

Innovation Studies in Korea: Origins, Branches and Activities

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I . Introduction

This article is to clarify the innovation studies in Korea in terms of their origins, branches of research and education, and activities. There has been no prior research on overall features of Korean innovation studies, although there has been an overview of Korean science and technology (Ministry of Science and Technology, 1997), and overview of its policy (Ministry of Science and Technology, 1987; OECD, 1996).

The history of Korean innovation studies is not so long. It is generally assumed that the time lag between the trend of innovation studies in Korea and that of the world's major research body is roughly about 10 years until 1990's. However, since then the forerunners on this area in Korea have caught up with the contemporary world trend and they exerted their efforts for internationalization. Therefore we notice that there are some signals of change in the research community from domestic orientation to internationalization.

To some extent the change can be judged as a new milestone. Kim (1997) characterized the development of industrial technology of Korea as 'from imitation to innovation'. It looks that the development of Korean innovation studies follows the development of Korean industrial technology.

This paper deals with the overall features of Korean innovation studies. But, we review the theoretical issues of innovation studies; the trend of innovation studies, the difference of MOT,

TIM and innovation studies, and the characteristics of Korean journals on innovation studies.

This paper might be useful not only to the introduction of overall features, but to checking the current status of Korean innovation studies and future direction of development.

II. Theoretical Consideration

1. Research of Technology and Innovation Management (TIM)

Linton & Thongpapanl (2004) analysed 10 leading technology and innovation management (TIM) journals for relative ranking of journals. Merino, Carmo & Alvarez (2006) called the group of the 10 journals as TIM Forum. It is noteworthy that the journals on knowledge management, corporate venturing, and information technology (IT) and telecommunication related areas are excluded in the TIM Forum.

Table 1. 10 Leading Journals (TIM Forum)

Title	Year of origin	Impact factor JCR ISI-2004	Major Research Areas
IEEE Transactions on Engineering Management	1954	0.573	MIS/Operations/O. Behavior
Research-Technology Management	1958	0.677	Practice Related
Technological Forecasting and Social Change	1969	0.461	Forecasting Related
R&D Management	1970	0.479	Economics/Finance/O. Behavior
Research Policy	1971	1.536	Economics & Finance
Technovation	1981	0.231	-
Journal of Engineering & Technology Management	1984	0.281	Organizational Behavior
Journal of Product Innovation Management	1984	0.885	Marketing
International Journal of Technology Management	1986	0.284	-
Technology Analysis and Strategic Management	1989	0.500	Organizational Behavior

Source: Appendix A in Merino, Carmo & Alvarez(2006).

Rearrangement of Table 17 of Linton & Thongpapanl(2004).

From the table we can notice the following facts: First, IEEE Transactions on Engineering Management is the oldest journal among the TIM Forum. The long age of the IEEE journal can be explained by the fact that the journal is originated from traditional engineering management.

Second, three journals began their publication around the year of 1970 and the main themes of the three are not overlapping, but complimentary each other. Third, journals from management perspective have appeared from 1980's, and the five journals have given big impact on the overall trend of the TIM society.

2. Education of Management of Technology (MOT)

MOT in industry sector has been an important task to achieve and some previous research proposed approaches to meet the requirement (see for example, Hill, 1972). However in education sector, MOT is not accepted as a regular course until at the end of 1980's.

It is important to note that the report of "Management of Technology: Hidden Competitive Advantage (1987)" by US National Research Council triggered MOT education. The report, the output of US endeavor, was to overcome weakening competitiveness of America since the Second Oil Shock of 1979, especially in manufacturing fields. The report defined MOT as a discipline covering engineering, science and management and its education as a combination of MBA and EM (Engineering Management) courses. MOT is also defined as a bridge between technology and business strategy (Zehner, 2000)

The MS program in Technology Management at Pepperdine University's started since 1989 (Zehner, 2000). Khalil(1998)'s NSF report showed a direction of MOT education. Mallick & Chaudhury(2000) studied MOT education in Business Schools.

Nambisan and Wilemon(2003) surveyed the topics of world graduate MOT programs. The topics are classified into 4 groups as shown in Table 3; 1) General topics in Business School, 2) topics for technology and innovation management, 3) other topics and 4) technology for management such as IT and telecommunications.

