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ALYTAUS KOLEGIJA

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# ROLE OF HIGHER EDUCATION INSTITUTIONS IN SOCIETY: CHALLENGES, TENDENCIES AND PERSPECTIVES

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# AUKŠTŲJŲ MOKYKLŲ VAIDMUO VISUOMENĖJE: IŠŠŪKIAI, TENDENCIJOS IR PERSPEKTYVOS

Mokslo darbai

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# INDEPENDENT SCIENCE AND KNOWLEDGE INDUSTRY

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**Summary**

Science is intuitive and not relied upon other's work. The theory of independent science is managed by individual and not by institutions. Science is free from any influence from any religious, political and cultural values. It is an individual's knowledge and his intuitive act that any scientific results may come out of his work. What has been published is not science, it is research. Science is a way of thinking. Whenever a person, authority or institution fails to control the science then they try to make the science corrupted. The present day world economy has a wide range of recognition of the importance of knowledge and intellectual capital in fostering economic growth and social change. However, it has been a challenge to devise useful way to measure importance of the knowledge and intellectual assets in the overall economy.

***Keywords:*** Independent Science, Production Function, Innovation, Research, Freedom of Speech, Knowledge, Economy, Industry, Publishing Science.

## Introduction

Generally, science is understood as an effort related to any research and development activity within the institutional setup. The insignia as 'scientist' has been more used to dignify a person involved in an institutional set-up under the specific terms of employment or service contract. For example, position holders in an institution involved in activities related to Science and Technology have given the name as "Scientist' and/or "Senior Scientist" etc. This is very funny because the famous person like Einstein has been called as "scientist' by people generally, but a position holder who simply because of holding a position might be calling as "Senior Scientist". Even the society rarely recognizes a person as a scientist who is independently conducting intellectual activities of his interest in a way he himself finds to be fit to obtain new knowledge and idea.

## 1. Objectives

The objectives of this article are:

i. To get insights on the subject of` independent science.

ii. To analyze the connection between independent science, science and technology, innovation, knowledge, freedom of speech, publishing and knowledge economy.

## 2. Methodology

This article uses the concept of independent science as discussed by Sandal (2016). The study is basically review of literature on science and its independent feature. The review of literature also cover the concepts of innovation, production function, freedom of speech, role of publishing in independent science and its relation to knowledge industry. I have tried to highlight the connection between the independent sciences with these concepts.

## 3. Discussions and Analysis

### Science, Innovation and technology

According to Albert Einstein, the whole of science is nothing more than an extension of everyday thinking (JACCARD & JACOBY, 2010). To explore new knowledge is science. The term science comes from the Latin word *Scientia,* meaning "knowledge" (VIOLATTI, 2014). Science is the process of generating knowledge based on evidence. (CONWAY, WAAGE, & DELANEY, 2010, p. 4).

Innovation is the process by which inventions are produced, which may involve the bringing together of new ideas and technology, or finding novel application of existing technology (CONWAY, WAAGE, & DELANEY, 2010, p. 4). It is about new ways of doing and seeing things as much as it is about the breakthrough ideas" (MARBURGER-III, 2011).

Conway et.al defines technology as the application of scientific knowledge, and frequently involves inventions i.e, the creation of a novel object, process or technique. The concept of need, of what is wanted, is

the ultimate driver of markets and an essential dimension of innovation (MARBURGER-III, 2011).

Science, Innovation and Technology used separately or used jointly may indicate the same thing for common people. These terms came along with the process of human civilization. Curiosity to do new things or achievement of new knowledge may be a matter related with an individual, but in other instances it may be a need-driven venture as well.

## Independent Science

The theory of independent science is managed by individual and not by institutions (SANDAL, 2016). An Independent scientist, historically also known as gentlemen scientist is financially independent scientist who pursues scientific study without direct affiliation to a public institution such as a university or government-run research and development body. The expression "gentlemen scientist" arose in post-Renaissance Europe but became less common in the 20th century as government and private funding increased (Wikipedia).

