Barriers to Commercialization of Research Findings in Humanities in Iran

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Abstract

Nowadays, the changes in the dominant economic models, the emergence of knowledge-based economy and the lack of research budgets have caused the academic and research centers to pay attention to the commercialization of research findings. Although, there exist some studies pertaining to this topic, most of them have dealt with natural sciences rather than humanities and soft technology. To bridge this gap, the current study tries to identify and overcome the barriers to commercialization of research findings in humanities using a contextual theory and an interpretive approach. The study uses qualitative methods in three steps. In the first step, previous studies related to this topic are scrutinized and several barriers to research commercialization are extracted. Then, in the second step, Delphi method is utilized to examine the extent of the influence of each barrier and identify more items. Finally, grounded theory is used to present a conceptual framework for the barriers to research commercialization in humanities. According to the findings, the most important barriers are related to policymaking, legal rights, resources, infrastructure, intrinsic value of humanities, technological nature of humanities, and behavior of the actors.

Keywords

Commercialization, barriers, humanities, Delphi method, grounded theory

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Introduction

Within the last decades, the missions, goals, and plans of the universities have undergone numerous changes. In the past, a university was only responsible for the education; the first movement in academic system in the late 19th century added conducting research to its functions (Etzkowitz, 2003).

In the late 20th century, in the U.S.A., a concern for the decrease in the national competitiveness considering advanced technologies and a rising trend of the criticism leveled against the universities due to mere attention to the new technologies and lack of attention to applying them, a redefinition of the role of general research systems was presented (Siegel et al., 2003). In this regard, the second academic movement occurred based on participating in economic development. In this sense, universities were supposed to carry the burden of economic responsibilities in addition to the education and research (Perkmann et al., 2013; Abreu & Grinevich, 2013; Rasmussen, Moen, & Gulbrandsen, 2006). This led to various forms of cooperation among universities and industries on commercialization of research.

Nowadays, numerous academic institutions announced the participation in economic development as a priority in their policies. Universities believe that merely conducting research would not result in added value and development of communities; nevertheless, they would play an important role to provide commercializing and applying the research findings in order to benefit the communities (Barclay, 1992).

Commercialization of research findings means transforming research findings into products, services, and procedures which can be the topic of commercial trades (Downie, 2006). In other words, research commercialization is defined as the transfer procedure and transferring theoretical knowledge into several economic activities in academic and research institutions (Spilling, 2004). In 2004, the Canada state defined commercialization as a procedure through which the research ideas and findings are developed and sold in the form of new technologies, goods, and services all over the world (Isabelle, 2004).

Attending to the commercialization of research findings is the representation of acknowledging the significance of science and technology and embracing its direct influence on economic, social, and

cultural development. Adopting this approach would hopefully lead to overcoming the barriers on the way of forming knowledge-based economy.

Despite numerous benefits of commercialization, the commercialization procedure is, by no means, a simple and linear procedure; nevertheless, it is a complicated procedure whose success requires paying attention to all dimensions of this issue including the role of different actors and capabilities of various scientific fields related to commercialization (Dominguez-Vargas & Camacho-Velaquez, 2001). The research finding commercialization approach is rooted in natural sciences. The technology (practical knowledge) derived from these sciences is "hard technology". Hard technologies refer to the tools and rules which are utilized by human beings in order to change, adapt and manage nature for their progress and survival (Jin, 2011). In general, hard technologies are mostly realized in material forms and hence, requests are abundant for them and their commercialization is easier and more tangible. However, humanities have different nature from the natural sciences. The technology (practical knowledge) derived from these sciences is "soft technology". Soft technology entails intellectual and innovational technology which focuses on thinking, ideology, values, viewpoints, individual, and organizational behaviors. Several technologies include social technologies, cultural technologies, soft bio technologies (healthcare technologies and increasing life expectancy), political technologies (diplomatic technologies), and financial and monetary technologies (Jin, 2011). Since soft technology is realized in the form of intangible phenomena, knowledge market of these sciences have not developed along with the other sciences.

In the 21st century, the significance of soft technologies in line with hard technologies has gradually been highlighted. Based on this paradigm shift, it might be said that the research in humanities is capable of changing into transferable, purchasing and selling technologies, and on this basis, these researches can be commercialized so that universities, research centers, and society benefit from them.

Since commercialization in humanities research is an emerging area, it might be confronted with numerous barriers and challenges. A review of the existing literature has indicated that a large bulk of research has been conducted on commercialization and its barriers. However, most studies have been focused on research in natural sciences including

nanotechnology, medicine, agriculture, technical-engineering, and natural sciences, and less, if any, attention has been paid to humanities and soft sciences.

To bridge this theoretical gap, the current study tried to identify and analyze the barriers and challenges of research commercialization in humanities in Iran in the form a contextual theory in order to contribute to overcoming these barriers. To this end, it was tried to address two questions taking an interpretive approach: i) What are the barriers to research commercialization in the field of humanities; ii) what is the conceptual framework for research commercialization barriers in the field of humanities? In order to answer these questions, Section 2 of the article presents a review of the literature. Then, Section 3 deals with the method, and Section 4, analyzes the data. Discussion is included in Section 5. Finally, Sections 6 and 7 present results and policy recommendations, respectively.

Literature Review

The available evidence from all over the world indicates that few countries have succeeded in commercialization and out of every three hundred raw ideas; only one was successfully commercialized (Stevens & Burley, 1997). This means beside the advantages of commercialization, it should be taken into account that this process is not simple and linear. There are a number of challenges and barriers to commercialization that need to be recognized.

The first prerequisite of commercialization is industries' awareness of the scientific research findings (Funk et al., 1995). However, numerous barriers hinder this process as follows:

- The research findings are published in such journals which are read by academics and industries have no access to them (Biemans & Harmsen, 1995).
- The negative attitudes of the industries towards the quality of the scientific research and qualifications of the researchers (Tahvanainen & Nikulainen, 2011; Funk et al, 1995) and industries' lack of understanding of the academic sector as a source of innovations (Rank & Brochu, 1999) have caused the industries not to acknowledge the research findings (Biemans & Harmsen, 1995) and to lose their inner interest in actively

searching for the research findings (Biemans & Harmsen, 1995; Funk et al., 1995).

