Research Characteristics and Agenda of Technology Management Discipline in Turkey

Hacer Ansal [a 1], Huriye Aygoren [b], Umut Ekmekci [c]

[a]: Isik University, Department of Humanities and Social Sciences, Kumbaba Mevkii Şile, 34980, Istanbul, Turkey
[b]: Middle East Technical University, Science and Technology Policy Studies Research Institute, Ankara, Turkey
[c]: Istanbul Technical University, Institute of Social Sciences, Istanbul, Turkey

Abstract:

Despite the growing importance of "Technology Management" (TM) field in advanced countries since 1990s, it is rather new for developing countries such as Turkey. Considering the diversity of needs and concerns in different countries, the evolution of TM discipline can be expected to follow different paths to include different national experiences and to consider unique national needs and concerns in relation with technology management. Therefore, to what extent this diversity is reflected in the mainstream TM research agenda is an important issue. Thus, the aim of this study is in two folds; first, to examine how the general research characteristics and agenda of TM discipline have evolved in the academic research in Turkey, and next, to what extent they have converged or diverged with the patterns of mainstream TM research in international journals, by analyzing the TM articles published by Turkish academics both in the national and international scientific journals. The findings of this research reveal that the TM discipline in Turkey indicate both divergent and convergent characteristics when compared with the results of recent studies about developed and developing countries. In addition, a significant difference is observed about how these characteristics are reflected in national and international journals.

Introduction:

The increasing consideration of technology as the major factor for competitiveness of firms and nations, and the raising awareness both in industry and in academia about the necessity of bridging technology and with managerial approach (Weimer, 1991; Liyanage and Poon, 2003; Kocaoglu, 1994) have resulted in a significant increase in academic research and education on technology management[2] (TM) since the 1990s.

[1] Corresponding author: Tel: + 90 216 528 71 91, E-mail: ansalh@isikun.edu.tr

[2] US National Research Council (1987) defined "management of technology" as "linking engineering, science and management disciplines to plan to develop, and to implement technological capabilities to shape and accomplish the strategic and operational goals of an organization". On the other hand, although the terms "technology management" (Liao, 2005; Phaal et al., 2006, Weimer, 1991), "management of technology" (Nambisan and Wilemon, 2003; Ball and Rigby, 2006, Drejer, 1997), "technological management" (Chanaron and Jolly, 1999) and "technology and innovation management" (Liyanage and Poon, 2003) are frequently used in the literature, the definitions, scope and borders as well as the distinction between these terms is still problematic in the literature and there is not a broad consensus how to define and distinguish each of them. In this study, we use the term "technology management" as an umbrella term that encompasses all technology and innovation management related themes, given in detail in Table 3 in the text, not only about management of technology at firm level, but also about the policy dimension of technology and innovation at industry and national level.

However, despite the increased popularity of the discipline, there are only limited number of studies on "the research in TM discipline" while the majority of previous "TM discipline analysis" focused on the content and curriculum of "TM education".

Considering the diversity of needs and concerns in different countries, in parallel to the diversity of national technological development levels, the evolution of TM discipline can be expected to follow different paths to include different national experiences and to consider unique national needs and concerns in relation with technology management. Therefore, to what extent this diversity is reflected in the mainstream TM research agenda is an important issue since TM literature has been mainly based on the developed country experiences. In that respect, the aim of this study is in two folds; first, to examine how the general research characteristics and agenda of TM discipline have evolved in the academic research in a developing country context, namely in Turkey, and next, to what extent they have converged or diverged with the patterns of mainstream TM research in international journals, by analyzing the TM articles published by Turkish academics both in the national and international scientific journals.

The first section of this paper discusses the evolution and nature of TM discipline, explores to what extent the national TM trends converge, and to what extent developing countries' unique needs and concerns are reflected in the international TM research agenda, by presenting an overview of previous analysis about the research trends of TM discipline worldwide. To examine the possible reasons for a convergence or divergence between developed and developing countries' agendas and research characteristics, we refer to the "Academic Dependency Theory". Second

section examines the methodological approach for the empirical part of this research. Third section presents and discusses the findings and explores the answers of research questions.

1. Literature Review and Theoretical Framework:

Although the TM discipline[3] has a 50 years of history, it has become a self-sustained discipline in the last 20 years as we witness the rapid increase in the number of publications and degree programs, and going under continuous transformation. While in the initial stages of this development the American experience had been providing fundamental guideposts, in the later stages, the TM field has proved to grow in diverse directions across different disciplines and geographies (Roberts, 2004). The increasing numbers of education programs worldwide (Nambisan and Wilemon, 2003) and the established international organizations, such as "Portland International Center for Management of Engineering and Technology" (PICMET) and "International Association for Management of Technology" (IAMOT) ensure the sustainable progress in the TM discipline with the active participation of the community of practitioners.

In the TM literature, the source and intellectual roots of the available body of knowledge as well as the sustainability of the discipline have been generally traced through the broad range of MOT education programs (Kocaoglu, 1994; Reisman,

[3] In this study, we consider the concept "discipline" in the light of the definition proposed by Fagerberg and Verspagen (2006). According to that, a "discipline" can be identified within three dimensions. First, a discipline is a distinctive body of knowledge. Second, it is about teaching of that body of knowledge to the others. Third, it involves the norms, institutions and organizations through which the practitioners (researchers, students, managers, etc) might judge, distinguish and communicate any body of knowledge in terms of whether it is "usefull or not", "true and untrue", "substantiated by the evidence or purely speculative", etc.

1994; Badawy, 1998; Linton, 2004; Liyanage and Poon, 2003; Mallick and Chaudhury, 2000). Examining the TM literature through analyzing academic research, on the other hand, is relatively recent and a developing research area (Pilkington and Teichert, 2006; Liao, 2005; Roberts, 2004; Ball and Rigby, 2005; Beard, 2002).

The research concerned with the identification of general trends of the TM research that explores the particularities of different contexts seem to be not yet undertaken except a few studies4. The lack of analyses of disciplinary features of the TM research might be partly explained with the emerging and highly diverse nature of the discipline. However, as Thomas (1996) points out, the research trend in TM discipline poses highly positivist and uncritical approach towards inquiring diverse management practices, and thus he emphasizes the need for a "less prescriptive" and "more critical" research and writing. This study aims to develop a critical perspective to the mainstream TM research agenda, relying on the argument of Thomas (1996).

