

Models of Informational Maintenance of Innovation Process in Higher School

Article Info:

Management Information Systems,
Vol. 7 (2012), No. 3,
pp. 020-025

Received 12 January 2012
Accepted 24 August 2012

UDC 371:[007:004 ; 378.1

Summary

This article considers implementation of innovation in higher education through the creation of a single informational and educational environment, which will enable providing quality achievement of vocational training and increase in competitiveness and professional mobility of experts. The models of information supply, which enables securing interconnection of the national innovation system of continuous education for professionals.

Keywords

implementation of innovation in education, information technologies, single informational and educational environment

1. Introduction

Only if higher school administration is keenly aware of a school's logical structure and, accordingly, the nature of interconnections between the educational divisions participating in realization of corresponding innovations, can the effective management of the innovative process in a higher educational institution be realized. From that point of view, structuring innovative processes and modeling a complex of interrelations between their separate components is of great importance within the system of innovative management.

2. The Problem of Choice of Information Resources

The objective analysis of environment is fundamental for the design of development strategy of educational institutions and decision-making, so that processes and changes in the environment, namely in science, technology, economics, politics and the labor market have a decisive impact on institutions and determine strategically important decisions, taken by their administrations.

According to this, the information support of institutions' innovative activity should be of a comprehensive nature. The needs analysis enable determining the structure of information and knowledge resources that provide innovation in educational institutions.

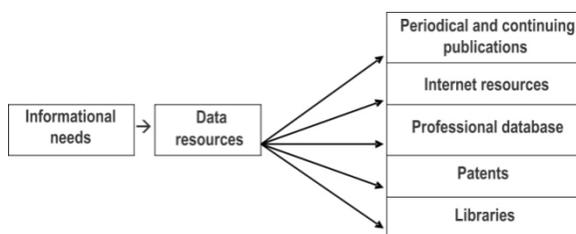


Figure 1 The structure of information (data) resources, providing innovation to institutions
Source: Authors

The increasing information flow and relatively high cost of access to proprietary information resources raise the issue of rational use of information resources in the innovation of an institution. A specialist faces the problem of choice which is limited by the budget of an institution: he should choose resources that would feature full, prompt and reliable information, scientific and technical value and other qualitative indicators. The search of information in open sources, including data mining and analytic intelligence technologies, based on advanced algorithms of large data array analysis could become an alternative strategy.

Let us try and evaluate the impact of the modern informational environment on the formation of innovative policy of an educational institution.

3. The Basis for Development and Essence of Educational and Informational Environment

It is known that process innovations in education are based on the use of either new learning

technologies, or new methods of educational process organization, or their combination, as well as on the results of existing studies and research. Such innovations are generally aimed at improvement of educational process efficiency, expansion of market for educational products and programs, and distribution of innovative educational products designed in an institution. At the same time, innovation can be regarded as implemented if it is introduced either into educational market or in a learning process.

Considering the characteristics mentioned above, innovations in the educational process should:

- feature scientific and pedagogical novelty,
- meet the ever-changing needs of the labor market and
- promote the institutional sustainable development.

Thus, innovations in education embody new ideas and insights, discoveries, inventions, and scientific and technical studies. The essential properties of innovation are not only their scientific and technical novelty, but also their pedagogical relevance to the educational process objectives. The possibility of dissemination in respect of educational innovation is potential and can be achieved by making some efforts that ensure standardization and compatibility of distributed learning resources.

The management of development and implementation of innovations in schools is closely connected with a permanent decision-making and control over their realization. These activities involve the receipt and processing of certain information flows – both on the external environment and on the internal school processes. Therefore, we can speak of the existence of the informational environment – internal and external – which potentially contains information to carry out decisions on innovation and control over their execution. The informational environment is an essential part of innovation development and implementation, and requires significant effort and resources at all stages of the innovation for its formation and maintenance. It is obvious that the more thorough the examination of information at the initial stage of innovation decision is, the more justified decision is made which results in its successful implementation. The success of innovation is random without appropriate information supply. In some cases, the certain factors underestimated due to lack of awareness are

the cause of rejection of innovations in the later stages of its implementation.