Independent science is related with a systematic attempt or an activity of an individual to obtain or discover a new knowledge on his utmost individual interest and effort. Science is an act of individual's thirst to explore new things and the result of the individual's effort is the knowledge. Concept of independent science has been inappropriately interpreted with the concept of production function. Relation of independent science with political phenomena like human rights, freedom of speech, publishing industry has been wrongly interpreted.

Independent Science is free from influence of any religious authority (like church), political authority (like government) or any cultural values. An independent scientist is free from influence from any production function. Gina Bari Kolata (1979, pp. 292-293) has given a good example of the nature of an independent scientist, which has been displayed in the box that follows.

**Table 1. Independent Scientist**

| **Independent Scientist** |
|---|
| John Angers is a physician in private practice who does research on the side. He receives no government funds or large grants. His research is supported in part out of his own pocket and in part by donations that patients and friends make to the Human Immunology Foundation, which he runs. The co-authors on his paper include his wife; English major who Angers say is a 'frustrated doctor."<br><br>Despite his independent style of research, Angers is not an Arrowsmith and work in complete isolation. He regularly attends scientific meetings (at his own expense) and gets to know other researchers, whom he then calls upon for advice and exchange of ideas. But what is remarkable is that by investigating in his own way things that he thinks are important, he has produced results that may make the established research community sit up and take notice. |

Generally science is attributed to research, where 'search' simply implies to go out to look something and re-search is do the same thing again applying the same process which has been used previously. But in a true sense, science is intuitive and not relied upon the others work, it is independent.

Science is free from any influence from any religious, political and cultural values. It is an individual's knowledge and his intuitive act that any scientific results may come out of his work. Innovation is that which has not been seen before. Innovation implies a separate scientific process. Under this activity, the entrepreneur himself identifies the process for innovation.

## Scientific method/process

With the clarity in science and innovation, the question may arise how does scientific innovation works? According to Conway & Waage (2010), scientific innovation involves the successful exploitation of new ideas to generate new techniques, products and processes. Traditionally, scientific innovation has been viewed as a process starting with curiosity-driven, basic research, which generates new understanding. Conway et. al. further elaborated, this then leads to translational research, which relates this fundamental understanding to systems we want to improve, and then to applied research, which produces the products which we can use.

Albert Einstein said, "the most incomprehensible thing about the world is that it is comprehensible" Most scientists would not say that science leads to an understanding of the truth. Science is a determination of what is most likely to be correct at the current time with the evident at our disposal (McLELLAND, 2006). The scientific method is a body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating the previous knowledge. To be termed as scientific, a method of inquiry is commonly based on empirical or measurable evidence subject to specific principles of reasoning (wikipedia, 2016). It has further mentioned that scientific method is the process by which science is carried out.

The overall process of science involves observation of the real world to have an interesting question to emerge. The emergence of new question in the mind of a scientist follows hypotheses on the different variables related to the questions. Moving forward to the new knowledge a scientist collects the related information, tests its validity, and evaluates the hypothesis based on the information collected. This gives him a new conclusion, which may be a new theory. Scientific method is a process to acquire knowledge based on an individual's intellectual process. "The regular occurrence of natural events encourages the development of some scientific disciplines. After a period of observation and careful recordkeeping, even some of the events perceived as random and unpredictable might begin to display a regular pattern, which initially was not immediately obvious. Eclipses are a good example." (VIOLATTI, 2014)

"Science has always functioned in two levels that we may describe as curiosity-driven and need-driven, and they sometimes interact in surprising ways" (MARBURGER-III, 2011, p. 1). Necessity is said to be the mother of invention, but in all human societies, ''necessity'' is a mix of culturally conditioned perceptions and the actual physical necessities of life. The concept of need, of what is wanted, is the ultimate driver of markets and an essential dimension of innovation. Innovation has the chicken-and-egg quality that makes it extremely hard to analyze (p. 2). Yet most social change is neither purely top-down nor bottom-up. It involves alliances between the top and the bottom, or between what we call the 'bees' (the creative individuals with ideas and energy) and the 'trees' (the big institutions with the power and money to make things happen to scale)" (MURRAY, CAULIER-GRICE, & MULGAN, 2010). What we can take the idea from the above is that science at the initial may be curiosity-driven but it turns back to need-driven and vice versa. But whatever are the cycles of its emergence and development, scientific process is independent.

