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Original article

The Network University of the World-Class Research and Academic Center "Kuzbass" as a Regional Strategy on Capacity Building through Infrastructure and Human Capital

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Abstract: *Introduction*. The paper introduces the concept of the Network University on the basis of the World-Class Research and Academic Center "Kuzbass". It is one of the largest projects aimed at improving the scientific and academic landscape of the Kemerovo region. The digital twin technology can increase the current efficiency of the Kemerovo State University and develop its resources. The research objective was to assess this potential. *Study objects and methods*. The Network University project presupposes establishing a number of interacting Kuzbass campuses that will prepare competitive post-industrial production specialists able to solve various administrative, analytical, and economic problems that the region is currently facing. *Results and discussion*. The research involved an urban planning analysis of the future Network University campuses. It resulted in several infrastructure solutions in the context of digital education and the Fourth Industrial Revolution (Industry 4.5). *Conclusion*. In case of network universities, higher education does not equal qualifications: education provides each student with a conscious choice and a development pathway in the world of digital economy. A successfully operating link between education and professional activity makes this pathway attractive for investments. The author gave an initial assessment and defined the infrastructure solutions for the future campuses. All these issues are part of research on the capacity of the Kuzbass Network University and integrate the project into Priority 2030, which is the former Strategic Academic Leadership Program.

Keywords: Network University, digital twin technology, digital education, Kemerovo State University, Kuzbass

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Оригинальная статья

Сетевой университет научно-образовательного центра мирового уровня «Кузбасс» как стратегия развития потенциала, инфраструктуры и человеческого капитала региона

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Аннотация: *Введение*. Проблематика настоящей статья связана с вопросами реализации одного из наиболее крупных проектов в направлении трансформации научно-образовательного ландшафта Кузбасса – проекта Сетевого университета научно-образовательного центра мирового уровня «Кузбасс». Целью исследования является оценка модели проекта сетевого университета в аспекте повышения собственной эффективности вуза и управления его ресурсными состояниями при помощи технологии цифровых двойников. *Объекты и методы исследования*. Предложен проект по созданию сетевого университета со взаимодействующими кампусами в Кузбассе, целью которого станет подготовка конкурентоспособных специалистов для отраслей постиндустриального производства и решения широкого спектра управленческих, аналитических и экономических задач территорий

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Кузбасса. *Результаты и их обсуждение.* Проведен градостроительный анализ территории, предложены конкретные проектируемые инфраструктурные решения по кампусам сетевого университета Кузбасса в контексте онлайн-образования и индустрии 4.0. *Выводы.* Образ сетевого университета связан с позиционированием обучения не с целью получения документа об образовании, а для обеспечения каждого человека осознанным выбором и реализацией траектории развития в условиях цифровой экономики. Прогнозирование успешного освоения человеком траектории и последующей профессиональной деятельности позволяет сделать траекторию его развития объектом привлечения инвестиций. Дана первичная оценка и представление результатов проектируемых инфраструктурных решений по кампусам. Вопросы входят в перспективы исследования возможностей сетевого университета Кузбасса и позиционирование проекта в стратегии «Приоритет 2030».
Ключевые слова: Сетевой университет, цифровой двойник университета, онлайн-образование, Кемеровский государственный университет, Кузбасс

网络大学的世界一流的科教中心"库兹巴斯"， 作为能力发展的策略，该地区的基础设施和人力资本

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摘要：引言。本文涉及库兹巴斯科学和教育格局转型中最大的项目之一，即世界一流的科教中心——"库兹巴斯"网络大学项目。本研究旨在使用数字化孪生技术，在提高大学自身效率和管理资源状况方面评价网络大学项目模型。 研究对象和方法。提出了一个在库兹巴斯建立一所网络大学和互动校区的项目，该项目旨在为后工业时代的生产部门培养有竞争力的专家，并解决库兹巴斯地区广泛的管理、分析和经济问题。 结果及其讨论。对该地区的城市规划进行了分析，并在在线教育和工业4.0的背景下，对库兹巴斯网络大学校园基础设施的设计提出了具体的解决方案。网络大学的形象与教育的定位有关，并不是为了获得有关教育文件，而是为了让每个人在数字经济中有意识的选择和实现发展轨迹。预测一个人成功发展轨迹和随后的专业活动，可以使其发展轨迹成为吸引投资的对象。对设计中的网络校园基础设施解决方案的结果进行了初步评估和介绍。这些问题包括在研究库兹巴斯网络大学的可行性并将该项目定位为" 2030优先事项"战略的前景中。
关键词：网络大学，大学数字化孪生，在线教育，克麦罗沃国立大学，库兹巴斯

INTRODUCTION

In terms of education, a region can develop both based on strategic initiatives or without them. The Network University is a social issue of global relevance. Its aim is to improve educational systems and develop skills and competencies of young people.

