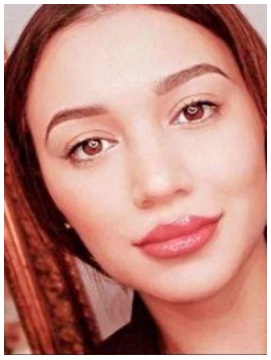
To cite this paper:

Benrachou, N. (2022) Theoretical foundations for the development of innovations in higher education organizations: Russian higher education organizations case study. *Human Progress.* 8 (2): 1. URL: http://progress-human.com/images/2022/Tom8_2/Benrachou.pdf. DOI 10.34709/IM.182.1. EDN AAORKA.

THEORETICAL FOUNDATIONS FOR THE DEVELOPMENT OF INNOVATIONS IN HIGHER EDUCATION ORGANIZATIONS: RUSSIAN HIGHER EDUCATION ORGANIZATIONS CASE STUDY



Narymen Benrachou
PhD student at the General Management, Economics and Finance
Department of Innovation and Investment
Economics and management of national economy
Kazan Federal university, Russian

Na-Benrashu@stud.kpfu.ru
18, str. Kremlevskaya,
Kazan, Russia, 420008
+7 (843) 233-71-09

Abstract. The study of higher education management has a long history and is currently being conducted by both local and international researchers. Universities have gone through several models (generations) in their development: the first generation university (model 1.0 - “Medieval University”) based on the concept of the seven liberal arts, the second generation university (model 2.0 - "research university"), based on the concept of V. von Humboldt, third generation university (model 3.0 - "entrepreneurial university"), fourth generation university (model 4.0 - "innovation university". The article compares the models according to the following parameters: stages of development of society, main functions, instruments, impact on innovation processes in economic systems, University Success Criteria, authors fundamental approaches to the problem. Systematization of characteristics of existing approaches to the analysis of university’s innovative development was carried out by the author, and management of access to the resources of the partner network of universities is described and analyzed.

Keywords: innovation; higher educational; model; development; universities.

JEL codes: O32; I23; I25.

Introduction

The first universities appeared in the Latin schools, the heirs of Aristotle's Lyceum and the Platonic Academy in the early Middle Ages. After the adoption of Christianity in Europe, schools with instruction in Latin were built near large temples and monasteries [1]. According to J. Wissem, the early universities were formed as a result of the development of the practice of giving public lectures, the right to lecture to individual lecturers was given by the city authorities and the Church. One of these lecturers was the French teacher and theologian Pierre Abelard, whose name is associated with the emergence of the University of Paris**.**

The purpose of the article is to find an answer to the question, to what extent do innovations play a role in the development of universities in the Russian Federation?

1. The evolution of models for the development of higher education organizations

1.1 First Generation University. (University 1.0)

In medieval philosophy, the problem of education began to be approached somewhat differently. Augustine Aurelius [2] formulated the foundations of a religious system of learning in which knowledge was to lead to true faith. Religious education that reflected the needs of the church could be obtained at a school attached to a monastery or cathedral. In the philosophy of education of the medieval period, the idea of the transformation of a person through education, upbringing and training is formed [3]. The educational process in the schools of the medieval period was focused on the system that had developed in the period of antiquity. A certain complex of sciences was formed, the development of which was necessary for the further study of philosophy, later called the "Seven Free Arts"[4]. University 1.0 is only an educational institution. Implements the education function. This is an ordinary university that implements educational programs. The criterion for the success of the university's activities is compliance with the culture of the corporation (including professional). Thus, the University 1.0 model, according to the researcher, involves communication with students in the form of knowledge transmission and does not involve dialogue, that is, the author means that this model does not provide for an interactive part of learning, although such technical means can be actively used like projector, computer, smart board, communication network with texts of lectures, presentations, assignments, tests. Therefore, this model assumes that the teacher also remains in the role of knowledge translator.