- The faculty members' lack of cooperation in business due to legal limitations and opposite cultural biases in some countries is another important reason (Howells & McKinlay, 1999).
- Bureaucratic professional structure with organizational traditional borders has led to bureaucratic inflexibility in universities (Siegel et al., 2003; Tahvanainen & Nikulainen, 2011). Those universities which move towards entrepreneurship have to revise the form and size of their structures in order to enhance their efficiency, effectiveness, and competitiveness. An increasing attention paid to the significance of knowledge and technology transfer among universities and industries not only brings the research closer to innovation but also fades the traditional borders among them and leads to creation of various transfer-driven mechanisms. These mechanisms include technology transfer offices, spin-offs, science and technology parks, and incubators (Locket & Wright, 2005; Funk, 2005).

Asserting the research findings in a scientific language and their impracticality are among the other important barriers (Biemans & Harmsen, 1995); this might be originated from the quality-related research deficiencies such as findings incredibility, methodology inefficiency, and research findings being unjustifiable (Funk et al., 1995).

In addition, several researchers believe that commercialization is not in line with the scientific ethics (Biemans & Harmsen, 1995), and this has caused researchers not to be inclined and motivated to commercialize their research findings (Tahvanainen & Nikulainen, 2011). Siegel and Funk (2005) believed that awarding the researchers would increase their motivation to commercialize their research findings. However, it should be taken into account that there are contrasts and oppositions among the academic and business sectors in terms of the existing cultures and incentives (Samsom & Gurdon, 1993; Rank & Brochu, 1999). Indeed, the researchers' first incentive is to be known in the academic communities through publishing their research findings in the academic journals, valid conferences, and thereby, to gain research grants (Siegel et al., 2003). They consider money as a tool for scientific development (Samsom & Gurdon, 1993), while the business holders are craving for commercializing technologies in order

to reach higher financial profits (Siegel et al., 2003). They view money as the goal and consider science as a tool to reach it (Samsom & Gurdon, 1993).

Lack of financial resources and the required mechanisms for attracting research budgets were pointed out as the other barriers on the way of commercialization (Rank & Brochu, 1999; Howells & McKinlay, 1999; Wright et al., 2007; Pellikka et al., 2012). This is evident in low financial resources allocated to the technology transfer offices (Wright et al., 2007), lack of financial resources for the initial prototype steps and lack of venture capital in order to form new firms and businesses (Rank & Brochu, 1999).

An obvious prerequisite for commercializing research findings is that the research centers gain familiarity with the commercialization procedures. Marketing skills play an effective role in this regard. Although the concept of marketing is frequently used, putting it into practice is still confronted with various challenges including researchers' lack of knowledge and skill in commercialization (Wright et al., 2007), inability to sell and distribute locally and internationally, lack of adequate and relevant information, lack of marketing units, lack of commercial mechanisms and research information spreading mechanisms (Pellikka et al., 2012) and lack of understanding of the customers' needs (Al Natsheh et al., 2015).

On the other hand, organizational policies and strategies may sometimes act as the major barriers to commercialization of research findings. In this regard, the most important challenges include not paying attention to commercialization of research findings in academic agenda (Rank & Brochu, 1999), lack of certain organizational strategies for commercialization (Shane, 2004), and lack of inter-disciplinary research teams in an organization (Kaarela, 2013). Moreover, the governmental policies and regulations may act as barriers to commercialization. For instance, the most important shortcoming of the current commercialization policies in Canada is decreasing investment in basic research (Rank & Brochu, 1999). Furthermore, weak regulations for intellectual properties and inefficiency of patent filing procedures are considered as some other barriers (Bulsara, Gandhi, & Porey, 2010; Tahvanainen & Nikulainen, 2011).

Another barrier to commercialization encompasses the problems in the business general environment including low market potential

(Pellikka et al., 2012), high dependency of the products market on the regulations, managers' unwillingness to purchase domestic technologies (Rank & Brochu, 1999), level and type of technology (Bulsara et al., 2010), time-consuming and costly nature of technology validation and issuing certificates, small and dispersed markets, lack of certain technology standards, difficulty in creating and developing new technologies supply chain (AL Natsheh et al., 2015).

According to the previous studies on commercialization and having deleted the repeated barriers, a checklist was prepared for the barriers to commercialization of research findings (See Table 1).

Table 11. A Checklist for the Barriers to Commercialization of Research Findings Based on the Literature

Code=B$_i$*	Research commercialization barriers	Reference
B1	Researchers' different motivations in universities and business sector;	(Samsom & Gurdon, 1993)
B2	Lack of familiarity and adequate information of the research users about the value of research findings;	(Biemans & Harmsen, 1995; Funk et al., 1995; Ahmed et al., 2017)
B3	Not approving the research findings by the industry and investors;	(Biemans & Harmsen, 1995, Namdarian & Naimi-Sadigh, 2018)
B4	Not implementing the research findings and the big gap between theory and practice;	(Biemans & Harmsen, 1995)
B5	Researcher's lack of familiarity with research commercialization process;	Biemans & Harmsen, 1995; Tahvanainen & Nikulainen, 2011)
B6	Lack of investment of the industry and investors in basic research;	(Rank & Brochu, 1999)
B7	Researchers' lack of belief in commercializing research findings;	(Biemans & Harmsen, 1995; Ahmed et al., 2017)
B8	Lack of financial resources for research commercialization in the most universities and research centers;	(Rank & Brochu, 1999; Howells & McKinlay, 1999; Wright, 2007; Pellikka et al., 2012; Epting et al., 2011)

