http://dx.doi.org/10.14400/JDPM.2013.11.12.11

이러닝 지원정책 활용성숙도 분석을 통한 정책 효과성 제고 방안

노규성*, 박상휘**
선문대학교 경영학부*, 한국외국어대학교 경영정보학과**

Measures for e-Learning Policy Effectiveness Improvement through Analysis of Maturity of Korean Policy Application

Kyoo-Sung Noh*, Sanghwi Park**
Div. of Business Administration, Sunmoon University*
Dept. of MIS, Hankuk University of Foreign Studies**

요 약 본 연구는 한국 정부의 이러닝 기술개발(R&D) 지원 정책에 대한 이러닝 공급업체의 정책 활용 성숙도를 분석하고, 기업 경영상 애로사항이 성숙도에 어떠한 영향을 미치는지 분석하여 정책의 효과성을 높일 수 있는 방안에 대해 모색하고자 한다. 이를 위하여 2012년 이러닝 산업 실태조사 자료를 이용하였다. 실태조사 자료 중 정부의 정책에 대한 기업의 인지, 경험, 향후 이용의향 설문 항목을 활용하여 6단계의 성숙도 모델이 도출이 되었으며, 이에 대한 운영, 기술개발, 마케팅 등 경영상 애로사항이 미치는 영향에 대하여 분석한 결과 이러닝 업체들은 자금 관리, 개발 기술의 사업화에 어려움이 많을수록 기술개발 지원정책 활용 성숙도가 높은 것으로 나타났다. 이러한 연구 결과를 바탕으로 지원 정책의 효과를 높일 수 있는 방안에 대한 함의를 논의하였다.

주제어 : 이러닝, 성숙도 모델, ICT 정책, 이러닝기업 애로사항

Abstract In this study, we analyze how the difficulties of e-learning firms' management affect to the maturity of the practical use of e-learning research & development (R&D) policies. And we explore the method that can enhance the effectiveness of policy. In the pursuit of this purpose, we use the 2012 South Korea e-learning industry survey data. Using variables of recognition of policy, experience of policy, and intention to use of policy, we find the maturity model of six stages. And we analyze the impact of the difficulties of operation, technology development, marketing to the maturity model. As a result, the more e-learning firms have problems of fund management and technology commercialization, they are located the higher maturity of the use of policy. Based on the results of these studies, we discuss the implication for how can enhance the effectiveness of policies.

Key Words : e-learning, maturity model, ICT Policy

Received 20 November 2013, Revised 20 December 2013
Accepted 20 December 2013
Corresponding Author: Sanghwi Park(Hankuk University of Foreign Studies)
Email: mis.psh@outlook.com

ISSN: 1738-1916

1. Introduction

The scale of the Korea e-Learning supply market increases each year. According to the 2012 Korean e-Learning Industry Survey Data, the total sales of the e-Learning supply market in 2012 was 2.7478 trillion won, an increase of 12.1% from 2011. The e-Learning industry develops each year: e.g. the market scale trend for the recent 5 years shows a stable growth from 1.7271 trillion won in 2007 to 2.7478 trillion won in 2012, and sales in major business areas, e-Learning content and solution businesses recorded a growth rate of 5%[8]. The Korean government promotes various policies for the improvement of small and medium sized e-Learning companies to support this development of the e-Learning industry[4], but it is pointed out that these policies are isolated from the industrial field[3].

Thus, this study analyzed the maturity of the applications of the policies supporting e-Learning companies in order to narrow this gap and examined the actual degree of utilization. In addition, it analyzes the impacts of difficulties in company management on maturity to propose plans to increase the effectiveness of the policies.

2. Related Works

2.1 e-Learning Policy and Supporting Business

The Ministry of Knowledge Economy of Korea announced the second e-Learning Industry Development and Revitalization Master Plan in 2011[5]. The Master Plan includes four strategies such as qualitative growth, smart learning, consumer orientation and export expansion and ten policy challenges such as improvement of e-Learning industry ecosystem, strengthening of technology innovation ability, training the creative talents, promotion of effective utilization of e-Learning and e-Learning industry overseas expansion[7].