1.1. General Features of TM Discipline:

TM as a discipline has acquired its main identity since the recognition of a technology as an integral part of the firms' strategy and its focus has shifted from technology to management, in early 90s (Badawy, 1998; Cyert and Kumar, 1994; Nambisan and Wilemon, 2004). According to Nambisan and Wilemon (2003), we are just experiencing the new transformation and currently sit between the old paradigm of management and the new paradigm of globally-led restructuring, based on the concepts such as globally distributed innovation systems, outsourcing, e-business infrastructure, etc.

[4] The works of Thomas,1996; Beruvides, 2001 are noteworthy.

However, in TM literature, there are variety of opinions regarding what TM discipline is and what it does (Drejer, 1996). Drejer distinguishes four different schools of thought as "the R&D management school", "the innovation management school", "the technology planning school" and "the strategic management of technology school". Such diverse body of knowledge has been inherited by the TM community since, unlikely other disciplines or subdisciplines, the scholars who contribute to the production of knowledge in technology management are very open to use the knowledge sources outside of the field (Cheng et. al., 1999). According to Pelc (2002), the knowledge base of the TM discipline has to be understood at the interface of both traditional source disciplines such as economics, management science, engineering sciences, etc and the practice-based concerns of different paradigms. This study extends the earlier taxonomy proposed by Drejer (1996) as TM is interactively grown out of "engineering management paradigm", "management of technology paradigm" and "technological entrepreneurship paradigm". The author argues that the rapidly changing needs of practice are key factors to explain how TM process evolves. Therefore, the evolution of TM discipline could be illustrated with shifting industrial paradigms and associated organizational restructuring (Reisman, 1994, Nambisan and Wilemon, 2003, 2004).

This brief overview suggests that TM discipline might presently be identified at the intersection of the several disciplines, therefore the disciplinary boundaries are not clear-cut. The significant characteristic of the TM field is its practice oriented development pattern. However, the tendency towards distinguishing TM discipline in particular from economics or public policy and locating it on the management ground

seem to be a dominant view among scholars. Similarly, the study of Cetindamar et al. (2007) found that regarding the authors' present academic unit, majority of the authors are affiliated with management-related departments in both types of countries. Respectively, the firm-based/organizational inquiries are more extensively studied instead of macro level analysis (Drejer, 1997; Cyert and Kumar, 1994; Pilkington and Teichert, 2006; Ball and Rigby, 2005; Roberts, 2004).

1.2. The Research Agenda in TM Discipline:

In the TM literature, the h existing body of knowledge has been mostly analyzed in consideration of its trans-disciplinary nature, but not through spatial inquiries where the different research agendas and intellectual interests of the different scholars in different countries are mapped. However, there seems to be a growing interest on differentiating the body of knowledge not only within cross-disciplinary terms but also incorporating the spatial characteristics. One such work that has been conducted by Pilkington and Teichert (2006), and remarkable differences have been observed between the research agendas and intellectual interests of the scholars coming from different parts of the world. The authors examined the geographical differences based on the classification of four regions as U.S, UK, Europe and the Rest of the World (RoW) and showed that, even though there are some overlapping schemes, the general TM research agendas exhibit significant differences across regions (Table 1).

Table 1: Geographical differences in TM Interests

North America	**Europe**	**UK**	**Rest of the World**
Dynamic organizations	Alliances and learning	Operation strategy	Diffusion
Resource based view	Learning organizations	Innovation process	Pull/markets
Technology strategy	Resource based view	PCs and electronics case studies	Adaptation of innovations
Evolution and diffusion	Knowledge management Patents Measuring R&D networks	R&D returns in uncertainty	National systems and differences

Source: Pilkington and Teichert, 2006.

Although this study is a valuable contribution since it is the first attempt to demonstrate the diverging interests between geographical contexts, it poses several limits; the inquiry is based on the analysis of only one journal (Technovation) and covers a relatively short period (1996-2003) which might not totally represent the possibly different patterns of articles published in several other TM journals in a longer period. Moreover, considering the young scholars and the scholars conducting empirical rather than theoretical studies (which might likely be the case for developing country scholars, as argued by Alatas (2003)), the citation analysis method used in the study might disregard valuable contributions made by the diverse body of scholars whose works have not been frequently cited. In addition, the categorization of the regions might not be conducive to differentiate the heterogeneity within the studied regions, since the regions are too broadly represented. Extending the scope and depth of the aforementioned analysis, Cetindamar et al (2007) showed significant differences between developed and developing countries on the basis of the comparative content analysis of the their agenda of academic research (Table 2).

Table 2: Most Common Five Topics in Developed and Developing Country Originated Articles

Developed country studies	Developing country studies
1. Organization (15%)	1. Technology policy (12.8 %)
2. Technology strategy (9.9%)	2. Organization (12.1 %)
3. New product development, design innovation (8.4 %)	3. Technological acquisition (11.4 %)
4. Technology policy (7.7 %)	4. R&D management (8.5 %)
5. Technological acquisition (6.9 %)	5. Technological change, technological development (7.8 %)

Source: Cetindamar et al., 2007

Analyzing the contents of ten TM journals between 1995-2005, the authors have found that TM research is dominated by the developed country studies (83%). Moreover, 36% of the developing country papers have been co-authored by developing and developed country scholars. Considering the agenda of TM research, the studies concerned with R&D management increased by around % 91 in developed

countries during ten years period, on the other hand, that ratio has decreased by % 46 in developing countries.

One can question why it is important to reflect the diversity between the research agendas of developed and developing countries, or more fundamentally, where does this diversity come from. The major difference between developed and developing countries in terms of the TM agenda is a result of different level of national technological capabilities. It is stated that the "mastering of existing technologies" is a major challenge for developing countries while the "boosting innovative performance" is for developed countries. (Lall, 1998; 2001; 2000; Dahlman et al, 1987; Amsden and Hikino, 1994). The unique experience and particularities of developing countries' problems in terms of transfer and adaptation of technology as well as technological capability accumulation processes for which different mechanisms can be effective, might require different managerial / organizational practices. Hence, trying to address the local needs, reformulate the inputs, and to organize the production processes according to local conditions and circumstances might very much unlikely be anticipated by the sites where the technology is developed. (Amsden and Hikino, 1994; Pavitt & Bell, 1993; Lundvall, 2002; Johnson et al., 2001; Archibugi and Coco, 2004). Therefore, practicing TM in particular conditions, circumstances and operational areas (Reisman, 1994; Roberts,1996; Chanaron, et.al., 2002; Beruvides, 2001; El-Kholy, 2001) as well as the commonalities and diverging features between the developing and developed country researches as well as within these groups, need to be further studied. This is what this study aims to contribute.

