

Future Study of Health Education System on the Path toward Globalization and Entrepreneurship in Iran, 2028 Horizon

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Abstract

introduction universities play a significantly important role in the development of societies. Furthermore, they have always been exposed to internal and external changes. Therefore, they are required to adapt themselves to the environment and its conditions in order to meet the needs and realize the values of society. In this regard, Universities of Medical Sciences across the country have attempted to manage their paradigmatic transition to entrepreneurship in order to synchronize with global trends. so, this study aimed to evaluate the futures faced by the higher education system in Iran in the move toward third-generation universities and globalization, using the scenario planning approach. Methods In this research, a combination of quantitative and qualitative methods were used, in three phase: I: Identifying the variables affecting the future of medical education, II: Finalizing Key Factors for Prediction and Building Scenarios (Future Estimates), Phase III: Building the Future (Scenario-making) Results Five factors, which had high impact and possibility of occurrence, were selected as the final key factors in the movement of Shiraz University of Medical Sciences toward the third-generation university. A: The ability of the system to funding the university B: stabilization of long-term policy-making towards the realization of third-generation university C: the cultural and attitudinal infrastructures of university D: Status of hardware (equipment) and software (educational contents and processes) infrastructures in this regards. Conclusion Four compatible scenarios was extracted using the Scenario Wizard Software. 1. quick move toward the third-generation universities 2. opening the wing of e-learning and virtual schools 3. turtle movement 4. alert of moving backward to first-generation universities. It seems that a proper and principled policy-making for moving toward third-generation universities is an essential goal, hence the future of this path must be clarified and a joint vision must be created.

Introduction

It is generally accepted that universities play a significantly important role in the development of societies. In addition, the specialized workforce is the axis of development, the driving force behind the transformation of society, and the only focal point of education that can accelerate the growth of society by having new ideas (1, 2). The cultural and social missions of universities and their considerable impact on the growth of societies (the civilization and development of committed and expert human resources on one hand, and the need to create an inward transformation of the university's atmosphere and use the unique capacity of this system on the other hand), have attracted attention to the interaction of universities with the society and the state in politics and planning as an important responsibility (3).

Furthermore, universities have always been exposed to internal and external changes affected by economic, political, social, cultural, national and international developments. Therefore, they are required to adapt themselves to the environment and its conditions in order to meet the needs and realize the values of society. From a foresight perspective, some scholars consider the pattern of university development as an interactive model, believing that universities must be responsive to the needs of

society and the state. As such, universities must move from their traditional role, which is merely the production of knowledge (second-generation universities), toward entrepreneurship universities that transform knowledge and ideas into action, in addition to just producing knowledge (Third Generation Universities) (4, 5).

In line with global changes in the process of development of universities, implementation of changes in the pattern of university development seems specifically necessary in Iran, considering the integration of the health higher education system with the service delivery system (6). Challenges such as inadequate coordination and alignment with the health care delivery system; lack of transparency of indicators showing the quality of medical education; weakness in decision-making and evidence-based policy-making; the dispersion and expansion of decision-making centers; and weakness of monitoring and assessing the approved policies and programs, are some of the shortages that currently exist (7). Along with these challenges, the rapid growth of science, the pace of changes in the health system and the society's needs, the demographic change in the country, and the advent of new and advanced technologies have also complicated the environment (8, 9). Therefore, universities in Iran need to be more dynamic in order to more properly meet social needs (10).

Given the presence of such challenges in the health higher education system, reforms in this sector have been recognized as one of the most important programs of the Ministry of Health and Medical Education of Iran. In addition, the development of this system is considered as one of the steps in the development of the health sector. According to this program, the comprehensive health education program of the country was first prepared based on upstream documents, such as Iran 2020 vision, Iran's comprehensive scientific map, a comprehensive health plan, and a health development plan. Afterwards, packages of transformation and innovation of the higher education system of Iran were prepared in order to plan for the implementation of the policies and strategies presented. One of the most important evolutionary packages is the move toward third-generation universities (8). Accordingly, universities of medical sciences across the country have attempted to manage their paradigmatic transition to third-generation universities in order to synchronize with global trends.

While the first-generation university is based on education, second and third-generation universities are based on research, and entrepreneurship and business, respectively (1). The third-generation university is composed of education, research, and innovation that is compatible with the needs of the environment and production of scientific and technological innovations. The products of these universities should be able to explore and solve problems, and must be able to sell their research results, which contribute to entrepreneurial motivation and the endeavor to generate new knowledge (11). Third-generation universities consider adaptability and creativity as a driving force. Some of the properties of third-

generation universities are: using knowledge as the main business, operating in a competitive international market, the development of open universities (collaborating with many partners), interdisciplinary research, multicultural organizations, and a lack of direct government funding (1).

In addition to entrepreneurship, the mission of third-generation universities is to contribute to the social and economic development of societies so that they can adjust the relationships between knowledge, industry and government by using a new model. Third-generation universities have the ability to innovate, recognize and create opportunities, develop teamwork, take risks and respond to challenges. By doing so, they can compete in global markets by creating economic growth (12, 13).

