ZARZĄDZANIE PUBLICZNE 3(35) 2016, s. 221–235
doi:10.4467/20843968ZP.17.018.5520
www.ejournals.eu/Zarzadzanie-Publiczne

Gábor Kovács
Széchenyi István University, Győr, Hungary
e-mail: kovacsg@sze.hu

Zsuzsa Stion
Széchenyi István University, Győr, Hungary

INNOVATION AUDIT AS A TOOL FOR BOOSTING INNOVATION POWER OF UNIVERSITIES

Abstract

Universities face increasing competition and depend more and more on political, economic, but also environmental factors. These lead to new turbulences for higher education organisations. Essentially, higher education systems become constantly more complex, reliant and fast changing, the level of disruption that confronts university leaders increases. In this context, innovation management is a central device to deal with foreseen and unforeseen disruption. The paper describes how innovation audit can be applied as a major means of change and innovation management to increase the competitiveness and innovation capacity of higher education institutions. The topic is presented from two aspects that later meet each other, from the aspect of higher education institutions and that of innovation management.

Key words: innovation audit, universities

Ensuring university development by institutional capacity for change

The significance and relevance of universities is based on their achievements in research and teaching and not on their willingness to make institutional changes happen [Shattock, 2003]. Nevertheless, institutional changes are necessary to develop the two core missions – teaching and research – and to create the modern university environment. The HEIs' autonomy and governance, the Bologna Process, the Excellence Initiative, but also the changes in the funding of higher education (HE) – to mention some of the key issues – have led to a fundamental discussion on the role and responsibilities of HEIs [Altbach, Peterson McGill, 2007; D'Ambrosio, Ehrenberg, 2007; Huisman, Pausits, 2010]. The changes range from

comprehensive system reforms to institutional change processes, which are often expressed and propagated with headings like "from research to innovation" [Etzkowitz, Leydesdorff, 2000].

The role of higher education for society and for the economy area is a matter of growing public and political concern. Policy makers, researchers, institutional leaders, higher education professionals, and the media around the world regularly address the importance of higher education especially as a driver of economic recovery and growth in response to the depth of the economic crisis.

The first step to understand organisational barriers means to understand the university's institutional role. Standards and profiling are two elements of the current academic discussion that highlight not only the width but also the depth of a particular complexity of knowledge production and interaction. It is one of the essential tasks of university leaders to develop an institutional profile of their universities, to identify and use external funding, to develop more efficient and effective organisations, and to sustain academic excellence with strategic advantages.

With the Europe 2020 strategy, the European Union reasserted its commitment to the goal of a dynamic, sustainable, knowledge-based economy. This concept of *knowledge triangle* stands at the centre of EU policy with regard to the knowledge economy. It links education, research and development, and innovation – each at the point of a notional triangle. University activities have traditionally been understood as two missions: teaching and research. However, more recently policy makers have been keen to encourage "all the other contributions of universities to society" [Etzkowitz, Leydesdorff, 2000], their Third Mission. The third mission, as a whole, includes lifelong learning, science parks and international cooperation. In line with the dynamic development of education and research activities, the University pays increasing attention to the development of "third mission" activities. Some of the pillars of third mission are innovation, technology and knowledge transfer.

Another approach to the third mission, from the perspective of tasks, can be made through research and the production of knowledge. Gibbon *et al*. [1994] describe the need for greater contextualization of research, as well as an opening towards markets, which goes along with seeing society and other stakeholders as an integral part of knowledge creation. This means that the relevance of research increasingly depends upon the customers and stakeholders, and relations with these.

As a consequence, it is less important to motivate departments but more relevant to manage the institutional research portfolio, to decide which idea or field for future funding is relevant and to run processes in research and innovation more effectively and efficiently [Dőry, Kovács, Pausits, 2015]. We call these processes research and innovation management.

Most of the universities have already invested a lot in research management to increase third party income and to attract and successfully implement research projects. However, headlines like "innovation union" or the "European paradox" indicate that there is a perceived failure of European countries to

translate scientific advances into marketable innovations. That is why university leaders are more strongly confronted with the 'new' goal to transfer research into innovation. A professional research management is a prerequisite to enable universities to solve the aforementioned so-called "European paradox". Innovation requires additional and different practices, which we suggest to call innovation management.