In improvement of e-Learning industry ecosystem area, projects such as small and medium scaled e-Learning company development and establishment of fair trade, improvements and infrastructure composition for activation of use of e-Learning publication, e-Learning foundation, small and medium company support and sophisticated quality management system have been promoted. In strengthening of technology innovation ability area, projects such as e-Learning content and customized learning management R&D, e-Learning standardized response and e-Learning professional manpower training have been promoted, and in promotion of effective utilization of e-Learning field, projects such as expanded introduction of e-Learning, small and medium company e-Learning introduction support, support using e-Learning for vulnerable classes in the field of public education have been supported. Lastly, in e-Learning export activation area, projects such as a strategic partnership establishment for developing overseas market, globalization support, solution of differences in education between advanced countries and developing countries through educational IT investment have been promoted[7].

2.2 Studies on Maturity Models

Nolan (1973) found through an experiment made between 1969 and 1971 that IT investment costs by time formed an S-shape. Based on this, he classified the information system growth phases of an organization into four stages: introduction, expansion, formalization and maturity, and starting from this, the information technology maturity model has continuously evolved and developed in various forms in research of organizations or field of studies on management[9].

Of these studies, Capability Maturity Model (CMM) developed by the Software Engineering Institute (SEI) at Carnegie Mellon University to enhance process

management ability of software development with capital support of the Pentagon has greatly influenced other subsequent maturity models. CMMI developed as a subsequent model of CMM was announced in 2001 as an integrated model to improve CMM for process management of other services or system with CMM for existing software process management 2001. Each maturity level of CMMI includes the activities necessary to achieve business objectives by phase, representing that low-level activities are satisfied with a progress to a higher level[1]. Thus, this study uses these concepts, and attempts to suggest a plan to improve the effectiveness of policies using the maturity model by evaluating the policy application maturity of e-Learning policies.

2.3 Studies on Difficulties in Venture Companies

Seok-ju, Chang (2006) said that South Korean venture companies' difficulties in overseas marketing included shortages of exclusive marketing manpower, lack of company PR, difficulty in excavation of customer base, difficulty in entering the market and difficulty in securing customer awareness and analyzed that measures for the improvements of the policy support would include those for generating new customers, securing the market, expanding exclusive marketing manpower, certification for product credibility improvement[12].

In addition, Mu-ho, Song (2004) said that the difficulties of venture companies in their foundation included difficulty in capital financing, avoidance of applicants, aging of founders, slump of new technology intensive establishment, excavation of business ideas, securing dealer and licensing process and mentioned the need of policies that could support these[6].

A commonality of the above studies is that venture companies need the policy that could support and improve companies' difficulties is necessary.

Regarding these policies, researchers in small and medium sized companies in 'a Survey on Small and Medium Company R&D Support Business' conducted in 2006 stated that most companies had vulnerable technology innovation abilities and were carrying out R&D projects at the level of simple introduction and utilization of particular technologies. Through this, the need of R&D support business to encourage small and medium companies to move up to the phase of enhancing technology accepting abilities and develop them to companies with considerable R&D ability and innovation ability was brought up[2].

Based on these results of literature research, this study attempts to analyze because of what difficulties e-Learning companies used R&D support policies and through that, it will suggest a plan to improve the effectiveness of the policies.

3. Proposed Method

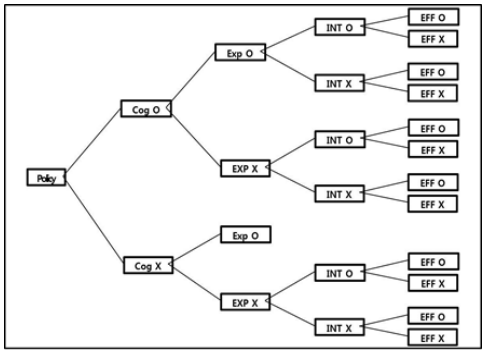
3.1 Research Model

This study composed a research model using a hierarchical database model. The tree structure model refers to a data structure in a wood shape in which the nodes assigning information form a parent-child-offspring relationship with a peak of the root node at the top information and a structure split like branches. A node without a node at the tip of the branch, that is, a child node which is located farthest from the root node is called a leaf. The tree structure is a material structure widely used in various areas such as file system management and database management[10].

