

Analysis of scientometric approach on technology assessment studies

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Abstract

The technology assessment (TA) is part of a worldwide effort to deal systematically with the question, how we should proceed. The propose of this study is survey approaches for technology assessment and which indicators can be considered the main features and aspects of technological knowledge. Technological aspects of scientometrics studies led to this side. This study has been done with research documentary method. The main findings of this research are ongoing in order to explain the role that scientometric studies can perform in technology evaluation is divided into the following:

Attention to technological indicator in scientometrics multi indicator, Technology to link with science policy, based on scientometric, and relying on science and technology policy to analysis evaluative scientometrics base on indicator that depends to technology knowledge. Therefore with use the scientometrics tools provide methods, techniques, qualitative indicators for study various aspects of science and technology and helped development information systems based on science and technology that affects of social structures, institutional and economic.

Introduction

Science and Technology are the main factors of development. In general, this principle is accepted that science and technology relate and affect together. That's why relationship between science and technology is one of the important and interesting studies to science policy, innovation and economic.

In era of information technology, technological changes in research and development, management, economic policy, will play major roles in various disciplines. This advancement is changing, as a significant strategic change for sustainable development around the world(Linstone, 2004; Shapiro, 1999).

Moreover, scientists according to these developments have, interested in measuring the progress of technology and how advance it. Technometrics is study and evaluate of new technologies. In large scale, this assessment is performed based on advances and new discoveries within the scientific community in the world(Mohr, 1999).

Technology assessment (TA) is part of a worldwide effort to deal systematically with the question , how we should proceed(Mohr, 1999).

Since, many experts believe that aspects of technological knowledge are very important than the aspects of technology hardware, This approach that in technology assessment has more popularity and attention that technology knowledge should be further noted than knowledge of –technology hardware and products.

Also, if scientometrics is as an tools, provides necessary information for decision making and science and technology policy at the international, national, organizational, and individual levels, it may also be admitted that the use of limited indicators and only relying on one of the few aspects of science and technology, cannot find to the valuable information in this area.

Due to, the place of technology assessment and evaluation in scientometrics and also role of these studies that can provide more evaluative analysis results, the purpose of this study is surveying different approaches for technology assessment, also which indicators and criteria can be considered as the main characteristics of technology knowledge and technological aspects of scientometric studies be directed to they.

Questions

What is the importance of technology evaluation on scientometrics?

How can scientometrics help the science policies with technological approaches?

How is technology assessment approaches in scientometric?

What is technological assessment approaches in scientometric?

Methodology

This study has been done with research documentary method. Data collection includes books (both print and electronic), journals and scientifically web sites.

Important findings

The main findings of this research are ongoing in order to explain the role that scientometric studies can perform in technology evaluation is divided into the following:

Attention to technological indicator in scientometrics multi indicator

Scientometrics includes all quantitative aspects of the science of science, communication in science, and science policy and it works on dimensions of research activities, as scientific cooperation, publications, research fronts, ranking of universities and etc. In contrast, the focus of bibliometrics, despite many wide-ambit definitions, has always been preponderantly on the literature per se of science and scholarship, while there is more to science and technology for scientometricians to measure and analyze than its literature output; e.g, the practices of researchers, the socio-organizational structures, research and development

management, the role of science and technology in the national economy, governmental policies(WILSON, 2001).

Technology to link with science policy, based on scientometric

According to previous studies , activities related to development in science , technology and innovations is considered as main propulsion productivity and economic growth and significantly contribute to economic development and improve living standards of communities. Planning and policy science and technology, are affiliated and related indicators fields that should be considered in science policies. Also results of the national R&D inputs , costs publications and patents that in this field is done and their outputs was needed for scientific policy that enable a country to decide correctly in the field of science and technology and innovation(NorooziChakoli A & hassanzadeh, 2009)

Relying on science and technology policy to analysis evaluative scientometrics base on indicator that depends to technology knowledge

Identification of the technological aspects of scientometric studies are needed to support the application of science policy. Studies demonstrated that there are different approaches to technology assessment and technology in each of these approaches technology are measured and evaluated from various perspectives. But the part of technology assessment that important in scientometrics is knowledge of technology aspects. Since many experts believe that it knowledge aspects are more important of technology hardware, this approach should be further noted in technology assessment that knowledge of technology aspects has enjoyed popularity and attention rather than hardware and technology products(GEISLER 1999). Evaluation of science and technology can be do ne with various approaches. Base of Giesler studies, technology assessment is possible with following approaches(GEISLER 1999):

Commercial and business metrics

- (GEISLER, 2001a) Sales income from products and process enhancements that can be imputed to commercialization of S&T outcomes in a given year).
- Suggested sales and income (in the innovation pipeline and from S&T projects in progress, by project or categories of products and processes).
- Proprietary sales and revenues ratio (the portion of sales of products and services, as well as revenues from licenses and similar income categories that are protected by patents and other instruments of trade secrets, that can be attributed to those patents that offer specific protection of product characteristics that provide exclusive features for the organization over its competitors)(GEISLER 1999; GEISLER, 2001a).

