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The process of identifying key uncertainties in the orthotics and prosthetics education foresight

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Abstract:

INTRODUCTION: Medical sciences effects on people's health; therefore, it is necessary to identify all threats, opportunities, and challenges in its policy and planning particularly in the education field. The orthotics and prosthetics (O and P) field of study has great importance alongside other rehabilitation sciences due to its preventive status, therefore, the purpose of this study is to investigate the role of key factors and, subsequently, identifying uncertainties to compile and plot a bright and planned future for O and P education system.

MATERIALS AND METHODS: At first, the key factors seemed to be influential improving the education and training quality of O and P students, were identified, weighted and ranked. All these steps were based on documentations and opinions of elites and deans of O and P through a semi-structured interview. Then, the final list of key factors and extracted drivers was placed and analyzed in cross-impact matrix by MicMac software.

RESULTS: Among the initial list of key factors and drivers which identified 45 elements; 19 key factors and drivers scored the highest. Among 238 evaluable relationships in the cross-impact matrix, 123 relationships (51.6% of total matrix volume) are 0, which means that factors do not affect each other and are not affected either. Two key factors were identified as critical uncertainties out of 19 key factors.

CONCLUSION: Achieving education development without a dynamic and active planning system is not possible. "Community-based education" and "government financial support" were identified as critical uncertainties of O and P future education system.

Keywords:

Education, foresight, orthotics and prosthetics, uncertainty

Introduction

How to design development policies based on insight and understanding the threats and future opportunities requires skill and prudence, therefore, foresight is used to write the future and possible changes in the national, regional, and institutional field to respond to these changes.^[1]

In general, planners have drawn and tracked their goals using facilities and peripheral environment recognition and, of course,

they have succeeded in realizing their goals to some extent based on predictions about future and society transformations in their time. However, it is the fact that future planning based on current needs or gaps in current services is not a proper national capital for a successful presence in the future world; therefore, to play a role in the future, it is necessary to seriously scenario the development propellants and future progresses based on trends by rely on new planning approaches and explore the current and future challenges and plan for a successful future presence in accordance with capabilities and abilities of the community.

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In other words, nowadays, the planning literature has crossed the prediction, providence and future discovery concepts and reached to foresight, whose task is to map the future and build it.^[2]

Each organization must be prepared to cope with environmental changes and challenges. These changes come from different sources such as technological innovations, rule changing, or market development. Organizations' leaders should be prepared to encounter with an uncertain and rapidly changing environment.^[3]

The universities have not been far from these changes, they must try with this attitude to ensure long-term survival, constructive competition with other leading educational centers and other scientific successes especially in the technology field; and constantly monitor the environment, identify the effective components and navigate them. Systematic program evaluation in the rehabilitation education field should be implemented in particular^[4] to have a bright future.

Among rehabilitation sciences, the orthotics and prosthetics (O and P) field of study needs changes and predictions to keep pace with global growth, due to their specific nature which is particularly engaged in providing products in addition to creating a health platform.

O and P education is defined as training the science and principles about equipment mounted on body as support (orthotics) and replacement equipment instead of lost organ (prosthetics) to improve function O and P training necessity as an integral part of health system in today's world is so high; as a result, in addition to specialized medical sciences from surgery to internal medicine and other related sciences such as health and family physicians, and even engineering field of study such as medical engineering, have been included in the O and P scientific cycle. Their high effectiveness in the technological, social, political, and value sectors has led a wide range of environmental components to be involved and affected.

The main objective of O and P education is to train specialists. Human resources are considered as the largest capital of each country; this valuable asset can change the country's basic health and pave the way to development through effective physical and intellectual education. The human resources development and education improvement in permanent development has considerable importance. In many developed countries such as the United States, a significant contribution of O and P growth have been assigned to new trends and upcoming changes (aging, diseases such as diabetic, industrial life growth, etc.).^[5]

In the old mindset, the faculty role was considered to be only teaching, research, and providing service activities to the university, while for example, leadership and modeling in a comprehensive approach to achieve great success are two important components that have been ignored for defining the professors' role in promoting academic activities. Leadership is a substantial contribution to improve education quality.

