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## Presentation of a Knowledge Commercialization Model based on Teaching-Learning

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### Abstract

**Purpose:** The general aim of this study was to present a knowledge commercialization model based on teaching-learning in Mazandaran Islamic Azad universities.

**Methodology:** The present study was applied in terms of purpose and descriptive-survey type in terms of method. The statistical population of this study included all faculty members of Mazandaran Islamic Azad Universities, which comprised 1537 individual. Using stratified random sampling, 308 individuals were selected as sample. To collect the data, a researcher-made knowledge commercialization questionnaire with 84 items and a researcher-made learning-learning questionnaire with 30 items were used. The face and content validity of the tools were confirmed by the experts and their reliability was calculated using the Cronbach's alpha coefficient for the knowledge commercialization questionnaire (0.89) and the teaching / learning questionnaire (0.85). Structural equations were used to analyze the data.

**Findings:** The results showed that learning-learning has a positive and significant effect on knowledge commercialization, and the knowledge commercialization from learning-learning receives a direct and significant effect with a coefficient of 0.785. The fit of the proposed model was also suitable.

**Conclusion:** knowledge commercialization is a process of transferring and transforming knowledge generated in research centers into a variety of business activities.

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## 1. Introduction

Knowledge is known as the crucial element of economic growth through the knowledge-based economy. Scientific knowledge is dramatically important for the innovation and development of new businesses, and universities play a significant role in generating knowledge and innovation (Baycan & Stough, 2013). What prevents the country's scientific and economic development is the distancing of the economic, industrial, and commercial system from the country's scientific, educational and research base. One should not be afraid of revealing the bitter fact that the industry, the trade and the market and, in general, our economy lacks a scientific basis relied on the knowledge of the day. Our scientific products are also largely confined to shelves of libraries and closed environments and cannot be released to the market. In today's world, the economic, political and military power of the countries is due to the volume of scientific production. Their economic, commercial, and industrial products are all parts of a single element. In order to fill this huge scientific and economic gap of our country with the advanced world, we have to make a great revolution, which is "commercialization of science and knowledge," and as long as this problem is not resolved, we are not able to widely obtain the science and knowledge. For sustainable development through the society, science should become a culture, and the culturalization of science in society also comes from its commercialization.

Commercialization is the process of transferring and transforming the generated knowledge in research centers into a variety of business activities (Park & Ryu, 2015). In other words, knowledge commercialization is a collection of efforts made to sell research work with the aim of gaining more profit and connecting more education and research to obtain economic and social goals (Hajipoor, et al, 2016). Thus, it can be stated that two main missions of universities in the field of knowledge are the research and application (Shafi Zadeh & Sadat Mohseni, 2012).

The continuity of the cycle of knowledge conversion into wealth involves various stages that the discovery of natural laws, formation of applied ideas based on scientific observation or natural needs, advancement of the level of the idea to the stage of technology, development of ideas and their transformation into process or product, competitive and economic production, and ultimately entering the financial and business cycle can be named. A cycle with the stages associated with the production of information and knowledge (Yadollahi Farsi & Kalatami, 2012). Indeed, the commercialization is defined on as the process of ownership of the ideas, the development of knowledge of its completion, the creation, and manufacture of consumer goods and the sale of products through the market. Therefore, the process of commercialization of knowledge embraces all activities from the emergence of ideas to production of design, prototype testing, manufacturing, and marketing.

Baniasadi (2013) acknowledges the requirements and prerequisites for the commercialization of knowledge at the university as structural, cultural, and political-legal factors. The cultural factor has the highest rank in the commercialization of knowledge (Baniasadi, 2013). Amiri, et al. (2011) stated that universities, by creating favorable culture and encouraging the commercialization of knowledge, the creation of appropriate structures for managing intellectual property, and the adoption of incentive and incentive policies and policies, could facilitate the path to commercialize the knowledge, entrepreneurship, and participation through economic development.

Many researches are conducted on the commercialization of knowledge. Erafan, et al. (2018), in a research entitled "An Analysis on the Ethical Components of Knowledge Commercialization in Higher Education", showed that the ethical components of knowledge commercialization in higher education are: Infrastructure and planning with two themes of justice and responsibility; education with the two themes of teaching-learning process and culture-creation; and support that includes two themes for organizing financial support and social support. Kheirandish et al. (2017), in a research entitled "Identifying and Prioritizing Organizational factors for Knowledge commercialization ," showed that organizational culture, organizational structure and strategy, human resources and management are the most important factors through the commercialization of knowledge in organizations. Pournaghi & Hejazi (2017), in a research