In this study, we intended to constitute a maturity model by utilizing the shape of the tree structure. This study attempts to analyze application maturity of e-Learning policies using the items such as the cognition of the e-Learning support policies, their usage in the past, the intention of the uses in the future and their effects. With these four items, a kind of a tree

structure can be formed, and by setting the support policy as the root node, each parent-offspring relationship is made under it in the order of perception, usage in the past, intention in the future and effects. However, in this model, the four items are not the real parent - child relationship. The order in which configure the tree structure depends on the time that each item occurs. The e-Learning support policy application maturity model is like Figure 1 below.

If the respondents have the cognition of the e-Learning support policies, experience of uses, intention to use them in the future and lastly, experience of the effects of the policies, the policy application maturity is highest while it is lowest if there is neither perception, experience, intention in the future nor effect. If they do not have the awareness of a policy, they must not have used them, of course, so in this case, the tree structure was set to have a child node for only the items with which they did not have experience. As a result of the formation of the model, it was expected that there would be a total of 12 stages of maturity.



[Fig. 1] Maturity Model of Practical Use of Policy

3.2 Data & Method

This study used the survey data on the suppliers of the Survey on e-Learning Industry in 2012 to achieve the goal of research. In 2012, the survey was carried out on a total of 380 companies, among which the data on 248 companies fitting the goal of research was used for an analysis[8].

For an analysis on policy application maturity, among the sheets of the actual condition survey of the suppliers, questionnaires on the statuses of cognition, usage in the past, intention of usage in the future and effects of six support policies for e-Learning company activities by the government (e-Learning quality certification, e-Learning manpower training support business, R&D support business, e-Learning international exhibition, e-Learning overseas expansion support business and system improvement) were used. This study analyzed the e-Learning R&D support policy among the six e-Learning support policies. With the above presented research models, through the results of classification of the 248 target companies by each phase, the overall policy application maturity was evaluated[8].

In addition, with the actual condition survey sheets, using a total of 10 items such as the suppliers' operating difficulties (place of business establishment, capital financing, securing manpower, low earnings rate and lack of legal knowledge), R&D difficulties (obtaining the new technology information, technology leakages and technical commercialization) and marketing difficulties (domestic and overseas), a plan to be an effective e-Learning support policy was sought[8]. To analyze the impacts of each difficulty in company operation, R&D and marketing on the utilization of the policies, this study carried out a multinominal logistic regression analysis. The multinominal logistic regression analysis is a technique used for analysis when more than dependent variables can be chosen by the respondents as nominal scales [11]. For the data analysis, SPSS 21.0 was used.

4. Experimental Results

4.1 Policy Application Maturity

The results of an analysis on e-Learning R&D

support policy application maturity are like Table 1.

Among a total of 248 companies, 136 companies responded that they were aware of R&D support business while 112 responded that they did not know it. The phase to which most companies belonged among the 12 stages of maturity was Stage 1, the lowest (41), followed by Stages 8, 4, 2, 5, 1 and 2. The above result can be shown in a chart as Figure 1.

As a result of an analysis, a number of the companies were located on a low level, and it turned out that it would be necessary to prepare a plan to increase the effectiveness of the policy.

As a result of an analysis, a number of the companies were located on a low level, and it turned out that it would be necessary to prepare a plan to increase the effectiveness of the policy.

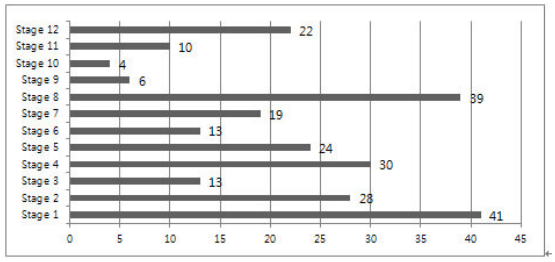
〈Table 1〉 Maturity of Practical use of Policy(1)