Innovation and innovation management

Key drivers in research and innovation are intangible assets. The role of intangible investment like research, innovation or education is at the core of smart growth and competitiveness of the European Union 2020 strategy. The role of intangible assets is recognised even more strongly, which is also due for the progress required measuring them, while there is also greater awareness of their contribution to the productivity growth of the economy. However, their role as a competitive asset of a country or organisation and intergenerational well-being has not yet been recognized fully. A wider set of measures is required that capture the full range of investments in intangibles, and that allow to test their possible contribution to innovation, productivity and growth [Geoghegan-Quinn, 2010]. The necessity and importance of measuring intangibles has become increasingly accepted in the business, financial and academic communities as a means for a better understanding of the value creation processes.

Creative solutions are not unknown realities in university life. Managing the university requires a lot of creativity. In management literature, creativity is very often focused on individuals or on the role of teams mainly identifying techniques to extract best performance. In fact, the importance of the relationship and connection between creativity and innovation is so important that this has to be addressed in the strategic development of the university. An analysis of all state universities' institutional development plans in Austria has shown that creativity as a strategic objective of the universities disappears more and more, with the focus shifting to accountability, to the need to implement the development plans, and to addressing the institutions' strategic choice to opt for risk. In conclusion, creativity and play are not considered important characteristics of the enterprise university.

This development needs to be reconsidered. One option to connect creativity with innovation is the notion of play. Massification, financial barriers and the transformation of universities into places of production are major barriers of that freedom. The pressure on individuals, teams, units to meet internal and external expectations appear as major barrier of play and freedom. Play is the antidote to the procedures and bureaucracy that are inevitable in institutions [Dodgson *et. al.*: 17). Innovation management has to bring back this important characteristic of universities and has to pay attention to creativity and playfulness.

The graph above shows why it is so important for universities to move from research to innovation (management). With research, universities depend on financial subsidies, hence they run high risk as to how this investment can be used best. If research can be moved and transformed into innovation, both risk and subsidies will decrease. From this perspective, university leaders should try not to limit university activities only to (basic) research but extend the cycle to innovation. The danger here is of course that universities will lose their profile and will focus only on applied research as governments identify innovations as enablers to reduce university funding. University leaders, policy makers and the business sector follow different strategies and represent different interests. Innovation and a professional innovation management enable universities to deal with this different views and positions in a good way.

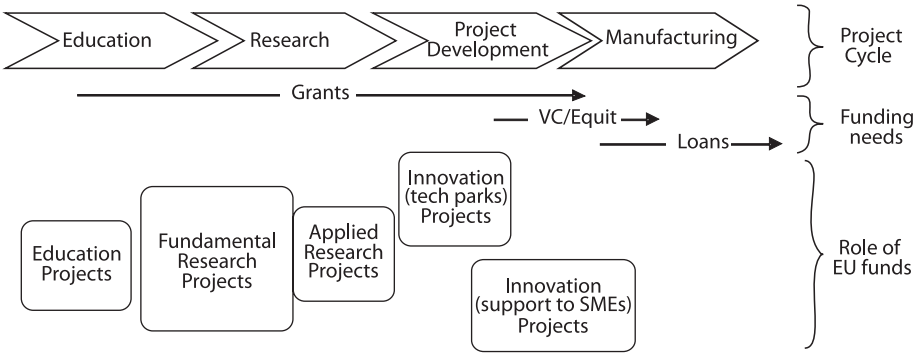

Figure 1. The "Research Triangle" and funding considerations of projects

Source: based on Almagro [2012]

The notion of innovation process involves different comprehensive activities among which R&D is only one of the major elements, which is not directly connected to any specific type of innovation [OECD, 2005]. Innovation itself does not only refer to R&D activity. An invention may only be considered innovation if it is applied by the economy [Schumpeter, 1939]. Consequently, innovation may be regarded as a process implementing creative thinking; therefore it may be developed efficiently if it is embedded in the organisational strategy [Seténi, 2009].

Innovation strategy is one (sometimes the most important) element of a given organisation's strategy, which is essential to create and maintain competitiveness. As a result, innovation strategy may not be elaborated or implemented on its own. Based on and originating from innovation strategy, R&D and innovations are controlled by innovation management [Inzelt, 1998].

In contrast to research, innovation management covers a wide range of tasks which go further than general project management:

– dealing with disruption;
– balancing portfolios;
– integrating organizational, technical and commercial elements;

– building advantage in intangible assets and activities;
– encouraging creativity and playfulness [Dodgson *et al*., 2014: 13].