entitled "The Study of Effective Factors on Knowledge Commercialization from the Point of View of university Students of Shahid Rajae Teacher Training University," showed that from the viewpoint of university graduate students, economic factors had the greatest impact on growth and The success of commercialization of knowledge. Then, the organizational requirements, environmental factors, cultural requirements, individual factors, political and legal requirements, educational and research mechanisms affect the growth and success of the commercialization of knowledge. Nowruz, et al. (2016), in a research entitled "Designing a Commercialization Model for Academic Research Findings", showed that the main components of commercialization of research findings were the technical-economic evaluation of the plan, the networking and dynamics of communication circles, the redesign of processes and mechanisms of trust building. Turkiantabar, et al. (2016) in a research entitled "Investigating the Factors Affecting the Commercialization of Scientific Research Results in Knowledge Based Companies in Iran", showed that all the 8 factors (individual, organizational, environmental-organizational, cultural-social, legal) , Economic, political and industrial) significantly predicted successful commercialization of scientific research results. In addition, legal, industrial, organizational, individual, and economic factors had the highest role in commercializing the scientific research. Hajipour, et al. (2016), in a research entitled "The Future of the Factors of the Success of the Commercialization of High-Tech Products", showed that: individual factors (individual minds, manager, individual, managerial personality, interpersonal manager, general conditions, experience), factors Organizational (human resources, financial resources, technical capabilities, production capability, marketing and sales ability, ability to attract and manage projects, strategic capabilities, organizational capability) and environmental factors (competitors, supportive institutions, infrastructure, social factors, legal factors And other political and economic factors and technology) are all among the factors behind the success of the commercialization of advanced technology products. Masteri Farahani, et al. (2015), in a research entitled "Providing a Structural Model for the Commercialization of Knowledge in Islamic Azad University of Tehran", showed that five factors of intergenerational collaboration, knowledge creation, intellectual capital, strategic orientation and the external factors are effective in commercializing knowledge. Abbasi Esfanjani & Ferouzandeh Dehkordi (2015), in a research entitled "Designing a Comprehensive Model for Commercialization of university researches through a Delphi approach", showed that among the three factors (context, content and structure) affecting the commercialization of research, the contextual factors take the first place, and the content and structure factors are ranked the second and third respectively. Kalantari et al. (2015) in a study entitled "The Study of Organizational Factors Affecting the Strategy of Commercialization of Academic Research," showed that university infrastructure, knowledge management, university strategy and college quality, the nature of research and business orientation, networks University, university management, university human resources, university structure, and university finance are through the influential factors in the choice of the commercialization strategy for nanotechnology researches.

Berggren (2017) in a research entitled "Researchers as Commercializing in an Entrepreneurial University," showed that researchers have a significant role in commercializing knowledge in an entrepreneurial university. In a research entitled "The tendency toward entrepreneurship to commercialize university research products," Nur Syahira, et al (2016) showed that innovation, risk-taking, active software and autonomy are effective in perceptions on the commercialization of university research products. Mesny, et al. (2016), in a research entitled "Commercialization of Academic Research in Administrative Sciences at the Canadian Science Foundation,": showed that the technology transfer method used in this university with other common methods of technology transfer are significantly different, and this emphasizes the characteristics of administrative science in the commercialization debate. In addition, the sample and the studied communities are different in culture, the economic issues involved with it, political issues, and educational issues in the success of the commercialization of knowledge. Ismail, et al. (2015), in a research entitled "A framework for the successful commercialization of academic research products in Malaysia,"

showed that the elements of the commercialization of research success are: the knowledge, skills and characteristics of the researcher, the creation of product ideas, development And product upgrades, commercialization paths, competitive advantage in the market, selection of business partners, fostering healthy relationships with business partners, and facilities and support. Rahim et al. (2015), in a research entitled "Emerging Commercialization of Technology: The Role of the Entrepreneur", showed that entrepreneurship competence is critical to risk-taking, knowledge, value, and self-confidence for successful entrepreneurs, they also stated that enterprise entrepreneurship and Infrastructure are the key factors to empowering academic researchers in order to innovate, while both of which are viable. Lin, et al. (2015), in a research entitled "The Impact of Mutual Co-operation and Knowledge Generation on Commercialization of Technology in Taiwan," indicated that mutual cooperation creates new opportunities for the production of knowledge and the commercialization of technology. Wu et al. (2015), in a research entitled "Commercialization of University Inventions: Individual and Organizational Factors Affecting the Licensing of Registered University Inventions", indicated that the probability of issuing a permit significantly affected individual factors, such as attitudes of inventors Investigate commercialization, further researches during the patent studies, and also the collaboration with industry scientists in researches. Lam (2015) in a research entitled "The Impact of Psychological Motivational Factors of Academic Scientists on Knowledge Commercialization," indicated that credit rewards and internal satisfaction as personal motivations directly affect the commercialization of knowledge, but the material rewards are influenced by the financial returns on the commercialization of knowledge. Khayat (2015) in a study entitled "The Study of Factors Affecting the Transfer of Technology in the Food Industry of the Philippines," indicated that structural factors, the factors due to technology transfer, and government-related factors and the technological features affect the technology transfer.