According to the program of development and innovation of the higher education system, Iran's universities of medical sciences should move toward becoming third-generation universities. With this background in mind, this study aimed to evaluate the scenarios faced by Shiraz University of Medical Sciences in the move toward becoming a third-generation university, using the scenario planning approach.

Methods

Phase I: Identifying the variables affecting the future of medical education

In this phase, a structured interview was applied to collect data and identify the variables affecting the future of medical education at Shiraz University of Medical Sciences. The statistical population of the study included managers of the vice-chancellor for research of Shiraz University of Medical Sciences, instructors and specialists in medical education, and health policymakers. The interviewees were selected through targeted snowball sampling with maximum diversity and consistency. First, the most known individuals were identified and selected, followed by the recognition of other experts according to their opinions. In total, 15 subjects were enrolled in the study.

Inclusion criteria were having expertise, sufficient experience, long-term view and complete familiarity with the factors affecting medical education. Prior to the research, the study's objectives were explained to the subjects in-person or over a telephone call, and consent was obtained from the participants. Moreover, the interview questions were provided to the participants before the process to familiarize them with the items. All interviews were recorded with the consent of the participants, and the recorded files were transcribed after completion of the interviews. In order to validate the data, the transcribed texts were shared with the participants and their feedback was received. Data analysis was performed

deductively and via a five-step analysis of the framework, including familiarization, identifying a thematic framework, indexing, charting, and mapping and interpretation (15).

In the familiarization stage, the researcher learned about the data by listening to the audio files and reading the manuscripts and notes, finding a general perspective on them. This step was carried out through repeated reading of the manuscripts by the researcher. During the familiarization process, key ideas and overlapping themes were written down. STEEPV and SWOT frameworks were considered as the framework for environmental analysis in three main categories of instructor, student, policy and infrastructure, in order to generate the conceptual framework of this study. In the third stage (indexing), the manuscripts were studied line by line and based on the conceptual framework, and parts of the data that were related to the particular theme were identified and indexed. Following that, the identified codes were summarized in the form of tables. Data analysis was performed using MAXQDA-11 software.

At this stage, the method designed by Lincoln YS, Guba EG was exploited to evaluate the quality of this phase, while considering four criteria of credibility, transferability, consistency or dependability, and confirmability (16). To this end and to achieve each of these criteria, the following measures were taken:

Credibility: sufficient time was spent to carry out this study. In addition, the research process was approved by three experts, and indexing was performed by KP and AG and received RR approvals.

Transferability: in order to ensure the transferability of the research results, the researcher consulted with three experts who did not participate in the study and had expertise in the field of health policy-making. To ensure transferability in the data analysis phase, special procedures of indexing and analysis of symbols and signs were exploited.

Consistency or dependability: interviews were recorded at all research stages in order to maintain detailed records for the study.

Confirmability: based on the principle of confirmability, the research results will be confirmed if all details are carefully recorded in all steps, as occurred in the present study. Moreover, raw data and all notes, documents, and recordings were maintained for the next probabilistic reviews.

Second Phase: Finalizing key factors for prediction and building scenarios (future estimates)

In the second phase, cross-impact analysis and future signals sense-making framework were applied to select key factors. In cross-impact analysis, the most important factors identified in the previous stage (expert interviews) were arranged in the form of a square matrix questionnaire. Afterwards, experts shared their view of the level of mutual impact of factors on each other, selecting the most important proponents after determining the role of each factor. In addition, the future signals sense-making framework was

exploited to determine the impact and probability of occurrence of identified factors. In this technique, new domains and latent key factors that make changes in the domain are identified, and a list of information about the future of the environment around the organization is provided (Table 1). To this end, a self-structured questionnaire was designed, scored on a five-point Likert scale. At this stage, the researcher received permission over the phone from experts to send them the questionnaire, and the questionnaire was then emailed to these people. Reminder emails were sent to experts every two weeks in case of a lack of response. After the completion, the mean views of responders for each question was estimated to analyze the questionnaires. As such, the factors with the most impact and the highest probability of occurrence were selected.

It should be noted that megatrends designed in this area in the Iranian Academy of Medical Sciences, as well as upstream documents and education transformation documents, were applied to finalize and complete the key factors for predicting and constructing scenarios in the field of medical education (see

Phase III: Building the future (Scenario-making)

In this phase of the study, scenarios were developed and strategies and requirements for the implementation of the scenario were explained to build future plans (?). In this respect, *cross-impact balance analysis was exploited to construct scenarios for moving toward third-generation universities (entrepreneurs)*. In this method, the probable situation (ranging from desirable to unfavorable status) of the selected factors was considered, based on the opinions of experts. Afterwards, another matrix questionnaire was designed, in which the effect of the occurrence of each situation on the occurrence or lack of occurrence of another situation was determined, according to experts' opinions and based on three features: strengthening, ineffective, and restrictive (inserting figures between 3 and -3). Following that, the results of this step were analyzed using Scenario Wizard software.

Results

The results of this study are presented based on three phases shown in the methodology section, above, retrieved from Model 1 (17).

Phase I: Monitoring and identifying effective factors

In the first phase of this study, we recognized the effective variables and factors in medical sciences education at Shiraz University of Medical Sciences (with regard to the pyramid rule in the above model).

