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Towards an Electronic Commerce Growth Stage Model

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Abstract

The advent of the digital economy and Electronic Commerce (EC) can be seen not as the development of existing commerce but rather as a new commerce pattern caused by Internet technology. There are many possible definitions of EC, but in this research we consider the definition of EC as the buying and selling of information, products, and services via Internet. The application of EC is diffusing into various areas such as merchandising, finance, education, advertising, entertainment and government. To better understand the shaping process of EC and to predict the direction of further diffusion, the growth stage model of EC is required.

It is difficult to find a growth stage model in relation to EC. Therefore, in this study, we divide the EC into a series phases, then develop a model explaining the shaping process of EC, regarding major domains of EC such as economic, social, political and technical. To provide a theoretical basis for the growth stage model of the EC, we consider existing literatures about information systems, organization and industry life cycle and then suggest a growth stage model reflecting major characteristics of EC. The growth stage model of EC developed in this research can not only predict the direction of EC growth, but can also provide a useful model as guideline to organizations in planning EC.

Key Words: Digital Economy, Electronic Commerce Growth Stage Model, Shaping Process, EC Planning

1. Introduction

The advent of Electronic Commerce (EC) can be seen not as development of existing commerce, but rather as a new commerce pattern brought about by information technology, telecommunication network infrastructure, and Internet technology [31; 24; 9]. The definition of EC may be regarded in different ways but Kalakota & Whinston [21] defined it as buying and selling goods via network. Considering the application of EC diffusing into such various areas as company, merchandising, finance, education, advertising, entertainment and government, in this research, we define EC as all kinds of commerce activities in cyber space on the network of information communication technology (ICT) with a wide viewpoint. To understand the various areas of EC and to predict the

direction of the EC diffusion, the systematic framework is required [34].

The growth theory divides the growth stage, direction and diffusion aspects into some phases suggested by the peculiar characteristics. There are familiar growth stage theories such as Nolan's growth stage model [29], Utterback's organization innovation process model [37], McFarlan and Mckenney's technology diffusion model [27], Levitt's product life cycle theory [25] and Hofer's [15] and Grant's [13] industry life cycle model. However, among the various models of growth stage theory suggested by many researchers, it is difficult to find one that applies to EC. Therefore, in this study, we define EC into a series of phases and then develop a model explaining the shaping process of EC. To provide a theoretical basis for the growth stage model of EC, we consider existing literature about information systems, organization and industry life cycle, and then suggest a growth stage model reflecting the characteristics of EC. The growth stage model of EC developed in this research can not only predict the direction of EC growth but can also provide a useful framework as guideline to organizations in planning EC.

2. Theoretical Background

2.1 Review of Previous Research

This study review previous studies relevant to the growth stage models of information systems, organization, and industry to provide the theoretical background for an EC growth stage model. The most familiar growth stage model in IS is Nolan's Growth Stage Model [29]. Nolan's Growth Stage Model is the theory explaining the unique characteristics of each phase when an information system (IS) is adopted by an organization, being diffused. This is significant in allowing each organization to predict direction and then establish guidelines about IS planning and management. Nolan's Growth Stage Model is illustrated in Figure 1.

As can be seen in Figure 1, the growth stage of IS is divided into four stages namely: initiation, expansion, formalization and maturity. In the initiation stage, the organization introduces a computer to reduce cost in functional areas. In the expansion stage, electronic data processing (EDP) facilities are connected to a wide

variety of applications. EDP function is also expanded widely and the EDP managers' responsibility is increased. In the formalization stage, organizational control is used to regulate the growth of the computer use and the rising cost. To reduce the scope of cost rising, the organization

starts to strictly control the information system. In the maturity stage, information technology is diffused and integrated into various areas. Organization and information technology become combined, and the short-term supply and the long-term investment are balanced.