In our view out of the ten methods of innovation management, first of all, the ones below can be related to the innovation audit procedure of higher education institutions [Pakucs, Papanek, 2006]:

1. Knowledge or technology management;
2. Cooperation and networking;
3. Innovation project management.

Knowledge (or technology management) aims to manage already acquired knowledge, as well as, enhance the acquisition of new knowledge. Among the techniques belonging to this group, the technology audit method may be closely related to the field of innovation audit, or it may be regarded as a special type of it. Technology audit is used for assessing an organisation's technological capacity, operations and needs, as well as, revealing the strengths and weaknesses of the whole technology process [Pakucs, Papanek, 2006]. One of its potential methods is preparing a knowledge map.

Cooperation and networking

With regard to this technique of innovation we should mention technology transfer, which is defined as a transfer and receipt of already known technology. Technology transfer may be utmost important for research institutes and higher education institutions carrying out R&D activities, as well as, for companies in terms of business-related networking. In case of this innovation management method, innovation audit helps assess whether a given organisation carrying out R&D activities may be suitable for building and managing such networks (and if they may, to what extent). Similarly, this consideration may also be relevant for the organisation involved in research to assess the chosen company for cooperation.

Innovation project management

Innovation project management regards different tasks as important during the three phases of the innovation process [Pakucs, Papanek, 2006]:

1. Pre-project management;
2. Project development management;
3. Post-project management.

The major areas of *pre-project management* include idea management and product portfolio management. As a result, innovation audit mainly targets creativity development, the quality and nature of idea generation, as well as, the evaluation of strategic issues and possibilities related to the innovation process. **Project development management** accompanies the life cycle of a product from the prototype through the market launch to the sales. The primary aim of post-project management is to encourage and organise the learning process based on previous experience. Project audit focusing on subsequent performance measurement may be mentioned as an example of it.

Innovation audit

It has been presented above how innovation audit can be related to the innovation processes, and what role it may play in them. Next the activity will be highlighted from the aspect of "audit", i.e. criteria and features related to organisational (corporate) audits will be determined and applied with regard to innovation audit. As the methodology of innovation audit originates from the business sector, first, the topic will be analysed from this aspect.

The term audit refers to "measurement" and "verification" at the same time, i.e. in addition to the measurement of mostly numerical, quantifiable results, it is also important that an audit should also provide objective evidence about the subject of the examination. The best elaborated and most widely spread audit models are related to the business processes of corporations. Among business audits, financial audits have the most comprehensive methodology. The approach applied for financial audit may also be used - with some alteration and addition in the field of innovation audit [Chiesa, Couglan, Voss, 1996].

A comparison with defined standards or practice, as well as a guarantee and possibility for it is of key importance in case of each audit. As a result, in the course of audit the following basic principles should be strictly enforced.

- Acquisition of and search for information of adequate quality and reliability based on previously determined criteria with preference to quantification.
- Exact definition of the audit's subject including the time period to be examined (especially in case of post-project management).
- Acquisition of adequate evidence, in optimal case achievement of quantifiable reliability level.
- Competent and independent (not subjective) examination.
- Communication of the audit's results to the organisation.

In case of innovation audit the above principles raise numerous problems. The major part of problems related to innovation and the innovation process is difficult to measure and quantify, therefore in the course of audit in many cases only relative, external reference points can be used, i.e. in many cases a comparison with "best practice" is not always effective.

According to Mentz, innovation auditing can be defined in the following way:

> The process by which a competent, independent person(s) accumulates and evaluates evidence about the process of innovation, related to a specific entity, for the purpose of reporting on the degree of correspondence between the innovation process and established best known practises in the innovation environment [Mentz, 2006: 71].

Innovation practices, although less quantifiable and absolute than financial practices, may be audited by means of "best practise criteria". Belliveau *et al.* [2002] prefer using the term "effective innovation practices" as opposed to "best innovation practices".

The subject of the innovation audit should also be defined with utmost care. It may refer to:

- The given innovation (in most cases product).
- The given organisational team.
- The whole organisation.