At this stage, four main categories of strengths, weaknesses, opportunities, and threats were identified using the opinion of experts. These categories were categorized into four levels: instructor, student, policy and infrastructure (Table 2).

Phase II: Finalizing factors for future estimation and scenario building

In this phase of the study, the effect and the probability of occurrence of any of the factors affecting the future of medical education in Shiraz University of Medical Sciences, which were identified in the previous stages, were evaluated. The results are presented in Table 3.

At this stage, taking into account the analysis of the internal and external environment of the university, the content of the interview with the experts, the results of the questionnaire, as well as the study of the megatrends developed in this field at the Iranian Academy of Medical Sciences, upstream documents and educational development document, five factors which had high impact and possibility of occurrence were selected as the final key factors in the movement of Shiraz University of Medical Sciences toward the third-generation university.

Phase III: Building the future (Scenario-making)

The five key factors presented in Table 4 were used to structure research scenarios. The basket of scenarios was compiled from the combination of different states of these factors and their possible situations using a cross-impact balance analysis (Table 4).

Four compatible scenarios, a network of direct and indirect effects and possible situations which were not rejected by experts, were extracted using the Scenario Wizard Software.

The first scenario: quick movement toward the third-generation universities (which includes a combination of possible situations of a1, b1, c3, d1, e1). This scenario is the most desirable future for Shiraz University of Medical Sciences, in which conditions and strategies have been described in detail as following.

The second scenario: opening the wing of e-learning and virtual schools (a1, b1, c3, d4, e1).

The third scenario: turtle movement (Very slow progress) (a2, b2, c3, d3, e2).

The fourth scenario: danger of moving backward to first-generation universities (a2, b2, c1, d2, e3).

Discussion

In each period of history, in spite of differences in methods and patterns of activity, universities have had a principle in common: helping to meet the needs of the community by providing a pathway for producing knowledge and applying it in the realm of action. During the past decade, universities have identified new missions for themselves to help societies, with the development of technology and the tremendous transformations created in human life in different societies (18). However, the focus on this mission did not fit the realities of the third millennium. Therefore, this important issue led the universities to pass the transition of research and to consider a special mission in the third millennium to survive. The mission articulated was entrepreneurship and the creation of knowledge-based wealth. In addition to being active in the field of human resources training and research, third-generation universities have opened up new horizons in the field of entrepreneurship, defining new career areas and creating wealth for themselves (19).

Not only are third-millennium universities *not* a burden to governments in terms of funding, but they also try to provide part of the community's capital as a mastermind and a powerful arm (11). The importance of this issue is clear to the custodians of higher education in the field of health, and a package of moves towards the third-millennium universities has emerged, for the development and innovation of medical education. Accordingly, the universities of medical sciences of Iran have the mission to adapt themselves to the standards of third-generation universities by building and creating the necessary capacities and infrastructures, passing through a short transition period, thereby operating with foresight and creating a common vision in this area. To this end, the results of the study showed that there are four different scenarios for the Shiraz University of Medical Sciences in moving toward third-generation universities (entrepreneurs). We will discuss each of these scenarios.

First Scenario: Quick Movement on the Pathway of Third-generation Universities

If there is economic, political, cultural and legal stability in the country, Shiraz University of Medical Sciences will be able to finance educational systems and research projects, and support students for studying internationally in passing advanced specialized courses. In such a situation, the recruitment and evaluation of instructors will be such that they will have the motivation, ability, and skill to educate entrepreneurial and creative students. In addition, a good opportunity is provided for the development of knowledge-based companies and entrepreneurs, and the activities of research and development units in hospitals and their associations in research fields; quality improvement at universities will also be expanded. Revision of the financing system of instructors and creation of suitable conditions for the establishment of contracts with industrial sectors, hospitals and healthcare services in the country (and

even the region) will improve the economic conditions of the instructors and, consequently, the university. In such a situation, suitable markets will be created for developing and strengthening the ideas and inventions of students and instructors for investment or export of products, which in turn will strengthen international relations. In addition, proper opportunities will be created for creating jobs and improving conditions for the progress of students, which, if continued, will be associated with importing actual money into Iran and increases universities' ability to create profits. The total of these factors will make the students and elite instructors more inclined to stay and cooperate further with the university. Under these conditions, one of the opportunities for the university will be the possibility of greater activities of foreign students, which will have economic benefits, as well as facilitating the interaction and exchange of information with other countries.

Shiraz University of Medical Sciences currently has an 8% share of the health market of the country, 13% of the market for medical and pharmaceutical equipment, access and communication with other Persian Gulf countries (to the benefit of investors), and top rankings among Iran's 47 research development centers, as rated in 2017 (3). Further benefits and opportunities include: establishing and promoting library software; having a high number of cited articles among the medical universities of the country; establishing a knowledge translation unit; designing a biomedical workshop in the comparative and experimental medical center; increasing the number of research thesis and non-thesis projects; increasing research grants; developing and enhancing governmental and nongovernmental research centers; equipping, developing and promoting services at the central laboratory of research; designing and approving the curriculum of specialized PhD in comparative biomedical sciences in the region for the first time; and increasing the number of faculty members of research units. By targeting research opportunities and creating technical knowledge, the university could present to the market workforces who have the ability to generate wealth. This focus would accelerate the process of moving toward third and even fourth-generation universities by strengthening the link between research community health, and increasing the university's pace towards reaching national self-efficacy.