Characterizing the composition of the resources and infrastructure of the University 1.0 model, the following objects can be distinguished:

1. University buildings. Universities were a rather amorphous structure until the advent of the Late Middle Ages. The Universities of Paris and Bologna did not have a single building after they

were founded: classes were held at the masters' homes, professors gave lectures and held debates in churches and monasteries [5];

2. University libraries. Information about medieval university libraries is relatively scarce. Since handwritten books were of great material value, they were considered as other property of the university, along with, for example, rector's insignia (in Heidelberg);

3. Academic journey. Until the end of the 18th century, the peregrination academic was an organic part of the academic community in Europe;

4. Financing. In the Middle Ages, there were theological discussions about tuition fees: knowledge was considered a gift from God, and remuneration for tuition was condemned. As secular education spread, the view arose that if a student offered a reward voluntarily, it was acceptable.

1.2 Second Generation University. (University 2.0)

The next stage in the development of universities is characterized by the development of engineering and scientific schools and laboratories. The qualitative leap that led to the transition of universities to model 2.0 is the integration of science into universities. Thus, the university becomes not only an educational, but also a scientific center in which experiments are carried out, theoretical models are created, models and technologies are being designed. This was facilitated by the growing need of society for scientific and engineering knowledge, for people of mental labor - researchers and inventors.

1. Oligarchic University. This development process lasted from 1945 until the very end of the 1960s European universities had a continental profile, conducted scientific research only for the purpose of obtaining grants, increasing theoretical knowledge or, as they say in the scientific community, received "knowledge for the sake of knowledge."

2. "Democratized" university. The development of a democratized university has spanned a period of time since the 1970s. At this stage, the proportion of students has increased, there has been a transition from a closed system, from elite higher education to massification the last one. This was characteristic of all European universities without exception.

3. Bureaucratic University. This process lasted into the 1980s and was characterized by an attempt by the state to control spending on higher education in connection with the oil crisis of the 1970s (Europe, China, USA).

4. Professional university. This phase began in the 1990s and continued into the 2000s. During this period, there is an increase in the number of professional courses (apparently, this was

provoked by competition and increasingly narrow specialization due to increasingly complex relations in the labor market).

5. Innovative university. This stage is characterized by the movement of European universities towards the University 3.0 model in 2010. According to J. Wissema, there is a gradual formation of the 3.0 model university, which is distinguished by: the creation and promotion of innovations to the market (their commercialization), the international language of teaching and the international market, going beyond the national idea, etc. [6].

1.3 Third Generation University. University 3.0 - "Entrepreneurial, innovative and technological"

In the era of post-industrialization, there is an increase in the urban economy and the number of commercial, industrial and service companies. The development and spread of private and joint-stock property provoked an increase in the need for qualified managers, good entrepreneurial skills. The society's need for economic, managerial and humanitarian knowledge is growing. The need for entrepreneurs and personnel for the "super-industry" and the urban economy. As a result of the development of methods of humanitarian and socio-cultural research and design, creative and innovative activities are being institutionalized. The qualitative leap that led to the transition of universities to model 3.0 is the integration of innovation and entrepreneurship in universities. Developing a scientific discussion between foreign and domestic authors, we note a number of problems of Russian universities that do not allow them to comply with the 3.0 model. As Ya.I. Kuzminov and I.D. Frumin [7] the key problem of regional (Russian) universities: the lack or weakness of their own research and development, isolation from the modern level of science and technology, weak ties with business. According to scientists, the possibilities of digital technologies will be able to improve the quality of education (Model 1.0.) in regional universities with the help of online courses from leading universities. However, in order to achieve “world-class” standards in Russian universities, it is necessary to strengthen the strengthening of their scientific (model 2.0) and project (model 3.0) components. Thus, the need to support all types of university activities is emphasized: educational, scientific, entrepreneurial. Digital technologies allow this to be done at a new qualitative level. Accordingly, we can talk about the formation of a new model of the university.

Another scientist G. Rozovsky, when analyzing a modern university, focuses on its "stakeholders", which indicates the development of the entrepreneurial function and Model 3.0. The scholar refers to the students, administrators, faculty, alumni, and trustees of the university as the “owners” of the university. Accordingly, according to the scientist, this is the main resource of the

university. Its financial well-being and the results of scientific, educational and entrepreneurial activities will depend on the effective interaction of the "owners" of the university [8].

