cooperated-commerce.

(3) Minority of ten million enterprises in China has got Internet connected, carried out online marketing, to say nothing of online procurement. Majority of medium and small enterprises and a small fraction of large and medium enterprises have not carried e-commerce. In other words, enterprises are less information-based and have not become the main force of e-commerce.

(4) Most e-commerce websites in China are making electronic information research, making e-advertising, e-catalog, e-inquiry, exchanging commodity information on line; minor enterprises make such e-transaction on line (e-bargain and ordering), as making business negotiation, signing contracts, exchanging documents on line; few enterprises complete e-shopping and e-payment.

(5) Owing to the disparate development of different industries and areas, there are great differences in e-commerce between southeast coastal areas and the central and western areas. For the moment, metropolises in southeast coastal areas have carried out e-commerce while most cities and countryside in the central and western areas have not. However, it is likely that the new arrivals will surpass the old-timers.

(6) Various, multiple and multimodal strategies for e-commerce development shall be adopted for the following factors: the weakness of information foundation of national economy, the low-level business automation, the coexistence of traditional business and modern e-commerce, and the coexistence of traditional market and online market.

Open questions in the development of e-commerce in China:

(1) There are no clear development strategies and forceful technical and economic policies for e-commerce development. There is no specific programs for e-commerce development. Though policy frameworks for e-commerce have been drawn up for many years, no one has come into existence.

(2) Laws and regulations, standards, specifications of e-commerce seriously lag behind current situations and shall urgently be strengthened, and the unsuitable

parts in the current administrative laws have not been revised timely. For example, there are no specific laws on electronic contract, the protection of online knowledge property and privacy, online information supervision etc. What is more, there are no enforcement regulations of network crime convictions and penalization.

(3) Because of the low level of computer application, there are not many enterprises and families connected with network. In addition, information technology has not become popular in both enterprises and families. Though netizens in China has been up to 210 million by the end of 2007, it only took up 15.6% of the total population, which is relative low comparing with 19.1% of average global popularization rate. In addition, the netizens are mainly in metropolises such as Beijing, Shanghai, Guangzhou and many other eastern cites. Only not more than 15% of enterprises in China do e-commerce, which is rather low compared with other countries. For instance, 60% of the small enterprises, 80% of medium enterprises and 90% of large enterprises in developed countries do e-commerce by means of the Internet.

(4) Economy and operation environments for the development of e-commerce are not complete. For example, social credit system has not been established; the network bandwidth cannot meet the requirement of e-commerce; e-payment methods are not mature; logistics distribution system does not match its own development.

(5) The technological level and occupancy of market of home-made products in China's information industry are comparatively low. Hardware and software in significant applied engineering and systems of e-commerce are mainly from foreign companies. System integration and information service shall be improved. Corresponding standards and specifications of computer application are not universal and shall urgently be enforced. Standards of e-commerce lag behind the current conditions and apparently there is not adequate investment in it. Enterprise management systems, mechanisms, concepts and organization structure cannot meet the requirements of market economy. Apart from what have been mentioned, some leaders have not thoroughly realized the importance and urgency of e-commerce application. There are no internal force, labor force, financial and physical resources for an enterprise to adopt e-commerce. There are no adequate talents, especially inter-disciplinary for information technology and professional experts.

1.2 Influence of Related Basic Sciences on E-commerce

The development of e-commerce, a systematic engineering, basically bases on the development of many other related sciences and technologies. Sciences of mathematics, computer, communications, and management have great influence

on the development of e-commerce soft environment. The development of logistics distribution, postal service, communications, electronic technology exert great influence on the development of e-commerce hard environment. The above disciplines and e-commerce are interdependent and interactive. In this chapter, the influence of computer science, communication science, and management science on e-commerce will briefly be dealt with. As for other corresponding contents, it will be expounded in the following chapters.

1.2.1 Influence of Mathematics on E-commerce

Many branches of mathematics and mathematical models are involved in e-commerce, the multidisciplinary science. Common mathematical models involved in e-commerce will briefly be introduced in relevant sections, such as probability model, queuing theory model, nonlinear dynamic model, graph theory model and many other equally important models such as Petri Net and commercial patterns.

1. Probability model

(1) Random event and probability

In given condition, the thing that is likely to happen or not is called a Random event ("event", for short), usually represented by the capitalized letters such as A, B, C, etc. For instance, suppose tossing a coin in the homogeneous condition, heads occuring is a random event. In given condition, the thing that is sure to happen is called a certain event, represented by U. In given condition, the thing that is impossible to happen is called an impossible event, represented by ϕ .

(2) Probability model

Probability theory is a science to study quantitative law of random phenomenon in nature. Random events in probability theory can be abstracted into three models: classical probability model, geometric probability model, and conditional probability model.

(3) Probability property

① The probability(P, for short) of all random events(A, for example) shall be $0 \leqslant P(A) \leqslant 1$.