On the other hand, learning is the central part of every individual's life. It happens even when we do not think about it. The learning process plays an essential and direct role in the learning experiences of the learners. In other words, a large part of the impact of an educational system on learners should be sought in what appears to be in the learning environment, because the interactive learning processes are planned to change behaviors. Jafari, et al. (2015) indicated that students' perceptions of globalization of higher education can predict their assessment of the quality of teaching-learning processes.

Considering that universities as the most important part of production and supply of knowledge facing the challenge of responding to the needs and expectations of society are through the most important custodians of learning in the educational system of the country; henceforth, there should be many efforts to transfer and apply knowledge and use it in the economic, social and learning sections, because today's entry of Iranian universities into knowledge business has become a necessity for advantages.

In Iran, the commercialization of academic intellectual capital is one of the important features of the law of the fourth development plan of the country in order to achieve the objectives of the 20-year vision document of the country, because, knowledge cannot create welfare as long as they cannot be applied (Fozouni arzaki & Zamani, 2014). Unfortunately, despite the scientific capacity of universities and legal predictions, Iranian universities do not have a proper position in the commercialization of knowledge and academic entrepreneurship and have not yet been able to effectively bring their scientific findings into the industry, and they have not been able to establish effective interactions between industry and a university. Therefore, the main question of the present research is: "How is the commercialization of knowledge-based according to teaching-learning in Islamic Azad universities of Mazandaran province?"

## 2. Methodology

This research is practical in terms of purpose and a survey-type in terms of descriptive method. The statistical population of this study was all faculty members of Islamic Azad Universities of Mazandaran province. They were 1537 individuals, and according to Cochran formula, 308 individuals were selected by random sampling method according to their academic degree.

**Table1.** Number of statistical samples based on academic degree

Academic Rank	trainer	Assistant Professor	Associate Professor	Professor	total
Society	745	699	85	8	1537
Sample	149	140	17	2	308
Ratio	0.485	0.455	0.055	0.005	1

To collect the data; a researcher-made knowledge commercialization questionnaire with 84 questions and 5 dimensions of: "Individual, Environmental, Subjective, Structural and Content" and the 22 components of "individual control, individual mentality, individual character, self-efficacy, interpersonal, creativity Individual, individual power, support institutions, social support, legal factors, economic factors, market potential, common culture and values, goals, strategies, organization, planning, resources and facilities, monitoring and evaluation, business processes, Relationships, Relationships & Technology" and a questionnaire made by the researcher-made learning-learning with 30 questions and 7 components of Quality of lesson design, quality of educational technology, quality Classroom atmosphere, quality of facilities and equipment, quality of time and place of teaching, quality of assessment of academic achievement and teaching quality " were utilized. The experts confirmed the face and content validity of the tools and their reliability was calculated using the Cronbach's alpha coefficient for the knowledge commercialization questionnaire 0.89 and the learning-learning questionnaire with the value of 0.85 which are statistically significant and validated. The structural equation analysis was also used to analyze the data using SPSS20 and PLS software.

## 3. Findings

How is the commercialization model of knowledge-based teaching-learning through the Islamic Azad universities in Mazandaran? The structural equation test was used to examine this question. The extent of the effect of knowledge commercialization on teaching-learning along with the presentation of an integrated and balanced model based on the relationships between variables was calculated using PLS software, which is presented in Figures 1, 2 and Table 1.