In the course of audit referring to innovation (product) there may be further classification according to the previously mentioned areas of innovation project management (pre-project management, project development management, post-project management). If an audit refers to a given organisational team, we should differentiate between the methodology of audits with regard to management (abilities leading innovation) and that related to other participants (their teams). If the innovation audit targets the whole organisation, innovation strategy issues are in the focus of attention.

Within the innovation activities, the innovation process model by Chiesa, Coughlan, Voss [1996], which is related to the technological innovation audit, first of all, differentiates **core processes** and **enabling processes**. The core processes include concept creation, product development, process innovation and technology acquisition. The enabling processes comprise the provision of (human and financial) resources, the adequate use of systems and means and the operation of managerial functions.

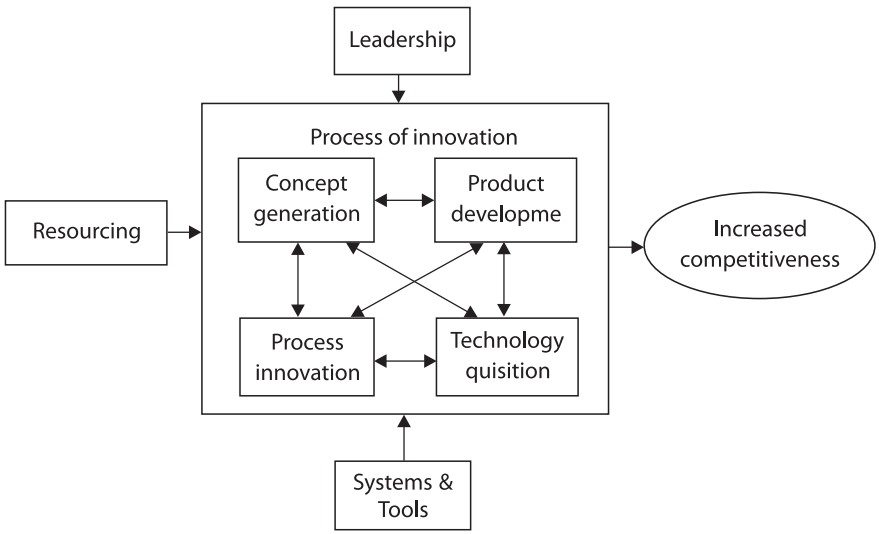

Figure 2. The process-based model of innovation

Source: based on [Chiesa, Coughlan, Voss, 1996]

When determining the performance of the individual processes we analyse the above-mentioned areas of the innovation process model. With regard to the current research, however, instead of increasing competitiveness another final

aim may also be relevant (e.g. maximising the long-term income generating capacity). In the process-based model innovation audit consists of three elements:

1. Competence innovation audit.
2. Process audit.
3. Performance audit.

Competence innovation audit

The competence innovation audit focuses on the innovation competencies of the organisation, its resources, structures, leadership, management and employees, and finding solutions as to how the organisation can be better equipped to deal with change.

Process audit

The process audit focuses on the step-by-step actions necessary to develop and implement an individual innovation. According to Chiesa *et al.* [1996] the process audit is a general auditing method and addresses the holistic attributes such as a culture, creativity, structures, implementation and others, forming part of innovation. It analyses the degree to which there are appropriate processes in place, the deployment of good practices and the degree to which each practise meets "best practises" and standards.

Process audit aims to check the processes necessary for innovation and examine whether a given organisation adequately implements and applies the best innovation practice suited to the organisation's operation. In the course of innovation audit the following areas are investigated.

- Concept creation for product innovation.
- Product development.
- Process innovation.
- Technology acquisition.
- Management.
- Resource provisioning.
- Systems and means.
- Increased competitiveness.

Performance audit

Contrary to the process audit, the performance audit directly addresses the factual process of a new product, service or process development; it requires the identification of metrics whereby processes, methods and involvement are measured

and equated with another measurable entity, usually money and time. It focuses on the measurable outcomes of the innovation process. Accordingly, performance audit requires the definition of metrics that can be quantified and measured in an unbiased way.

By means of performance audit, the performance of the individual part processes, as well as, that of the whole innovation process may be measured. It is essential that the realisation of the final goal may not only be analysed from the aspect of a given innovation, but it should be evaluated by taking all the elements of the portfolio into consideration. A less successful innovation trial may also have a positive result in the long run by indirectly benefiting from the experience.