Code=B_i*	Research commercialization barriers	Reference
B9	Not considering commercialization of research findings in the agenda of universities aiming to produce economic benefits;	(Rank & Brochu, 1999)
B10	No commercialization culture in academic sector;	(Rank & Brochu, 1999)
B11	Lack of fund for prototyping;	(Rank & Brochu, 1999)
B12	Lack of risk investment in the industry and among investors in order to establish new companies;	(Rank & Brochu, 1999)
B13	Lack of mutual trust among academic sector, industry and investors;	(Rank & Brochu, 1999)
B14	Disregarding the influences of commercialization of academic research by the government, industry and investors;	(Rank & Brochu, 1999)
B15	Not considering academic sector as a source of innovation by the small and medium industries;	(Rank & Brochu, 1999)
B16	Differences between the academic scientists' motivations and the dominant culture on universities;	(Siegel et al., 2003a, Namdarian & Naimi-Sadigh, 2018)
B17	Bureaucratic inflexibility of the structure of universities;	(Siegel et al., 2003a; Tahvanainen & Nikulainen, 2011)
B18	Inadequate rewards for persuading the faculty members to commercialize their research findings;	(Siegel & Phan, 2005)
B19	Researchers' lack of knowledge and skills for starting and managing the business;	(Wright , 2007)
B20	Challenges related to patents procedures;	(Bulsara et al., 2010)
B21	Lack of motivation for commercialization among the researchers;	(Tahvanainen & Nikulainen, 2011)
B22	Researchers' belief in incompatibility of commercialization with the scientific ethics;	(Tahvanainen & Nikulainen, 2011)
B23	Inability to sell and distribute locally and internationally;	(Pellikka et al., 2012)
B24	Lack of adequate information related to the market;	(Pellikka et al., 2012)
B25	Lack of market identification and marketing units in organization;	(Pellikka et al., 2012)
B26	Lack of advertisement and information spreading mechanisms related to the products;	(Pellikka et al., 2012)
B27	Low potentiality of the market;	(Pellikka et al., 2012)
B28	High dependence of the products market on rules and regulations;	(Al Natsheh et al., 2015)
B29	Lack of a systematic model and time and required mechanisms for attracting research funds;	(Pellikka et al., 2012)
B30	Not perceiving the customers' needs;	(Kaarela, 2013)

Code=B$_i$*	Research commercialization barriers	Reference
B31	Small and dispersed markets;	(Al Natsheh et al., 2015)
B32	Costly and time-consuming nature of technology validation and issuing the license;	(Al Natsheh et al., 2015)
B33	Professionals and inventors' doubt about the researcher's scientific qualification of researches;	(Tahvanainen & Nikulainen, 2011)
B34	Doubt about the method and quality of data gathering;	(Biemans & Harmsen, 1995)
B35	Industry's lack of awareness of the results of studies and developed technologies in universities and research centers;	(Funk et al., 1995)
B36	Researchers' negative attitude towards involving in business activities;	(Siegel & Phan, 2005)
B37	Few financial resources allocated to transferring technologies by the universities and research centers;	(Wright, 2007)
B38	Not having standards for locally developed technologies;	(Al Natsheh et al., 2015)
B39	Unwillingness to buy domestic technologies by managers and lack of trust in domestic products;	(Rank & Brochu, 1999)
B40	Level and type of technology;	(Bulsara et al., 2010)
B41	Lack of commercialization units or technology transfer offices in universities and research centers;	(Siegel & Phan, 2005, Namdarian & Naimi-Sadigh, 2018)
B42	Weakness in regulations related to intellectual property;	(Tahvanainen & Nikulainen, 2011)
B43	Difficulty in creating and developing the supply chain for new technologies;	(Al Natsheh et al., 2015)
B44	Lack of particular organizational strategies for commercialization;	(Shane, 2004)
B45	Lack of interdisciplinary research teams in organizations and the researchers' interactions with such teams;	(Kaarela, 2013)

Research Methodology

The main objective of this study is to provide a theoretical framework for barriers to commercialization of research findings in the field of humanities. For this purpose, the study uses qualitative methods in three steps:

Step1: In theory building approaches, identifying a significant part of the data is based on the adoption of a qualitative documentary study method. Documentary study means analyzing the set of documents

including data related to the topic of the study (Bailey, 1994). In this method, the researcher extracts and references the concepts related to the topic of his research through understanding the purposes of the documents and texts (Gaborone, 2006). As it was mentioned in the literature review section, barriers to research commercialization vary across contexts, scopes, and level of analysis. In this regard, documentary study was used to collect the barriers to research commercialization through documents and texts (See Table 1).

Step2: Putting merely emphasis on documentary study method would lead to neglect or even ignore some of the barriers. Moreover, considering the significance of context in commercialization, the topic of the study was examined in terms of the status quo in Iran. Hence, in the second step, it was tried to validate the preliminary list of barriers (Table 1) through forming a panel of Iranian experts in two Delphi rounds. Delphi method answers this question "what can/should it be?". This technique entails a set of survey or questionnaire procedures. Based on the preliminary questionnaire, the following questionnaires were developed and a group of experts in a field of study would respond to the items till reaching a consensus (Boyd, 2003). In this way, having used Delphi method, a set of barriers were eliminated based on the experts' consensus and Iranian context and some other barriers were added.

Step3: Having completed the two aforementioned steps, a comprehensive checklist of barriers to research commercialization was obtained in the field of humanities in Iran. In order to categorize the barriers, identifying their relationships and theory building, the grounded theory method was used. The grounded theory method provides a basis for developing theories through analyzing qualitative data and their mutual relationship (Creswell, 1998). Using this method and adopting a qualitative and interpretive approach, the collected data were analyzed and a theory was inductively presented in order to have a clear perception of the status quo (Charmaz, 2008). Figure 1 presents the research process.
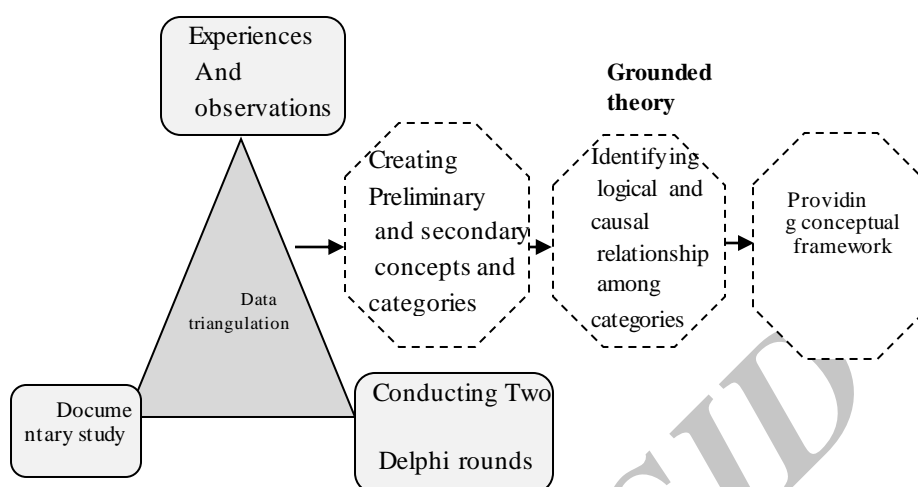
Figure 1. Stages for developing a conceptual model for the barriers to commercializing humanities research

The first step was fully discussed in Section 2. Following this section, Subsections 3-1 and 3-2 elaborate on the second and third steps, respectively.