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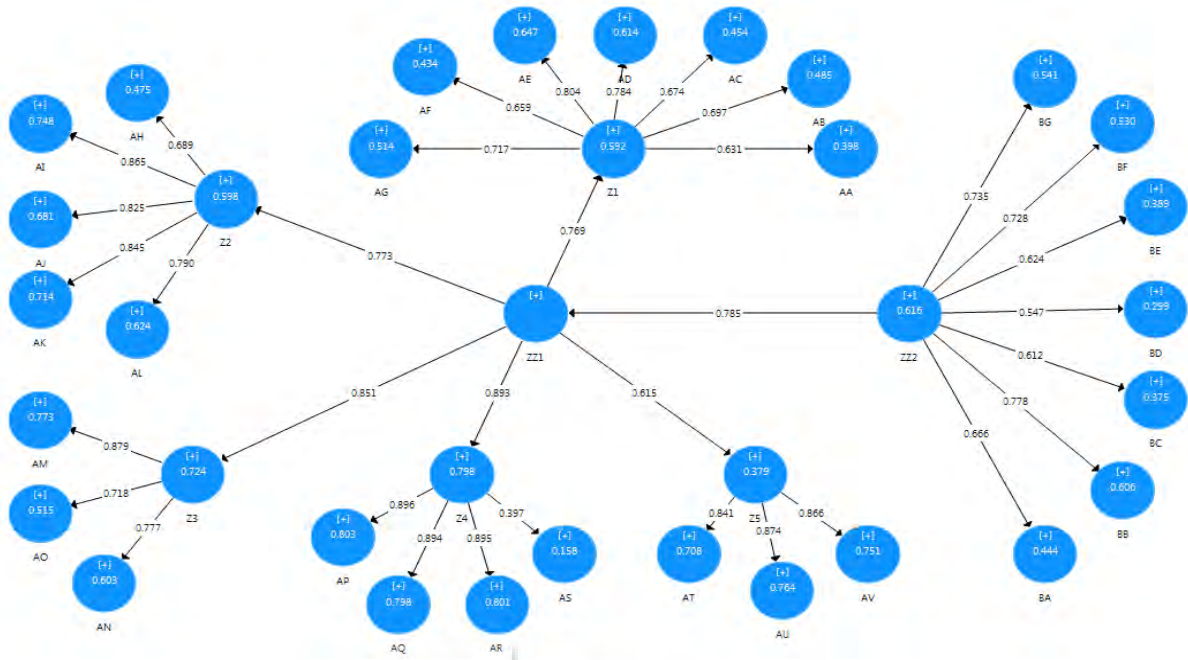


