A Study on the Influence factors for Development of Korean IT Service Industry

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Abstract

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After 1990, Korean information technology industry was developed enormously. To estimate these situation, there were many studies such as based on resource based view, transaction cost theory, and so on. These studies were focused on the efforts of company itself and the main body of development were the company not environmental factors. But in developing countries such as Korea, environment which is government policies, other companies, etc. is important factor. So present study estimate the environmental factors for evolution of Korean IT industry with population ecology concept..

Keywords:

IT Industry, Population Ecology, Organizational Founding

Introduction

Among organizational theories, population ecology of organizations has received growing attention in the scholarly literature. The theory adopts a selection approach for studying organizations, It seeks to understand the dynamics of change that take place within organizational populations as well as to understand how organizational characteristics, ecological determinants, and macro-environmental conditions affect the rates of these processes is an important element of organizational ecology, questions of organizational founding have received relatively less research attention.

The past 20 years of efforts for informatization has put Korea on top of the world in terms of IT with the world's best network infrastructure and a competitive IT industry. All of this has been achieved through government policies that foster IT, private sector investment into IT infrastructure, and people's capability to actively adopt and recreate new technology and trends(NIA, 2006).

Countries around the world are now making strong efforts to find ways to become a leader in the ubiquitous society, or the information revolution. Korea has also established and is promoting national strategies in order to take on the 'ubiquitous revolution' as an opportunity for national growth.

Thus, there is tremendous contribution to develop Korean information technology industry. But there is little researches about government and public sector support and effect. Many researches treat these environmental factors with only secondary ones. So present study shows the importance of environment factors in growing industry, especially information technology in developing countries such as Korea.

Status of Korean Industry

IT Equipment

Production by the Korean IT equipment industry grew 0.6% to KRW 165.9 trillion in 2005 from KRW 164.9 trillion in 2004. Compared to 2004, components production increased 3.9%, whereas production of telecommunication, information, and broadcasting equipments decreased by 0.4%, 6.9%, and 9.3% respectively.

The export of IT equipment grew considerably over the last three years (18~32.8%), but the growth rate was 9.2% between 2004 and 2005 at USD 102.33 billion. The export of information and broadcasting equipment respectively fell 18.8% and 5.7% whereas telecommunication equipment and components grew 7.4% and 31.5%.

The import of IT equipment increased 8.4% from USD 49.75 billion in 2004 to USD 53.95 billion in 2005. The import of broadcasting equipment decreased 4.0%, while telecommunication and information equipment, and component imports increased 14.8%, 19.6%, and 6.6% each.

Software

The Korean software industry recorded significant growth from 2000 to 2005 at an average annual growth rate of 14.0%, exceeding the volume of KRW 20 trillion. In 2003 and 2004, it lingered around at a mere 1.0% growth rate due to a slump in the global IT market, but it soon recovered to 10.6% in 2005. The negative growth in packaged software also turned around thanks to the continuous growth in computer-related service and digital contents, recording the production volume of more than KRW 21 trillion. Software

exports in 2005 grew to USD 1.189 billion, which showed an annual growth rate of 49.7% from USD 155.84 million in 2000. The exports in digital contents development service in 2005 significantly increased 109.0% from 2004, and the export in computer-related service grew 10.6%.

Packaged Software

The packaged software market expanded to a 20.4% average from KRW 2.173 trillion in 2000 to KRW 5.936 trillion in 2005. The market for each type of packaged software also grew. For application software, the biggest segment in the market showed a growth rate of 33.2% compared to the rate in 2004, followed by the next biggest, system software with 32.7% growth.

Computer-related Service

The computer-related service market grew by an average annual rate of 11.0% between 2000 and 2005, from KRW 8.1486 trillion in 2000 to KRW 13.7584 trillion. The system integration (SI) service sector fell 1.2% from 2004, whereas system management and maintenance grew 7.5%.

Digital Contents Development Service

The digital contents development service market expanded by an average annual growth rate of 25.9%, from KRW 565.8 billion in 2000 to KRW 1.7882 trillion in 2005. The entertainment and game sector holding the biggest segment saw a decrease in production volume by 2.3% compared to 2004, while the life and culture information contents, which showed a dramatic fallback in 2004, fully recovered its growth.