Table 2. Major Topics of World MOT Programs

Group	Topics
1	Finance/Accounting, Organization Theory, New Product Development, Production Management, Quality Management, Statistics/Decision Theory, Negotiation/Conflict Management
2	Technology Strategy, Innovation Management, Technology Entrepreneurship, Technology Marketing, Technology Planning, Technology Policy
3	E-biz, Economics, Project/R&D management, Corporate Venturing, Intellectual Property
4	IT, Telecommunication

Source: Adjustment from Nambisan and Wilemon(2003), p.953

3. Definition and Trend

The terms of MOT and TIM are generally used in education and in research, respectively. And some times those terms are used interchangeably and ambiguously. We, therefore, need to define MOT and TIM. MOT, in other word techno-management, is simply defined as 1) a combination of engineering school and management school in the education and 2) areas for the management of technology in the firm environment. Meanwhile TIM includes MOT and social management of technology, or techno-economics and techno-policy. On the other hand, innovation studies can be defined as areas including TIM and social aspects of technology, that is non-management areas of technology.

There, however, has been a strong trend that MOT leads TIM and innovation studies both in the world as shown in Nambisan and Wilemon(2003) and in Korea discussed later part of this paper.

However, there are several branches to MOT. A representative school, the Science Policy Research Unit of Sussex University, UK and the leading group of Research Policy, has a balancing perspective between the two; technology policy and technological innovation management. Technology policy is economics oriented and TIM is management oriented. Seoul National University has merged two programs of Techno-management and Techno-policy programs from 2006.

III. History of Korean Research and Education

We use the term innovation studies rather than TIM since the term is more useful to introduce overall features of Korean research and education.

1. Origins of Innovation Studies

There had been a techno-economics research group in the Korea Institute of Science and Technology (KIST), which reviewed the investment feasibility of KIST's output and nation-wide big technology businesses, from early 1970's. Members of this group became

leaders of various fields such as venture capital, university, and research institute¹. This group can be said as an origin of innovation studies in Korea.

1980 is a monumental year both in innovation studies and the activities of industrial technology. In 1980, Professor Linsu Kim published a paper, "Stages of development of industrial technology in a LDC: A Model," at *Research Policy*, and also Professor Jinjoo Lee co-published a paper of "An Analysis of Factors Influencing the Utilization of Contract Research in a Developing Country, Korea" at the same journal. Also, Professor Kwang-Doo Kim wrote a report, which might be called a book, *A Study on Technological Innovation for International Competitiveness* (International Economics Research Institute, 1980).

In 1982, Professors Linsu Kim and Jin-JU Lee published *Process and Policy of Technological Innovation* (Korea Development Institute, 1982), and Professor Seok-Chol Yoon wrote a book, *Theory of Technology Accumulation and Management* (Ilshinsa, 1982). These articles and books are the leading writings that affect Korean studies on innovation studies.

In industry, Korea Industrial Technology Association (former Private R&D Institute Association) was established in 1980 with several dozens of R&D institutes of private companies. The establishment and activities of the association were based on the government policy to enhance the development of industrial technology. This association had backed a research group of Techno-economics Study Group since 1985, which would be the Korean Society for Innovation, Management and Economics (KSIME) in 1992. The association commenced publication of monthly journal, *Technology and Management* (former *Management of Technology*) in 1983.

At policy side, the Science & Technology Policy Institute (former Science & Technology Evaluation Planning Institute; STEPI) published their magazine, *Science and Technology Policy* since 1991. The magazine was published biweekly, weekly, every 10 days, monthly, bimonthly. The organ contains short essay, translation, edited translation, information or introduction, and research reports in about 150 pages.

There are two scholarly journals on innovation studies in Korea. *Technology Innovation Studies*, formerly the *Journal of Korean Society for Innovation, Management and Economics* (~1995) has been published since 1993 by the KSIME. This journal had one issue a year during 1993-1996, two issues during 1997-2003, and has three issues from 2004.

The Journal of Korea Technology Innovation Society is published by the Korea Technology

¹ Dr. Ho-Il Lee, 2007 President of KOTIS and the Chairman of 1st China-Korea Conference on Innovation Studies, Professor Yoo-Soo Hong were the members of the group.

Innovation Society (KTIS) since 1998 with three issues a year, and 4 issues from 2005. KTIS, who's members are about 1,100, was separated from KSIME in 1997, by different understanding about innovation studies. Two founding members of KTIS requested the inclusion of field studies into *Technology Innovation Studies*, but it was not accepted.