As performance audit gives a quantitative result, it is not suitable for laying the foundations for learning and knowledge. It indicates the place of shortages and problems, and the size of the difference between the current and the desired performance, but it does not reveal any of the possible reasons, therefore it does not help solve problems. It can perform this task only with the method of process audit.

The aim and means of innovation audit

The main aim of innovation audit is to point to the strengths and weaknesses and provide, first of all, strategic (not operative) guidance for development facilities. The implementation of audit helps with the following issues:

- Analysing the current innovation practice and performance.
- Identifying the differences between the current and the targeted practice and performance and the reasons for them.
- Increasing an organisation's innovation power.
- Dismantling barriers to innovation.
- Ensuring the necessary motivation for the innovation activity.
- Encouraging the creativity of those involved in the innovation process.
- Making an action plan about the directions of the necessary changes.

Methodology

Initially, the methodology of innovation auditing took the form of financial auditing, but this approach soon changed. Due to the quantitative nature of financial auditing, it was found to be of little practical use. Only some of the causal methods, for finding and analysing the audit data, were used. A much better methodology was found in the form of an innovation audit [Chiesa *et al*., 1996].

Some examples of different measurement frameworks for measuring innovativeness, which is the heart of innovation audit models, shall be highlighted here. Most of the models include the majority of those dimensions which constitute innovativeness, however they provide different perspectives of focus.

- The Diamond model (proposed by Tidd, Bessant, 2013) considers the following five dimensions for innovation assessment: strategy, process, organization, linkages, learning.
- The Innovation Funnel Model consists of nine elements (stages): strategic thinking, portfolio management and metrics, research, ideation, insight, targeting, innovation development, market development, selling.
- The Innovation Value Chain model (based on Hansen, Birkinshaw, 2007) presents innovation as sequential, three-stage process that involves idea generation, idea development and the diffusion of developed concepts.
- The Oslo Manual Innovation Measurement Framework also provides guidelines for collecting and interpreting innovation data in comparable manner.

Based on these theoretical frameworks, many assessment tools have been developed for the purpose of international benchmarking, such as a result of 1-InnoCERT, Inno-BIZ, NESTA and IMProve projects [Gamal, 2011].

Formal techniques

A number of formal techniques can be used for innovation project appraisal, such as financial analysis; economic appraisal (including CBA) and scoring, weighting and rating (SWR) systems (as a form of multi-criteria analysis). The financial analysis of a project helps determine the financial viability and sustainability of the project and focuses upon their cash implications. An integrated project appraisal begins with the financial analysis and then proceeds to the economic analysis. Compared to financial analysis, the project's profile in the economic appraisal provides a flow of net economic benefits generated by the investment, and in effect economic analysis appraises the project's contribution to the economic welfare of the region or country. A socio-economic cost-benefit analysis (CBA) goes beyond financial appraisal by examining the social costs and benefits in terms of their net impact on society's well-being [Jenkins *et al*., 2011].

Table 1.

Differences between financial analysis and economic appraisal

Financial analysis	Economic appraisal
• Considers only financial cash-flows	• Considers economic costs and benefits
• Used by the private sector but can also be used by the public sector	• Used mainly by the public sector due to the focus on net benefit for society
• Focuses on financial flows directly affecting project sponsor and/or Exchequer	• Focuses on economic and financial flows affecting society

Source: own construction.

Scoring, weighting and rating (SWR) systems try to consider all the costs and benefits which are difficult to value in monetary terms. The weighted scoring method involves identification of all the non-monetary factors that are relevant to the project; the allocation of weights to each of them to reflect their relative importance; and the allocation of scores to each option to reflect how it performs in relation to each attribute. The result is a single weighted score for each option, which may be used to indicate and compare the overall performance of the options in non-monetary terms.

Margin note: Innovation management with a view towards valid objectives

As the first step in order to develop an effective innovation management system, the objectives of such a system have to be identified. For a higher education institution direct economic benefits as well as strategic and operational advantages can be obtained. The most valuable economic benefits can be listed as follows:

- Higher license income due to successful technology transfer.
- Spin-off establishments, efficient incubation, and M&A opportunities.
- More R+D ideas and projects suitable to apply for grants / funds.
- Options for service income by providing an appropriate Identity and Wealth Management (IWM)) and Identity and Access Management (IAM) services for businesses.
- Decrease in expenses due to optimized R+D processes.