Thus, in the university 3.0 model, the main resources are: entrepreneurial infrastructure (innovation ecosystem, small and medium-sized companies, start-ups, spin-out, spin-off), the resource of entrepreneurial initiative of the main staff. In model 3.0 universities, the main entrepreneurial function comes to the fore, ensuring the commercialization of its intellectual potential, infrastructure, relations with the external environment, with enterprises and organizations, with state and municipal authorities, with the local community become important. Accordingly, the key resource of universities is their social capital.

1.4 Fourth generation university. University 4.0

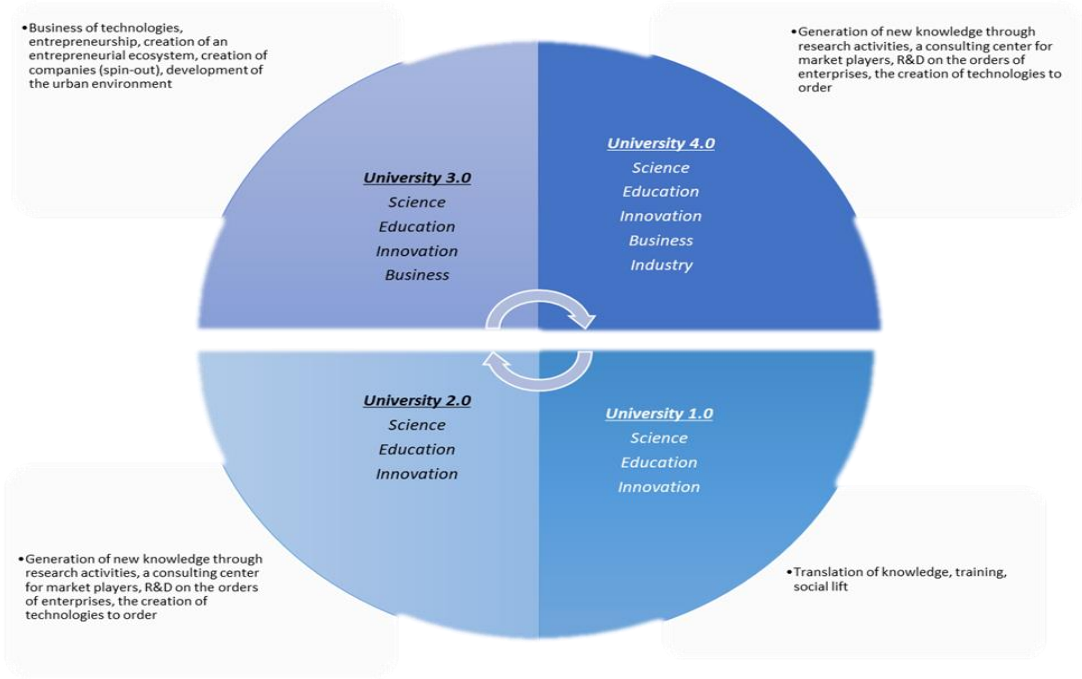
This model is a platform for new practices and cognitive technologies, which is able to implement the function of capitalizing one's own knowledge. The rapid development of technology has led to the innovation revolution, and the trends corresponding to it: the development of cognitive industries, the knowledge economy, artificial intelligence and the application of cyber-physical systems in industry. In this regard, the need for collective and hybrid intellects, a creative person is increasing in society. There is an institutionalization of the ethics of cooperation, trust and participation. The qualitative leap that led to the transition of universities to the 4.0 model is the innovation of the main activities of the university.

University 4.0. creates knowledge of the future [9] and implements the function of its supplier together with all the functions of the carriers of previous missions. Separate departments of the university of this model have the resources and competencies to solve problems that are unrealizable at industrial enterprises. That is why the most important criterion for the success of the university can be the creation of a viable product, a contribution to the development of the ecosystem of society [10].