2. Education of Innovation Studies

There are a dozen of graduate schools specialized in innovation studies. These schools can be grouped as TIM schools and Non-TIM schools. Non-TIM schools are specialized in science history, philosophy, and scientific, that is the science of science.

TIM schools were established in the mid of 1990's. Big TIM schools are those of Korea Advanced Institute of Science and Technology (KAIST), Seoul National University (SNU) and Information and Communication University (ICU). All these schools are government supported universities. There are other schools or programs of the age; Choongnam University and Hannam University in Daejeon Metropolitan City.

New schools for TIM education have been established since 2000. In addition, thanks to the policy to support MOT school from 2006, MOT will be a major and strong trend on education of innovation studies.

Currently Ministry of Industry and Trade has launched a policy to support TIM education through Techno-management Program since 2006. Sungkyunkwan University, Pohang University of Science and Technology (POSTECH) and Korea University of Technology and Education, and Techno-management Program in SNU.

Table 3. Major TIM Schools

	ICU M'gt Department	KIAST Techno-m'gt School	SNU* Techno-Policy Program
Open	1997	1995(1981)	1994
Origin	Management	Engineering	Resource
Organization	Independent	Independent	Joint Program
Course	BA/MA/Ph.D	MBA/MS/Ph.D	MS/Ph.D
Student No.	77(?/59/18)	260(38/84/138)	156 (85/71)
Professor	16	63	10
Emphasis	IT specialization	MOT	Techno-economics

Note: ICU- Information & Communication University, SNU- Seoul National University
KAIST- Korea Advanced Institute of Science & Technology

* Techno-policy program and Techno-management program has merged in 2006.

IV. Activities

1. Major Areas of Scholarly Journals

Major Areas

We analyzed the major fields of two Korean journals by keywords extracted from the article titles. As can be seen from Table 4, the relative emphasized areas of KTIS are Technology Innovation, Information & Telecommunication Technology, and Valuation of Technology, whereas JTI is strong in R&D Management and Management of Technology. Simply speaking, KTIS is field-oriented and JTI is on traditional areas. Both Korean journals are not MOT journal, but TIM journal. Area distribution of Technovation is Technology Management 35%, Technology Innovation 49%, Entrepreneurship and others 16%. (Merino et al, 2006)

Table 4. Keywords Group by Areas

Category	KTIS	JTI	Total
Technology & Innovation	41	32	73
Information & Communication	26	1	27
Technology Policy	22	30	52
R&D Management	15	36	51
Economics of Technology	15	25	40
Management of Technology	4	19	23
Valuation of Technology	21	7	28
Venture	9	4	13

Source: Namn, Park, and Seol (2005)

Distribution of Article Styles

In Technovation, styles of a journal are measured by theoretic, empirical, and professional. The table 5 is a comparison between the Korean journals and Technovation in terms of the three styles. As can be seen from the table, the ratio of professional articles (mostly case studies) is about 10%. KTIS is very similar to Technovation in the style of papers.

Table 5. Styles of Korean Journals (Combined until 2004)

Journal	Theoretical	Empirical	Professional
KTIS	62%	29%	9%
JIT	50%	40%	10%
Technovation	60%	30%	10%

Source: Namn, Part, and Seol (2005) and Merino et al (2006)

Major Contributors

In Korean TIMs, most of the authors in Table 6 are strongly tied to a journal. They serve as leaders in certain areas, for example, Professor Seol initiated the research area of "valuation of technology", which is shown one of the major keyword category in KTIS.

Table 6. Major Contributors of TIM Journals

Author	KTIS (1998-2004)	JTI (1993-2004)	Technovation (1997-2004)
Seol, Sung Soo(Hannam U.)	19	1	
Song, Wee Jin(STEPI)	9	4	
Bai, Jong Tae(KAIST)		4	
Park, Yong Tae(SNU MOT)		10	
Yoo, Seung Hoon(Hoseo U.)	7	2	
Watanabe Chihiro (Tokyo U.)			28
Amrik Sohal (Australia Monash U.)			22
Elias Carayannis (George Washington U.)			19

Source: Namn, Park & Seol (2005), Merino et al (2006)

Knowledge volatility

It is conjectured that the different research areas have different citation pattern: Fast changing research area tends to cite previous research which had been done not long ago. Table 7 confirms that our conjecture. Information technology and communication area has the shortest average citation period of 4.11 followed by the valuation of technology of 6.81 years. It implies that new areas' knowledge is very volatile, and becomes obsolete very quickly.