Appropriate Strategies in This Scenario

- 1) Two-way training for ordinary students and subspecialized training for elite and accelerating students, particularly in disciplines and colleges with potential for specialized training, such as the schools of pharmacy and modern technologies.
- 2) Correction of the financing structure of the university in two methods: private, with student fees; and public, i.e. free of charge.

- 3) Correction of the structure of the recruitment of faculty members (taking into account the relevant expertise in entrepreneurship and modern knowledge of marketing) tailored to this goal.
- 4) Improvement of the structure of faculty assessment and review of the criteria for promoting faculty members in line with this goal (e.g. the number of new ideas turned into wealth for each instructor, or the number of students who have carried out innovations and have created wealth owing to the teaching of these faculty members).
- 5) Improvement of the educational curriculum in the same direction (specialized courses in entrepreneurship, the creation of wealth, creativity, critical thinking, innovation, marketing, project management, branding, and patent registration).
- 6) Improvement of in-service training for instructors to develop and enhance the skills necessary for the realization of third and fourth-generation universities (specialized courses in areas of entrepreneurship, the creation of wealth, creativity, critical thinking, innovation, marketing, project management, branding, and patent registration).
- 7) Creation of an entrepreneurial perspective and development of entrepreneurs in the university.
- 8) University internationalization.
- 9) Establishment of production halls (scaling up) to convert laboratory samples at an industrial scale.
- 10) Creation of a risk-taking support fund.
- 11) The creation of a cultural attachment for cultural monitoring over the path of income generation of the university. (In the cultural annex, the appropriateness of initiatives and innovative tasks is evaluated by assessing entrepreneurship and income generation against indigenous and religious culture, since the unbalanced development of wealth production may lead to the destruction of Iranian culture components)
- 12) Establishment of an independent budget line for increasing the quality of medical and health education in the annual budgets of the executive organization (Ministry of Health and Medical Education), and simplification of regulations and rules (deregulation) in support of increasing the participation share of the non-governmental sector in training.
- 13) Expansion of the number of scientific poles and centers of excellence.
- 14) Facilitation of entrepreneurship and an increase of the production capacity of health knowledge, products, and services.
- 15) Publication and share of knowledge produced.

In order to achieve the above strategies, the following measures must be taken:

- Strengthening basic health sciences and in-depth assessment for the extension of knowledge borders and the development of health-related inter-disciplinary cooperation (basic application)
- Financial and infrastructure support for the production of knowledge-based products in the field of medical education, such as software, and native/national reference books
- The evolution of the medical education system with strengthening approaches such as focusing on learning vs. training alone, coverage of the needs of Iran in 2025, and the provision of educational services with global credibility, and the creation and development of entrepreneurial and wealth-creating disciplines in order to commercialize the education sector.

Second scenario: Laying the Foundation for Using the Help of E-learning and Virtual Schools

If there is economic, political, cultural and legal stability in the country, Shiraz University of Medical Sciences will be able to establish and expand its virtual school into more diverse fields and with more advanced equipment and facilities. Moreover, it can make the necessary investments in the area of supply by improving hardware and software infrastructure. The university could then expand its virtual school and extensively collaborate with universities in other parts of the world to hold joint courses. In such a situation, the possibility for foreign students to study in these virtual colleges will be higher, which would lead to increased international relations between the university and foreign students and instructors. In return, this will increase the possibility of exchange of knowledge and information.

Furthermore, the article citation rate of the university will increase by performing joint projects. In the case of expansion of virtual and remote education, educational content will be changed and the production of electronic curriculum content will be supported. In addition, the conditions for recruiting, evaluating, and paying instructors will change in a way that they would have adequate motivation, ability, and skill to train students at the international level. All of these factors will increase the university's ability to maintain and educate instructors and students with international thoughts and skills, which will increase their willingness to stay and develop their cooperation with the Shiraz University of Medical Sciences. On the other hand, the increase of international job opportunities and joint projects will create profits and added value for students and instructors at Shiraz University of Medical Sciences.

However, given the emerging megatrends in medical education, such as the expansion of borderless health care and health, and the improvement of health/bioinformatics information technology, as well as the development of fourth-generation smart hospitals with advanced intelligence and management systems in clinical and non-clinical settings, the necessity of expanding schools and universities of

medical sciences of the region becomes more important in terms of the content, methods and infrastructures required for educational purposes to align with these changes.

Requirements

- 1) Correction of methods of recruitment, assessment and improvement criteria of faculty members proportional to having the necessary expertise in the field of health/bioinformatics information technologies and smart information systems to provide remote care
- 2) Correction of the educational curriculum to build familiarity with and use of advanced intelligence information systems and smart management of clinical and non-clinical areas
- 3) Development of academic and non-academic education of information technology and improvement of general English language skills at all educational levels
- 4) The increase in the number of online medical education courses and modular courses available
- 5) Support for the production of electronic curriculum content.