Delphi and Panel Formation Process

Delphi method was devised as one of the structured methods for reaching consensus (Fink et al., 1984) in RAND in the 1950s (Riggs, 1983) and entails a series of questionnaires or sequential rounds with controlled feedback aiming to cause consensus among a group of experts on a specific topic (Hasson et al., 2000; Powell, 2003). It is conducted by those who have knowledge about and expertise in the research topic. These experts are recognized as the Delphi panel (Hasson et al., 2000; Okoli & Pawlowski, 2004).

In the current study, the barriers to research commercialization were first extracted from the existing literature. The required expert areas were determined and the panel members were selected through purposive sampling. Then, two Delphi rounds were conducted. The questionnaires were electronically distributed and collected in both rounds (through e-mail). In the first round, a list of the barriers, extracted from the literature, was given to the humanities panel

members in order to determine the extent of their influence. Moreover, they were asked to add more barriers that were not included in the given list. Those barriers suggested by the panel members in the first round were added in the second round questionnaire. For the purpose of the current study, a 5-point Likert scale was chosen ranging from 1 (*very low influence*), 2 (*low influence*), 3 (*moderate influence*), 4 (*high influence*), and 5 (*very high influence*). On this scale, number 3 was considered as the neutral point. In this sense, the study encompassed two ranges: Lack of consensus between 1 and 3 and consensus between 4 and 5. Analyzing the data, those barriers with their mean in the lack of consensus range were deleted. Hence, the second round questionnaires along with the previous comments and mean values of the first Delphi round and the barriers suggested in the first round were given to the panel members for determining the extent of consensus among them. After this round, Kendall's coefficient of concordance (*W*) was calculated to determine the extent of the panel members' consensus. Kendall's coefficient of concordance is a measure of the agreement aiming several (*m*) quantitative or semi-quantitative variables that are assessing a set of *n* objects of interest. It was calculated through SPSS. Hence, $0 < W < 1$, Number 1 represents perfect concordance (Legendre, 2010).

Demographic Information

The statistical population consisted of all the faculty members of universities and research centers, researchers and MA and PhD students in the field of humanities. Since the results of the study would benefit the Iranian research institute for information science and technology (IRANDOC), it was tried to choose the experts in humanities from the fields related to this research center. Accordingly, the humanities experts were chosen from the fields such as management, linguistics, social sciences, philosophy, library, and information sciences. The purposive sampling method was adopted, presuming that the researcher's knowledge was used for screening the panel members (Hasson et al., 2000). The criteria for selecting the panel members were the theoretical knowledge, practical experience, their willingness and capability for participating in research and easy accessibility to them. Like any other sampling methods, this method also depends on such factors as access to people, required time and cost of data gathering. In

Delphi method, which requires including various experts of the research topic in the panel, these limitations would increase. Although the number of panel members varied between ten and more in previous studies, in the case of consensus among the panel members, ten to twenty members were recommended (Hung et al., 2008; Okoli & Pawlowski, 2004). In the current study, the participants' resumes were used to identify the experts. In this way, twenty five people were identified in the field of humanities. Having screened and used the aforementioned criteria, fifteen experts were included in the sample. Fifteen members of the humanities panel were PhD holders, out of whom, five ones had educational degrees in management (majoring at technology, science and technology policy, and education); three members had educational degrees in the field of library and information sciences; two members in the field of philosophy (science and technology); two members in the field of social science, and finally, two members in the field of linguistics (majoring at general linguistics). Out of fifteen members of the humanities panel, one had PhD; twelve members were assistant professors and two members were associate professors. They were faculty members of various universities including Shahid Beheshti University (2 members), Tarbiat Modares University (2 members), Iranian National Museum of Science and Technology (1 member), University of Tehran (3 members), Sharif University of Technology (1 member), Research Center of Humanities and Cultural Studies (4 members), Islamic Azad University (1 member), and a researcher from Iran Organization of Management and Planning.

Developing a conceptual model for the barriers to research commercialization

Having completed the checklist of barriers to commercialization throughout Delphi process, grounded theory was used in order to form a conceptual model for them. Grounded theory is a qualitative research method through which a set of data is formed theoretically so that the theory explains a process, action, or interaction at an extensive level. This research strategy relies on three elements including concepts, categories, and propositions. The major process entails coding and categorizing raw data and extracting the main concepts and categories and their relationship in the form of a theory. Accordingly, in order to analyze the data, three ways including open coding, axial coding, and

selective coding were utilized (Strauss & Corbin, 1990).

Data Analysis

Delphi rounds and using grounded theory are explained for developing a conceptual model for the barriers on the way of commercializing research in humanities. To this end, this section is divided into two stages: 1) Analyzing Delphi data related to the barriers on the way of the humanities research commercialization, 2) analyzing grounded theory for the barriers on the way of commercializing research in humanities.

Analyzing Delphi Data

In total, two rounds of Delphi were conducted. Taking into account the data resulting from Delphi rounds and several sections of the questionnaire in each round, measures of central tendency including mean (μ) and standard deviation (σ) were calculated. The questionnaires were distributed in two rounds of Delphi and those barriers for which $\sigma < 1$ and $\mu > 3$ were included in the second round and those barriers for which $\mu \leq 3$ and $\sigma \geq 1$ were omitted (Cline, 2000). Kendall's coefficient of concordance was calculated in two rounds.

First Delphi round

In the first round, forty five barriers to research commercialization (Table 1), which were previously identified in literature, were given to fifteen panel members in the form of a questionnaire through e-mail in order to receive their comments on the extent of their influence on the research commercialization in humanities on a Likert scale. Moreover, they were asked to suggest some other barriers which were not included in the list (Table 2). Table 3 presents the results related to the mean and standard deviation. Those barriers marked by (*) were those on which the panel members had the highest degree of consensus. Other barriers were those on which the panel members had the lowest degree of consensus and thereby, they were omitted from the second round questionnaire. A total of twenty three barriers were omitted since the panel members believed that these barriers were related to the natural science rather than humanities. The mean of standard deviation was 0.908, which was lower than 1, indicating an acceptable degree of consensus on these barriers. Kendall's coefficient of concordance (*w*)

was 0.677, indicating seemingly strong consensus on these barriers. Moreover, the panel members suggested the following barriers to research commercialization in humanities (Table 2).