A criterion for scientific process is definite to make the scientific process independent. Sandal opines that a scientist cannot be said to be independent if s/he is working under an engagement that determine his work within a master-servant or employer-employee relationship. The person who himself get involved in the scientific process should have certain level of economic and social condition. The independent scientist should have certain level of intellect, brave and courage to be involved in independent scientific process.

Question emerges what is the difference between and scientific and a research process. Research is somehow mechanical, because talking about research in present context indicates an act, which has to be conducted and completed under a fixed and already set standards and with a fixed objectives. However, science in purely intuitive in nature and having individualist approach. Research may be conducted in a closed institutional set-ups but science is a natural and individual act of a scientist, which is free from any standards, forms, and rules. It is spontaneous and highly knowledge based.

## Economy and Knowledge Industry

Economy has its foundation on the production function. Production function is a process that converts inputs: land and labor into the entrepreneur's profit as an output of the process. Within the production function, the enterprise is inside the function and the owner is outside the function.

Economic activity depends upon many other functions. It is affected by many variables and affects various other variables. Hence, economy has basic foundation of inter-dependence. The knowledge economy is the use of knowledge to generate tangible and intangible values. Technology and in particular, knowledge technology helps to transform a part of human knowledge to machines. This knowledge can be used by decision support systems in various fields and generate economic values. Knowledge economy is also possible without technology (Wikipedia, 2016, p. Knowledge Economy). Knowledge is now recognized as the driver of productivity and economic growth, leading to a new focus on the role of information, technology and learning in economic performance (OECD, 1996). The term "knowledge-based economy" stems from this fuller recognition of the place of knowledge and technology in modern OECD economies.

The growing codification of knowledge and its transmission through communications and computer networks has led to the emerging "information society". The need for workers to acquire a range of skills and to continuously adapt these skills underlies the "learning economy". The importance of knowledge and technology diffusion requires better understanding of knowledge networks and "national innovation systems". Most importantly, new issues and questions are being raised regarding the implications of the knowledge-based economy for employment and the role of governments in the development and maintenance of the knowledge base (OECD, 1996).

Knowledge cannot be proved with its effectiveness unless it disseminated, shared between the persons of similar capacity, and communicated to the mass of people having same capacity to observe its effectiveness. Publishing is a mode of communicating the knowledge obtained. Sharing of knowledge publicly relates with the freedom of speech and the interrelation of science with politics.

Now we have question like what is freedom of speech? Rutherford (2016, pp. 50-53) defines, "Speech should be thought of as the major avenue through which the total personality, physically, emotionally, intellectually and socially, expresses itself." Speech is probably the most fundamental and common tools used

in communication. Formation of ideas however, limited in scope, means mental activity and probable mental growth. Thinking is done in terms of language. The spoken word, it would seem, is the principal channel of receiving and giving information and exchanging ideas and feelings" (pp. 50-51).

Freud argues that freedom of speech benefits people by providing a harmless outlet for aggression, suggesting that it is better to express aggression in words than in violent deeds or to repress it altogether. The intellectual roots of the contemporary concern with "freedom of expression" (as opposed to "freedom of speech") can be found in Freud: to focus on freedom expression is to ignore the qualitative differences among forms of self-expression and to neglect the specifically political character of speech (SCHWART, 1986). All principles of contemporary freedom to speech are guided by political principles. Politics is related with the production function. Freedom of speech is a part of collective thinking whereas scientific truths are individual process. Freedom of speech is all about politics and propaganda. It is a production function.