Figure1. Structural Model in Standard Estimating of Path Coefficients

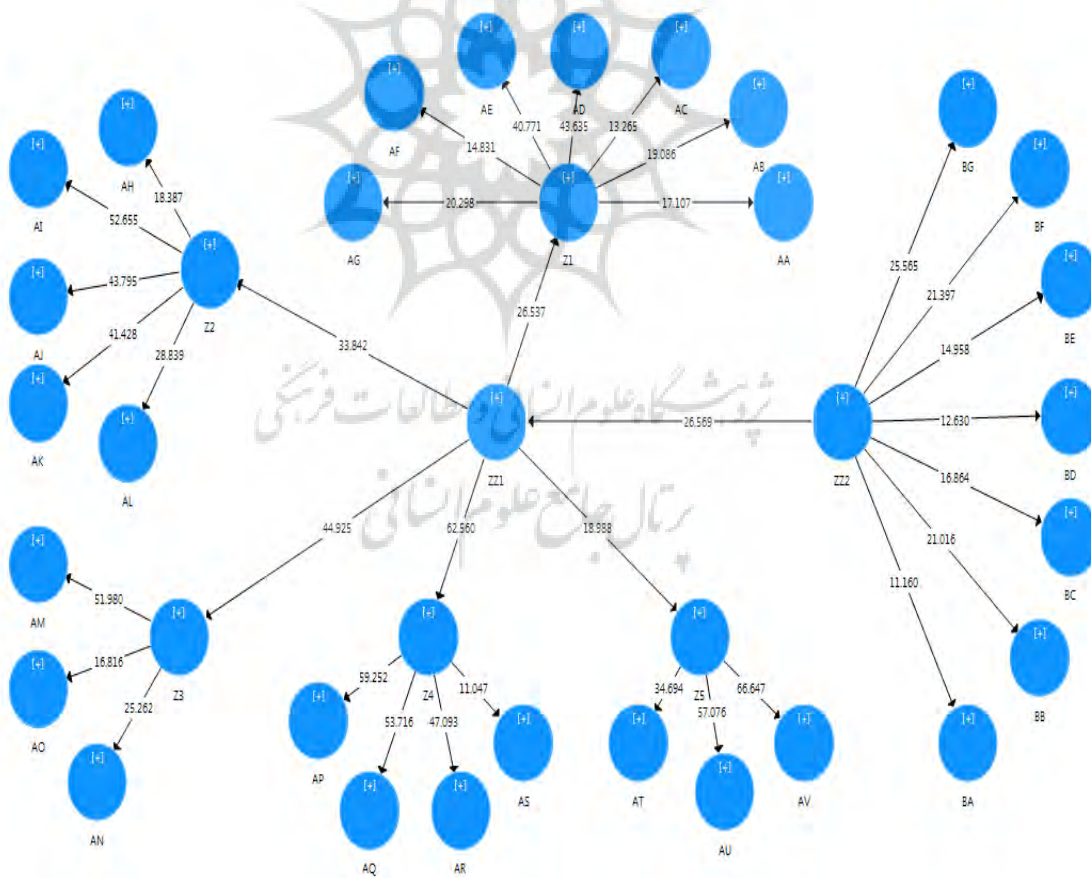


Figure2. Structural model through significant path coefficients

**Table 2.** The results of the finding of  $\rightarrow$  Path analysis

Variables	The t statistics	Standard coefficient
the effect Teaching - Learning On Commercialization of Making Knowledge	26.569	0.785

Figures 1 and 2 and the path analysis results presented in Table 2 indicate that there is factor loading of 0.785 between the exogenous variable (learning-learning) and the endogenous latent variable (the commercialization of knowledge) according to the standard load factor. In addition, due to the fact that the t-value is outside the range (2.58 and 2.58) at 99% confidence level, the effect of teaching-learning on knowledge commercialization has been significant; therefore, there is a significant relationship between teaching-learning variable and business Knowledge.

The structural equation of the study is as follows:

$$\text{Teaching - Learning} * 0.785 = \text{Knowledge Commercialization}$$

The above structural equation model suggests that: the endogenous latent variable (knowledge commercialization) is affected directly and significantly by the exogenous variable (teaching-learning) with a influence coefficient of 0.785 and  $t = 26.569$ .

The GOF index was used to determine the degree of appropriateness of the knowledge-based commercialization through Mazandaran Islamic Azad University. This index is compared through the three values of 0.01 (weak), 0.15 (average) and 0.35 (strong).

$$\text{GOF} = \sqrt{\bar{C} \times \bar{R}^2} = \sqrt{0.792 \times 0.580} = 0.678$$

The GOF index was calculated equal to 0.678. Considering that this value is higher than 0.15, the model has a suitable fit.

#### 4. Discussion

Today, knowledge is considered as one of the key factors in creating wealth, ability and science of countries and is considered as a powerful tool in national development. Knowledge and skills are considered as the main sources of value added in modern economics. Therefore, one of the requirements for entering the modern economy is the commercialization of knowledge.

The commercialization of knowledge for universities has major benefits such as creating a sustainable source of income for universities; finding sources of funding for academic researches; an opportunity to learn new challenges for future researches and creation of a capable environment for creative research; and creation of innovative for faculty members of universities and research centers (Nowruzi et al., 2016). On the other hand, developments in recent decades, including globalization, increased technological competition between countries, increased national and global costs, and the creation of conditions that make the universities financially self-sufficient and play new roles in societies while the importance of business research reveals knowledge. Therefore, in this research, the knowledge-based teaching commercialization model in Mazandaran Islamic Azad universities was studied.

The results of this study showed that teaching-learning has a positive and significant effect on knowledge commercialization and the proposed model has appropriate fit. Explaining this finding, it can be stated that: knowledge commercialization is a process of transferring and transforming knowledge generated in research centers into a variety of business activities. In other words, knowledge commercialization is a set of efforts to sell research work with the aim of making more profit and connect more education and research to economic and social goals, which is one of the important pillars of the technological innovation process. On the other hand, the continuity of universities depends on innovation in the organization and, in the long run, they can cause the success. Hence, one of the goals of the teaching-learning process is to commercialize the knowledge. As Erafan, et al. (2018) stated, the teaching-learning process is one of the dimensions of education and training as well as the dimensions of knowledge commercialization in higher education. This point is also confirmed by the present study.

In the end, according to the research findings, the following suggestions are presented to the directors and officials of Azad University: 1) Establishing the necessary conditions for the participation of the private sector and the industry in supporting university researches and researchers 2) Appropriate incentives should be established such as scientific and professional promotion, the impact of entrepreneurial activity on the evaluation of professors, the fair share contribution from the proceeds to the inventors and the staff of the relevant unit in order to motivate the academic activists to commercialize knowledge 3) Giving more freedom to act as university professors and researchers to enter the business and business activities of freedom 4) Creating associations, networks and other channels of communication between industry activists, academics and investors to become involved in the process of commercialization of knowledge 5) Providing the necessary conditions for the employment of college graduates in the industry and helping them to publish their results easier 6) Organizing workshops, seminars, conferences, and gatherings to familiarize the professors with the commercialization of knowledge.





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