On the other hand, modeling is a key factor to achieve success; it brings the creativity and self-reliance nature in students. Dealing with real-world constraints and its social impacts are significant challenges in scientific and academic research.

The criteria, such as students, objectives, achievements, continuous quality improvement, curriculum, teachers' attitudes, facilities and supports for review and qualitative evaluation of an educational program, have been included in the new training attitudes.^[6]

Future specialists in the O and P field should understand the available capacities based on upstream policies during their education course and, of course according to the community needs and at the same time realize that how much their role as a member of health team can affect different aspects of people's lives.

Thinking about future requires a specific language to be formulated with. The planner needs a tool to express the future regarding predictable elements. These tools are scenarios. If uncertainties are identified well, scenarios can help policymakers and planners on this path. In fact, uncertainty is the same as the unpredictability of future developments and outcomes.^[7]

To achieve a distinctive framework in a world full of uncertainties, O and P educational planners should challenge their assumptions about path course through the "What if this happens?" question, so they can see the future of this study field more clear. Scenario planning goal is to help authorities and managers change their attitudes toward the fact concept and bring their perspectives closer to existing realities or emerging ones.^[8]

After identifying key drivers and most important factors affecting the O and P educational development in Iran Medical Sciences Universities and investigating the influencing extent of these factors on each other and on the future status of this field, this research is intended to identify the unpredictability of developments and events that will occur in the future, due to uncertainties and with a futuristic approach. In fact, this will pave the way for future scenarios in the next phases, as well as formulating strategies, planning, and policymaking to achieve optimal scenarios.

Materials and Methods

According to the necessity of identifying the key factors and drivers in O and P training and exploring uncertainties among them, this is a practical case study which has used qualitative and foresighting methods to collect information. Considering the research nature, this is a qualitative and exploratory study. The elite and pioneers of O and P throughout Iran and educational planners were considered as the statistical population. With regard to the information type necessary for conducting this research, the nonprobability judgment sampling (targeted) was used. For this purpose, a sample of 22 experts in O and P consisting of professors and managers with sufficient expertise, long-term vision and full mastery over the O and P education along with the authorities and educational planners at macro level were selected.

Initially, academic documents, the Internet, university websites, databases such as web of science, ERIC, Scopus, and PubMed were reviewed to collect information and identify key factors including trends and drivers. In the next step, the more detailed and accurate information was collected through a semi-structured interview with the elites, officials, and planners. Information acquisition and interviews with elites continued in their offices until the saturation point was found.

The STEEPV model which includes six fields of community, technology, social, economic, environmental, policy-making and values were used for data classification.

After this stage and identify trends and drivers, a questionnaire was prepared in the next stage and the importance of each drivers and key factors was extracted by a score of 1–5. Subsequently, the professor's opinions were obtained through a matrix and scores of 0 (no influence), 1 (low impact), 2 (moderate impact), and 3 (strong impact), respectively. Since key uncertainties identification is a part of scenario compilation process; uncertainties were obtained from trend analysis and cross-impact analysis using MicMac software (2017, France).

Results

Out of 22 elites, officials and educational planners who participated in the interview (2 ministry officials, 2 educational planners, 17 orthotics and prosthetics specialist, 1 person in Chairman of the Working Group on Forensics of the Academy of Medical Sciences) three persons were female and the rest were male from Tehran, Isfahan, and Shiraz Universities and applied science center of red crescent in Tehran province.