Freedom of speech and politics are interconnected. Politics and its mechanism always try to influence the activities of the whole of the society. A vibrant community of scientists, technologists and entrepreneurs are needed to assure the flow of knowledge and information throughout the innovation ecosystem. Government financial support for education and training enhances the formation and growth of that workforce infrastructure (National Science Board, 2012, p. 13).This is related to the politics, or is a political agenda. Whatever steps or program taken by government or other institutions in a standard set of rule is related to production function within the economy, but science is independent-individual-intellectual thinking process.

Science is independent but politics is dependent on number of different factors. By nature of its features independent science is dynamic as against somehow the static nature of politics. The boundary of scientific work is not limited but the politics is limited within the political and/or geographical boundary. Politics has to be guided by the certain principle norms for which political forces get organized, operated and collapsed. On the contrary, science is not guided, it is sovereign and an independent scientist does what he finds to be suitable for his intellectual endeavors. Politics is basically issued based and a production functions whereas, science is not based on any given issue and outside the production function.

Science has nothing to do with politics. Scientific work is a natural process. No certification from any authority including the government, parliament or any of the power centres need to give insignia to the scientists. Scientist requires no hats as certification of their work. Even in an environment of no freedom of speech/expression, independent scientific effort may exist, but there may be hindrances to share the scientific knowledge publically because of existing political value. Whenever, a person, authority or institution fails to control the science then they try to make the science corrupted.

Here, a pertinent question like why scientific work is to publish if we believe that science is independent may arise. However, publishing is indeed required to communicate the science. According to the Guidelines for Scientific Publishing by the ICSU Press (1999, p. 13), putting on the one side the 'business" questions, answer to the question "why publish?" is that the object of the learned society publisher is "to communicate science". It has been further mentioned in the guidelines that "a learned society as a publisher is likely to be intrinsically committed to the role, whereas the commercial publisher receives capital or generate revenue which might be employed in another area of business altogether, where better opportunities for profit are perceived by the owners." Journalism is not a part of scientific process because it is an economic activity Journalism is a part of the production function that generates revenue and distributes salary.

In accomplishing their responsibility, the publisher adds value. Publisher does the job of editing, production, marketing and distribution. While playing this role publisher provides its name and gives a guarantee of quality of published material, which the reader or the user of the information may recognize.

- Trade or consumer publishers: Carry publishing job only for profit irrespective of their act on so-called social responsibility.
- Learned society publishers: Their act may give them some types of surplus but they do not work for profit, but work for servicing science (1999) ICSU.

Leaned society in its role as a publisher can best serve science by doing what it can do best for dissemination of knowledge and information. Instead of so-called "trade" or consumer publisher, learned society publishers, because of the authority they can bring to the task, have a special advantage in publishing science.

Scientists are highly affected by publication practices. Through publication, an individual's (or, more commonly, a group's) experimental work and thought become part of the fabric of science, something to be talked about, contested, admired, built upon, criticized, or even neglected (but with the potential for rediscovery at a more opportune moment)'' Vermus (2016, p. 164). The advancement of science depends upon publications that keep scientists in communication with one another. The advancement of civilization depends upon publications that keep the rest of mankind in communication with scientists (SMITH, 1954). Mellor opines the popularization of science is an important part of the scientific process. All scientists engage in the production of texts addressed to groups other than the core group (2003, pp. 509-538).

The broad label “knowledge economy” covers a wide array of activities and interpretations (POWELL & SNELLMAN, p. 200). Powell et.al further elaborate that the knowledge economy as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence. The key components of a knowledge economy include a greater reliance on intellectual capabilities than on physical inputs or natural resources, combined with efforts to integrate improvements in every stage of the production process, from the R&D lab to the factory floor to the interface with customers.