The "University 4.0" model is a university where students, together with engineers, teachers and leading employees, can solve problems that are considered unsolvable and unattainable in modern industry. This is based on the assumption that the level of development of science, technology and competencies is such that there are tasks that cannot be solved in the near future, impossible to solve for the funding allocated for this, etc. But due to the fact that such tasks are very important, they are defining for the industry. And if the university is able to solve such problems, this will allow it to become a technological leader. This is one of the important properties of university 4.0. The specificity of the University 4.0 model implies an increase in the role of access control to infrastructure facilities, which cannot be realized without creating a partner network of

universities in which students, teachers and researchers could get access to the infrastructure facilities they need:

Fig. 1: Model innovative development of higher education in the Russian Federation[1]



This Russian Federation model of higher education innovation represents a new stage of the scientific revolution, which began at the turn of the century. The University of the Generation 4.0, as it is known, has the ability to initiate the next technological revolution around the turn of the 2020-30s.

2. Modern university

At the current stage, the national technology initiative envisages the creation of innovative centers on the basis of modern universities by 2035 to anticipate the needs of future markets.

A modern university is a complex, multi-level model that has absorbed many functions. Their combination may vary depending on many factors: the local order of the region, the characteristics of the labor market of the country, the city, the urban socio-economic environment, the expectations and visions of employees, as well as the totality of trends and transformations in global education.

In this regard, the level of variability of the form, content, goals, tasks and missions of universities becomes more complicated and increases. The "knowledge economy" imposes strict requirements on all participants: an educational product can be competitive in the context of

[1] Prepared by the author

growing globalization only if it is unique. The university is no longer just a center of culture or a center of science or a factory for the production of an intellectual workforce, its scope is significantly expanding, in contrast to the period of its inception.

Thus, a feature of the evolution of the concepts of university models is not the replacement, but the expansion of their functions and competencies and the preservation of the former ones with their transformation in accordance with the role of universities in society.

Based on the study, a comparative table of the most important characteristics of the university 1.0 - 4.0 was compiled according to the considered approaches of various scientists on this issue (table 1).

Table 1: Comparative table of the most important characteristics of the university 1.0 - 4.0[2]

Model university	Stages of development of society	Main functions	Instruments	Impact on innovation processes in economic systems	University Success Criteria	Authors fundamental approaches to the problem
1.0	Pre-industrial (traditional) society (Neborsky E.V.)	Translation of knowledge; Personnel training; social lift	Educational standards (Karpov A.O.; Barabanova N.I.); Methods and guidelines (Frumin I.D.)	Through educational activity (Salmi J.; Frumin I.D.)	Compliance with the culture of the corporation (including professional) (Karpov A.O.; Barabanova N.I.; Neborsky E.V.)	Karpov A.O.; Barabanova N.I.;. Neborsky E.V.; Salmi J.; Frumin I.D.
2.0	Industrial society	Generation of new knowledge through research activities (Karpov A.O.); Consulting Service Center for Beginning Players (Denisov I.V.; Yusima V.N.)	Execution of R&D on the orders of the industry Creation of technologies "to order" (Karpov A.O.; Neborsky E.V.)	Through research and commercialization of knowledge in the R&D format (Barabanova N.I.)	Knowledge of the classics in the original and the ability to hypothetical de-ductive thinking (Denisov I.V.; Yusima V.N.)	Karpov A.O.; Barabanova N.I;. Neborsky E.V.; Denisov I.V.; Yusima V.N.
3.0	Post-industrial (information) society	Commercialization of new technologies; Entrepreneurship (Wissema J.; Neborsky E.V.); Creation of new companies (Karpov A.O.)	Rights Management (Neborsky E.V.); Entrepreneurial ecosystem (Neborsky E.V.); Development of the urban environ-ment (B. Clark)	Carrying out a full cycle of knowledge commercialization (B. Clark)	Conformity expected competencies	Karpov A.O.; Clark B.; Wissema J.; Neborsky E.V.
4.0	Knowledge Society (Industry 4.0)	Identification of human talents and competencies through the development of "smart" technologies and "smart" industries (Popov E.V.; Vlasov M.V.); Development of the noosphere (Simakhina M.O.)	Smart education (Kuzminov Ya. I.; Zakharov A.B.); Virtual reality (Ya. I. Kuzminov; Zakharov A.B.); Cloud technologies (Ershova I.G.)	Through the creation of knowledge of the future (Kuzminov Ya.I.; Zakharov A.B.)	Creation of a viable product, contribution to the development of the ecosystem of society (Stepanova T.E.)	Neborsky E.V.; Ershova I.G.; Stepanova T.E.; Popov E.V.; Vlasov M.V.; Simakhina M.O.; Kuzminov Ya.I.; Zakharov A.B.