The variables distribution and scatter in the dispersion page indicates the type of system stability; in this study, given that most variables are scattered around diagonal axis, the system can be considered as unstable. Among the initial list of key factors and drivers which identified 45 elements; 19 key factors and drivers scored the highest after surveying. Among 238 evaluable relationships in the cross-impact matrix, 123 relationships were 0, 75 were belonged to number 1, 109 were belonged to number 2, and 54 relationships were number 3. Also based on statistical indicators, the matrix with 5-times data rotation had 100% desirability and optimization which indicates the high validity of the questionnaire and its answers.

After gaining the professors and planners opinion about the influence of these key factors on each other, "community-based education" and "government financial support" were identified as uncertain factors shown in Table 1.

In the cross-impact matrix, there is a ranking from the most influential to the most affected depending on the factor location; out of eight factors [Figure 1] of

Table 1: Influential key factors and drivers list in the orthotics and prosthetics education

| Row | Key factors and propellants | Row score | Column score |
|-------|---|-----------|--------------|
| 1 | Technology development | 23 | 31 |
| 2 | Demand change | 18 | 23 |
| 3 | Changes in the patient's population pyramid | 15 | 12 |
| 4 | Changes in the diseases prevalence | 21 | 9 |
| 5 | Transnationalization of education | 32 | 25 |
| 6 | Changes in product market | 19 | 33 |
| 7 | Educational standards requirement | 24 | 31 |
| 8 | National credit implementation | 25 | 27 |
| 9 | Unit trustee | 31 | 12 |
| 10 | Education based on community needs | 32 | 39 |
| 11 | Curriculums implementation | 20 | 22 |
| 12 | Decentralization policy for education | 17 | 17 |
| 13 | New teaching-learning methods | 18 | 33 |
| 14 | Clinical competency | 28 | 36 |
| 15 | Specialization of the study field | 30 | 31 |
| 16 | Changing environmental conditions | 19 | 0 |
| 17 | Financial resources | 33 | 35 |
| 18 | Changes in the teacher's attitudes toward education | 33 | 32 |
| 19 | Changing the student's population pyramid | 18 | 7 |
| Total | | 455 | 455 |

specialization, trans-nationalization policy, teacher's attitudes, clinical competency, standardization, and educational accreditation, the two above-mentioned factors are most influential and affected [Figure 2]. It means that there is no precise forecast for them and it is possible that they will have two opposite modes in the future; for this reason, these factors have uncertainty.

These two factors are ranked in the top three and after affecting other factors; they still remained at the highest positions from third to fifth place, meaning that they have a special place in the educational system and should be given particular attention during strategic planning. If you refer to upstream documents such as the vision document, educational evaluation packages of the health ministry and general health policies, their footprints will be seen directly and indirectly in the Iran macro planning.

Discussion

The future always has uncertainties, but it is natural that as we move ahead into the future time, the predictability level decreases and uncertainty increases. In the short time, when predictability is high, prediction method should be preferred. In the long term, everything is uncertain, and generally, it has been proven that the planning profit in this situation decreases along hopeful expectations which are our only knowledge from future.

Education development achievements without a dynamic and active planning system are not possible. The priorities and basic future orientations of O and P education system must be determined at the first place. Obviously, going through transition stage from the current situation and achieve the desired status in the long-term would require a transformation in the key

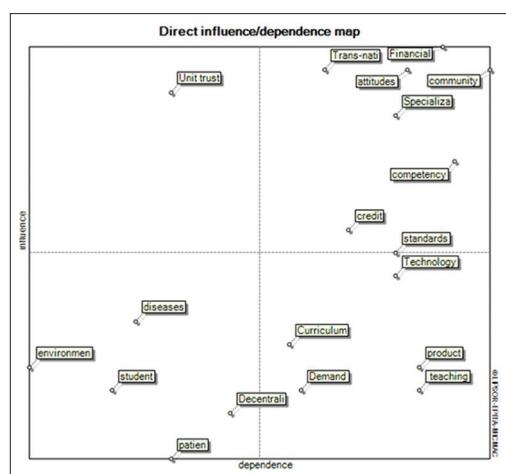


Figure 1: Cross-impact matrix

structure and institutions through acquaintances with uncertainties. To have a dynamic planning in the O and P education system, it is necessary to know what factors affect the existing processes and how they can manage a desirable future.