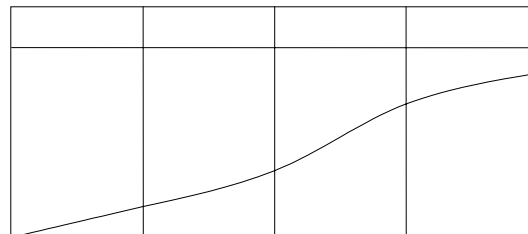


Figure 1. Nolan's Growth Stage Model

Utterback [37] suggested a theory dividing the innovation process of organization into three phases: idea generation, problem solving, and implementation and diffusion. The idea generation phase is the integration of information about the consumer's need and technical methods to reduce the gap between the idea and the technical suggestions. The developing process of new products is started by acknowledging the development possibility of technology, and from this, new ideas and concepts are advanced. The problem solving phase is the process of analyzing the technical problems given in the idea generation step. In this step, the information for problem solving has to be instantly usable, and other research and development activity is required. The implementation and diffusion phase is the process of using new processes for manufacturing, the shipping of new products into the markets and the delivering of information for innovation to make economical influence. On the basis of Utterback's model, the adoption of information communication technology can be understood as being shaped through serious steps such as the general innovation process.

McFarlan and Mckenney [27] suggested a different four-step model to analyze the diffusion of new

technology in an organization. First is the technology identification and investment step. In this step, a new technology with potential profits is identified, and capital for the technology application is raised. Second is the learning and adaptation step of the technology. In this step, the user share their ideas about previous problem with the technology application. The user's experimentation in various areas is also encouraged. Third is the rationalization and management step. In this step, many techniques are developed through the effective application of the new technology to guarantee the confidence and permanency of investing in new skills. Fourth is the widespread technology transfer step. In this step the effectiveness and experience of the new technology is spread and technical basis is affirmed. The learning of the technology is also finished and the long-term strategy is established.

The product life cycle theory is generally accepted as the model that echos the human cycle being born, growing, maturing and declining, at last arriving at natural death [25]. As each product has its life cycle, industry too has also a life cycle [15], as can be seen in Figure 2.

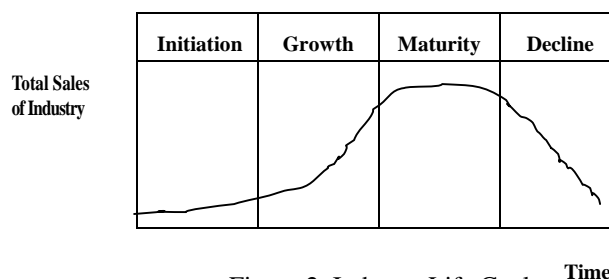


Figure 2. Industry Life Cycle

An industry grows through the initiation period. In the growth period, once a product is known to markets, the demand of the product has a tendency to rapidly increase. In the maturity period, the demand increase is slow-moving and diminishes. As it declines, the industry becomes a so-called 'decaying industry', with its scope constantly reducing. Major forces deriving industry life cycle is the pattern of demand increased. The demand

increase itself is regarded as the diffusion process of knowledge about the product. According to the progress of the industry life cycle, the demand is popularized from the high-income bracket, and the technology also becomes standardized [38]. Although, in the early stage, the product design is frequently changeable, the design becomes oriented for cost and durability, and then the difference disappears as standardization progresses.

Moreover, in the aspect of the production and distribution, at the early stage, the production is small scale. On entering the growth period, production scale becomes insufficient, but in the maturation and decaying period, over-production can cause a problem. The industry is usually a monopoly and oligopoly system of a few enterprises at the early stage. Gradually many new enterprises enter into the competition making it keen, and eventually, through the competition in price, many businesses withdraw. The major elements for the success

of each industry phase are different according to each step. For instance, in the early stage, product innovation is the major element. However, through the growth and maturation period, cost and process innovation becomes important. In the decaying period, cost reduction, the rationalization of industry facilities and the role of distribution and brand are important to take into account. On the basis of this review, Table 1 provides a summary of the previous research of the life cycle in terms of its strengths and weaknesses.