Third Scenario: Turtle Movement

This scenario is similar to the current situation. In this context, the motivation system and rewarding pattern of teachers is inappropriate, resulting in inequities in payments to instructors and lack of motivation in promoting educational and research activities. This situation discourages those who are actually competent and scientific references in their own specialized fields to contribute to the area of policy-making and targeting (lack of meritocracy). The lack of transparency, as well as promotion and financial issues of the faculty, reduces their sense of trust in the university's education system, and less attention will be paid to endeavors that have less financial benefit for them. This will consequently lead to the departure of a higher number of prominent instructors from the university system.

One of the challenges of this scenario is the expansion of an industrial approach to medicine, which could have the following consequences: unbridled and non-expert use of new technologies; excessive increase in costs; harm to the spiritual relationship between physicians and patients; disregard for the spiritual dimension of human beings; lack of attention to ethics; violation of patients' privacy; fading of oriental, religious and Iranian originality in students and some instructors; and ultimately, lack of localization of new educational models, approaches and technologies to replace the use of old and inefficient models of advanced countries. All of these factors will lead to the backward movement of the university in terms of achieving scientific authority in medical sciences education. Another important

issue faced by the university is the consolidation of the Ministry of Health and Medical Education, including excessive centralization in the ministry, and lack of managerial authority at the university level. This situation is detrimental to decision making and results in a loss of financial and human resources in this field. Another challenge of the university is an overemphasis on subspecialized education, which could have consequences such as lack of training for a multidisciplinary workforce, and an apparent disregard for interdisciplinary sciences and the needs of the community, all of which will ultimately increase the costs and decrease the efficacy of the educational system.

It is notable that even now under these conditions, there are opportunities for the universities of the region. If they wish to continue with the maintenance of quality, will strengthen these issues inevitably: given the access of some of these universities to the international waters, they might be able to grow and expand fields related to marine biology and fisheries. In addition, with regard to the geographical location of the universities in this region and their proximity to the Persian Gulf neighboring countries and presence of experienced instructors in these universities, there will be proper conditions for growing and expanding medical tourism industry, which will lead to import of currency and improvement of financial support of the university.

Explaining the future status of medical education at Shiraz University of Medical Sciences in this group of scenarios

- 1) A possible realization of third-generation universities
- 2) Disruption in the supply, creation and launching of distance education in more diverse fields and the inability to use more advanced teaching technologies.

Appropriate Strategies in This Group of Scenarios

- Meritocracy and improving the reward pattern for instructors.
- Developing medical guidelines and encouraging physicians and health professionals to follow them.
- Society-based education tailored to the needs of community members and the use of indigenous models in education.
- Improving the motivational system for distinguished students in order to maintain and reduce their migration, such as offering financial and intellectual support for converting innovative industrial-scale ideas; patent registration; and participation in international conferences and workshops to develop their knowledge and information in their field.

- Making fundamental changes in the worldview of medical and paramedical students by paying more attention to the spiritual aspects of patients and the ethics of care, and considering religious and Iranian philosophy in the educational approaches in the country. In Iran, due to the priority of earning an income and the financial problems encountered by workers in government systems or even by physicians in the private sector, the mental and spiritual dimensions and respect for patients have become less important, which is opposite to the teachings of Islamic Iran. Therefore, more attention must be paid to this area.
- Integrating multiple research centers with similar goals, to decrease parallel work and waste resources.
- Monitoring the purchase and evaluation of advanced health technologies, in a way that the advancement of technology in health information, home care, remote care, intelligent interventions, distance education, and electronic health records facilitates the best possible treatment and follow-up of patients. While this issue is a positive note from the global community's view, the lack of proper rules and lack of adequate supervision for the suitable application of advanced technologies or referrals tailored to the patient's treatment process (which increases the asymmetry of information and financial benefits of the provider) causes a heavy financial burden on the shoulders of the health system, as well as patients and their families.
- Reforming the structure of the Ministry of Health and Education, and separating the health sector from education.
- More attention to basic sciences and health to promote community health and reduce costs.

Fourth Scenario: Alert for Moving Backward to First-generation Universities

In unstable economic, political, cultural and legal conditions, Shiraz University of Medical Sciences will not be able to finance a new educational system and research projects, or support students for studying internationally in passing specialized advanced courses. It is even possible that the university could fail to pay the salaries of instructors.

In such a situation, the university will be unable to participate in policy-making and long-term planning, and will lack the ability to invest in the provision and upgrading of hardware and software infrastructure. All of these factors will contribute to a lack of ability on the part of the university to train and maintain elite instructors, students, and staff, with the result that these individuals are unlikely to want to cooperate with Shiraz University of Medical Sciences they will be more likely to leave the organization. Further, this process will lead to the entrance of poor-quality students to the university and ultimately there is the possibility of disturbance to the pyramid of training effective human resources for the region.

Explaining the Future Status of Medical Education at Shiraz University of Medical Sciences in This Group of Scenarios

- 1) Failure to realize third-generation universities
- 2) Limitation in the provision, creation, and establishment of distance education in more diverse fields, and the inability to use more advanced teaching technologies.

Appropriate Strategies in This Group of Scenarios

- 1) Development of long-term plans and goalsetting (10-15 years) for directing current educational and research activities towards macro goals.
- 2) Transparency in the tasks, promotion and financial rewards of instructors; improving the motivational system in order to increase the sense of trust to encourage outstanding instructors to remain within the university system.
- 3) Development of international university capacities and indicators so that the university will rate well in international rankings of universities, in order to attract foreign applicants and prevent the emigration of distinguished students and instructors.

