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Health Science and Technology Evaluation: Emerging for Innovation

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INTRODUCTION

The Iran vision 2025, the scientific and innovation development plan and the health scientific and innovation development plan developed for clarifying the way and the future of science and technology in the country. The importance of access to the objectives of these maps has put light on the importance of monitoring and evaluation of science and technology development. Now that, only 14 years are left to achieve to these objectives, we should develop and perform the monitoring and evaluation of science, technology, and innovation development with a new perspective. This should be in accordance with the set objectives to specify the progress and identify the strengths and weaknesses in achieving them and to increase the probability of the same.

THE ASSESSMENT OF SCIENCE AND TECHNOLOGY IN THE WORLD

The most important determinant for specifying appropriate indices for assessing science and technology is the approach of health research system, as an umbrella for science and technology, which determines the interaction between producer and user of health research. The first generation of the theories for knowledge creation process was of a supply-oriented approach. In this generation of theories, the process of knowledge creation was a type of linear process that considered economic growth, security, and social welfare as the natural result of new opportunities through research in basic sciences and then their application in generating products and social and economic services. Therefore, the starting point was the study of basic sciences and the duty of government was to enforce this point through financial supporting. The second generation of the knowledge creation process was with a demand-oriented approach. In this approach, market is not seen as a passive and immobile entity which only awaits the results and consequences of studies and be formed under their influence. The demands and needs play a crucial role in generating of knowledge and will influence the type of future knowledge. As of 1975, the systemic theories emerged. Within these theories, knowledge creation process includes the adaptation of market need to technological opportunities resulting from different research. There is a feedback loop within the parts of this chain indicating a mutual interaction among its various stages.[1]

When the science development owns a supply-oriented approach, the objective will be to increase the scientific products. As such, the scientific production and its input (i.e., human and financial resources) will be the most suitable

tool for assessing science and technology. When a demand-oriented approach is important, the success of science and technology will depend on their response to the market's existing needs (problem solving approach). Finally, if the science and technology planning is undertaken based on a systemic approach, the mutual interactions of knowledge creation and technological opportunities with market's needs will play an important part in the success of science and technology. Therefore, in this approach, the facilitators of demand and supply interactions will also be regarded as the success indicators of the science and technology system, in addition to the inputs and outputs of the research system. Accordingly, in the innovation systems which is built based on a systemic approach, organizations and foundations are the most important components. In line with the evolutional path, the approach of assessing science and technology has transformed from simple models of input, process, and output to complex models such as innovation system framework.

However, in addition, another event has also influenced this evolutional trend, which is a transition from resource-based to knowledge-based economy (KBE). The KBE is one within which the production, distribution, and use of knowledge are the main base of growth, welfare, and employment.[2] In this type of economy, the stored knowledge in people and technology envisages as the main core of countries' economic development. The following general indices are introduced by OECD (the Organization for Economic Co-operation and Development) for measuring knowledge-based economy, measuring knowledge inputs, knowledge stocks and flows, knowledge outputs, knowledge networks, and knowledge and learning.[3]

The infrastructures of the KBE include scientific system, innovation, human resources, and intellectual properties, technology and technological progress, globalization, and research and development. In fact, the knowledge-based economy is fulfilled when the necessary infrastructures exists. In order to measure these infrastructures and countries' capabilities for fulfilling the KBE, a few frameworks and indices are introduced. One of these frameworks is that of World Bank. This framework specifies four main pillars as the indices for studying countries' status in the transition path towards KBE (measuring knowledge in the world's economics). These four pillars encompass economic and organizational regime, skill and education, communication and information infrastructures, and innovation system. For any of these pillars, some indices have been developed.[4] In addition, World Economic Forum calculates a combinative index, composed of 12 pillars, called Competitive Global Index for countries. The assumption for this index is that competitiveness is a set of institutions, policies, and factors which determines the production level of a country. The production level of a country specifies the continuity of the success obtained from its economy. It also determines the rate of return on investment (ROI)–physical, human, and technology. The more competitive the economy of a country, the more income will be achieved for its citizens. The countries are classified into five groups on the basis of these indices: Countries with factor driven economy, countries with efficiency driven economy, countries with innovation driven economy and countries which are in a transitional stages from one to another. These 12 foundations are categorized into three areas, basic requirements area including institutions, infrastructure, macroeconomic environment, health, and primary education; efficiency enhancers area containing higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness and market size; and innovation and sophistication factors encompassing business sophistication and innovation.[5]