Table 1. Summary of Previous Research

Division Stage Model	Strength	Weakness
Nolan's Growth Stage Model [29]	<ul style="list-style-type: none"> •Ease of information planning •Effective management and control of system •Presentation of direction for MIS growth 	<ul style="list-style-type: none"> •Shortage of logical linkage between each stage •Difficulty of verification Model limitation for the electronic commerce system
MaFarlan's Information Diffusion Model [27]	<ul style="list-style-type: none"> •Supports long term information system planning •Effective information planning for the whole organization 	<ul style="list-style-type: none"> •Rigidity of information system planning •Gap immanence in the adoption of information technology to organization
Utterback's Innovation Process of Organization [37]	<ul style="list-style-type: none"> •Comprehensive model for organization innovation 	<ul style="list-style-type: none"> •Shortage of detailed characteristics at each stage of innovation
Industry Life Cycle Theory [15]	<ul style="list-style-type: none"> •Industry change based on life cycle •Arrangement of the development of industry structure and competition 	<ul style="list-style-type: none"> •Different concepts for applying to whole ICT

2.2 Previous Research of Electronic Commerce Model

This section shows the theoretical background for identifying the characteristics of EC and developing the growth stage model through a literature review about the EC model.

Nissen [28] suggested the integrated EC model. This model divides commercial activity between purchaser and seller into five functions, which are used as a framework showing the relationship in the functional process between product, information, and payment. The model describes the five functions as 1) need definition, 2) resource finding, 3) negotiation, 4) purchase, and 5) use and maintenance in the purchaser's aspect, as well as 1) the arrangement, 2) the customer finding, 3) the negotiation, 4) the order execution, and 5) customer support in the seller's aspect. Nissen's business model proposes a conceptual model focusing on the commerce process between purchaser and seller, therefore, it is somewhat limited to explain the global scope of EC.

Information Infrastructure Task Force [18] provides a global EC framework which explains the principle and policy in the aspects of the economic, legal, and business issues. The detailed explanation is as follows. First, it divides economic issue into 1) customer and tax, and 2) electronic payment systems. Second, in the legal issue, there are 3) the unified business code for EC on the Internet, 4) copyright, 5) privacy, and 6) preservation.

Finally, the business issue includes 7) network infrastructure, 8) content, and 9) technical standard. This framework divides the issue related to the EC into three aspects such as the economic issue, the legal issue, and the business issue. However, it is a limitation that this framework disregards the technical aspect, which is one of the major issues of EC.

Zwass [39] suggested a three level structure model to facilitate the complex system and the development of EC. He defined hardware, software, database, and communication technology as the infrastructure level; classified message, transmission, searching, negotiation, an agreement as the service level; finally, customers and business partners, information sharing and cooperation, and electronic markets are defined as the product and structure level. This model is meaningful for the hierarchical classification of EC in terms of the system aspect. However, it does not explain the relationship between the hierarchical levels.

Kalakota and Whinston [21] proposed an EC framework consisting of legal and public policy, standardization and protocol, the information super highway, network infrastructure, general business service infrastructure, and EC application technology. However, this framework is likely to focus on the technical aspects among the several EC elements, and does not provide major characteristics about each element.

The US government proposed a global EC framework to promote global commerce on the Internet [36]. The

framework divided the principle to guide policy development and the guidelines of essential issue about EC, and a road map for international commerce into the financial, legal, and market access issues. It sets taxes and customs, and electronic payment in the financial issue; EC code in the legal issue; information technology, communication infra, contents, and technology standards in the market access issue. This framework has tried to explain comprehensively the relevant part of EC. However, the technical issues that should be considered as important factors in the EC domain are not categorized as a separate issue.

3. EC Growth Stage Model

3.1.1 Social Aspect

In e-commerce diffusion, the most important aspect is the social aspect. Generally, people prefer business in the market place so it is necessary to expand their understanding and experience about cyber business through networking. Moreover, it is only recently that the Internet is diffused and used in various social fields. Therefore, social members' recognition and reliance on cyber business based on networks such as the Internet have a major effect on the diffusion of EC. In addition, there is social risks in the barriers to the diffusion of EC. For example, the consumer's protection, contract completion, identification problems, counterfeiting of electronic payments, personal information protection and so on. Therefore how to handle effectively the various risks from transaction through EC is a major factor for the diffusion of EC.