Accordingly, a case study by WSB (Visa Skola Biznisa) proposed a model that is a product of the joint investment between the National Louis University. In this model, the key mission of entrepreneurial universities is to help create the opportunity and capacity for local and regional development, to be active in the field of economics and to create a knowledge-based society, as well as to encourage the development of industry, commerce, services, urban development, and technological citizenship in an active and action-oriented form (20, 21). Moreover, the results obtained by Etzkowitz showed that the goals of entrepreneurial universities will be realized when the results and achievements of some particular research or innovation are revealed. In addition, it was noted that value-adding occurs by the university itself operating the result of the research or innovation (22).

Conclusions

It seems that a proper and principled policy-making for moving toward third-generation universities is essential for Iran: the future of this path must be clarified and a joint vision must be created. Performing futures analysis in this area can help to think and decide more coherently about the future, and help policy-makers, managers, and planners in this field by creating insight into the future of entrepreneurship universities in health higher education. Therefore, it is suggested that the mentioned key factors and other environmental factors be constantly monitored by the higher education in Shiraz University of Medical

Sciences in order to keep up with the process of globalization and the expansion of entrepreneurial universities. By doing so, the authorities will be able to make more appropriate decisions about the future with a clearer vision. In addition, they will lay the foundation for developing opportunities for recruiting the best students and staff, which could lead to establishing a global market, attracting students and researchers seeking the best occupational opportunities in the global academic market.

Declarations

This manuscript has not been published elsewhere and it has not been submitted simultaneously for publication elsewhere.

***Ethics approval and consent to participate**

This study is approved by Shiraz University of Medical Sciences ethics committee with the ID number of IR.SUMS.REC. 1396.S1063.

***Consent for publication**

There was no difficulty in publishing the results. All the included databases and materials are available for public use.

***Availability of data and material**

Data is available in an endnote library.

***Competing interests**

There is no competing interest.

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***Abbreviations**

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Tables

Table 1. Future Signals Sense-Making Framework (FSSF)

Impact Probability	Low	High
Weak	Insignificant	Weak signs (surprises)
Strong	Original trends	Ultra-trends

Table 2. Results of Thematic Analysis of Effective Factors (Strengths, Weaknesses, Opportunities, and Threats) on Medical Sciences Education at Shiraz University of Medical Sciences

Main Classes	Levels	Codes
Strengths	Instructor	<p>Full-time faculty members</p> <p>Committed and religious faculty members</p> <p>Experienced faculty members</p> <p>Presence of experienced managers with a history of ministry and management at the ministry level</p>
	Student	<p>Enrolling intelligent students with the highest ranks in the national university entrance exam</p> <p>Creating the proper fields for medical nursing and management students</p> <p>High admission statistics of students in levels of master's degree, residency, and PhD</p>
	Policy-making	Presence of new educational methods (e.g. blended learning and e-learning) and new evaluation methods
	Infrastructure	<p>The coherent, strong and planned education system of Shiraz University of Medical Sciences</p> <p>The possibility of continuing graduate and postgraduate studies in almost all medical disciplines at Shiraz University of Medical Sciences</p> <p>The high number of articles and citations</p> <p>Presence of the Health Sciences Research Center</p> <p>Presence of supportive educational groups</p> <p>The possibility of becoming a reference in some fields (joint program with several schools)</p> <p>The existence of fully updated laboratory equipment and departments, such as virology and immunology</p> <p>Presence of research poles</p>
Weaknesses	Instructor	<p>Lack of transparency in job descriptions and promotion and financial issues</p> <p>The faculty members' vulnerability in terms of trusting the system</p> <p>Being under pressure from three sides of education, research, and treatment, and neglecting education, which has fewer profits for instructors</p> <p>Lack of fitting of the instructors' vocational courses to the needs of our community</p> <p>Injustice in payments to clinical and basic sciences instructors, which causes a lack of motivation</p> <p>Lack of openness to criticism</p>
	Student	<p>Disruption of the pyramid of human resource training (our freshmen are very vulnerable and weak)</p> <p>The increase of specialism and excessive number of specialists and subspecialists</p> <p>A decline in motivation and creativity of students</p> <p>Fading of Eastern, Iranian and religious authenticity in new generation students</p> <p>Failure to observe patients' rights by students</p> <p>The lack of openness to criticism</p> <p>Lack of optimal use of the results of student theses and conversing them to technical knowledge</p>
	Policy-making	<p>Impact of pre-revolutionary decisions on medical education</p> <p>Lack of attention to the upstream documents of the country</p> <p>Priority of treatment over education in the country</p>