[2] Systematized by the author based on analysis

The proposed comparative table makes it possible to systematize the opinions of various approaches to the main functions, tools, criteria for success and the conditions for the influence of universities on innovation processes in economic systems that ensure the fulfillment of the mission. universities in the changing phases of the development of society, as well as in the future to determine the stages of the resource development of universities.

2.1 Characteristics of existing approaches to the analysis of innovative development, of the university

1. Campus, buildings, structures, premises. Since the emergence of the first universities, the campus has been one of the most important types of university resources. Different organizations have different approaches to the composition of indicators characterizing a given resource.

2. The World Economic Forum publishes the annual Global Competitiveness Index (GCI) - a global study and the accompanying ranking of the countries of the world in terms of economic competitiveness.

The group of indicators closest to the group of resources we are analyzing is “Infrastructure” and “Institutions” in the block “creating favorable conditions”. Within the Infrastructure group, the GCI analyzes the following metrics: road infrastructure quality, rail density, train efficiency, airlines, air transport services efficiency, sea routes and their efficiency. Engineering infrastructure: availability of electricity supply, quality of electricity, impact of unsafe drinking water, reliability of water supply.

2.2 Management of access to the resources of the partner network of universities

A partner network of universities allows stakeholders to quickly access resources and infrastructure elements. It can be implemented on the basis of a single digital network platform containing dynamically updated information about the infrastructure elements of partner network universities.

The World Intellectual Property Organization (WIPO) publishes every year the World Intellectual Property Indicators, an analysis of intellectual property activity worldwide.

The group of indicators closest to the group of resources we are analyzing is “Infrastructure”. Within the Infrastructure group, WIPI analyzes the following indicators:

1. ICT: 1.1. ICT available; 1.2. ICT is used; 1.3. Government online services; 1.4. Electronic participation;

2. General infrastructure: 2.1. Electricity consumption; 2.2. Logistics performance; 2.3. Gross accumulation;

3. Environmental sustainability: 3.1. GDP / unit of energy use; 3.2. Environmental indicators; 3.3. ISO 14001 environmental certifications / billion PPP $ GDP;

1.3. The Higher School of Economics (HSE) publishes the annual statistical collection Indicators of Science.

The group of indicators closest to the group of resources we are analyzing is: “5.4.20. Internal costs for research and development in the higher education sector by types of costs. Within the framework of the group, the HSE Compendium analyzes the following indicator: Land plots and buildings.

1.4. The Federal State Statistics Service of the Russian Federation (Rosstat) and the Ministry of Science and Higher Education annually publish statistical information in the field of research and development and in the field of higher education.

The group of indicators closest to the group of resources analyzed by us is: “HPE-2 “Information on the material, technical and information base, financial and economic activities of an educational organization of higher education”. Within the group, the following indicators are analyzed in the reports of the Ministry of Science of the Russian Federation:

1. Fixed assets, including: buildings and structures, library fund, intangible fixed assets, and other types of fixed assets;

2. Equipment and materials. This type of resource gained its relevance during the transition of the university to model 2.0, the research university model. Research requires appropriate equipment and materials.

The Global Competitiveness Index does not analyze these indicators.

The Federal State Statistics Service of the Russian Federation (Rosstat) and the Ministry of Science and Higher Education annually publish statistical information in the field of research and development and in the field of higher education.

Machines, equipment, and other items have their own records (measuring and control instruments and devices, laboratory equipment, information machines and equipment, including computer technology). A separate line accounts for the entire cost of high-priced machinery and equipment (worth more than 1 million rubles per unit).

Personal computers, electronic terminals (computers), multimedia projectors, interactive whiteboards; printers; scanners; multifunction gadgets all have their own records (MFPs).

3. Human capital (teachers, researchers, labor resources employed in the field of education and science). This type of resource has a dual nature. Because on the one hand, a person is an

element of infrastructure (according to the definition, infrastructure is what ensures the operation of the system, a person fits this definition), on the other hand, a person is an active stakeholder who can change this infrastructure.