Two different but not mutually exclusive approaches might be proposed in order to explain what lies behind the reflected commonalities and diverging features between the developing and developed country works. The first approach might consider the context dependent practical needs that are likely to be reflected in the local researchers' agenda. The second approach might question how the knowledge production processes of developing countries' scholars are influenced by the interactions occurring between developing and developed countries' scholars. This inquiry can be examined through "Academic Dependency Theory".

1.3. Academic Dependency:

"Academic dependency theory" mainly argues that "*the social sciences in intellectually dependent countries are dependent on institutions and ideas of western social science such that research agendas, the definition of problem areas, methods of research and standards of excellence are borrowed or determined from the west*" without critically assessed by the dependent academia (Alatas, 2003). Indeed, reflecting on the 40 years history and the future of technology management discipline, Riesman (1994; 344) urges the scholars and the scientific institutions to be reflexive about the phenomenon of "*natural drift*" which means "*natural tendency towards professional regression where a small professional elite core maintains intellectual control over a much wider jurisdiction*". Respectively, being concerned about the similar tendencies in several disciplines he proposed to question the influence of the particular academic groups and the ways how this influence is exerted on TM scholars. In a similar vein, the studies examined the management science discipline demonstrated a great dominance of the U.S based theories worldwide (Baruch, 2001; Boyacigiller and Adler, 1991). The study conducted by Usdiken and Pasadeos (1995)

has also supported the general tendency prevailing in mainstream management science discipline for the organization studies.

There are two distinctive approaches to explain the theoretical and conceptual proximity and divergence between diverse bodies of knowledge, According to convergence perspective, the knowledge base of a certain discipline converges across countries in three ways. In the first proposition, late industrialization stimulates the dependence on the foreign theories, perspectives and methods (Usdiken, 2007). Respectively, the foregoing intellectual activities are bounded with initially imported frameworks which prevents the potential development of situated knowledge. The second proposition concerns the universal and contexless appropriation of capitalist management methods across globe (Minzberg, 1973; Guler, Guillen, and Macpherson, 2002). The third reason considers the globally diffused powerful accreditation organizations (Hafsi and Farashahi, 2005) such as AACSB (The Association to Advance Collegiate Schools of Business) or IAMOT, in case of TM.

The opposite view rejects the idea of the universality of management theories (Hofstede 1993; Jaeger, 1990; Hafsi and Farashahi, 2005). According to cross-cultural theorists, first, the assumptions driving the universal management theories and practices are subject to examination, in particular their deployment on non-western context should be carefully examined. Second, the emphasis on cultural differences should not lead to the "separation" (Boyacigiller and Adler, 1991; Doktor, Tung and Von Glinow, 1991; Özkazanç-Pan, forthcoming), instead, different cultural and social formation should be integrated.

Alatas (2003) developed some appropriate measures to demonstrate how academic dependency process made operational. There are several dimension of the academic dependency identified by the author, however the most important two will be examined here due to their relevance to the aims of this study. The first dimension is ideas. The dependency on ideas illustrates that theoretical analysis mostly originate from U.S, U.K or sometimes France. In turn, in developing countries, there can be founded abounded numbers of empirical research which are based on the adoption of theoretical and conceptual frameworks developed in Western countries. The second dimension attributes to the media of ideas, such as books, scientific journals, proceedings of conferences and digital publications of different kinds, etc. The ownerships and control over the journals, publishing houses, websites, etc might be seen as the established mechanisms sustaining academic dependency over the media dimension.

According to Alatas (2003), academic dependency is worsened by practicing "the global knowledge division of labour" whose major characteristics are the division between (1) theoretical and empirical intellectual division of labour, (2) other country studies and own country studies, and (3) comparative and single case studies.

Theoretical and empirical intellectual division of labour refers to the fact that the social scientists in the "*social science powers*" conduct both theoretical and empirical studies, in turn, the scholars in the Third World, do mainly produce empirical works. The division between "other country studies and own country studies" argument might be explained as the social scientists from advanced countries conduct studies about both their own countries as well as other countries, however, the academics in

the third world constrain themselves with mainly on their own country studies. Associated with the second characteristics, the division between "comparative and single case studies" points out that where in the First World, most of the works conducted in comparative ways, but in the third world, generally single case studies on home country prevail.

However, the level and the quality of academic dependency might show different characteristics in every country, we anticipate that, the established academic reward system as well as the scholars' reflexive attitudes might determine the amount and the kind of knowledge production. For instance, in Japan or in Germany, publishing in national language and in national journals are much credited compared to the publications in international scientific media (Alatas, 2003)

Having been informed by the arguments posed in this section, this study aims to examine whether the research agenda of the Turkish TM scholars and the main characteristics of their national and international publications exhibit any difference from those of developed and developing countries, or other geographical regions investigated in previous researches (Cetindamar et al., 2007, Pilkington and Teichert, 2006).

2. Methodology:

The empirical part of this research is based on the content analysis of all the collected TM related articles that were published by Turkish academics in national and international peer-reviewed research journals –excluding books, conference proceedings and working papers- starting from 1974 till 2007 May. Therefore, it is

not an analysis of some specific TM journal, rather, a unique approach that tries to reach to all the published work of Turkish TM researchers.

In order to reach all the TM related articles, first the academics who are involved in TM research and education activities in Turkey were identified through three different databases; the web sites of all universities in Turkey that give the list of academic staff and their research and teaching activities; the ARBIS (Researcher Information System) database that presents all the registered Turkish academics classified according to their research fields; and finally the YOK (High Education Council) thesis database that gives the list of Master and Ph.D. level dissertations, completed between 1986-2003, together with the name of authors and dissertation supervisors. As a result of the exploration of these three databases, 259 academics were identified as having research interest in TM field.

In the next phase, those academics were reached via e-mail and asked to send their updated CVs including their publication list 124 academics replied positively to our request and confirmed their research activities in TM discipline. Selection of articles from the CVs was made on the basis of the publications' relevance to the pre-selected key-words [5] (Table 3) that represent the main topics / sub-fields of TM discipline.

Table 3: Topics Investigated in Articles

[5] The list was also used in the research carried out by Cetindamar et.al. (2007) that was initially drawn from five resources. First, the tables of contents of eight American TM textbooks published between the years 1998 and 2006 are reviewed (Petrozzo, 1998; Pavitt, 1999; Howells, 2005; Burgelman, Maidique and Wheelwright, 2001; Tushman and Andersen, 1997). Second, the findings of review papers of individual TM journals are read (Pilkington and Teichert, 2006; Teichert and Pilkington, 2006; Pilkington, 2006). Third, a few theoretical articles (Drejer, 1997) are considered. Fourth, articles comparing curriculum across different programs are analyzed (Nambisan and Wilemon, 2003; Kocaoglu, 1994). Finally, the subject headings are reviewed for the two major international TM conferences in 2005 and 2006, namely International Association of Management of Technology (IAMOT) and Portland International Conference of Management of Engineering and Technology (PICMET).