		<p>Lack of adequate understanding of about the nature and function of the university by policymakers</p> <p>Confusion in the current medical education and making spontaneous decisions</p> <p>The existence of a mass student production approach in the current medical education of the country</p> <p>Providing intensive medical education courses so that students could acquire welfare</p>
	Problems related to the philosophy of medical education	<p>Imported nature of medical education philosophy in the country</p> <p>The attention of the current medical education to the physical aspects of human beings and not to the mental and psychological dimensions</p> <p>Training physicians who mostly think about income rather than ethics</p> <p>The existence of an industrial and mechanical approach to medicine</p> <p>The lack of a complied philosophy of education in medical education</p> <p>Strengthening the spirit of individualism in the current medical education system</p> <p>Lack of fit between religious philosophy and educational approach in the country</p>
	Problems related to limiting others	<p>Imported nature of medical education approaches in the country</p> <p>Imported nature of medical education curriculum in the country</p> <p>Lack of return on western approaches to medical education in the country</p> <p>Imitating the west in predicting medical education</p> <p>Being behind the west in terms of the time of implementing the medical education programs</p> <p>Lack of existence of proper texts in the country and translations of texts</p>
Threads	Economic	<p>Instability in economic issues</p> <p>High taxes (35%) on instructors' incomes</p> <p>The inability of long-term planning to invest in improving the education system and training infrastructures</p> <p>The inability of the system to fund and motivate full-time instructors to maintain their social status for achieving academic authority</p>
	Social, cultural, and value-related	<p>Emigration of talented students due to dissatisfaction with the social environment</p> <p>The pattern of rewards and punishments of sovereignty is not in a way that people who have a scientific reference in a particular area pay attention to policy and targeting in that area (lack of meritocracy)</p> <p>The role of political lobbies in granting scientific rewards such as various festival awards</p> <p>Rewarding those who value the community in practice is not observed, and therefore, people just give slogans.</p>
	Political	<p>The improper political condition of the country for training elites</p> <p>Emigration of elites abroad</p> <p>Instability in the region</p>
	Technological	<p>The lack of cultural, financial infrastructures and skilled human resources for the use of new technologies</p> <p>Wasteful use of new technologies that cause:</p> <p>Excessive costs on the shoulders of people</p> <p>The weakening of the spiritual relationship between the physician and the patient</p>

		Endangering of the privacy and security of patients using advanced technology
	Structural	<p>Consolidation of the ministry of health and medical education</p> <p>Excessive centralization in the ministry and lack of managerial power and authority at the level of university</p> <p>Lack of localization of imported models and the use of old models of advanced countries (our compliance with advanced countries)</p> <p>Lack of multi-disciplinary forces and lack of attention to interdisciplinary sciences</p> <p>Lack of economic infrastructures and political and managerial potentials</p> <p>Excessive attention to subspecialized training and disregard for the needs of the community</p>
Opportunities	Environmental	Having a suitable geographical location and access to free waters for the activity of foreign students

Table 3. Impact and the probability of occurrence of factors affecting the movement of health higher education at Shiraz University of Medical Sciences toward a third-generation/entrepreneur university

Row	Factors	Impact	Probability
1	The ability of the system to financially support the university in order to realize third-generation universities	5	3
2	The decision of the ministry of health for moving toward an entrepreneurial and third-generation university	5	5
3	Cultural and attitude infrastructures of instructors, students, and the staff of university in order to realize third-generation universities	5	3
4	Distance education to decrease the government custody charge	5	3
5	Improving the hardware (equipment) and software (educational processes and contents) facilities and infrastructures in order to realize third-generation universities	5	3
6	System's inability to create motivation	4	3
7	An improper awarding system that leads to a lack of meritocracy	4	3
8	The inability of long-term planning	4	3
9	Emigration of elites abroad	3	3
10	Stop of associate degrees and MScs and creation of specialized and subspecialized courses	2	2
11	Inaccurate and uncontrolled use of new technologies	2	3
12	Instability in economic issues	4	3
13	Educations be (Education is?) divided into two normal and subspecialized classes for elites	4	2
14	Private (with costs) and public (free of charge) educations	3	3
15	The mitigating effects of the ministry of health and medical education on education: the nature of the profitability of treatment and the lack of profitability of education	3	4
16	The coherent, robust and planned training system	4	2
17	Excessive centralization	3	3
18	Lack of localization of imported models	2	2
19	Disregarding interdisciplinary sciences	3	3
20	Excessive attention to subspecialized training and disregard for the needs of the community	3	3
21	Changing the evaluation and rating of instructors in line with third-generation universities	2	3
22	Increasing the interactions between a university with industry and branding and patents	4	2
23	Possibility to continue postgraduate and doctoral studies	3	3
24	The high number of articles and citations	2	3
25	The existence of scientific and advanced research poles	3	3
26	The existence of completely updated laboratory equipment	3	3
27	The ability of activities of foreign students	3	3
28	The unfavorable political condition of the country in training elites: bureaucracy, slow working process	3	4
29	Resistance to change	3	2