Information Technology Service Industry

The IT service is the key industry that has led the growth of Korea's IT industry as well as the entire national economy since the 1990s. Its growth rate has somewhat slowed as the market attained maturity, however, there are a few sectors around wireless data that are still growing significantly. Also with emergence of new services, the IT service industry is expected to maintain its position as the key industry for national growth in the future. Sales in the IT service industry in 2005 reached KRW 44.6729 trillion, which is a 4.1% increase from the previous year. The backbone telecommunication sector also marked a slight growth with launch of new services like Internet phone and entry of new broadband Internet providers, despite decelerated growth in voice sales and market pressure to cut down service fees. The sales in online information service led the growth of entire value added telecommunication sector with better accessibility to gateways of mobile phone operators, which were enabled by the policy that opened their wireless network from the latter half of 2005. The sales in IT service market is growing on average 5.0% every year, and is expected to reach KRW 57.2650 trillion by 2010.

IT Industry Export and Import

Though the increase rate of IT export in 2005 slowed down to 9.2%, it topped the USD 100 billion level for the first time in history and reached USD 102.3. The amount of IT imports in 2005 increased 8.4% from the previous year to USD 53.95 billion, and the balance of IT industry trade in 2005 recorded a surplus of USD 48.4 billion, which is more than double or 209% of the surplus of the entire industry trade of Korea in 2005, USD 23.2 billion. The IT industry portion in the entire export industry is still large at 36% since 2003, and the portion of imports is 20.7%, constantly decreasing from its highest level at 23.7% in 2003. A breakdown of exports shows the mobile communication devices slowed its increase with 0.7% or USD 19.55 billion, while mobile communication components increased 32.7% or USD 6.28 billion. Thus, the export of mobile communication devices including components came to exceed USD 25 billion. Meanwhile, the export of semiconductors increased 18.5% from the previous year at USD 32 billion exceeding USD 30 billion level for the first time in history. Exports in memory semiconductors that takes up more than 50% of semiconductors exported decreased 0.5% from the previous year, whereas the export of logics (17.3%) and wafers (74.2%) dramatically increased. The export of digital TVs (including components) reached USD 6.15 billion, a 6.4% increase from last year; however, LCD monitors fell down by 7.0% to USD 6.28 billion. USD 10.2 billion worth of display panels were exported with 134% increase from the previous year, entering into the top three export items that exceed USD 10 billion, following mobile phone devices, and memory semiconductors.

Previous Researches on Organizational Founding

In 1975, Oliver Williamson published *Market and Hierarchies*, which redefined transaction cost analysis. In 1977, John Meyer and Brian Rowan published a foundational article on institutionalized organization, and Michael Hannan and John Freeman published their seminal article on the population ecology of organizations In 1978, Jeffrey Pfeffer and Gerald Salancik published their book on resource dependence theory, *The External Control of Organization(Amburgey and Rao 1996)*. Thus, population ecology concept is main theme in organization behavior researches.

The organizational founding literature has focused its attention on the effects of ecological variables(population density, prior foundings, and prior deaths) and some institutional foundings(Messallam 1998). A decade ago, the concern has shifted to testing the effects of the degree of organizational niche overlap and non-overlap on foundings of organizations(Baum and Singh 1992)

The goal in this paper is to answer the following question, do ecological variables and institutional-environment variable affect the organizational foundings differently. The theoretical perspective selected, the previous empirical

evidence gathered, and the hypotheses proposed in the present study concerning the effects of these variables, will each be discussed below.

Density Dependence and the Population Dynamics of Organizational Founding

Ecological research suggests that population density, prior foundings, and prior deaths affect the foundings of organization. The effect of population density on the founding is widely recognized as the density dependence model of organizational founding(Carroll and Hannan 1989). Desity dependence means that the dynamics of a population depend on the size of the population itself. Hannan and Freeman(1989) proposed that organizational founding and entry rates respond th process of legitimacy and competition and that founding has a nonmonotonic, inverted U shape with regard to density. The results of previous researches were concerning the effects of population density on organizational foundings require more attention be given to a further examination of other organizational population(Hannan and Freeman 1987, Tucker et al 1988, Carroll and Hannan 1989, Barnett and Amburgey 1990). Furthermore, Singh and Lumsden(1990) emphasized the importance of modeling population density and population dynamics(prior foundings and prior deaths) together. The present study aims at testing the curvilinear effect of density on founding and at modeling the effects of population density and population dynamics toghether. This modeling will show the relative importance of these variables in affecting organizational founding.

Hypothesis 1 : Population density has a curvilinear relationship with organizational founding.

Many empirical studies supply supporting evidence for the effect of prior foundings(Delacroix and Carroll 1983, Tucker et al 1988, Carroll and Hannan 1989). While other empirical research reports a monotonic effect of prior foundings, Delacroix and Solt(1988) found a strong positive effect of prior foundings in the California wine industry. Barnett and Amburgey(1990) also found a positive relationship between prior and subsequent foundings of American telephone companies. Tucker et al.(1990) noted that the effect of prior foundings of voluntary social-service organizations on current foundings is positive. Yet, the curvilinear effect of prior foundings is not found to be present in a population of marketing cooperatives(Staber 1989). The present study expects a curvilinear effect of prior foundings on subsequent foundings.