Keyword Number	TM TOPICS - Keywords
1	Technological change, technological development
2	Technology strategy
3	Technology foresight, technology forecasting, technology planning, road-mapping, technology intelligence
4	Technology assessment – evaluation
5	Technological acquisition, Technology transfer, Technology diffusion adoption, adaptation, dissemination
6	Research and development management, global R&D
7	Project management
8	New product development, design innovation
9	Technological collaborations, technological alliances, networks- intra-firm collaboration, co-operation – relationships, global networks
10	Technology commercialization, technology marketing, innovation marketing
11	Technology financing and investment issues
12	University-industry spin-off (Technoparks, Scienceparks, technological incubators)
13	IPR, patents
14	Production/ manufacturing, supply chain, quality management, operations management (Technology utilization efficiency performance implementation)
15	Organization, organization culture, organization structure, organizational learning teams, CTOs, competence, knowledge - creativity - ideas management – management of engineers and researchers
16	Emerging technologies (Nanotechnology, Biotechnology, IT), production/manufacturing technologies (CAD, concurrent engineering), supply chain technologies, Development and improvement of process technologies – ICT – e-business technologies – virtual operations
17	Entrepreneurship, corporate venturing – entrepreneurship
18	Social and ethical aspects of technology management, sustainability
19	MOT education and training
20	Technology policy—National technology management policies and systems, Innovation systems, national innovation systems, regional innovation systems, sectorial innovation systems, open innovation systems
21	*Other Tech. Mgt. Topics*

Acknowledging the broad limits of the field, we do not claim that these selected key words represent the whole area of technology and innovation management literature. However, the established list is believed to represent a meaningfully large part of the field, if not the whole.

In the analysis of selected articles, each article is coded according to the codebook (Appendix A)[6] by considering following criteria; number of authors, the country affiliation(s) of the author(s), the present academic unit(s) of the author(s), the existence of comparative research, the countries investigated, research methods used, unit of analysis, objective of research and the main topics of TM covered in the

[6] A similar codebook is used by Cetindamar et.al. 2007

article. Each article has been coded by at least two authors of this paper and cross-checked, in order to ensure high degree of reliability of the research methodology.

3. TM Research in Turkey:

TM has attracted the academic interests of the Turkish scholars in the 1990s that was reflected on not only increased number of published articles but also through increasing number of education programs (Ansal and Ekmekci, 2006). As shown on Table 4, the TM research activities in Turkey started as early as 1974 and 1986 mainly on national technology policy area, but they gained momentum mainly after 1995, started first with articles published in national journals, and followed by international publications after 1996. From 1974 to 2007, the total number of published articles that we have reached was 155 of which 90 were published in Turkish academic journals and 65 in international journals.

Table 4: Distribution of Investigated TM Articles Published between 1974 – 2007

Year	International Journals	National Journals	Total
1974	1	0	1
1986	0	1	1
1990	1	0	1
1991	1	1	2
1992	0	1	1
1993	1	2	3
1994	1	3	4
1995	0	3	3
1996	1	6	7
1997	8	6	14
1998	2	5	7
1999	5	7	12
2000	3	1	4
2001	5	8	13
2002	2	7	9
2003	10	16	26
2004	8	10	18
2005	4	7	11
2006	7	3	10
2007	5	3	8
Total	65	90	155

3.1. TM Research Agenda in Turkey:

According to the findings of our study, the mostly studied top five topics that cover 60 % of the total collected articles, were; "technological change and development" (15.4 %), "organization studies perspective"(15.4 %), "emerging technologies such as nanotechnology, biotechnology and IT, or manufacturing technologies" (11.2%)" technology policy and systems of innovation approach" (9%) and "new product development and design innovation"(7.9 %) as shown on Table 5. Even though our classification of research themes do not comply with the classification used in the Pilkington and Teichert's (2006) study, a rough comparison of TM interests on Table 1, shows that there is not any suggestive similarity between these and the topics studied in U.S, UK, Europe and "Rest of the World" regions. The topic of 'organization specific' studies held in U.S and Europe, has also been extensively studied by the Turkish scholars. In addition, the National Systems of Innovation topic which is mostly studied by the "Rest of the World" is one of the top five topics in the Turkish research agenda.

Table 5: The Mostly Studied Five TM topics in All Articles Investigated

Keyword Number	TM TOPICS – KEYWORDS	Frequency	(%) in Total
1	Technological change, technological development	41	15.4
15	Organization, organization culture, organization structure, organizational learning teams, CTOs, competence, knowledge - creativity - ideas management – management of engineers and researchers	41	15.4
16	Emerging technologies (Nanotechnology, Biotechnology, IT), production/manufacturing technologies (CAD, concurrent engineering), supply chain technologies, Development and improvement of process technologies – ICT – e-business technologies – virtual operations	30	11.2
20	Technology policy—National technology management policies and systems, Innovation systems, national innovation systems, regional innovation systems, sectoral innovation systems, open innovation systems	24	9.0
8	New product development, design innovation	21	7.9

On the other hand, when our results are compared with the study held by Cetindamar et al. (2007) in which developing and developed countries' TM agendas are examined (Table 2), regarding five mostly studied topics, we see that Turkey has its unique

agenda and priorities neither totally resembles to developing countries' nor to the developed countries', although there are some common topics shared with both. Comparing our findings with those of developing countries, we have seen that "organization related issues", "technology policy" and "technological change & development" are common topics for Turkey and developing countries. However, "R&D management" and "technological acquisition & diffusion" and "technology transfer" do not occupy the Turkish agenda as much as it does in developing countries case. Similarly, high interests towards "new product development", "design innovation" and "emerging technologies" in TM agenda in Turkey seem to be not compatible with that of attributed to developing countries.

In the light of the arguments of development scholars, Turkey as a late industrialized country is supposed to be more concerned with the effective use of the foreign technologies, thus the technology transfer and technological acquisition issues would be expected to be more on the research agenda of the Turkish scholars. However, this contradictory tendency might be explained with the country's increasing catching up efforts. Nevertheless, this suggestion is too broad and it is also beyond the scope of this study. Therefore, we rather take this input as a call for further research.