As mentioned above, the strategic and value fits have high impact for the university. The advantages of the innovation management cannot only be identified through financial benefits and effective and efficient operations. Other measures and opportunities in light with other organisational goals can be identified as well. Institutional strategic and operational advantages can be summarized as follows:

- Acquisition of socially valuable consortial and industrial R+D cooperations.
- Greater contribution to the development of the economic – social environment.
- Better university goodwill: more attractive institution for staff and students.
- Demonstration of responsible research through implementation and interaction with society at large.

Margin note: Technically effective innovation management

Based on the literature review provided by Waal and Maritz [2007], six key processes ought to be addressed in the pursuit of managing innovation effectively:

- Identification of appropriate innovation metrics and its subsequent and continued measurement.
- Formulation of an innovation strategy.
- Development of suitable innovation processes.
- Making use of appropriate innovation tools.
- Having an innovation supportive organization.
- Providing innovative leadership.

Margin note: Using questionnaires

Most frequently, innovation audit is based on a survey where data are collected through a questionnaire. The questionnaire is designed primarily to be a self-audit aid, although in some circumstances it could be completed by an external person. The way it is used can be modified to meet the specific needs at different organization levels. Most of these questionnaires cover issues connected to leadership, resources, knowledge management, innovation experience and focus, creativity, intellectual property management, measures, ethics and values and organisational culture.

One possible and recommended structure of the questionnaire is as follows (based on Coombs *t al*., 1998): In each part of the questionnaire three additional columns must be created for marks for Satisfaction, Importance and Action. Values (from 1 to 5) in column "Satisfaction" show the degree of satisfaction with the current innovation performance of the organization. In column "Importance" the level of importance attached to the given activity must be identified. Finally, column, "Action" is ticked if some significant action might need to be taken.

Table 2.

Possible structure of an innovation audit questionnaire [Coombs *et al*,, 1998]

	Satisfaction Low / High 1 2 3 4 5	**Importance Low / High 1 2 3 4 5**	**Action**
R&D Management Activities			□
'Mapping' of Knowledge Relationships			□
R&D Human Resource Management			□
Intellectual Property Management			□
R&D Information Management			□

One could complete the questionnaire by co-ordinating a variety of relevant views, or a number of people from the same audit area could each fill in the questionnaire for subsequent group discussion and analysis. The main benefits

from this process are likely to be a deepening understanding of the nature of knowledge management practices relevant to effective innovation, rather than as a 'magic bullet' to solve many complex problems [Coombs *et al*., 1998].

Summary

Universities are engines of innovation per se but not necessarily innovative (enough) as organisations since they often lack transformation capacities when it comes to marketization of research results. Of course the university is not a (business) enterprise; however, it has similar potentials which can be utilized better.

One of the leading goals in European higher education is to overcome the paradox which can be described as the hiatus between the existence of research achievements and the low level of marketable innovations. Universities should manage innovation rather than leave it to chance, by creating supportive structures, practices and processes.

The innovation capacity of universities and an effective institutional ecosystem can be valued through innovation audits. These audit "exercises" help to identify institutional weaknesses and potentials to build an innovative university. An innovation audit is both a demonstration and evaluation of innovation as well as a means to raise self-awareness at same time. As was shown in this article, different techniques and approaches can be used for such an audit. The above-mentioned approaches are sketches to initiate further discussion of implicit values, attractive objectives, and fitting devices, and they are intended to provide a first introduction to concepts and methodology of innovation audits. Compared with institutional strategy and context financial analysis, economic appraisal scoring, weighting and rating (SWR) systems can be seen as different approaches to creating an innovative organisation.

It must be underlined that a university must not be seen as an institution which follows financial and (micro) economic highways only. Innovation audits, too, should consider the importance of the third mission in its wider sense, including social engagement and responsible research, all of which should also be taken into account, e.g. in the self-evaluation process.

References

Almagro A. (2012), *Identification of Potential Projects for 2014–2020 in the Knowledge Economy and Energy Sectors*, JASPERS Stakeholders' Meeting, Zagreb, 14 June, http://www.kiksz.eu/downloads/jaspers/Antonio%20ALMAGRO%20Presentation.pdf [access: 12.05.2015].

Altbach Ph.G., Peterson McGill P. (2007), *Higher Education in the New Century: Global Challenges and Innovative Ideas*, Sense Publishers, Rotterdam.