Cognition O (136)	Experience O (41)	Intention O (31)	Effect O (22)	Stage 12
			Effect X (9)	Stage 11
		Intention X (10)	Effect O (4)	Stage 10
			Effect X (6)	Stage 9
	Experience X (95)	Intention O (58)	Effect O (39)	Stage 8
			Effect X (19)	Stage 7
		Intention X (37)	Effect O (13)	Stage 6
			Effect X (24)	Stage 5
Cognition X (112)	Experience X (112)	Intention O (43)	Effect O (30)	Stage 4
			Effect X (13)	Stage 3
		Intention X (69)	Effect O (28)	Stage 2
			Effect X (41)	Stage 1

4.2 Correlation between Maturity and Management Difficulties

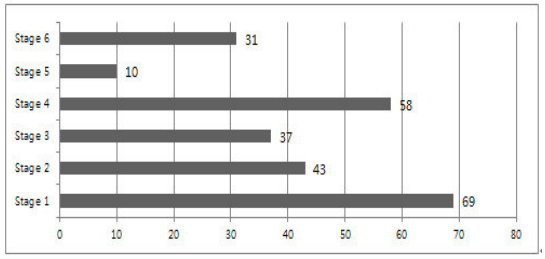
The correlation between policy application maturity and difficulties in company management is like Table 2. First, in the correlation between the variables used in the analysis of maturity, it turned out that there were correlations among perception, experience and intention while effects showed a correlation only with the intention variable, so it turned out that the above maturity model should be adjusted from 12 stages to 6 stages.

The reason why the effect variable did not have any correlation with the perception and experience variables is because there was a possibility that there could be two kinds of characteristics of the responses to the effects.



[Fig. 2] Maturity of Practical use of Policy(2)

In other words, if the respondents have awareness and experience, they might respond if there were any real effects of the policy while if they did not have perception or experience, they might respond to the question with the effects expected for the policy. The result of the adjusted maturity analysis is as follows:



[Fig. 3] Adjusted Maturity of Practical use of Policy

As a result of an analysis of the correlations among criterion for maturity classification, the variable of intention of the future use, supplier's operating difficulties (place of business foundation, capital financing, insurance of manpower, low earnings rate and lack of legal knowledge), R&D difficulties (obtaining the new technology information, technology leakages and technical commercialization) and marketing difficulties (domestic and overseas), it turned out that they had negative correlations with the variables such as capital financing, insurance of manpower, low earnings rate, obtaining the new technology information, technology leakages, technical commercialization and overseas marketing.

〈Table 2〉 Correlation between Maturity and Mgmt Difficulties

	Cog.	Exp.	Int.	Eff.
Cog.	1	-	-	-
Exp.	.404**	1	-	-
Int.	.270**	.200**	1	-
Fee.	.056	.077	.302**	1
Work	-.060	.045	.032	-.037
Fund	-.182**	.037	-.150*	.047
Man	.102	.096	-.130*	-.063
Profit	.101	.103	-.131*	-.104
Law	-.081	.011	-.105	.115
Inform	-.108	.052	-.184**	.006
Outflow	-.043	.025	-.125*	.053
Commer	-.204**	-.120	-.195**	-.015
Domestic	-.107	-.012	-.100	-.049
Abroad	-.140*	-.029	-.232**	-.140*

This is a result of responses O and X to the perception, experience, intention and effect variables encoded 1 and 2, respectively, and the severe the degree of difficulties, the more the use of the policy becomes. Thus, it overall, satisfies with the goal of this study to examine a policy alternative with improved effectiveness through the relationship between the company's difficulties and policy application maturity.

4.3 Influence Relationship between Maturity and Management Difficulties

The results of a multinominal logistic regression analysis carried out in this study in order to concretely identify the causal relations between support policy application maturity and company management difficulties and examine the degree of contribution between the variables are like Tables 3 and 4.

〈Table 3〉 Result of Multinominal Logistics Regression Analysis(1)

Model Fitting Information	-2 Log Likelihood	x^2	df.	Sig.
	590.357	76.223	35	.000
Goodness of Fit	x^2	df.	Sig.	
	703.935	760	.928	

As a result of likelihood ratio testing of the model, the value of -2 log-likelihood was 590.357 and significance probability was .000 at the degree of freedom of 35, and in a goodness-of-fit test, significance probability was .928, which did not dismiss the null hypothesis that the model was appropriate, so the model to be analyzed in this study turned out to be a statistically significant model.