Table 2. Suggested Barriers (SB) by the Panel Members in the First Delphi Round

SB1. Humanities research problem solving methods are processes, laws and game rules;	SB12. Lack of integration among the policies of the institutes involved in decisions making in humanities;
SB2. Inadequate knowledge of the nature of sciences;	SB13. Innovation sources in researches in humanities are lifestyles, values and beliefs;
SB3. Flexible and interpretable of research findings in humanities;	SB14. Operational mission, goal and objective in humanities are thinking style, values and Individual behaviors, groups, and organizations;
SB4. Soft nature of technology in humanities;	SB15. Technological parameter in humanities entail physiological, social, and cultural factors;
SB5. Public unawareness of humanities;	SB16. Weak relationship between the researches' issues and decision-makers' needs at the time of conducting research;
SB6. Unawareness of the managers in industry of the significance of humanities in a society;	SB17. Existing weak regulations and guidelines for enhancing the rankings of faculty members;
SB7. Not paying attention to clarifying the concept of knowledge commercialization in humanities in national strategic planning;	SB18. Presenting impractical education to the researchers at universities (traditional teaching structures);
SB8. Lack of communications and social networks among the investors, industries and universities;	SB19. Unclear application and implication of humanities in the society;
SB9. Lack of problem-based researches in humanities;	SB20. Lack of a local, purposive, and systematic model for researches commercialization;
SB10. Weak entrepreneur culture in Iran;	SB21. Non demand-driven researches;
SB11. Funding research in the traditional way and by the government;	

Second Delphi round

In this round, the barriers accepted in the first round and twenty one suggested barriers (Table 2) were sent electronically in the form of a questionnaire to the panel members in order to receive their comments on a Likert scale on the extent of their influence on hindering commercialization of research findings in humanities. Besides, they were asked to suggest the barriers which were not included. Table 3 presents the results related to the mean and standard deviation. As Table 3 displays, there was an acceptable degree of consensus on 43 identified

barriers. The mean value for the standard deviation of these 43 barriers was 0.608 indicating consensus among the panel members. Moreover, Kendall's coefficient of concordance (w) was 0.759, indicating strong consensus on these barriers. It is worth noting that the panel members suggested no additional barriers in this round.

Table 3.Results of the Second Delphi Rounds

No.	First round		Second round		No.	First round		Second round	
	μ_1	σ_1	μ_1	σ_2		μ_1	σ_1	μ_2	σ_2
B_1	3.80	0.67*	4	0.65*	B_{24}	3	1		
B_2	3.93	0.88*	4.06	0.88*	B_{25}	3	1.19		
B_3	3.26	1.16			B_{26}	2.80	1.14		
B_4	4.20	0.67*	4.40	0.63*	B_{27}	2.40	1.12		
B_5	4	0.65*	4.13	0.63*	B_{28}	2.80	1.01		
B_6	4.06	0.70*	4.06	0.45*	B_{29}	4.13	0.63*	4.20	0.67*
B_7	4.13	0.63*	4.13	0.51*	B_{30}	3	1.13		
B_8	4	0.84*	4.06	0.59*	B_{31}	3.26	1.03		
B_9	4.26	0.59*	4.20	0.56*	B_{32}	3.33	1.23		
B_{10}	4.06	0.79*	4.40	0.63*	B_{33}	3.33	1.11		
B_{11}	3	1			B_{34}	4	0.65*	4.20	0.67*
B_{12}	3	1.19			B_{35}	2.93	0.96		
B_{13}	4	0.75*	4.13	0.74*	B_{36}	4.06	0.70*	4.46	0.51*
B_{14}	3.26	1.37			B_{37}	2.80	1.01		
B_{15}	3.26	1.09			B_{38}	3.33	1.11		
B_{16}	3.80	0.94*	4.26	0.45*	B_{39}	3	1		
B_{17}	4	0.84*	4.33	0.61*	B_{40}	2.46	1.12		
B_{18}	3	1			B_{41}	4.13	0.63*	4.53	0.83*
B_{19}	4.13	0.74*	4.33	0.61*	B_{42}	3.53	0.91*	4.26	0.79*
B_{20}	3.06	1.03			B_{43}	2.80	1.01		
B_{21}	3.33	0.97*	4.20	0.67*	B_{44}	4.20	0.56*	4.60	0.50*
B_{22}	4	0.65*	4.26	0.45*	B_{45}	4.13	0.51*	4.40	0.63*
B_{23}	2.86	1.06							
Suggested barriers(SB) in the second Delphi round									
SB_1			4.13	0.74*	SB_{12}			4.46	0.51*
SB_2			4.26	0.45*	SB_{13}			4.13	0.63*
SB_3			4.06	0.59*	SB_{14}			4.13	0.74*
SB_4			4.06	0.45*	SB_{15}			4.06	0.88*
SB_5			4.60	0.50*	SB_{16}			3.80	0.77*
SB_6			4	0.65*	SB_{17}			4.20	0.41*
SB_7			4.26	0.45*	SB_{18}			4.20	0.56*
SB_8			4.13	0.63*	SB_{19}			4.20	0.56*
SB_9			4	0.65*	SB_{20}			4.13	0.63*
SB_{10}			3.93	0.59*	SB_{21}			4.06	0.45*
SB_{11}			4.20	0.67*					

Grounded Theory for Analyzing the Barriers to Commercialization

According to the results of Table 3, 43 of the barriers to commercializing research findings in humanities are finalized. In order to reach for more coherence and making better analysis and interpretation, 43 barriers in two Delphi rounds (preliminary concepts of barriers) were combined and classified into fifteen more abstract concepts shown in Table 4 (secondary concepts).