Belliveau P., Griffin A., Somermeyer S. (2002), *The PDMA ToolBook for New Product Development: Expert Techniques and Effective Practices in Product Development*, John Wiley & Sons, Inc., New York.

Chiesa V., Coughlan P., Voss C. (1996), *Development of a Technical Innovation Audit*, „Journal of Product Innovation Management", Vol. 13, No. 2, March 1996, 105–136.

Coombs R., Hull R., Peltu M. (1998), *Knowledge Management Practices for Innovation: An Audit Tool for Improvement*, CRIC Working Paper, No. 6, June, Centre for Research on Innovation and Competition, The University of Manchester, Manchester.

Gibbons M., Limoges C., Nowotny H., Schwartzman S., Scott P., Trow M. (1994), *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, SAGE Publications Ltd., London.

D'Ambrosio M., Ehrenberg R.G. (2007), *Transformational Change in Higher Education: Positioning Colleges and Universities for Future Success*, Edward Elgar, Cheltenham, UK, Northampton, MA.

Dodgson M., Gann D.M., Phillips N. (2014), *Perspectives on Innovation Management* [in:] M. Dodgson, D.M. Gann, N. Phillips (eds.), *The Oxford Handbook of Innovation Management*, Oxford University Press, Oxford.

Dőry T., Kovács G. Pausits A. (2015), *Institutional Leadership Between Market needs and Organisational Barriers in Research – Innovation Management as the Vehicle of Change*, „Leadership and Governance in Higher Education", No. 1, 24–41, Raabe Verlag, Berlin.

EIB (2008), DG Regio's *Guide to Cost/Benefit Analysis of Investment Projects*, European Investment Bank, http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf [access:10.07.2010].

Etzkowitz H., Leydesdorff L. (2000), *The Dynamics of Innovation: From National Systems anf Mode 2 to a Triple Helix of University-Industry-Government Relations*, „Research Policy" 29 (2),109–23.

Gamal D. (2011), *An Overview of Innovation Measurement Frameworks and Innovation Audit/Management tools*, EgyptInnovate, Technology Innovation and Entrepreneurship Center.

Geoghegan-Quinn M. (ed.) (2010), *Report of the High Level Panel on the Measurement of Innovation established*, September 30, Final version, http://ec.europa.eu/commission_2010-2014/geoghegan-quinn/hlp/documents/20101006-hlp-report_en.pdf [access: 12.10.2013].

Jenkins G.P., Chun-Yan Kuo, Harberger A.C. (2011), *Cost-benefit Analysis for Investment Decisions*, „Development Discussion Paper", No. 1, Queen's University, Kingston, Canada.

Hansen M., Birkinshaw J.M. (2007), *The innovation, value chain* „Harvard Business Review", 85 (6), 121–131.

Huisman J., Pausits A. (eds.) (2010), *Higher Education Management and Development*, Waxmann, Münster.

Inzelt A. (1998), *Nemzeti innovációs rendszerek* [in:] I. Annamária (eds.), *Bevezetés az innovációmenedzsmentbe*, Műszaki Könyvkiadó – Magyar Minőségi Társaság, Budapest.

Mentz J.C. (2006), *Developing a competence audit for technological innovation*, Dissertation M. Eng. (Technology Management), University of Pretoria, http://hdl.handle.net/2263/30490 [access: 04.04.2014.].

Pakucs J., Papanek G. (eds.) (2006), *Innováció menedzsment kézikönyv*, Magyar Innovációs Szövetség, Budapest.

Schumpeter J. (1939), *Business Cycles. A Theoretical, Historical and Statistical Account of the Capitalist Process*. McGraw Hill, New York.

Setényi J. (2009), *A minőség iskolája (Quality in School). Raabe*, 2nd ed., Budapest.

Shattock M. (2003), *Managing Successful Universities*, Society for Research into Higher Education, Open University Press, Berkshire.

Tidd J., Bessant J. (2013), *Managing Innovation: Integrating Technological, Market and Organizational Change*, 5th ed., John Wiley&Sons.

Waal A., Maritz A. (2007), *Managing Innovation: A Typology of Theories and some Practical Implications for New Zealand Firms*, http://www.researchgate.net/publication/234110571_Managing_Innovation_A_typology_of_theories_and_practice-based_implications_for_New_Zealand_firms/file/5046352d2770d45480.pdf [access: 17.10.2011].