Innovative training system should be based on unified concepts, terminology, “supporting structures” (goal, the conditions, the development area, etc.). A necessary condition for the functioning of such unity is to provide informational and educational environment of an institution. Some experts believe the purpose of informational and educational environment is to ensure sustainable development of innovative education. Creation of informational and educational environment eliminates spatial factor between all the actors of the process of innovation (government, society, research teams, educational institutions, etc.).

Thus, the need for development of informational and educational environment of educational innovations system is justified by pedagogical, social, economic, methodological and theoretical prerequisites.

Unified concepts of informational and educational environment form a complex, purposeful, dynamic system of scientific views on the innovation in an institution. Such a concept should include:

- general regulations,
- conceptual apparatus,
- methodological framework and
- theoretical foundations.

Informational and educational environment of an educational institution must provide interconnection of the national innovation system and life-long training system. According to the Presidential Address to the Federal Assembly of the Russian Federation given on May 26, 2004, the goals of the National innovation system can be defined as (a) the growth of satisfaction of social and intellectual (spiritual) needs (secure needs in creativity, in education) and (b) creation of perspectives for future development (development of scientific capacity, improving the personnel professionalism).

Accordingly, establishment of conditions for the full and harmonious personality development, aimed at improving the economic, cultural and moral potential of Russia should be recognized as the goal of innovative professional training system.

Let us consider in detail the process of innovation in an educational institution in connection with the information flows, ensuring the creation, development and dissemination of innovations.

4. Forms of Innovation

Traditionally there are three logical forms of the innovation process (Darroch & McNaughton, 2002):

- simple institutional (natural),
- simple inter-institutional (commercial) and
- extended.

The simple institutional process of innovation involves the creation and use of innovations within a single institution.

In a simple inter-organizational innovation process, innovation serves as an object of exchange between educational institutions. This form of the innovation process means separating the functions of creator and producer of innovation from the functions of its consumer.

Extended innovation process reveals itself in the constant appearance of new innovation producers, breach of a producing monopoly, and improving educational products by means of mutual competition.

It is obvious that the second and third logical forms raise additional requirements for educational product interoperability.

5. Models of Innovation

There are several different models divided into two consolidated types: linear and nonlinear models that are traditionally used to study inner logic of the innovation process and to design the system of connections between educational departments participating in innovative projects on the basis of that inner logic (Gallouj & Djellal, 2010).

A) Linear Model of Innovations

The innovation process is frequently represented as a linear model of innovation, consisting of a series of sequential steps. According to that model, the fundamental idea is implemented in applied research, which constitutes the basis for innovation and subsequent dissemination. This model establishes linear direction – the more fundamental research there is, the more applied research is done, thus the more innovations are developed and, consequently, the more advanced educational technologies are introduced.

Linear model of innovation processes assumes single trend of the innovation development, as it does not consider complex feedback from different stages of development, and their recurrence.

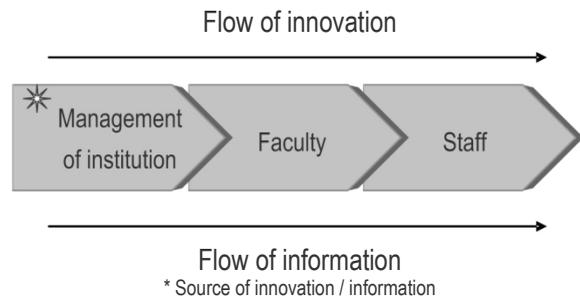


Figure 2 Linear model of innovations
Source: Authors

The main advantage of a simple linear model is the uniqueness of the innovation process structure. This model helps to clearly define the list of core tasks to be solved at every stage, to distribute responsibility for performing these tasks among educational departments, and to design the system of necessary interconnections between departments. Information flows securing the implementation of innovations are that easily organized as well. Their main features are single trend and the uniqueness of the information flow. The disadvantages of this model are:

1. The model is based on the erroneous assumption that all the innovative ideas are the result of fundamental and applied studies held at special research and development departments of an institution. De facto, most ideas come out from the educational departments, teaching staff and managerial board.
2. In a simple linear model research and development, department of an institution is responsible for nothing but the implementation of initial stages of innovation. This approach is not efficient enough.
3. Models of this type ignore the complex set of direct and reverse connections established between the educational departments in carrying out innovative researches and determined by the probable results of the performance of each of the stages of the innovation process.

The inconsistency of the linear model lies in the fact that it does not consider the influence of the environment (labor market) on the development of research and studies, and cannot reflect the complexity of interconnections between science, education, labor markets and production.

B) Non-Linear Model of Innovations

In non-linear models of innovation processes, every innovation study is represented as a set of

operations with the unknown structure and sequence of carrying out. These models are based on the assumption that the individual stages of innovation can be performed several times, and return of entire process to previous stages may also take place. The process of implementation of any innovation has a “basic line” that characterizes typical sequencing of such milestones of development and has a unique direction from the stage of identifying innovative ideas to the stage of its technical realization and commercialization. All stages of the innovation process are linked together with the complex set of direct and reverse connections allowing adjustment of any interim results of this process.

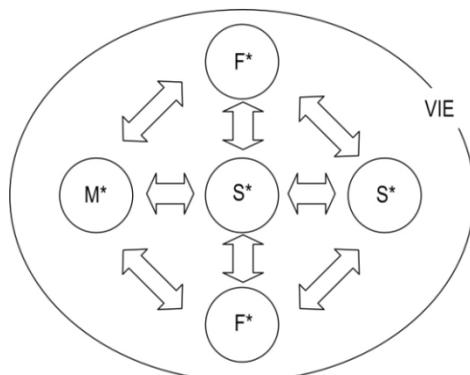
The functioning of educational departments is not solely linked to the specific stages of the innovation, but is of an adaptive problem-oriented nature. The main source of innovation is in the functioning of institutional information services (informational and educational environment).

Informational and educational environment of an institution is a solid structure with clearly defined connections between its elements. These connections ensure the fulfillment of training.

At the same time, the institutional information resources are designed to supply the educational process (information, methodical, and scientific), customer service, providing management activities.

Information services performed within the informational and educational environment include the informational and analytical support, consulting and educational services.

Informational and analytical support is designed to meet the goals, perform tasks, functions of the innovative training system, intended for systematization, analysis, information modeling, evaluation, synthesis, dissemination and implementation of innovation.



* – Source of information / innovation, M – management, F – faculty, S – staff, VIE – virtual informational / innovational environment

Figure 3 Non-Linear (Cloud) model of innovations
Source: Authors

Additional innovative educational services include e-learning, vocational training, retraining and training in the area of innovative activities. Educational services designed (a) to meet the personal and professional needs in acquiring new knowledge about the achievements in their respective fields of science, technology and culture, best domestic and foreign innovative practices, (b) to introduce new educational and information technologies, improve scientific and methodological support for training process, improve training quality, (c) to organize and conduct scientific research, technical and experimental studies, and (d) to develop interconnections between science and education, science and professional activity.

There is no doubt that the informatisation of innovation infrastructure of an educational institution should be based on its characteristics (flexibility, openness, adaptability).

The institutional innovation infrastructure generally includes certain centers (scientific, methodological, technological and innovation, education and business, etc.), industrial parks, technology incubators.

Certain innovation process stages can be cyclical until either the desired result is achieved or a necessary change in process is determined. The nature of connections between the institutional departments performing related stages of development is the most important factor in the effectiveness of the innovation process.