Table 4.Extracting Secondary Concepts of the Barriers to Commercializing Research

Secondary concepts of barriers	Preliminary concepts of barriers
Motivational barriers	o Researchers' different motivations in universities and business sector (B_1); o Differences between the academic scientists' motivations and the dominant culture on universities (B_{16}); o Lack of motivation for commercialization among the researchers (B_{21});
Attitudinal barriers	o Researchers' lack of belief in commercializing research findings (B_7); o Researchers' belief in incompatibility of commercialization with the scientific ethics (B_{22}); o Researchers' negative attitude towards involving in business activities (B_{36});
Awareness and informing barriers	o Lack of familiarity and adequate information of the research users about the value of research findings (B_2); o Public unawareness of humanities (SB_5); o Unawareness of the managers in industry of the significance of humanities in a society (SB_6);
Legal barriers	o Existing weak regulations and guidelines for enhancing the rankings of faculty members (SB_{17}); o Weakness in regulations related to intellectual property (B_{42});
Policymaking barriers	o Funding research in the traditional way and by the government (SB_{11}); o Not paying attention to clarifying the concept of knowledge commercialization in humanities in national strategic planning (SB_7); o Lack of integration among the policies of the institutes involved in decisions making in humanities (SB_{12});
Financial barriers	o Lack of financial resources for research commercialization in the most universities and research centers (B_8); o Lack of investment of the industry and investors in basic research (B_6);
Skill-related barriers	o Researchers' lack of familiarity with research commercialization process (B_5); o Researchers' lack of knowledge and skills for starting and managing the business (B_{19});
Intrinsic barriers on humanities	o Unclear application and implication of humanities in the society (SB_{19}); o Innovation sources in researches in humanities are lifestyles, values and beliefs (SB_{13}); o Operational mission, goal and objective in humanities are thinking style, values and Individual behaviors, groups, and organizations (SB_{14}); o Inadequate knowledge of the nature of humanities (SB_2);

Secondary concepts of barriers	Preliminary concepts of barriers
Technological nature barriers in humanities	o Soft nature of technology in humanities (SB$_4$); o Technological parameter in humanities entail physiological, social, and cultural factors (SB$_{15}$);
Research method barriers in humanities	o Not implementing the research findings and the big gap between theory and practice (SB$_4$); o Doubt about the method and quality of data gathering (B$_{34}$); o Humanities research problem solving methods are processes, laws and game rules (SB$_1$); o Flexible and interpretable of research findings in humanities (SB$_3$);
Research topic barriers	o Weak relationship between the researches' issues and decision-makers' needs at the time of conducting research (SB$_{16}$); o Lack of problem-based researches in humanities (SB$_9$); o Non demand-driven researches (SB$_{21}$);
Cultural barriers	o No commercialization culture in academic sector (B$_{10}$); o Weak entrepreneur culture in Iran (SB$_{10}$);
Organizational structure barriers	o Bureaucratic inflexibility of the structure of universities (B$_{17}$); o Presenting impractical education to the researchers at universities (traditional teaching structures) (SB$_{18}$); o Lack of commercialization units or technology transfer offices in universities and research centers (B$_{41}$);
Networking barriers	o Lack of mutual trust among academic sector, industry and investors (B$_{13}$); o Lack of interdisciplinary research teams in organizations and the researchers' interactions with such teams (B$_{45}$); o Lack of communications and social networks among the investors, industries and universities (SB$_8$);
Planning and management barriers	o Not considering commercialization of research findings in the agenda of universities aiming to produce economic benefits (B$_9$); o Lack of a systematic model and time and required mechanisms for attracting research funds (B$_{29}$); o Lack of a local, purposive, and systematic model for researches commercialization (SB$_{20}$); o Lack of particular organizational strategies for commercialization (B$_{44}$);

Then, fifteen secondary concepts were categorized into six main categories. These main categories were more abstract than the secondary concepts (See Table 5). The barriers might resemble formally or one concept might be included in more than one category. These are common in analyzing qualitative data. In the thematic analysis approach, formal similarity of the concepts and categories is acceptable. One concept might be categorized based on its affinity with each of the main categories. The main categories and their relationship

with the concepts are presented in Table 5.

Table 5.Extracting Main Categories of the Barriers to Commercializing Research

Main categories	Secondary concepts of barriers
Behavioral barriers	Motivational barriers;
	Attitudinal barriers;
	Awareness and informing barriers;
Contextual barriers	Legal barriers;
	Policymaking barriers;
Resources barriers	Financial barriers;
	Skill-related barriers;
Identity barriers in humanities	Intrinsic barriers on humanities;
	Technological nature barriers in humanities;
Research structure barriers in humanities	Research method barriers in humanities;
	Research topic barriers;
Infrastructure barriers	Cultural barriers;
	Organizational structure barriers;
	Networking barriers;
	Planning and management barriers;

Based on the panel members' opinions, the major and core category among these six main categories was the research structure barriers. Policymaking and legal barriers were considered as the contextual factors while resources and infrastructure barriers were conceived of as causal factors and the technological nature barriers and intrinsic barriers in humanities were among the intervening factors. All these barriers would lead the humanities researches to become impractical and thereby, no economic and social value would be achieved. In this sense, a conceptual model for the barriers to commercializing research in humanities is presented in Figure 2.
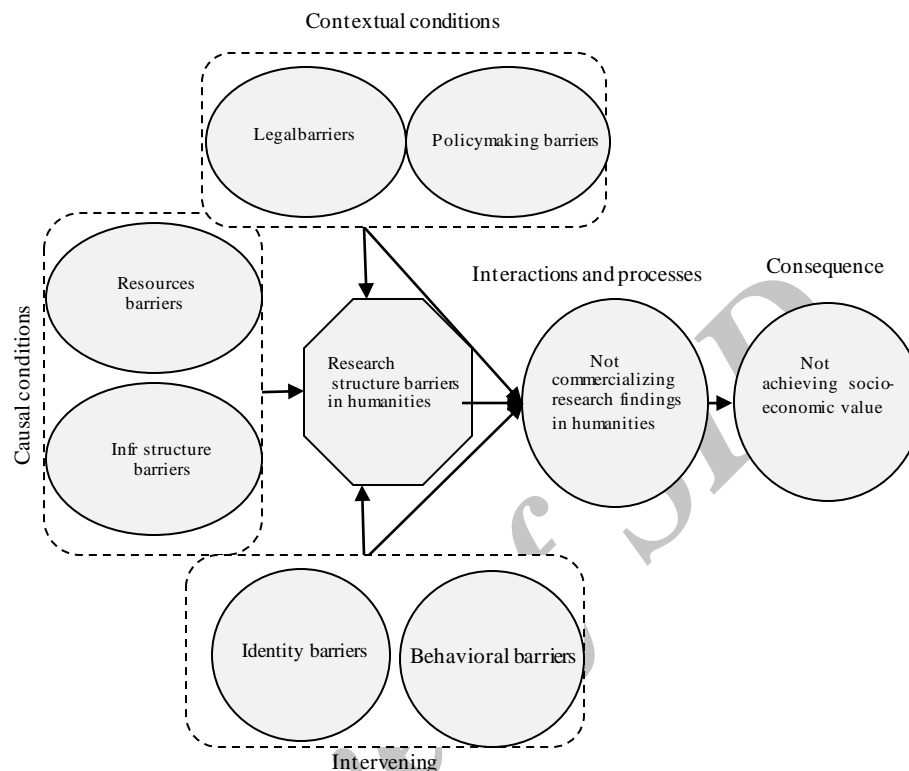
Figure 2. A conceptual framework for the barriers to commercializing research findings in humanities