〈Table 4〉 Result of Multinominal Logistics Regression Analysis(2)

Effect	-2LL	x^2	df.	Sig.
Intercept	607.960	17.604	5	.003
Fund	607.263	16.907	5	.005
Man	598.203	7.846	5	.165
Profit	599.930	9.573	5	.088
Information	597.617	7.260	5	.202
Outflow	592.073	1.716	5	.887
Commercial	603.462	13.105	5	.022
Abroad	600.535	10.179	5	.070

* -2LL: -2 Log Likelihood

In the result of likelihood ratio testing showing the influence relation between the variables of company difficulties with correlation with the variable showing the intent of the future use of the support policy, that

is, policy application maturity, it turned out that among the operating difficulties, capital financing variable and among the R&D difficulties, technical commercialization variable respectively had a significance probability of 0.005 and 0.022 which means that there were significant influences. In other words, the more difficulties in financing operation capital and commercializing the developed technology, the higher the company's e-Learning R&D support policy application maturity becomes.

4.4 Comparison of Business Contents by Maturity Phases

Lastly, to compare the business contents of the companies belonging to the maturity phased as an analysis phase, a cross analysis was carried out. They include the business contents such as e-Learning content business, e-Learning solution business, e-Learning service business and side-work.

〈Table 5〉 Phased Characteristics of Business Contents

Characteristics	Contents	Solution	Service	Mixed
Stage 6	2(0.8%)	8(3.2%)	3(1.2%)	18(7.3%)
Stage 5	0(0%)	0(0%)	3(1.2%)	7(2.8%)
Stage 4	4(1.6%)	15(6%)	6(2.4%)	33(13.3%)
Stage 3	4(1.6%)	10)(4%)	9(3.6%)	14(5.6%)
Stage 2	4(1.6%)	11(4.4%)	7(2.8%)	21(8.5%)
Stage 1	8(3.2%)	14(5.6%)	22(8.9%)	25(10.1%)

First, for the business contents, most companies doing e-Learning content business belonged to Stage 1, the lowest maturity phase, followed by Stages 2, 3 and 4, so it turned out that those doing the content business usually had low policy application maturity. For the e-Learning solution business, most companies belonged to Stages 4, 1 and 2 while for the e-Learning service business, they belonged to the order of Stages 1, 3 and 4. Lastly, most companies doing more than 2 businesses as side work belonged to the order of Stages 4, 1 and 2, and in particular, unlike other businesses, many belonged to the highest phase, Stage 6 relatively, so it turned out that those doing side work used the e-Learning R&D support policies more frequently.

4.5 Implications of Results and Proposal of Policies

As a result of an application maturity analysis of e-Learning R&D support policies, almost a half of the companies analyzed (45%) did not even recognize support policies. This necessitates efforts to make them aware of the policies through aggressive promotional activities.

As a result of a multinominal logistic regression analysis, the more difficulties in capital management such as financing and operating capital and commercialization of the developed technology the e-Learning companies had, the higher their application maturity of the e-Learning R&D support policies became. First, for capital financing, since most e-Learning companies were small and medium companies, basically, they are lacking of capital, and raise the capital by manufacturing and selling e-Learning contents, most of which are solved by receiving projects. Yet, even in this case, they can get payment after they obtain the quality certification of the products, so they have difficulties in smooth capital financing. If the support for this capital financing in the R&D support policy contents is supplemented, the effectiveness of the policy will increase.

Regarding technical commercialization, currently, the support policies are concentrated simply on solutions such as LMS (Learning Management System) and e-Learning environment, and for more effective policies, there should be a great reinforcement toward content developments such as SNS base, content production and intelligent LMS. This can be found also in the result of comparison of the general characteristics, to some degree, solution business, service business and side-work companies belonged to

Stages 5 and 6 while only 0.8% of the companies doing content business belonged to Stage 6, so their level of using the policies turned out to be low.

To sum this up, for effective e-Learning R&D support policies, efforts should be made to make them ones for R&D fitting the directions of information technology and software evolution.