The present day world economy has a wide range of recognition of the importance of knowledge and intellectual capital in fostering economic growth and social change. However, it has been a challenge to devise useful way to measure importance of the knowledge and intellectual assets in the overall economy. Different types of focuses as mentioned below have been devised to measure the importance of knowledge and intellectual capital on the social change.

- Human Knowledge, organization and intellectual capital
- Research and Development efforts
- Investment in information and communication technology
- Investment in education and training
- Organizational reforms

Science, innovation and technology has significant implication of knowledge economy and knowledge has impact on the science, innovation and technology. In the present era of scientific innovation and technological advancement, which was not imagined by the previous generation, emphasis on importance of independent science is not an exaggeration because independence ensures purity in thinking and holiness in delivery. Attempt to influence the science from any segment of the society may corrupt the science resulting in misuse of knowledge, innovation and technology.

## Conclusion

Science should be independent from any influence and interference. Science if controlled by the government or any other authority, which might have power to influence, will lose its basic properties or features. In the present day world economy, knowledge and intellectual capital is indispensable for fostering economic growth and social change.

The key components of a knowledge economy include a greater reliance on intellectual capabilities in every stage of the production process. Independent science has indispensable contribution to the economy and knowledge industry; and it keeps going irrespective of political or other mindset of the society. Government tries to control the science but it cannot be successful in any way it wanted to control. In turn, government tries to corrupt science. Corrupting the science means to name knowledge based activity as science working basically according to the will of the political masters instead of an independent individual intellectual process.

## Acknowledgment

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**Anotacija**

**NEPRIKLAUSOMA MOKSLO IR ŽINIŲ PRAMONĖ**

Paprastai mokslas suprantamas kaip pastangos, susijusios su bet kokia mokslinių tyrimų ir plėtros veikla institucinėje struktūroje. Žodis “mokslininkas” dažniau naudojamas kaip ženklas pagerbti asmeniui, kuris dalyvauja institucinės struktūros specifinėje veikloje pagal konkrečias darbo ar paslaugų sutarties sąlygas. Net visuomenė retai pripažįsta kaip mokslininką žmogų, kuris savarankiškai vykdo intelektinę veiklą, susijusią su jo susidomėjimu ir tokiu būdu gauna naujų žinių ir idėjų. Mokslas yra intuityvus ir nėra pagrįstas kitų darbu. Savarankiško mokslo teoriją valdo individas, o ne institucijos. Mokslas yra laisvas nuo bet kokių religinių, politinių ir kultūrinių vertybių įtakos. Tai asmens žinios ir jo intuityvus veiksmas, bet kokie moksliniai rezultatai gali atsirasti iš jo darbo. Tai, kas buvo paskelbta, nėra mokslas, tai yra moksliniai tyrimai. Mokslas yra mąstymo būdas. Kai asmuo, valdžia ar institucija nesugeba kontroliuoti mokslo, jie bando mokslą iškraipyti. Šio darbo tikslas yra:

Gauti įžvalgų apie savarankišką mokslą ir analizuoti ryšį tarp savarankiško mokslo, mokslo ir technologijų, inovacijų, žinių, žodžio laisvės, leidybos ir žinių ekonomikos. Šiame straipsnyje naudojama nepriklausomo mokslo samprata, aptarta Sandalio (2016). Tyrimas iš esmės yra literatūros apie mokslą ir jos atskirų ypatybių apžvalga. Literatūros apžvalga taip pat apima inovacijų sąvokas, gamybos funkciją, žodžio laisvę, leidybos vaidmenį nepriklausomame moksle ir jos ryšį su žinių pramone. Aš bandžiau akcentuoti nepriklausomo mokslo ryšį su šiomis sąvokomis. Valdžia bando kontroliuoti mokslą, tačiau jai tai nepavyksta. Savo ruožtu vyriausybė bando korumpuoti mokslą. Griauti mokslą reiškia žiniomis pagrįstą veiklą padaryti mokslu, veikiančiu iš esmės pagal politikų valią, o ne atskirą individualaus intelekto procesą.

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