Regarding the TM topics studied in developed countries, we observed that "organization", "technology policy" and "new product development & design innovation" topics are common between the Turkish and developed countries agenda. However, the "technology strategy" and the "technology acquisition" topics are not reflected in the Turkish agenda to the extent they have been studied by the developed country TM scholars.

Table 6: Comparison of TM agenda of Turkey with Developed and Developing Countries

Turkey	Developed country studies	Developing country studies
Technological development (15.4 %)	Organization (15%)	Technology policy (12.8 %)
Organization (15.4 %)	Technology strategy (9.9%)	Organization (12.1 %)
Emerging technologies (11.2 %)	New product development, design innovation (8.4 %)	Technological acquisition (11.4 %)
Technology policy (9.0 %)	Technology policy (7.7 %)	R&D management (8.5 %)
New product development (7.9 %)	Technological acquisition (6.9 %)	Technological development (7.8 %)

Source: Comparison of Our Findings with Cetindamar et al. (2007)

3.1.1. Research Agenda Differences in National and International Journals:

In order to evaluate to what degree the research media matters, as argued by the Global Knowledge Division of Labour" approach, we have separately examined the Turkish TM articles published in the local journals and international journals.

The common topics studied in national and international journals (as shown on Tables 7 and 8) respectively are; technological development & change: (19.2 %)-(9.1%), organization studies (12.2%)-(18.2), emerging technologies (12.2%)-(9.1%). Regarding the uncommon topics, the national journals are occupied with technology transfer & acquisition & diffusion (8.3 %) and technology policy (9.6%).

Table 7- The Mostly Studied Five TM Topics in Articles Published in National Journals

Keyword Number	TM TOPICS – KEYWORDS	Frequency Observed in Articles Published in National Journals	(%) in Total
1	Technological change, technological development	30	19.2
15	Organization, organization culture, organization structure, organizational learning teams, CTOs, competence, knowledge - creativity - ideas management – management of engineers and researchers	19	12.2
16	Emerging technologies (Nanotechnology, Biotechnology, IT), production/manufacturing technologies (CAD, concurrent engineering), supply chain technologies, Development and improvement of process technologies – ICT – e-business technologies – virtual operations	19	12.2
20	Technology policy—National technology management policies and systems, Innovation systems, national innovation systems, regional innovation systems, sectorial innovation systems, open innovation systems	15	9.6
5	Technological acquisition, Technology transfer, Technology diffusion adoption, adaptation, dissemination	13	8.3

In turn, the studies published in international journals deal more with new product development and design innovation (11.6 %) and production - manufacturing - supply chain (10.7 %) (Table 8).

According to these findings, it can be suggested that the themes that are commonly studied in national and international journals exhibit similar considerations which are probably driven by the practical needs of the technology management practice area on country-wide.

Table 8- The Mostly Studied Five TM Topics in Articles Published in International Journals

Keyword Number	TM TOPICS – KEYWORDS	Frequency Observed in Articles Published in International Journals	(%) in Total
15	Organization, organization culture, organization structure, organizational learning teams, CTOs, competence, knowledge - creativity - ideas management – management of engineers and researchers	22	18.2
8	New product development, design innovation	14	11.6
14	Production/ manufacturing, supply chain, quality management, operations management (Technology utilization efficiency performance implementation)	13	10.7
1	Technological change, technological development	11	9.1
16	Emerging technologies (Nanotechnology, Biotechnology, IT), production/manufacturing technologies (CAD, concurrent engineering), supply chain technologies, Development and improvement of process technologies – ICT – e-business technologies – virtual operations	11	9.1

However, the different topics studied in national and international journals demonstrate some proximities to developing and developed country topics. Such that “technological acquisition & transfer” and “technology policy” are the most studied topics in national publications as well as in developing countries agendas, however, not that common in international publications of Turkish scholars. On the other hand, “new product development and design innovation” is one of the most studied topics by the developed country scholars and Turkish scholars in international publications, yet, not as much in national publications. Moreover, “emerging technologies” which

is reflected neither in developing country nor developed country agenda is extensively studied in national and international publications of the Turkish scholars.

These findings may suggest that Turkish scholars converge to the general trends based on the analysis of the internationally published articles. On the other hand, the works published in the Turkish Journals seem to be showing more divergent characteristics Therefore, the different research interests reflected on different research media (local vs. international) might be questioned in relation to the "Academic Dependency" argument.

3.2. Analysis of Findings based on Academic Dependency Argument:

As discussed in detail in the first section of this paper, "dependency school" scholars argues that the level of "global division of knowledge labour" might be traced through three indications. The first indicator refers to the theoretical versus empirical research comparison. The second indicator proposed is concerned with comparative analysis. The third indicator refers to the 'own country" and "other country" studies. According to this view, the "dependent" country scholars generally produce empirical rather than theoretical studies, based on single country analyses that are mostly concerned with home country related issues, whereas the studies from advanced countries consider generally theoretical discussions, and their analyses are based on both home country and other countries.

3.2.1. Research Purpose:

According to our data as shown on Table 9, research purpose of 59.6% of the total number of 155 articles is "presentation, enhancement and development of existing theories" which originates mostly from frontier countries whereas only 1.9 % aims to

develop a new theory. This difference is further exacerbated in the studies published in international journal, since 69.7 % of these studies rely on the existing theories whereas this rate drops to 52.2% in the Turkish journals. The major difference between nationally and internationally published articles comes due to the fact that "informative" papers that do not present in-depth discussions about existing or original theoretical discussions, or offer policy implications hold a large share (24.4 %) in national journals, while their share is rather limited (6.1 %) in international ones. However, since policy generation measure does not distinguish the theoretical orientation, our data is not suggestive in that sense. However, the equally shared interest (around 20% for both studies) towards policy generation field might exhibit the Turkish scholar's concern for nationwide challenges in addition to micro-level problems.

Table 9: Distribution of Articles According to Research Purpose

Research Purpose	Frequency Observed in Articles Published in International Journals (1)	% of (1)	Frequency Observed in Articles Published in National Journals (2)	% of (2)	TOTAL (3)= (1)+(2)	% of (3)
Presentation /development/ enhancement of existing theory	46	69.7	47	52.2	93	59.6
Policy generation	13	19.7	21	23.3	34	21.8
Unclear/no mention of a theory / no policy implications/informative paper	4	6.1	22	24.4	26	16.7
New theory development	3	4.5	0	0.0	3	1.9
TOTAL	66	100	90	100	156	100

3.2.2. Cross-Country Analysis:

According to our findings, the studies held by the Turkish scholars in both national and international journals generally take the single country perspective and the comparative research is purely exercised (Table 10).