5. Conclusion

This study analyzed the maturity of the application of companies based on the 2012 Data of the Survey on the Actual Condition of e-Learning Industry to propose a plan to improve the effectiveness of e-Learning support policies. Next, it analyzed the influences of difficulties in the uses of the support policies through an analysis of the relationship between maturity phases and company management difficulties. As a result of the analysis, the more difficulties in the company capital management and the commercialization of the developed technology they feel, the more their uses of the R&D support policies became, and through the results of the analysis, policy alternatives such as supplementation of contents of capital financing, support for commercialization of technology focused on content development were suggested. This study has a great significance in that it analyzed the national statistical data like the Survey on the Actual Condition of e-Learning Industry from a new perspective and proposed new political alternatives through the analysis.

The support policies for e-Learning companies include R&D support policy, e-Learning quality certification business, e-Learning manpower training support business, e-Learning international exhibition and e-Learning overseas expansion support business. Based on the procedures and results of this study, it will be necessary to study these businesses in the future, obtain the enhancement of overall effectiveness of e-Learning support policies to make up for the limitations of this study.

REFERENCES

[1] CMMI Product Team, "Capability Maturity Model Integration Version 1.3", Carnegie Mellon University Software Engineering Institute, USA, 2010

[2] Korea Small Business Institute, "Improvement Strategy for R&D of Small and Medium-sized Enterprise", Korea, 2006

[3] Kyoo-Sung,Noh, Seong-Hwan,Ju, "A Study on the Environment Analysis and Policy of Smart Education", the journal of digital policy and management, SDPM, vol. 11, no. 4, 2013

[4] Kyoo-Sung,Noh, Seong-Hwan,Ju, "A Study on Promoting Policy of Smart Learning Industry", the journal of digital policy and management, SDPM, vol. 9, no. 6, pp. 197-203, 2011

[5] Ministry of Knowledge Economy of Korea and etc, "the 2nd Master Plan for e-Learning industry Enlargement and Activation", 2012

[6] Mu-ho, Song, "A Study on the Stage of Bottle-Necks & Foundation Procedure of Venture Business", The Korea Entrepreneurship Society, vol. 7, no. 4, pp.25-43, 2004

[7] National IT Industry Promotion Agency, "2011-2012 e-Learing White Paper", Korea, 2013

[8] National National IT Industry Promotion Agency, "2012 Survey of Korean e-Learning Industry", Korea, 2013

[9] Nolan, R. L., "Managing the Crises in Data Processing", Harvard Business Review, March-April, pp.115-126, 1979

[10] Ruzicka, M., "Electrorheological Fluids: Modeling and Mathematical Theory", Springer Verlag, USA, 2001

[11] Se-hee, Hong, "Bi- and Multi-nominal Logistic Analysis", Kyoyook Book, Korea, 2005

[12] Seok-ju, Chang, "A study on the marketing

revitalization strategy for promoting small and medium sized venture Business", "The Journal of Entrepreneurship and Venture", vol. 9, no. 3, pp.135-158, 2006.

노 규 성(Kyoo-Sung Noh)

- 1984년 2월 : 한국외대 경영학과(경영학사)
- 1995년 2월 : 한국외대 대학원 경영정보학과 (경영정보학 박사)
- 2003년 3월 ~ 2010년 2월 : 中國 延邊科學技術大學 兼職教授
- 1997년 9월 ~ 현재 : 선문대학교 경영학부 교수
- 2004년 5월 ~ 현재 : 한국디지털정책학회 회장
- 2008년 9월 ~ 현재 : 한국소프트웨어기술인협회 회장
- 2010년 1월 ~ 현재 : 스마트융합학술전국연합 의장
- 관심분야 : 디지털정책, 스마트융합&스마트러닝
- E-Mail : ksnoh@sunmoon.ac.kr

박 상 휘(Sanghwi Park)

- 2008년 2월 : 한라대학교 경영정보학과(경영학사)
- 2010년 2월 : 한국외대 일반대학원 경영정보학과(경영정보학 석사)
- 2011년 8월 ~ 현재 : 한국외대 일반대학원 경영정보학과 박사과정 재학 중
- 2010년 3월 ~ 2011년 7월 : 한국소프트웨어산업협회 정책연구팀
- 2013년 8월 ~ 현재 : 선문대학교 경영학부 겸임교수
- 관심분야 : IT투자 및 성과 평가, IT정책, 디자인 사이언스
- E-Mail : mis.psh@outlook.com