3.1.2 Economic Aspect

EC changes the structures and the transactions of business, the organization, market and industry. Therefore, we need to examine the influence of the economic aspect within EC diffusion. That is, it is necessary to consider the usage of electronic payment, the reduction of product circulation process [6], the curtailment of distribution process [5], and the reduction of transaction cost. Without an intermediary such as the middle distribution process, direct business transaction between the seller and buyer is possible on the network, curtailing the transaction cost [32]. Moreover, e-commerce based on information communication network infrastructure is different from traditional business in terms of product types and business transactions. It is expected that the world EC market will grow rapidly. Research agencies predict a 70-100% mean yearly growth. Therefore, it is predicted to continuously increase the portion of total sales based on e-commerce in a firm. On the basis of these, we analyze major issues in the economic aspect and then reflect them in the growth stage model of EC.

The previous EC models provide limited frameworks regarding some elements of EC. This article attempts to provide an EC growth stage model for predicting the shaping process of EC.

3.1 The Development of the Framework for the EC Analysis

This study extracts major variables to adequately explain the phenomenon of EC better than previous research EC models. We attempt to divide the various EC issues into four aspects: 1) the social aspect [18; 21], 2) the economic aspect [28; 18; 36], 3) the political aspect [18; 36], and 4) the technical aspect [39; 21; 36]. The detailed explanation of each aspect follows.

3.1.3 Political Aspect

To successively promote EC, regulations and legislation should be established. After the government establishes a general policy, actions, standards and plans for facilitating EC, they need to drive forward to a pan-government policy in line with the industry policy, the active support, and the institutions considered on government dimension. Without this preparation of policy, the continuous diffusion of EC will not happen. Therefore, the policy level and the time predicted for policy establishment are important elements for the determination of EC growth. On the other hand, e-business on the Internet is performed through different procedures from those of the off-line business [16]. Thus, it is necessary to establish new laws for the electronic signature to recognize electronic business and transaction [11]. Settling the core of the disputes and the electronic registry should be reached by the agreement. The intellectual ownership on the Internet, patent rights, trademark rights and conveyance are to be entered into in domestic and foreign agreements.

3.1.4 Technical Aspect

To facilitate e-commerce, it is necessary to develop the essential factors and subside EC technologies. EC uses various forms of information such as data, voice, and pictures between the contracting parties in a business on the basis of ICT. Because EC is in a developing state, there are many tasks to be solved technically and socially. These problems and tasks will be gradually settled. However, to make EC active, the technical issues like the network infrastructure, the security for safe deals and the electronic payment system must be seriously considered [20]. That is, the technical infrastructure should be prepared to facilitate the shaping process of EC [39]. A safe network must exist to make EC possible and then communication functions reorganized. In addition, the technical aspects need to be established the security and the standard of information sharing, the platform of software and hardware, the building of databases and the

electronic payment system to exchange products and services.

These are the major issues in the four aspects of EC in terms of society, economy, policy, technology. On the

basis of this review, we attempt to arrange the detailed variables to be analyzed in the four aspects of EC (see Table 2).

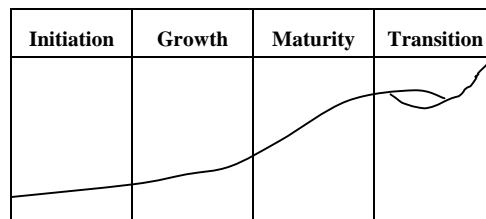
Table 2. Analysis Category of EC Growth Stage