Elites and policy-makers experts in this field agree that the O and P education system is more affected from financial resources and community-related education sides due to its polyhedral nature along with other factors.

High expenses of O and P training programs^[9] and financial constraints and problems can be one of the future challenges.^[10] O and P field of study is dependent on financial resources under the name of academic budgets, and it needs to be more realistic.^[11] Meanwhile, development programs of O and P colleges for higher education along the topic of reducing training costs is one of the long-term objectives.^[12] Financial resources can be evaluated from several aspects, one is the equipment and facilities for learning how to build tools, and the other is components supply to deliver needed tools to patients; it means having education along meeting the people's needs and of course, achieving this level through education with the best clinical functions and concentrating on new technologies beside funding could affect the fate of related colleges.^[12] Naturally, different authorities should take the responsibility for financial support; meanwhile, the private sector, and in particular the nongovernmental organizations (NGOs)^[13] can also enter to this issue but under supervision.

The lack of training managers' concerns and easy attraction of nongovernmental funds can prevent training to be affected of exchange rate, currency swings, and subsequently government financial instability.

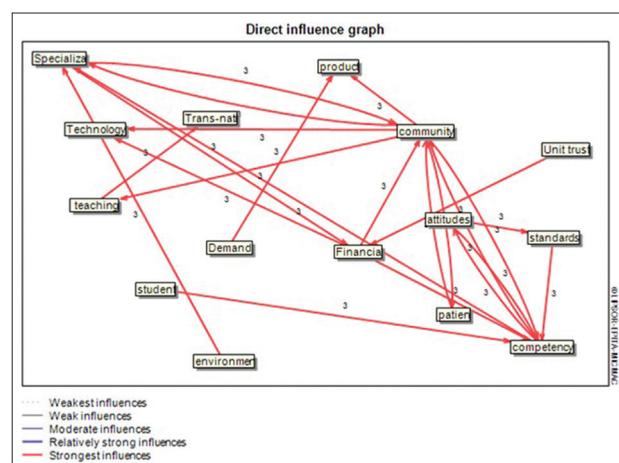


Figure 2: The matrix of influential and affected factors in the orthotics and prosthetics education

On the other hand, proper and scientific services available for all people are another issue that needs further investigation under titles such as quality-based education and reasonable costs. Initially, the updated needs of community should be identified through monitoring and a dynamic and continuous education based on gender rights observation should be planned through different ways, such as communication with relevant NGOs, not investing in unnecessary diseases and paying attention to different cultures.

In fact, timely attention to the people's future needs in specialized fields can prevent their false demands on products and reduce unnecessary costs and will be very effective in preventing the waste of resources. This matter will not be possible except by education and comply various professional guidelines.

Providing treatment services to a patient in the best way and with an economic purpose depends on the government and its financial ability,^[14] how to use government's maximum capabilities in planning is another challenges ahead.

Finally, an accurate and coherent planning can be achieved by reviewing and evaluating different educational needs such as the relationship between educational curriculum and patient needs and the availability of patient's healthcare associated with the financial resources.^[15]

Conclusion

Foresight in the training of O and P requires the transparency of the support of state funding and its requirements.

If the needs and priorities of the community of O and P services are identified, all policies and planning can be based on available resources.

Whether financial resources can help us to provide and plan technology in light of the economic conditions governing the people is one of the future challenges of this field.

In general, according to the results of the analysis carried out in several stages of the process, one can change the vision and the paradigm and shift from traditional patterns of teaching productivity to those that are important from the point of view of the experts (productivity based on knowledge, technology, and community-based innovation) as an appropriate approach to promote the development of orthotics and prosthetic education.

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Conflicts of interest

There are no conflicts of interest.

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