② The probability of a certain event is 1, and the probability of an impossible event is 0. That is to say, $P(U) = 1, P(\phi) = 0$.

③ If events A and B satisfy $A \cap B = \phi$, then $P(A \cup B) = P(A) + P(B)$.

(4) Relations between random events

To accurately work out probability, closely related to events, it is necessary to master the relations between probablility and events.

① inclusion and equality of events

② sum of events

③ product of events
④ incompatible events
⑤ contrary events
⑥ subtraction of events
(5) random events relations and probability calculation
① addition formula of contrary events probability

If event A is incompatible with event B, that is $A \cap B = \phi$, $P(A \cup B) = P(A) + P(B)$. For example, the calculation of the probability of "three-spot or five-spot" after throwing the dice falls into the category of incompatible events. Therefore, its probability shall be:

$$P(\text{three-spot or five-spot}) = P(\text{three-spot}) + P(\text{five-spot}) = 1/6 + 1/6 = 1/3.$$

② addition formula

The following is the formula for any random event A and B:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

③ In dependence of events. If event A and event B satisfy $P(AB) = P(A)P(B)$, they are independent.

If event A and event B are independent, then $P(B \mid A) = P(B)$, $P(A \mid B) = P(A)$

To accurately calculate probability, it is necessary to have knowledge of the relationship between random events and several common probability models. After that, it is just needed to calculate.

2. Queuing theory model

The information flow in e-commerce runs in global Internet. When the information arrives at the computer's intelligence node, it will flow to the next node, which needs processing by processors (called "service" in queuing theory). If information to be processed at the node is beyond the processing capacity of the processor, the information has to queue for processing. How long will the information has to wait for service? What is the length of the queue? How to arrange the queue to ensure the shortest queue, the lowest cost and the best service? All above problems will be studied in queuing theory.

The model of queuing theory is shown in Fig. 1.3.

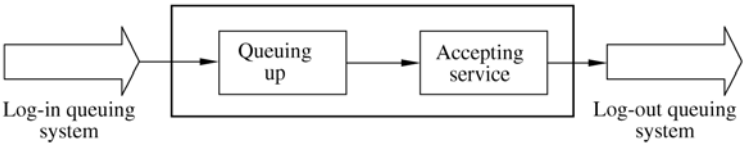

Figure 1.3 Queuing Theory Model

That is, the information arrives at the service window according to some law, queues for service in terms of some laws and leaves after getting service.

The following factors in queuing theory influence greatly on the whole process: F (laws of event arrival), S (service regulations), and M (numbers of service windows), by which we can express the mathematical models of queuing with the F/S/M in queuing theory. If a model with poisson's distribution as the event arrival, exponential distribution as the queuing discipline, "first come, first served" regulation as the service regulation, and the service windows being 5, its queuing model can be expressed by M/M/5.

The queuing models in common use contain the M/M/S model (arrival and treatment are all exponential distribution, and the number of service windows is S), M/M/S (the arrival distribution is the exponential distribution, treatment distribution is random distribution, the number of service windows is S) and privileged M/M/S (Data are treated on a priority basis).

3. Nonlinear dynamic model

Nonlinear science, a front-line science, is to study nonlinear phenomena in various subjects. It is a multidisciplinary science based on branches characterized by nonlinear, and is called the third revolution of natural science in the 20th century. The birth of nonlinear science reveals that people's cognition of things always goes from the easy to the difficult and complicated, and will gradually be deepened. Achievements of sciences make people enamored of the natural harmony and perfection, and form the idea that any complicated natural phenomenon can be described by a simple law or a set of specific mathematical equations. It is almost agreed by all physical scientists that universal fundamental laws are decisive and reversible, among which Newton's Second Law, $m\frac{\mathrm{d}^2x}{\mathrm{d}t^2}=F$, is the representative (m for particle mass, x for position vector of particle motion, F for external force). Actually it is not always the case, for there are the coexistences of both reversible and irreversible evolutionary processes, both determinacy phenomenon and chance phenomenon, both future incorporated in the past and future unincorporated in the past. Prigogine's "Dissipative Structure" theory questioned the symmetry of time, supplied new theory for the study of complicated phenomena in nature and therefore won the Nobel Prize in 1997. Presently, dissipative structurology, chaos, bifurcation, mutation theory, fractal theory, synergetics, cellular automata complement with each other. Accordingly, the nonlinear dynamics, a multidisciplinary to study complicated phenomena, comes into being.

Mathematical models studied in nonlinear dynamics contain dissipative structurological model, chaos model, bifurcation model, mutation theory model, fractal model, synergetics model, cellular automata model.

It is difficult to describe chaos model, fractal mathematics model, synergetics model, and cellular automata model with specific mathematical equations. Much of nonlinear dynamics can be applied to e-commerce. For instance, chaos and