Analysis Domain		Explanation
Aspects	Analysis Variable	
Social Aspect	Social Trust	•the degree of reliance of social members accepting e-business through network [19].
	E-business Awareness	•the degree of awareness of social members about the various trade through e-business [19].
	Risk degree	•the degree of risk in the various trades through e-business [8].
Economic Aspect	Product	•the type of products in e-business [19].
	Transaction Cost	•the cost of products in e-business [19; 8].
	Gross Sales	•the relative importance of sales in e-business [6].
Political Aspect	Laws & Institutions	•the laws and regulations in online business [11].
	Policy & Publicity	•Policy and public information for the diffusion of the e-business [22].
Technical Aspect	Technological Infrastructure	•the degree of development and application in the e-business technology [30; 8].
	Standardization	•the degree of Standardization for information sharing and electronics with e-business [10]
	Security	•the degree of the advance of security systems in performing e-business [10]

3.2 Development of EC Growth Stage Model

We attempt to provide a growth stage model for EC on the basis of Nolan's growth stage theory and industry life cycle model. We divide EC growth into four stages: initiation, growth, maturation, and transition; we then

analyze major issues on EC according to a social aspect, an economic aspect, a political aspect and a technical aspect. The EC growth stage model applied in this study can be seen in Figure 3. We then analyse the characteristics of each step on the basis of the EC analyse category defined in Table 2.



<Figure 3> EC Growth Stage

3.2.1 Initiation Stage

In the initiation stage, enterprises try to propose the product and service to customers and buyers through e-commerce. The acknowledgment degree of social members and the reliability of EC are low, but the danger degree is high.

In addition, the demand of the product is small, but the amount of sales is increasing. The products for this stage focus generally on special products such as the books, flowers, S/Ws and CDs with low prices and simple processes for selling and buying. The number of EC users are few. That is why not only the transaction cost is somewhat high, but also the sale price of EC is low. This high transaction cost in the initiation stage will play as a factor to delay the diffusion of EC.

The institution and laws concerning EC in the initiation stage are not arranged systematically, and a preparation is made to make them legal. The policy plans of EC are mainly acted out by governments. The

education and public information for EC diffusion usually made by experts become more popular among the public. The essential technology of the technical infrastructure is developed in this stage, and unstandardized EC technologies compete with each other. They will have keen competition that leads toward standardization. The security technology is somewhat vulnerable to external infringement and hackers, because in this stage the basic technology and network infrastructure is still developing.

3.2.2 Growth Stage

In the growth stage, the competitions among many enterprises are more accelerated due to the innovation of ICT and EC diffusion. Therefore, product sales and services are diffused step by step among customers and in the company. In proportion to the understanding of social

members and the social trust for EC, the danger degree become weak.

In this stage, it is necessary to affirm the EC support system using information technology as fast as possible. This will obtain a relative advantage in the customer market by occupying the electronic market before other companies can.

In the initiation stage, the companies open their homepages, and send their information through electronic catalogs to introduce their products and service to customers. However, in the growth stage the total product selling on the Internet will be expanded and the amount of sales is increasingly enlarged. Though EC diffused, the existing intermediaries will disappear and new type of middleman will have an advent. That is, if the customer spends more time searching for a product on information, the electronic intermediary will be needed to execute it in cyber space. Through this, the transaction cost per unit will be lower and lower.

EC institution and law of the growth stage become systemic and strengthen the background for facilitation of EC use, settlement, and diffusion. EC policy and public information led by the government in the initiation stage are transferred into public organizations and companies at the growth stage. The public information and education of EC are expanded for the general users of EC.

EC technology in the growth stage become more standardized as the unstandardized technology drops out. As the technology standardizes, the technology diffusion speeds up. With this, the security technology is improved for identification and certification, approach control, alteration prevention, and auditing. In particular, the certification agency is affirmed, the form of certification is set, and the standard protocol for digital signatures is established in the growth stage.

3.2.3 Maturity Stage

Social trust and customer acknowledgement of EC become mature in this stage. As the degree of danger on the EC lowers, the market share and the revenue of the EC gradually increase.