The thrilling transformational potential of the education system offers numerous opportunities and challenges, given

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the new hi-tech trends[1, 2, 3, 4, 5]. A lot of foreign and domestic research revolves around these issues[6, 7, 8, 9, 10, 11, 12]. For instance, Bashabsheh *et al.*, Wang *et al.*, Pereira et al., and Gao *et al.* evaluated the feasibility of modern digital technology in teaching construction and architecture[13, 14, 15, 16, 17, 18]. Lebedev, who analyzed the existing forms of university networks, defined the essence of network interaction in higher education and academic training as a form of regional integration[19]. Zhukovskiy compared traditional instruments of diplomacy and "new instruments" as tools of national policy. International Network Universities play an important role in supporting foreign policy initiatives on the global and regional levels[20].

Regional universities have never been considered as an industry capable of generating a significant part of the gross regional product. On the contrary, the regional system of higher education and related research facilities is responsible for 10–12% of the regional annual budget spending. However, if higher education is treated as a business unit, the structure of the gross regional product can change. The Network University is a regional research and academic consortium of universities and research institutes. This consortium will allow research and academic organizations to build an effective network in the region, strengthen the existing technical infrastructure, develop a single educational space, and improve the academic mobility of students and professors.

The annual decline in the number of applicants will inevitably affect Kuzbass and its universities as more and more young people are migrating to other regions. Unfortunately, it is the best school graduates that choose to apply for rival universities. A certain percentage of student migration is irrevocable, which means that Kuzbass keeps losing more than just indicators of education

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efficiency, e.g. average state exam score, etc. Therefore, the region needs a university that would be equal to those market leaders that seem so attractive to Kuzbass school graduates. In this context, the "green field" university model appears to be the best solution: it is a university based on the relevant agenda, hi-tech educational environment, breakthrough science, and social mission. The present research introduces a Network University project that will include two campuses: the northern one in the city of Kemerovo and the southern one near the Sheregesh ski resort. The Network University will be a center of academic gravity that attracts and accumulates human and intellectual potential for the benefit of the region. In addition, it will provide the best solutions on the advanced development of the region with the aim of transforming it into a comfortable environment for life, study, and recreation.

The research objective was to assess the project of the Kuzbass Network University as a means of increasing the efficiency of the local education and resource managing by using digital twin technology.

STUDY OBJECTS AND METHODS

The study featured the infrastructure solutions for the two campuses of the future Kuzbass Network University in the context of higher education. The study established the types of interaction between the campuses, the prospects of the project, and its impact on the region.

RESULTS AND DISCUSSION

The Kuzbass Network University is one of the largest projects aimed at transforming the scientific and educational landscape of the region. The current vision is that of a powerful center of attraction that realizes the local intellectual potential, conducts frontier research, and develops advanced educational programs in the key areas of the World-Class Research and Academic Center "Kuzbass"[21, 22]. Initially, the Network University project depended on the agenda of the Research and Academic Center "Kuzbass". However, the project offers opportunities that raise the development of science and higher education in the region to a qualitatively new level. In fact, it creates the prospects for strategic breakthroughs far beyond the agenda of the Research and Academic Center and extending far into the future.

Obviously, the Kuzbass Network University project will create a foundation for long-term plans and strengthen the competitiveness of the regional research and academic ecosystem.

The presented project is, in fact, one of the crucial stakes of Kuzbass: in the future, it can make it a prominent industrial, research, academic, and innovation center, recognized both nationally and worldwide.

The order for the Network University project as a center of breakthrough knowledge and advanced competencies arose at the stage of developing the scientific and innovative agenda for the Research and Academic Center "Kuzbass". The existing network of universities and research institutions was obviously unable to provide world leadership in the key areas of science and technology. The region needed a powerful tailored and well-equipped center of academic gravity, which would attract and accumulate intellectual potential and generate competitive knowledge on the best-practice basis, i.e. advanced knowledge demanded for regional development. Thus, the regional University 4.0 project appeared on the very first agenda of the Research and Academic Center "Kuzbass", which makes it the main stakeholder of the Network University project.