Table 10: Number of Countries Studied

Number of Countries	Frequency Observed in Articles Published in International Journals (1)	% of (1)	Frequency Observed in Articles Published in National Journals (2)	% of (2)	TOTAL (3)= (1)+(2)	% of (3)
Single country study	42	70.0	49	54.4	91	58.7
Not clear / Not specific to any country	13	21.7	35	38.9	48	31.0
Two or more countries investigated	10	16.7	6	6.7	16	10.3
Total	65	100	90	100	155	100

49 % of all studies are single developing country (home country) studies, in turn, 10.3% of all studies are comparative studies. However, regarding the rate of comparative studies in international journals, we see that 64.6 % of all research are single country studies, in turn, 15.4 % is comparative research. On the other side, in Turkish journals, 54.4% is single country study, but only 6.6 % takes the comparative research.

3.2.3. "Other Country" Comparisons:

Our data indicate that, the majority of the Turkish studies (49 %) focus on the "home country", Turkey. On the other hand, 20% of all research considers the other countries. However, 31% of the researchers do not have a country focus. The distribution of the researches according to national and international publications is also worth mentioning. In the international publications, the 46.2% of the total body of the research is concerned with "own country", however, in national journals this rate increases to 51.1 per cent. In addition, in the international journals, while the 33.8% of the studies consider other countries, in national publications, this rate is only 10 per cent (Table 11).

Table 11: Research Focus of the Articles

Research Focus	Frequency Observed in Articles Published in International Journals (1)	% of (1)	Frequency Observed in Articles Published in National Journals (2)	% of (2)	TOTAL (3)= (1)+(2)	% of (3)
Turkey Focus	30	46.2	46	51.1	76	49.0
No Country Focus	13	20.0	35	38.9	48	31.0
Other Country Focus	22	33.8	9	10.0	31	20.0
TOTAL	65	100	90	100	155	100

Our findings support the Academic Dependency arguments, especially in terms of cross-country analyses, as the publications of Turkish scholars both in national and international journals are mostly concerned with single country analyses that focus on Turkey as their home country. On the other hand, the findings about theoretical vs. empirical researches contradicts with the argument of dependency school, at least in national journals where articles based on theoretical discussions hold the largest share (28.4 %) in total.

3.3. Characteristics of TM Research in Turkey:

3.3.1. Interdisciplinary Character of TM Research:

Regarding the interdisciplinary character of TM knowledge, the TM researchers in Turkey come from different disciplines as "management", "economics", "engineering" and "industrial, engineering and technology management" etc. once again demonstrating the interdisciplinary nature of the TM field (Table 12). Although there are a few full-time faculty who teach and conduct research in engineering and technology management research area, the most Turkish scholars contributing to the knowledge base of TM come from economics as much as management disciplines which is contrary to the earlier findings and suggestions that emphasize that TM

discipline is a mainly management oriented area and the academic affiliation of the TM scholars are mostly management-related departments as we discussed earlier.

However, the ranking of these two disciplines differ between national and international publications. The findings indicate that scholars from economics mainly publish in national journals, while on the other hand, business administration oriented scholars publish to a great extent in international journals. Another interesting finding is that the scholars from industrial management (or technology management / engineering management) who are relatively more directly involved to the MOT discipline mainly prefer to publish in international journals. While the share of academics from industrial management discipline in 14.3 % in internationally published articles, it is only 1.4 % in nationally published ones.

Table 12 : Authors' Present Academic Units / Affiliations

Authors' Present Academic Units / Affiliations	Number of Authors who publish in International Journals (1)	% of (1)	Number of Authors who publish in National Journals (2)	% of (2)	TOTAL (3) = (1)+(2)	% of (3)
Business Administration / Management	52	37.1	45	31.0	97	34.0
Economics	41	29.3	52	35.9	93	32.6
Engineering	18	12.9	18	12.4	36	12.6
Industrial Management / technology management / engineering management	20	14.3	2	1.4	22	7.7
Research Institute (advanced studies / research)	4	2.9	11	7.6	15	5.3
Social Sciences	0	0	10	6.9	10	3.5
Non academic consultant / businessperson	1	0.7	4	2.8	5	1.8
State / Governmental Offices	2	1.4	2	1.4	4	1.4
Basic Sciences (Physics, chemistry, mathematics)	1	0.7	1	0.7	2	0.7
No Information	1	0.7	0	0	1	0.4
Dual appointments in multiple organizations / departments	0	0	0	0.0	0	0.0
International organization, such as UN, UNCTAD, OECD etc.	0	0	0	0.0	0	0.0
OTHER	0	0	0	0.0	0	0.0
TOTAL	140	100	145	100	285	100

3.2.2. Unit of Analysis of TM Research in Turkey:

By analyzing the unit of analysis of the studied articles, we have seen that not only firm-based focus but also the national level is also considered by the Turkish TM scholars (Table 13). In that respect the arguments highlighting the dominancy of firm-based inquiries in the TM literature lack support since our data show that the broader contexts are also extensively studied by the Turkish TM scholars. Another noticeable difference between articles in national and international journals is that firm level analyses constitute much larger part in international journals (54.4 %) in comparison to national journals (28.4 %), correlated with the result that the academic background of internationally publishing academics is mainly business administration / management science that focus on the firm-level analysis. In turn, a greater part of nationally published articles have a national level focus, mainly concerned with national technology policies.

Table 13: Distribution of Articles According to Unit of Analysis of the Articles

Unit of Analysis of the Articles	Frequency Observed in Articles Published in International Journals (1)	% of (1)	Frequency Observed in Articles Published in National Journals (2)	% of (2)	TOTAL (3)= (1)+(2)	% of (3)
Firm level	37	54.4	27	28.4	64	39.3
Unclear	2	2.9	28	29.5	30	18.4
National level	9	13.2	20	21.1	29	17.8
Industry level	7	10.3	8	8.4	15	9.2
Project level	7	10.3	1	1.1	8	4.9
Regional level	2	2.9	5	5.3	7	4.3
Individual (person) level	0	0	3	3.2	3	1.8
International level	0	0	2	2.1	2	1.2
OTHER	4	5.9	1	1.1	5	3.1
TOTAL	68	100	95	100	163	100

Conclusion:

The findings of this research, especially the significant differences in national and international publications by Turkish scholars in terms of focused TM sub-fields, support the argument that it is not possible to define a universal TM research agenda. Country-specific TM concerns, facing different phases of technological capability building process and the diversity in knowledge and experience accumulation in TM field are the major reasons of such a diversity among national TM agendas.