Hypothesis 2: Prior organizational foundings have a curvilinear relationship with organizational founding.

The curvilinear relationship between prior deaths and subsequent fouding rates has also received mixed support in t he empirical research. Delacroix and Carroll(1983) suggested that prior deaths have a curvilinear effect on the births of newspapers. Tucker et al.(1988) also found that

prior deaths have a significant curvilinear effect on founding. On the other hand, Holliday et al.(1987) reported that prior deaths have a negative effect on the subsequent founding of state bar associations. Barnett and Amburgey(1990) also found that prior deaths were negatively related to subsequent foundings of telephone companies.

Hypothesis 3: Prior organizational deaths have a curvilinear relationship with organizational founding.

Environmental Conditions: Economic and Political

Organizational researches suggest that environmental conditions affect the birth frequencies of organizations(Delacroix and Carroll 1983). Several empirical studies have examined the effect of economic conditions on organizational founding. Most of the previous studies have focused on common economic indicators such as economic conditions(Delacroix and Carroll 1983, Carroll and Huo 1986, Hannan and Freeman 1987), availability of capital(Delacroix and Solt 1988), and Gross National Product(Carroll et al 1989). The present study seeks to examine the effect of some new economic indicators on organizational foundings. These indicators are the growth rate of the GDP, the growth rate of export, and the growth rate of imports.

Hypothesis 4 : Population density has a curvilinear relationship with economic indicators
Hypothesis 4a : Population density has a curvilinear relationship with the growth rate of GDP.
Hypothesis 4b : Population density has a curvilinear relationship with the growth rate of export.
Hypothesis 4c : Population density has a curvilinear relationship with the growth rate of import.

Concerning the empirical evidence gathered on the effects of political conditions on organizational founding, the newspaper industry studies(Delacroix and Carroll 1983, Carroll and Huo 1986) have shown that political turbulence strongly affects founding. Concerning the effects of political turmoil on investment The effect of the legal environment on organizational founding has received little attention in population ecology studies. From the ecological perspective, models of policy effects on organizational populations have not been well developed(Wholey an Sanchez 1991). This may be due to the fact that most of the previous studies examined populations that were largely unaffected by government policy. Carroll et al. propose that 'it is worth considering a few of the industries that have experienced drastic policy changes and for which some organizational data are available'(1988: 375). The present study aims to expand population ecology research to include policy changes as another institutional environment variable that may affect organizational founding.

Hypothesis 5 : Population density has a curvilinear relationship with new IT policy.

Methods
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In line with earlier organizational ecology research, the present study uses the event history analysis technique to estimate the effect of ecological and institutional-environment variables on organizational foundings. The purpose of such estimation is to come up with a model that describes better the determinants of the foundings of information technology companies in Korea.

Population

The population of interest in this study is the entire population of companies registered on stock exchange market or audited by financial firm during the period 1992-2004. The reason for choosing 1992 as starting year of publishing Annual Corporation Reports by Maekyung Economic Paper Company.

Data Collection

In line with earlier studies, data required for the event history analysis were collected from various secondary sources. The data defining the events of interest, organizational founding and organizational withdrawal, were collected from annual corporation report and KORCHAMBIZ(www.korchambiz.net). Data about macro-economic variables were gathered from economic statistics system(ecos.bok.or.kr) of Bank of Korea. And the data about national information policies and changes of IT cabinet are gathered from the homepage of ministry of information and communication of Korea and Korea Internet White Paper 2007.

Variables and Measurements

Dependent Variables
The organizational founding is the dependent variable in the present study. The organizational founding date is defined as the formal incorporation of the organization(Singh et al. 1986). The present study considers the formal date when registered on stock exchange market or audited by financial firm.

Independent Variables
The dependent variables are classified into two groups – ecological and institutional environment variables. The two ecological variables are prior foundings F(t-1), the total number of firms that withdrew in the previous year, and population density N(t). Population density is calculated annually by using the following equation:

$$Density_{(t)} = Density_{(t-1)} + foundings_{(t)} - Deaths_{(t)}$$

The institutional-environment variables are made up of economic three economic variables(the growth rate of Gross Domestic Product(GDP), exports(EXP), and imports(IMP)) and new published IT policies(POL) counted each year.