The main advantages of this model are:

1. The model shows that the experts of institutional research and development department required carrying out all stages of the innovation process.
2. The model considers the necessity to establish a system of flexible connections between all departments involved in the implementation of innovation. These connections should be both direct and reverse, as well as easily adjustable to the changing conditions of innovative project realization.
3. The model focuses on the role of the structural parameters of an institution as important factors in the impact of its innovations.

Comparing non-linear and linear models, the main differences between them are as follows:

1. The non-linear models imply interactions between stages of the innovation process; there are feedback loops, as well as the impact of the environment.

2. New ideas emerge and are developed at all stages of the innovation process, meaning that basic research and administrative pressure are not the only promoters.
3. The results of research are used in various forms in all stages of the innovation process, i.e. transfer of innovative educational technologies are also available at all stages of the innovation process.

Thereby the development of informational and educational environment of an institution is realized in the form of increase in the number and size of its elements, gradual expansion and consolidation of these elements through the consecutive implementation of available possibilities, the systematic creation of new real possibilities and on this basis, an intensive and accelerated promotion of innovative educational program of an institution to a new qualitative state. That type of environment contributes to intensive development of ability to innovate, of attitude to changes, to development, to conscious and purposeful co-ownership of information resources, to innovation activity and innovation capacity. Consequently, an innovative environment reproducing the innovative urge is formed. (Svetina & Proda, 2008)

6. Main Issues to be Solved to Develop Effective Educational and Informational Environment

Informational and educational environment of an institution must be linked into a coherent whole with the national innovation system (Kultan, 2011).

The process of developing informational and educational environment must be accompanied by the informatisation of the system of training, which provides the organization of relevant access to information resources.

On the other hand, all the institutional departments consolidated in a single informational and educational environment, have the opportunity to interact in the course of training, transfer and exchange of experience, research and innovation, etc. The development of informational and educational environment must be both vertical – combining purpose, conditions and infrastructure, and horizontal – consolidating resources, services provided by the each party of information exchange to solve professional problems.

While the above-mentioned information infrastructure is being created and developed,

certain important issues must be solved to effectively support the innovation system. The main issues are as follows:

- development of navigation systems for the main types of federal and regional information resources with a friendly user interface,
- development of data-portal for scientific and technical information of an institution,
- debugging of the e-library,
- ensuring information exchange between institutional innovation infrastructure and organizations of the national innovation system.

An important element in the information infrastructure of innovation processes support is telecommunication technologies and networks that provide parties of innovation processes with access to information resources and operational cooperation.

Goals and objectives in this area due to specific needs of the scientific-technical area and the innovation system are designed to:

- provide high-speed information exchange,
- facilitate the integration with foreign specialized research networks for solving problems of high complexity,
- improve efficiency of use of high-performance computing and supercomputing applications based on high-speed remote access to these resources,
- ensure the implementation of current research issues in the field of meta-commuting, distributed computing (cloud technologies).

Realization of these goals will assist in creation of telecommunication network of the new generation in institutions, which will serve as an effective tool for implementing high-tech innovative projects, and also allow educators and professionals to use opportunities of the global information infrastructure in their work.

7. Conclusions

Development of informational and educational environment with regard to the above-mentioned propositions will ensure: a) achievement of high quality vocational education, b) improvement of competitiveness of professional mobility of experts, c) formation of multi-level vocational education, while maintaining its quality and practical orientation, d) achievement of correspondence between the educational and professional interests of an individual, the requirements of labor market and the volume of

continuing education system, e) development of information systems and technology, telecommunication networks in education, multimedia and distance technologies, electronic methodical software, f) development of science and innovation in informational and educational environment of an institution, g) development of international cooperation in the area of educational system innovative support.

Thus, the innovation process covering education, express itself in modernising and technologising educational content, strengthen the focus of applied research and training functions. As a result, ongoing innovations require development and implementation of new approaches to the development of informational and educational environment of an institution.

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