ASSESSMENT OF SCIENCE AND TECHNOLOGY IN HEALTH SCIENCE

Various frameworks and methods are presented for assessing the science and technology in health science and measuring its effects on ensuring people's health and welfare.[6] For ecologic methods, the amount of money spent and resources used for research and its effects on people's health (e.g., life expectancy and reduced mortality rate) have been investigated.[7-9] In case studies, any program and or research grant are looked into for a long period of time in order to realize their effects and paybacks. In addition, the assessments could be undertaken at university, research center, and

individual levels by various indices. Accordingly, some frameworks are initiated to clarify what areas are measured as impact of health research and by its indicators. The most important of these frameworks is payback model that introduces the research impact of health sciences in five categories of knowledge; advanced (e.g., publication and citation analysis), capacity building (e.g., the number of PhD by research student), informing policy making (e.g., the use of primary research in clinical guidelines), health and health care impact (mortality, morbidity, quality of life and quality of care), and economic and social benefits (e.g., decreasing the work days lost by disease, health benefit in quality-adjusted life years (QALYs) per health care cost).[10-13] The framework of Canadian Academic of Health Science (CAHS) has further expanded the indices related to these areas.[14] The key problem of these frameworks in the evaluation of research system lies in the fact that they do not specify the necessary infrastructures for transition from knowledge an advanced, capacity building, and informing policy making to the next two other areas.

DISCUSSION

The examples for attention to the KBE in the Iran vision 2025, the scientific and innovation development plan and the health scientific and innovation development plan in macro objectives of science and technology and the signs for achieving to them are clearly stated. The performance of health research system is related to the performance of health system and also to the political, economic, and social environment. Therefore, two sets of indices should be specified and measured in order to monitor and evaluate science and technology development in health sciences area–performance of the health system and knowledge-based economy indices.

Therefore, given the mapped science and technology horizon of The Iran vision 2025, the scientific and innovation development plan and the health scientific and innovation development plan, the duty of health research systems in different areas is to identify the country's strengths and weaknesses and determine solutions for achievement to them.

REFERENCES

1. Mousavi A. An introduction to economics of science: Theoritical foundation, National Research Institute for Science Policy, Iran, 2009.
2. Azimi NA, Barkhordary Dourbash S. Identifying pillars of the knowledge based economy, National Research Institute for Science Policy, Iran, 2010.
3. The Knowledge Bases Economy. Organization for Economic Co-Operation and Development (OECD), General distribution OCDE/GD (96) 102. 1996.
4. Chen DH, Dahlman CJ. The Knowledge Economy, The KAM Methodology and World Bank Operations. Washington, D.C: World Bank Institute; 2006.
5. World Economic Forum, The Global Competitiveness Report 2010–2011, Available from: http://www.weforum.org, [Last accessed on 2013].
6. Yazdizadeh B, Majdzadeh R, Salmasian H. Systematic review of methods for evaluating healthcare research economic impact. Health Res Policy Syst 2010;8:6.
7. Research, T.A.S.f.M., Exceptional Returns the Value of Investing in Health R and D in Australia. The Australian Socity for Medical Research; 2003.
8. Economics A. Exceptional Returns The Value of Investing in Health R and D in Australia II. The Australian Society for Medical Research; 2008.
9. Exceptional Returns, The Economic Value of America's Investment in Medical Research. the Mary Woodard Lasker Charitable Trust; 2000.
10. Buxton M, Hanney S. How can payback from health services research be assessed? J Health Serv Res Policy 1996;1:35-43.
11. Buxton MJ, Hanney S. Developing and applying the Payback Framework to assess the socioeconomic impact of health research. Med Clin (Barc) 2008;131 (Suppl 5):36-41.
12. Hanney S, Buxton M, Green C, Coulson D, Raftery J. An assessment of the impact of the NHS Health Technology Assessment Programme. Health Technol Assess 2007;11:iii-iv, ix-xi, 1-180.
13. Hanney S, Mugford M, Grant J, Buxton M. Assessing the benefits of health research: Lessons from research into the use of antenatal corticosteroids for the prevention of neonatal respiratory distress syndrome. Soc Sci Med 2005;60:937-47.
14. Canadian Academy of Health Sciences: Making an Impact, A Preferred Framework and Indicators to Measure Returns on Investment in Health Research; 2009.

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