Analysis Method

To estimate the organizational founding, the poplation is considered to be the unit of analysis. Foundings have been treated as the events through which the population is produced(Amburgey and Carroll 1984). Follwing previous studies(Hannan and Freeman 1987, Carroll and Hannan 1989), the 'duration of time' between successive foundings is used to estimate the effects of independent variables on organizational foundings. The regression analysis has been used to estimated the effect on organizational foundings.

Data Analysis and Results

Descriptive Statistics

The distribution of the number of total foundings of IT companies in Korea during the period 1992-2004 is shown in Figure 1.
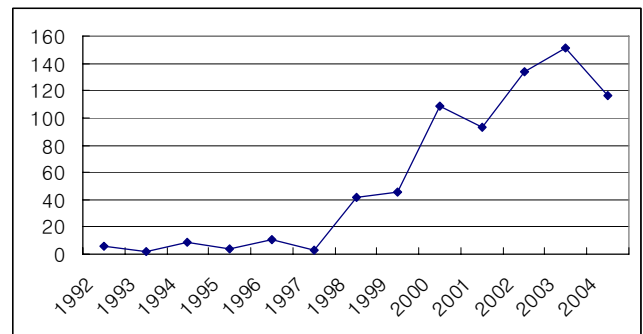

Figure 1 – The distribution of the number of foundings

Density Dependence Across Populations

To estimated the relationship between density and foundings and deaths, we analyze regression as below.

Model Summary

Model	R Square	Adjusted R Square	Std. Error of the Estimate
1	.892	.871	47.57273

a   Predictors: (Constant), d, f

ANOVA(b)

	Sum of Squares	df	Sig.
Regression	187662.357	2	.000(a)
Residual	22631.643	10	
Total	210294.000	12	

a   Predictors: (Constant), d, f
b   Dependent Variable: density

Coefficients(a)

	Standardized Coefficients	t	Sig.
	Beta		
(Constant)		.252	.806
f	.923	6.382	.000
d	.031	.214	.835

a Dependent Variable: density

By the result, there is significant relationship between density and founds. So, hypothesis 1 was accepted.

And to estimated the effect of prior foundings and deaths to the foundings, we analyze regression as below.

ANOVA(b)

	Sum of Squares	df	Sig.
Regression	940.611	2	.428(a)
Residual	4530.306	9	
Total	5470.917	11	

a Predictors: (Constant), p_d, p_f
b Dependent Variable: f

As the above result, there is no significant relations between prior foundings or deaths and foundings, so hypothesis 2 and 3 are rejected.
And the results of the analysis which estimate the relationship between population density and economic indicators are below.

Model Summary

Model	R Square	Adjusted R Square	Std. Error of the Estimate
1	.525	.367	105.32959

a Predictors: (Constant), IMP, GDP, EXP

ANOVA(b)

	Sum of Squares	df	Sig.
Regression	110445.101	3	.071(a)
Residual	99848.899	9	
Total	210294.000	12	

a Predictors: (Constant), IMP, GDP, EXP
b Dependent Variable: density

Coefficients(a)

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		3.796	.004
GDP	−.844	−2.970	.016
EXP	.050	.131	.898
IMP	.633	1.463	.177

a Dependent Variable: density

By the result, there is significant relationship between density and economic indicators. Especially, GDP affect to the population density individually. So hypothesis 4 and 4-1 are accepted.

And the results of the analysis which estimate the relationship between population density and IT policies are below.

Model Summary

Model	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669	.636	81.29381

a Predictors: (Constant), pol

ANOVA(b)

	Sum of Squares	df	Sig.
Regression	133589.418	1	.001(a)
Residual	66086.832	10	
Total	199676.250	11	

a Predictors: (Constant), pol
b Dependent Variable: density

Coefficients(a)

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		−1.454	.177
pol	.818	4.496	.001

a Dependent Variable: density

As above result, there is significant relationship between population density and new IT policies. So hypothesis 5 was accepted.

Discussion and Conclusion

Population ecology has attracted its share of critical attention(Astley 1985, Perow 1985, Young 1988), and some of the criticisms are currently being actively debated(Freeman & Hannan 1989, Brittain & Wholey 1989, Young 1989). The main criticisms relate to the supposedly deterministic nature of ecological ideas, the lack of attention to adaptation and change, the nature of the key constructs and the units of study, the nature of the organizational populations studied, and the divergence between theoretical constructs and their measures, particularly in the density-dependence arguments
In present study, we proved some hypothesis that the relation between density, founding, and envirinional factors such as economic indicators and IT policies. So we could get the result that there is significant affect to density by foundings, GDP, and government policies.
But there is some problem in coordination about density. In