Discussion

Following the storyline in the grounded theory framework which entails the core category, conditions (causal, contextual, and intervening), interactions and processes, consequences, in this study, a theory was presented for research commercialization barriers in the field of humanities.

According to the results of Section 4, the structure of humanities researches was selected as the core category. It was selected as the core category due to three reasons: i) It is a fundamental barrier to which other barriers are related; ii) It has an analytical aspect; iii) It has been repeatedly referred to by experts on the Delphi panel in various ways.

Hence, other categories could be analyzed in relation to this category.

The structure of researches in the field of humanities is exposed to two methodological and topic challenges. The main methodological barriers are as follows: Impracticality of the research findings in the field of humanities, the existing gap between theory and practice, doubts in methodology and quality of data gathering, changeability and interpretability of the research findings. On the other hand, topic related barriers in the field of humanities are as follows: Weak relationship between research topic and social needs, lack of problem-solving nature of the research. The underlying reasons for all might be traced back to causal, contextual, and intervening categories.

The most important causal category includes resources barriers (such as financial and skill-related barriers) and infrastructure barriers (such as cultural barriers, organizational structure, networking, planning, and management). Most researches in the field of humanities are basic ones aiming to develop the knowledge boundaries. However, industry and investors rarely invest in the basic research; on the other hand, low academic research budget has led to the applied research to be more preferable. This low resource allocation has made a negative impact on research in the field of humanities. Moreover, an obvious prerequisite for research commercialization is researchers' familiarity with the commercialization concepts and procedures. Most researchers in the humanities do not have the enough knowledge and skills to set up and run businesses. Lack of entrepreneurship and commercialization culture is considered as a major infrastructural barrier to commercialization in many universities all over Iran. Furthermore, there still exist some traditional teaching structures at universities which are actually impractical. The existence of organizational structures with traditional boundaries has made it impossible for universities to connect with the industry. One other infrastructural barrier is weak academic networking. If the researchers in the field of humanities establish a research network with those in technical-engineering fields or industry sector, their research quality and capital

attraction would be positively influenced and this would facilitate commercialization. Another infrastructural barrier is planning and management challenges including not placing commercialization of research findings in academic sector agenda, lack of the required mechanisms for attracting research budgets, lack of local commercialization models, and lack of certain organizational strategies for commercialization.

Moreover, the influence of the contextual categories, which are legal and policy making barriers to commercialization should be considered. Although the significance of commercialization has been highlighted in the duty act of the Ministry of Research, Science, and Technology, Development Plans of the country, Iran's 20-year vision plan, and National Report of Higher Education, but the required legal settings for commercialization of research findings have not been provided. There is no law regarding research commercialization in the field of humanities and soft technologies. Moreover, there exist several problems regarding policy making. For instance, the concept of commercialization in the field of humanities has not been clarified in the strategic plans of the country. On the other hand, the policies of the decision-making institutions of the country regarding the missions of the humanities are neither coherent nor integrated.

Furthermore, there are behavioral barriers (e.g., motivational, attitudinal, awareness, and informing barriers) and identity barriers (e.g., technological nature and intrinsic barriers) in the field of humanities which were presented in the form of intervening conditions in the current study. Lack of researchers' motivation to commercialize their research findings is the major barrier which underlies the fact that the faculty members' status is promoted based on their number of articles and research projects; hence, they are more inclined to gain research scores than to generate revenue. Changing the faculty members' status promotion guidelines may overcome this barrier. On the other hand, many researchers in the field of humanities hold negative attitudes towards getting involved in business and it is

considered as the main attitudinal barriers in relation to the commercialization of research findings. The lack of awareness of the industry and the public about the importance of the humanities in society is considered as the other barriers to commercialization of research findings. Many of the barriers are due to the nature of humanities and the uncertainty about the nature, functions, and applications of these sciences in society. The main reasons for this are as follows:

- The research finding innovation relies on the lifestyles, values, and beliefs in the field of humanities;
- The mission, goal, and operational aim of the field of humanities are thinking styles, values and behavioral moods of individuals, groups, and organization.

On the other hand, technological parameter of the field of humanities mostly entails physiological, social, and cultural factors. As a result, the technological nature is soft and is not observable and tangible like natural sciences technologies; this is what makes understanding commercialization related to the humanities technologies difficult.

Conclusions

The dominant economic paradigm shift and movement from industrial economy to knowledge-based economy, and the significance role of the universities and research centers in development and growth of a society have turned their heads towards commercializing research findings, profit gaining, and creating added value. Commercialization of research findings approach provides the field of humanities with an opportunity to move away from theoretical state to a productive knowledge state and take actions to develop the society and to solve social problems. Nevertheless, as it seems an emerging area in Iran, its realization would be confronted with numerous challenges and barriers. The first step to resolve these challenges and barriers is to know them. To this end, the current study was conducted to identify the existing challenges and barriers to which commercialization of research findings is exposed. Based on the existing literature, the barriers vary across different contexts and scopes and analytical level. However, few studies

have been conducted with regard to these barriers in the field of humanities. Taking an interpretive approach, the study tried to explore the existing barriers of commercialization of research findings in the field of humanities from Iranian researchers' viewpoints and to interpret them in a contextual framework. In this regard, having reviewed the existing literature, a checklist including 45 barriers was prepared (See Table 1). Within two Delphi rounds, the checklist was given to a panel of 15 experts in the field of humanities in order to elicit their viewpoints on research commercialization barriers in the Iranian context. According to Delphi results, 23 barriers were eliminated and 21 barriers were added by the panel members. Hence, a finalized checklist including 43 barriers was obtained. Afterwards, it was tried to analyze and interpret the barriers through using grounded theory, in a framework constituting core category, conditions (causal, contextual, and intervening), procedures/interactions, and consequences. The core category included research structure barriers (e.g. methodology and research topic barriers). Funk et al. (1995) pointed to such barriers as quality-related problems and deficiencies, e.g. uncertainty about the results credibility, inadequacy of research methodology, and research findings unjustifiable. Moreover, some other barriers related to the research structure that the interviewees referred to in this study entail a weak relationship between research topics and needs of the society, non-demand-driven researches, changeable and interpretable nature of research findings in the field of humanities.