2.3. In the Global Competitiveness Index, the group of indicators that we analyze is closest to the group of indicators: "Human Capital". Within the "Human capital" group, the GCI analyzes the following indicators: "health" and "skills and abilities". The group of indicators "health" includes: "healthy life expectancy (years)", the group of indicators "skills and abilities" includes: "labor force" ("average years of study"), "skills and abilities" (sub-indicators: "degree of training "Quality of training", "Skillset of graduates", "Digital skills among an active population", "Ease of finding qualified employees" "Future workers" (sub-indicators: "Average years of schooling") Skills of the future workforce (sub-indicators: "Critical thinking in learning", "Teacher-student ratio in primary school").

The specificity of the University 4.0 model implies an increase in the role of access control to infrastructure objects, which cannot be done without creating a partner network of universities where students, teachers and researchers could get access to the infrastructure they need.

Conclusion

Specialization strategies can be either static or dynamic. Static is aimed at increasing concentration and increasing profitability.

Dynamic - focusing on the development of innovative potential, efforts in this case are aimed at strengthening the diversification of buyers, and in terms of competencies - at reducing inertia. Innovative alternatives leading to radical changes in the organization's strategy, since are based on new approaches to competition, often accompanied by proposals for new products and solutions. Characteristic for enterprises of a new technological order. How do we do?

The R&D management system in superclusters should differ from the established system in the rest of science. It is necessary to form a special institutional and infrastructural environment.

We introduce scientific superclusters as a separate object in the public administration system, through the Decree of the President of the Russian Federation. The Government of the Russian Federation is appointed responsible for implementation.

We form pilot superclusters as a joint federal-regional-corporate project, through an agreement with the Government of the Russian Federation of the regions of the Russian Federation and other interested parties. The condition of the agreement is the roadmap and the TOE of the cluster program, as well as the definition for each cluster of one responsible coordinating organization from science, business. We create/concentrate a new package of development tools

that ensures the achievement of the goal of the supercluster: technological and digital testing grounds, targeted R&D programs, personnel growth programs, exemption from a part of federal taxes of participants of programs, specialized thematic funds, including venture capital, special technology parks, TASED and SEZ, etc. We form a single package of support for residents through a service platform, which is also available for virtual residents' World-class university campuses by model.

References

1. Wissema, J. (2016) University of the third generation. URL: https://biznes-knigi.com/avtor-yohan-vissema/6760-universitet-tretego-pokoleniya-yohan-vissema/read/page-4.html/.

2. Augustine, A. Confession / Translation from Latin M.E., Sergeenko. M. "Renaissance". SP IVO - SID. 1991. 488 p.

3. Neborsky, E.V. (2017) Reconstruction of the university model: transition to format 4.0 // World of Science. No. 4. P.: 2-5.

4. Ramelli, I.L.E. (2013) Seven Liberal Arts / In: The Encyclopedia of Ancient History. DOI 10.1002/9781444338386.wbeah10067.pub2

5. Ferruolo, S.C. (1988) "Quid dant artes nisi luctum?": Learning, Ambition, and Careers in the Medieval University // History of Education Quarterly. Vol. 28. Issue 1. P.: 1-22. DOI: https://doi.org/10.2307/368281

6. Marcian, C. (2019) Marriage of Philology and Mercury. M.; St. Petersburg. Center for Humanitarian Initiatives. Petroglyph. 200 p.

7. Kuzminov, Y.I.; Frumin, I.D. (2018) Twelve solutions for new education: report of the Center for Strategic Research and the Higher School of Economics. Moscow: Vysshaya shkola ekonomiki.

8. Barabanova, M.I.; Trofimov, V.V.; Trofimova, E.V. (2018) Digital Economy and University 4.0 // Journal of Legal and Economic Research. No. 1. P.: 178-184.

9. The road to academic excellence: the formation of research universities / ed. F.J., Altbach; D., Salmi. M.: Publishing house "Ves Mir". 2012.

10. Gafurov, I.R.; Safiullin, M.R. et al. (2020) Development of a methodology for comprehensive assessment and scenario forecasting of the competitiveness of higher education institutions. Regional aspect. Nizhny Novgorod: Publisher: IP Kuznetsov N.V. P.: 109-118.