At this point, the customers will know well the characteristics of each internet business each, and various types of internet business models will appear. As the various types of products become standardized by the high market share products, the differentiation is reduced. In addition, with the technology diffusion, imitations are easily made. That is why the EC market is being aggravated and overwhelmed with competitors.

Therefore with a mature EC market, a strategy is needed to adjust the competitive advantage from differentiation to cost. Intangible digital products such as music, software, movies, research information, and VODs are going to be transferable on a massive scale. However, with users increased through EC, the transaction costs per unit become low, the degree of the sale price of EC will be high in the total sale price.

In the previous stage, the laws for EC encouragement and EC usability were confusing due to the scattered and

systematically unmanaged legal issue. However, in the mature stage, the law will be unified. The users' acknowledgments of EC diffusion play an important role. Therefore, the education and publicity for users is to be made.

Moreover, in this mature stage, the technology base of EC will be completely standardized and then spread extensively. One of the most important technologies in EC is security. This will be completed and standardized in relation to the telecommunication security, shopping mall certification, security technology of customer data and so on.

3.2.4 Transition Stage

The transition stage is the transformation period to facilitate EC growth, re-establishing new strategies, products and ICT facing limitation in the previous growth stage. That is, the technology and knowledge accumulated during the EC growth stage get newly arranged, applied and then a new strategy of information communication technology will be provided.

Furthermore, the various business domains of EC are reviewed, arranged and unified. EC systems run loosely in the past will be newly evaluated and redeveloped according to the new information strategy. The EC laws revised by separate countries will have been unified into a law of international EC.

New technological advances to challenge technological are needed. In technology research, when standard technology is compared with research ambition for the technology, if research ambition is lower than the technology standard, it will be categorized as a technology-push. On the other hand, if higher, it will be categorized as the demand-pull [24; 9; 35].

Until now, EC research is inclined to the technology-push. However, in the transition stage, with new theory and research ambition diffused, the paradigm of technology research [23] will be changed into the demand-pull. The companies that do not grope for technical advances in the transition stage will be combed out in competition with other companies that are entered in the e-commerce market with advanced technology.

4. Conclusion

EC is regarded as a new type of business system in which a product and service are transferred to clients on the basis of the information communication technology. The rapid diffusion of Internet use and the active efforts for making networks rapid, the endeavor of the company and the financial institution for the support of EC and the advanced technology for payment system have made EC a new paradigm of the global digital economy in the 21 century. However, among the research until now, there has been no research presenting an EC growth stage model for the phenomenon of EC diffusion process, and the prediction of the further direction of EC growth.

In this paper, on the basis of the stage theory suggested by many researchers, we present an EC growth stage model. We divided EC growth into four stages: initiation, growth, maturity, and transition, and then classified major issues of EC into four categories: social, economical,

political, and technical aspects. With this, we identified the major characteristics according to EC growth stage. The characteristics of EC growth stage discussed in this study are outlined in Table 3.

Table 3. Characteristics of EC Growth Stage

Analysis Domain		Electronic commerce Growth Stage			
Aspects	Analysis Variables	Initiation	Growth	Maturity	Transition
Social Aspect	Social Trust	Low	Medium	High	Very High
	Awareness of E-business	Low	Medium	High	Very High
	Risk Degree	High	Medium	Low	Very Low
Economic Aspect	Product Type	Special	General	Digital	-
	Trade Cost	High	Medium	Low	Very Low
	Gross Sales	Low	Medium	High	Very High
Political Aspect	Laws and Institutions	Preparation	Individual EC Law	Unification of Domestic EC Law	Unification International EC Law
	Policy and Publicity	Nationally Oriented	Enterprise Oriented	Consumer	General
Technical Aspect	Network Infrastructure	Development	Standardization	Application	New Paradigm
	Standardization	Low	Medium	High	Very High
	Risk Degree	Low	Medium	High	Very High

The EC growth stage model suggested in this research will provide individuals and organizations with a useful conceptual framework for understanding the process of EC. However, in further study, the actual application of the EC growth stage model presented in this paper should be applied in practical e-commerce circumstances.

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