Bibliometric metrics,

Usually Bibliometric indices using a fully numerical scheme, than the publication is grouped based on countries or geographic regions. This index includes a number of scientific

output, citations, co-operation, patents, the patents cited, relationships indexes, , scientific correlation, scientific citation links, the correlation between scientific output and patents, co citation, representation visual techniques for scientific fields and countries that Using these indicators, Can reduce some incompetence such as difference in publication and citation in various scientific field, expending high time to recognize the value of a scientific report, cited failure of a valuable scientific outputs for a long time and ... and also could more effectively to assess the science and technology(GEISLER 1999). Publications (includes scientific papers, technical reports, and articles in scientific journals, book chapters, and proceedings of conferences and symposia. These measures can only be in the form of ratios to the investments in S&T that have generated these measures, or selected expenditures by category of type of industry and academic discipline—all in a given time period) and Citation Analysis (includes counts of citations of scientific and technical articles, as one measure of impacts on scientific community and quality of the scientific effort that has generated the publications cited. This increase may also be in the form of ratios to investments in S&T, or by academic discipline and type of industry or sector in which the scientific effort has been conducted)Are important factor in bibliometrics (GEISLER, 2005).

Patents

Exclusive rights that often a of government patent office granted to a patent for a certain period. Despite special legal privileges are for patents, and this can different them from scientific papers. Typically, a patent shows research and development activities that have been successfully done in countries(Gibbons,1994 quoted in: (NorooziChakoli, 2011).

The scientific publication is output of scientific activities a scientific institution that published in journals and serials in various community and indicate scientific community level. Therefore, patents as well as scientific publications, providing the possibility of analysis link structure in the field of science and technology for a community. For patent could contemplate these aspects(GEISLER 1999):

- Count of patents (produced by S&T unit and per S&E in the unit and in the organization. This measure may also be in the form of ratio of number of patents in a given time frame per expenditures for S&T, namely, a measure of the cost per patent by type of industry so as to account for different patenting practices)(GEISLER 1999).

Briefly we evaluate the performance of a country's technology and the knowledge transfer between science and technology with the analysis is done on the patents,

Peer review metrics

For co-operation assessment can be used Internal and external criteria:

- Internal evaluation (subjective rating of the S&T unit, its activities and its outcomes, by other people and units in the organization, such as marketing and production. This type of measure may be in the form of written evaluations and some ranking scale on an instrument that measures judgment of respondents, ad hoc or in a periodical manner.)
- External evaluation (subjective evaluation of the S&T unit, its activities, its outcomes, and its overall quality—by a panel of experts. This measure may be in the form of an invited effort requested by the S&T unit or its organization or external

S&T experts, consultants, and other knowledgeable people in the community, or in the form of routine evaluation, as part of an on-going assessment of S&T).

Also can have specific panel evaluations of any outcome from S&T, such as a specific scientific paper, project, or program. Also includes specific judgmental assessment of a product, a patent and individual scientist and engineer. This measure may be considered a measure of quality, as viewed by expert reviewers(GEISLER 1999).

Stages of outcomes

- Immediate outputs (includes measures of the proximal or direct outputs from the S&T/R&D activity, such as bibliometric measures).
- Intermediate outputs (includes outputs of the organizations and entities that have received the immediate outputs, transformed them, and are providing the transformed outputs to other entities in society and the economy).
- Pre-ultimate outputs (includes measures of the products and services that are generated by those social and economic entities that had received and transformed the intermediate outputs).
- Ultimate outputs (measures of the things of value to the economy and society that were impacted by the pre-ultimate outputs)(GEISLER, 1999).

Assessment power of technology

Evaluation power of technology is another approach to technology assessment, evaluation power of technology is a process in which measured the current level of technological capabilities and abilities of its technological that to be identified strengths and weaknesses of a unit. Power of technology is related with other science and technology indicators such as publishing, financial and human that there is relationship between these indicators and scientometrics (NorooziChakoli, 2011).

Among the important evaluation of power of technology that could be linked with other scientometrics indicators can imply to evaluation of competitive industrial that evaluate the comparative performance nations and they provide important information about the industrial development. Other objectives of this assessment is identify level of knowledge and specialized staff in the of performance industrial tasks fields in organization and subsequent in the country.

Conclusion

Based on top contents can be inferred that always technology, science, their relation and applications has been pay attention and with creating relationship between these factor can help science policy. In the process of technology assessment should be contemplate the textual and non-textual indices. In most texts in the process of country's technology assessment will focus on many factors such as growth rate patents, patents ratio to scientific products, as well as manpower, research and development it, because when these factors

are important in every country, can be seen the progress of science and technology innovation and implementation of science and its progress that in conclude the country can desire to objectives in science policies and determine some of the indicators used in scientometrics such as achieve the authors, scientific texts and journals core. With scientometric tools can offer methods, techniques, structures and qualitative Indicators for different aspects of science and technology and based on science and technology can help development of information systems. The development of these systems also affects social structures, organization, and economy. As well as, correlation can calculate between different categories of economic, social , science , also science size in a society, scientific efficiency and network and strategies could present to improve academic status of each country. The impact of science and international cooperation , specialization and development survey, their results will use for research and science policies.

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