Table 7. Average Citation Year for Major Areas

Journal	Average	Maximum	Minimum
Technology Innovation	7.43	28.33	0.75
Venture	6.93	27.16	0.83
Technology Policy	6.02	23.80	0.71
R&D Management	8.47	27.74	1.00
Technology Economy	8.16	30.50	0.61
Valuation of Technology	6.81	26.44	0.78
Management of Technology	7.25	23.63	1.19
IT and Communication	4.11	17.44	0.48
Grand Average	7.12	27.01	0.73

Source: Namn, Park & Seol (2005)

2. Journal Itself

Publication Data

The frequency of journal publication is an important consideration from the authors and readers. The following is the data for knowledge generation frequency and knowledge produced per annum.

Table 8. Publication Data *

Journal	Frequency p.a.	Number of Articles p.i.	Number of Articles p.a.	annex
Research Policy	10	10	100	BR
IEEE Transactions on Engineering Management	4	10	40	P, BR
Research Technology Management	9	8-9	75	TD
Technological Forecasting and Social Change	6	8-9	50	TD
R&D Management	5	7-8	40	BR
Technovation	12	9-12	120	IV
Journal of Engineering & Technology Management	4	5-7	24	BR
Journal of Product Innovation Management	6	4-5	30	BR, SA

International Journal of Technology Management	12	5-7	75	TR/CR/MR CS, BR
Technological Analysis & Strategic Management	5	7-8	35-40	
KTIS**	4	12-15	53	
JIS**	3	9-10	29	

Source: Web sites for the Journals

Note 1. * 2004-2005 data ** 2005

2. p.i.: per issue, p.a.: per annum

P: practice, TD: technical discussions, IV: industrial viewpoints,

BR: book review, SA: spotlight articles, CS: case studies,

TR/CR/MR: technical/conference/management reports,

It is noteworthy that most TIM journals have special section in each journal such as technical discussions, industrial viewpoints, spotlight articles, technical, conference and management reports and case studies. Book review is the popular section in the TIM journal; Six journals have book review sections. This section must be a good source of information for the readers, although this is a strategy for better product. International Journal of Technology Management has serviced many reports and case studies.

Table 9. Constituency of Editorial Board

Journal	Number of Editors	Editor	Editor Concentration
IEEE Transactions on Engineering Management	10	USA	US/Rutgers Univ.
Research Technology Management	16	USA	Practitioner
Technological Forecasting and Social Change	5	USA	USA
R&D Management	22	UK	UK/Europe
Research Policy	9	UK	SPRU/UK/Europe
Technovation	6	Canada	worldwide
Journal of Engineering & Technology Management	6	USA	USA
Journal of Product Innovation Management	55	USA	USA
International Journal of Technology Management	23	UK	worldwide
Technological Analysis & Strategic Management	50	UK	worldwide

Source: Web sites for the Journals

Editorial board of each journal is also an important factor for authors. The nationality of the Chief editor of TIM journals are mostly USA and UK, meanwhile Editor-in-Chief of Technovation is Canadian. But the distribution of nationality of editorial board is very diverse. There is a concentration in the distribution of nationality of the members of editorial board. If the chief editor of each journal is an USA citizen, members of editorial board are USA concentrated. If the chief editor of each journal is an UK citizen, there are two concentrations: UK and Europe concentration and worldwide distribution.

V. Conclusions

Even though it is not perceived, this year is the 10th year of KTIS foundation. Fortunately we celebrate the conclusion of the first decade by an international conference, especially with the China Techno-Economics Society.

KTIS has member of more than 1,000, publishing the journal 4 times. Also KTIS has 2 regular conferences per year, 1-2 times of Round Table discussions and irregular activities such as workshops and policy recommendations to the government. These activities mean KTIS is well grounded in Korea.

Now, it is the time for KTIS to go abroad. In terms of society, KTIS should publish English journals, which will be a signal to negate the inflow-only of foreign knowledge, but contribution of Korean knowledge to the world to some extent. In terms of researcher, members of KTIS should participate in the TIM Forum from now on.

We expect the China Techno-Economics Society also share the same vision with Korea Society, and hope both society get complementary cooperation to go world.

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