Furthermore, policymaking and legal barriers were identified in terms of contextual conditions. Legal barriers included weak intellectual property regulations, pointed in Bulsara et al.'s (2010) and Tahvanainen and Nikulainen (2011). Moreover, weak regulations of the faculty members' status promotion were one major legal barrier pointed by the interviewees. They also referred to the governmental policies and strategies. The challenges related to policymaking barriers entailed supplying research funds in a traditional way and by the government, not paying attention to the clarification of the knowledge

commercialization of the field of humanities in strategic planning of the country, incoherent and non-integrated policies of decision-making institutions in the field of humanities.

In addition, resources barriers (e.g. skill and financial ones), and infrastructural barriers (e.g. cultural, organizational structure, networking and planning and management barriers) were identified in the causal conditions. Lack of financial resources has been highlighted as an important barrier to commercialization by numerous scholars, e.g. Runk and Bruch (1999), Howells and McKinlay (1999), Wright et al. (2007), Pellilkka et al. (2012). Researchers' lack of knowledge and skill (Wright et al., 2007) and their unfamiliarity with the commercialization procedures (Pellikka et al., 2012) were pointed as skill-related barriers considered in the current study. Lack of commercialization culture in the academic sector was also pinpointed as a cultural barrier (Howells & McKinlay, 1999; Samsom & Gurdon, 1993). Weak entrepreneurship culture in Iran was another cultural barrier. The bureaucratic inflexibility of the academic structure (Siegel et al., 2003), and lack of commercialization units or technology transfer offices in universities and research centers (De Baker & Welgross, 2005; Locket & Wright, 2005; Siegel & Phan, 2005) were identified as the structural barriers. Other structural barriers encompassed traditional and impractical teaching structures. Furthermore, the interviewees referred to the networking problems among the investors, industry and academics. This was highlighted by Karla (2013) in terms of the absence of interdisciplinary research teams. Additionally, planning and management barriers were identified, e.g. not placing research commercialization in the academic sector agenda aiming to create economic profits, lack of the required mechanisms for attracting research funds (Runk and Bruch, 1999), lack of certain organizational strategies considering commercialization (Shane, 2004), and lack of an organized local commercialization model.

The behavioral barriers (e.g. motivational, attitudinal, and informational barriers) and identity barriers in humanities (e.g. intrinsic and technological nature barriers) were identified in terms of

intervening conditions. Motivational barriers included lack of commercialization motivation among the researchers (Tahvanainen & Nikulainen, 2011), different incentives of the academic and business sectors (Samsom & Gurdon, 1993). Attitudinal barriers included researchers' lack of belief in commercialization (Bimanz & Harmisen, 1995), and their negative attitude towards getting involved in business activities (Howells & McKlainay, 1999). Moreover, informational barriers included lack of adequate familiarity of the industries with the research findings (Funk et al., 1995), and the public's lack of knowledge about the humanities, and managers' lack of knowledge about the significance of research in the field of humanities. In addition, the experts believe that some research commercialization barriers in the field of humanities result from its nature. From their viewpoints, innovations in research in the field of humanities roots in the values and beliefs and the operational aim of the field entails thinking style and behavioral states of individuals, groups and organizations. This caused the application of humanities seem uncertain in the public's viewpoints. Moreover, the physiological, social, and cultural factors mostly underlie the technical knowledge in humanities. However, as it is not as tangible and observable as that of the technical-engineering, and natural sciences, understanding technical knowledge commercialization is difficult in the field of humanities. In the following section, several policy recommendations are presented to contribute to overcoming some of research commercialization barriers in the field of humanities by the policymakers.

Policy Recommendations

Based on the results, several recommendations are presented for the managers and policymakers to overcome the barriers to research commercialization in humanities:

- Commercialization is an emerging area in humanities and the other sciences, and requires culture making, education, and necessary actions taken by the government and the academic and research institutes. This would decrease humanities

researchers' negative attitudes towards getting involved in commercialization.

- The concept of research commercialization in the field of humanities has not been clarified in the policies and plans. This has led to the researchers' confusion. Policymakers should pay more attention to this issue.

- Establishing power link among researchers in humanities and technical engineering fields and developing their interactions and cooperation in research activities; In order to pave the way for this cooperation, the heads of the universities and academic centers should encourage the researchers to conduct interdisciplinary studies.

- There exist different and contradictory viewpoints towards commercialization which result from the contrast among the underlying purposes of the national policies related to humanities. Integration among the policies of several policymaking institutions, like supreme council of Cultural Revolution and Presidential Deputy for Science and Technology, leads to the unity of procedures among researchers in terms of commercialization activities.

- Developing patent filing procedures for humanities and soft technologies could also contribute to commercializing research findings in the field of humanities.

- Establishing a close relationship between university and industry would raise both groups' consciousness and set the scene for commercialization of research findings. This would foster the faculty members' sabbaticals through exchanging researchers.

- The government has to make investments and allocate funds to applied research and fundamental research particularly in the field of humanities. Most studies in the field of humanities are fundamental ones. Supporting this would contribute not only to developing knowledge boundaries but also to implementing its potential in order to meet the societal needs.

- Changes in the faculty members' promotion system and policies of the universities and research centers in order to develop commercialization approach would lead the humanities research towards commercialization.

- Nowadays, techno-markets, incubators, science and technology parks, and spin-offs have been created in the field of natural sciences and technical-engineering. However, few ones have been created in the field of humanities. Creating and extending such centers in the field of soft sciences and humanities would contribute to commercializing humanities research.

- Modifying the educational system and presenting applied education to the university students in general, and students in the field of humanities in particular, would lead to the acquisition of adequate knowledge and skill considering

commercialization of research findings.

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