Table 4. Key Factors and Possible Situations of Each Factor in 2020 Vision

Key Factors	Code	Possible situations for Iran until 2028	Considered Impact
A: The ability of the system to funding the university in pursuit of the third-generation university	a1	University financing in order to realize the third-generation university	Favorable
	a2	Lack of financing university in order to realize the third-generation university	Unfavorable
B: The decision of the ministry of health to move toward the entrepreneurial university and third-generation university: stabilization of long-term policy-making towards the realization of third-generation university (while changing the governments and parliaments)	b1	Stability of long-term policy-making in order to realize third-generation university	Favorable
	b2	Lack of stability of long-term policy-making in order to realize third-generation university	Unfavorable
C: the cultural and attitudinal infrastructures of university instructors and students in order to realize the third-generation university	c1	The tendency of students to realize the third-generation university and the reluctance of instructors and employees	Favorable
	c2	The tendency of students and instructors to realize the third-generation university and the reluctance of employees	Preserving the status quo
	c3	The tendency of students, instructors, and university staff to realize the third-generation university	Favorable
D: Status of hardware (equipment) and software (educational contents and processes) infrastructures in order to realize the third-generation university	d1	Availability of hardware and software infrastructures in order to realize the third-generation university	Favorable
	d2	Lack of availability of hardware and software infrastructure in order to realize the third-generation university	Unfavorable
	d3	Availability of hardware infrastructures and lack of availability of software infrastructures in line with the realization of third-generation university	Preserving the status quo
	d4	Lack of availability of hardware infrastructures and the availability of software infrastructures in line with the realization of third-generation university	Preserving the status quo

E: Electronic education	e1	Expanding distance education in various university disciplines, with advanced educational technology	Favorable
	e2	The limited realization of distance education (less disciplines) with advanced educational technology	Preserving the status quo
	e3	The limited realization of distance education (fewer disciplines) without advanced educational technology	Unfavorable

Figures

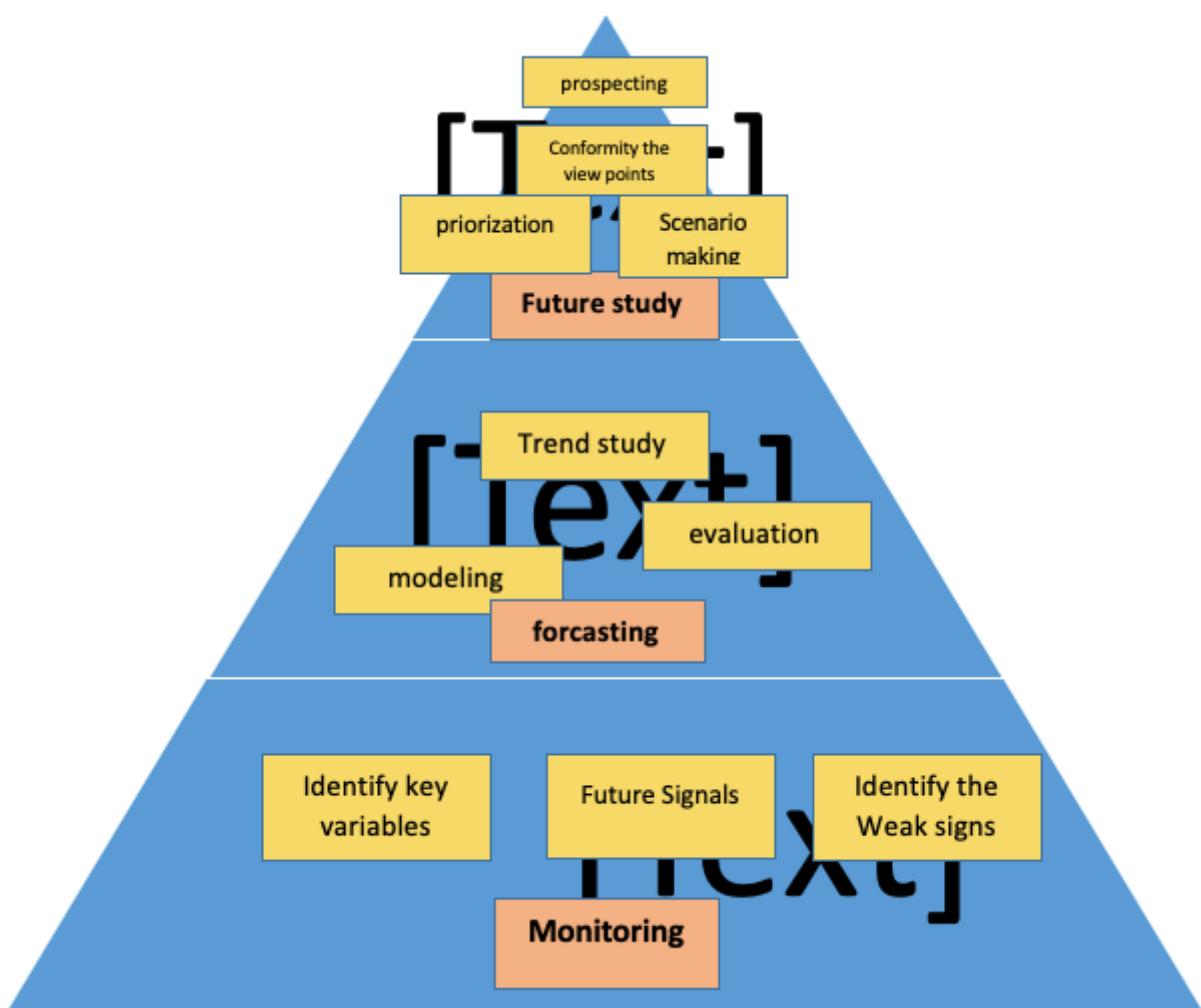


Figure 1

Process of Foresight in Medical Sciences Education