The TM agenda in Turkey shows both diverging and converging trends with the agenda of developed and developing countries. Organization related issues such as "organizational learning, creativity, knowledge management" etc. are common for all three groups, which indicates increasing consideration of knowledge and organizational learning as the major competitive advantage both for developed and developing countries. "Technology policy" is another subject that holds a large share of the agenda of developed countries, as well as in the articles of Turkish and developing country scholars. Considering the diverging trends, while "technological change / technological development" is a major concern for Turkish scholar, and also for scholars from developing countries with a lesser extent, it is considered that frequently in developed country originated studies. On the other hand, the research agenda of Turkey diverges from other developing country studies in terms of the frequency of "emerging technologies", "new product development" and "technological acquisition" issues, and from developed countries in "technology strategy" related topics. It is also an interesting finding that while "technological acquisition" is a common issue, it does not occupy as much consideration of Turkish scholars.

On the other hand, a deeper analysis that distinguishes nationally and internationally published articles suggests that the TM research trends may differ also among national and international publications. While "technology transfer" is not listed among five top topics studied in international publications, it is much more frequently studied in nationally published articles. In fact, it is not surprising result since efficient acquisition and assimilation of foreign-based technology has been one of the major needs of Turkey as a typical developing country that lacks the capability to produce advanced technologies. In addition, TM field is relatively new for developing countries in comparison to developed countries that experienced the industrialization process earlier. Correspondingly, it is rational to assume that advanced countries as the originators of new technologies have felt the need to plan and manage technological changes earlier than developing countries while developing countries as well as Turkey were more concerned about technology transfer issue.

The difference between reflected TM agendas in national and international publications, and the convergence of Turkish scholars' research interests in international publications with the research agendas of developed countries in some aspects might be examined with two factors; first, in order to be published and take part in the journals that are mainly originated in advanced countries, Turkish scholars adopt the focus of their researches to the interests of developed countries. The asymmetry in the representation of developing and developed countries in the content of current TM literature, as well as in the involvement of scholars from developing and developed countries in the international TM community, demonstrated by previous researches (Cetindamar et al., 2007), support this argument. Second,

supporting the major arguments of Academic Dependency Theory, Turkish scholars may tend to adopt their research interests to the TM agendas of advanced countries, which in fact do diverge with the research agendas reflected in national publications. In turn, such a tendency may cause to the lack of a developing-country perspective in the international TM research agenda.

Finally, it may be suggested that the disparities reflected in different research media of TM should be taken seriously by the National and International TM organizations (IAMOT, PICMET, etc.) and the TM literature. Creating different mechanisms to foster networking opportunities and interrelationships between developed country and developing country scholars and emphasizing the inclusion rather than separation would enrich the knowledge base.

References

(1) Alatas, S. F., "Academic Dependency and The Global Division of Labour in the Social Sciences", Current Sociology 51 (6), 599-613, 2003.
(2) Amsden, A.H. and Hikino,T., "Project Execution Capability, Organizational Know-How and Conglomerate Corporate Growth in Late Industrialization", Industrial and Corporate Change 3-1, pp. 111–148, 1994
(3) Ansal, H. ve U. Ekmekci, "Analysis of Management of Technology and Innovation Studies in Turkey", IAMOT 15th International Conference on Management of Technology, Beijing, China, 22-26 May 2006.
(4) Archibugi, Daniele & Coco, Alberto, "A New Indicator of Technological Capabilities for Developed and Developing Countries (ArCo)", World Development, Elsevier, vol. 32(4), pages 629-654, April, 2004.
(5) Badawy, M.K., "Technology Management Education: Alternative Models". *California Management Review* 40 (4) Summer, 1998.
(6) Ball, D. F., Rigby, J., "Disseminating research in management of technology: journals and authors", R&D Management 36 (2), 205-216, 2005
(7) Baruch, Y., "Global or North American? A Geographically Based Comparative Analysis of Publications in Top Management Journals", International Journal of Cross Cultural Management 1 (1), 109-126, 2001
(8) Beard, J. W., "Management of Technology: A Three-dimensional Framework with Propositions for Future Research", Knowledge, Technology & Policy 15 (3), 45-58, 2002
(9) Beruvides, M.G., "The Impact of Organizational Culture on the Management of Technology in Developing Nations". IAMOT Paper Series, 2001, Accessed in 29.Feb.2008. Available Online at : http://www.iamot.org/paperarchive/122D.PDF
(10) Boyacigiller, N., Adler, N. J., "The Parochial Dinosaur: Organizational Science in a Global Context", Academy Management Review 16 (2), 262-290, 1991
(11) Burgelman, Robert A.; Maidigue Modesto A. and Wheelright Steven C., "Strategic Management of Technology and Innovation and Analysis", McGraw-Hill/lrwin, Boston, 2001

(12) Cetindamar, D., Ansal H., Wasti Pamuksuz, N., Beyhan B., "A Knowledge Map of the Technology Management Discipline", EUROMA (European Operations Management Association) Conference, Ankara,15-17 June, 2007
(13) Chanaron, J., Jolly, D., "Technological Management: Expanding The Perspective of Management of Technology", *Management Decision*, Vol. 37 No.8, 1999
(14) Chanaron,J-J.; Jolly, D.; Soderquist, K., "Technological Management: A Tentative Research Agenda", International Journal of Technology Management, Vol.23, No.6, pp. 618-629, 2002
(15) Cheng, C.H., ; Kumar, A.; Motwani, J.G.; Reisman, A.; Madan, M.S., "A Citation Analysis of the Technology Innovation Management Journals", Engineering Management, IEEE Transactions on, Vol. 46, No.1, pp.4-13, 1999
(16) R. M. Cyert and P. Kumar, "Technology Management and the Future,". IEEE Trans. Eng. Manage., Vol. 41, pp. 333–334, Nov. 1994
(17) Cyert and Kumar, "Technology Management and the Future", IEEE Transactions on Engineering Management, Vol. 41, No. **4.** November, 1994
(18) Descarriers, F., "The Hegemony of the English Language in the Academy: The Damaging Impact of the Sociocultural and Linguistic Barriers on the Development of Feminist Sociological Knowledge, Theories and Strategies", Current Sociology, Vol.51, No.6, pp. 625-636, 2003
(19) Doktor, R., Tung, R. L., Von Glinow, M. A., „Incorporating international dimensions in management theory building", Academy of Management Review 16 (2), 259-261, 1991
(20) Drejer, A., 'Frameworks for the management of technology: towards a contingent approach', *Technology Analysis and Strategic Management*, Vol. 8, No. 1, pp.9-20, 1996
(21) Drejer, A., "The discipline of management of technology, based on considerations related to technology", Technovation 17 (5), 253-265, 1997
(22) El-Kholy, O.A., " MOT Education in Developing Countries: A Case Study from the Gulf States", IAMOT Paper Series, 2001, Accessed in 29.Feb.2008. Available Online at : http://www.iamot.org/paperarchive/141A.PDF
(23) Guler, I., Guillen M.F., Macpherson J.P., "Global competition, institutions and the diffusion of organizational practices: the international spread of ISO 9000 Quality Certificates", Administrative Science Quarterly 47 (2), 207-232, 2001
(24) Hafsi, T., Farashahi, M., "Applicability of management theories to developing countries: a synthesis". Management International Review, 45 (4), 483-509, 2005
(25) Hofstede, G., "Cultural constraints in management theories", Academy of Management Executive 7 (1), 81-94, 1993
(26) Jaeger, A., "The applicability of western management techniques in developing countries: a cultural perspective", in: Jaeger A., Kanungo R. (Eds.), Management in Developing Countries. Routlege, London, pp.131-145, 1990
(27) Johnson, B.; Lundvall, B-A., 'Promoting Innovation Systems As a Response to the Globalizing Economy' in Jose E. Cassialota; Helena Lastres; Maria M. Maciel (eds) , Systems of Innovation and Development: Evidence from Brazil. Cheltenham: Elgar, 2003.
(28) Kocaoglu, Dundar F., "Technology Management: Educational Trends**",** IEEE Transactions on Engineering Management, Vol. 41, No. 4, pp. 347-349, November, 1994
(29) Lall, S., "Market Stimulating Technology Policies in Developing Countries: A Framework with Examples from East Asia", World development, Vol.26, No. 8, pp. 1369-1385, 1998
(30) Lall, S., "Competitiveness Indices and developing Countries: An Economic Evaluation of the Global Competitiveness Report", World Development, Vol.29, No.9, pp. 1501-1525, 2001
(31) Lall, S., "The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-1998", Oxford Development Studies, Vol.28, No.3, pp. 337-369, 2000
(32) Liao, S., "Technology management methodologies and applications: a literature review from 1995-2003". Technovation 25, 381-393, 2005.
(33) Linton, J.D. and Thongpapanl, N., "Ranking the technology innovation management journals", *Journal of Product Innovation Management*, No.21, pp. 123-139, 2004
(34) Liyanage S., Poon, P. S.,,"Technology and innovation management learning in the knowledge economy"**,** *Journal of Management Development*; Vol. 22 Issue 7, p:579, 2003
(35) Lundvall, B-A; Johnson, B; Andersen, E.S. and Dalum, B., 'National Systems of Production, Innovation and Competence Building', Research Policy 31213-231, 2002
(36) Mallick, D.N., Chaudhury, A., "Technology management education in MBA programs: a comparative study of knowledge and skill requirements". *Journal of Engineering and Technology Management*, 17 (2) June 2000
(37) Mintzberg, H., "The Nature of Managerial Work", Harper & Row, New York, NY, 1973

(38) Nambisan, S. and Wilemon, D., "Redefining the Technology Management Education Agenda: A Call for Greater Industry Involvement," *Research-Technology Management*, 47(6), 9-13, 2004
(39) Nambisan, S. and Wilemon, D., "A Global Study of Graduate Management of Technology Programs," *Technovation*, 23, 949-962, 2003
(40) Özkazanç-Pan, B., "International Management Meets 'The Rest of the World'. Academy of Management Review", Special Topic Forum on International Management: Critique and New Directions, forthcoming
(41) Bell, M. and Pavitt, K., 'Technological Accumulation and Industrial Growth: Contrasts Between Developed and Developing Countries', *Industrial and Corporate Change*, 2(2), 1993
(42) Pavitt, K., "What We Know about the Strategic Management of Technology", *California Management Review*, pp.17-26, 1990
(43) Pelc, "Knowledge mapping: The Consolidation of the Technology Management Discipline", Knowledge, Technology, and Policy, Volume 15, Number 3 / September, 2002
(44) Petrozzo Daniel P. "*The Fast Forward MBA in Technology Management"*, New York: J. Wiley, c1998
(45) Phaal, R., Farrukh, C.J.P., Probert, D.R., "Technology Management Tools: Concept, Development and Application", Technovation 26 (3) , 336-344, 2006
(46) Pilkington, A., "Conceptualizing the management of technology", 2nd European Conference on Management of Technology: Technology and Global Integration, September 10-12, 2006, Birmingham, UK., 2006
(47) Platt, L.and Wilson, G., "Technology Development and the Poor/Marginalised: Context, Intervention and Participation", Technovation, Vol.19(1999), pp.393-401, 1999
(48) Riesman, "Technology Management: A Brief Review of the Last 40 Years and Some Thoughts on Its Future", IEEE Transactions on Engineering Management. Vol. 41, No. 4, November 1994
(49) Roberts,E.B., "A Perspective on 50 Years of the Engineering Management Field", Engineering Management, IEEE Transactions on, Volume 51, Issue 4, pp. 398 – 403, 2004
(50) Pilkington, A. and Teichert, T., "Management of Technology: Themes, Concepts and Relationships", *Technovation*, No: 26, pp. 288-299, 2006
(51) Steven W., Xielin L., Wei X., "A Survey of Chinese Literature on the Management of Technology and Innovation, 1987-1997", International Journal of Technology Management 21 (1,2), 130-45, 2001
(52) Thomas, "The Devil Is in the Detail: Revealing the Social and Political Processes of Technology Management, Technohgp Analysis & Strategic Management, Vol. 8, No. 1, 1996
(53) National Research Council, "Management of Technology: The Hidden Competitive Advantage. National Academy Press", Washington, DC, 1987
(54) Üsdiken, B. and Pasadeos, Y., "Organizational analysis in North America and Europe: A comparison of co-citation networks", *Organization Studies*, Vol.16, No.3, pp. 503-526, 1995
(55) Üsdiken, B., "Commentary: Management Education Between Logics and Locations", Scandinavian Journal of Management 23 (1), 84-94, 2007
(56) Weimer, W.A., "Education for Technology Management**",** Research- Technology Management, Vol. 34, No. 3, pp. 40-45, May-June, 1991