The roadmap of strategic development of Kuzbass until 2030 includes novel competencies and practices. As a result, it is of utmost importance that the Government of Kuzbass participated in the Network University project. In fact, the regional authorities of the highest level have been involved in the project from the very beginning.

The Kemerovo State University is the largest institution of higher education in the region and the Flagship University of Kuzbass. It is only natural that it is directly involved in the Network University project. The Kemerovo State University helped to substantiate and promote the concept, as well as to plan the agenda and the roadmap of the future scientific, academic, and innovation activities. In addition, one of the leading companies in the local construction market is involved in the development of the architectural concept of the future campuses.

Figure 1 shows a chart of Kuzbass as part of the Siberian conurbation and features its socio-economic parameters in the context of the development of science and higher education.

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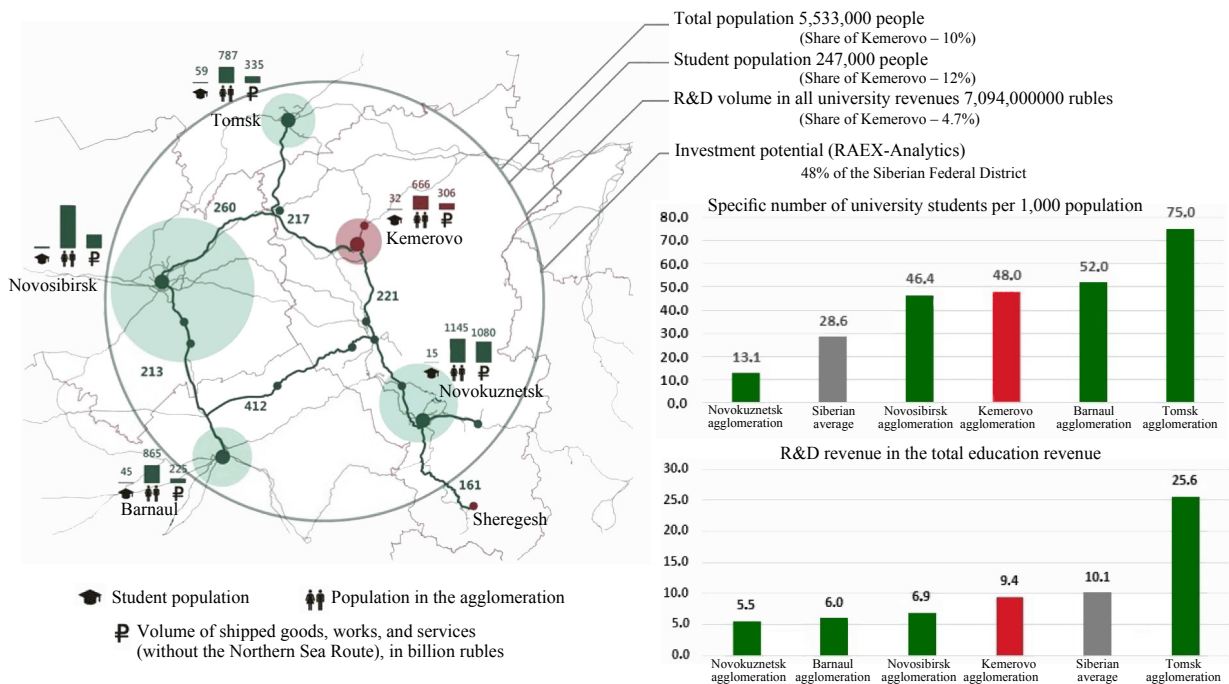Strategizing: Theory and Practice. 2021;1(1)

Fig. 1. Kuzbass as part of the Siberian conurbation
Рис. 1. Кузбасс в составе Сибирской конурбации

The infographics is a typical visualization of the socio-economic parameters of Western Siberia. Its scientific and academic potential demonstrates quite clearly that the city of Kemerovo and the Kuzbass region are integral part of the Siberian conurbation network, which gives excellent opportunities for contacts, social ties, and mutual labor migration, including academic personnel. Western Siberia is an area of robust socio-economic development with substantial human potential. While Kuzbass is superior to its neighbors in terms of economy and revenue, its science and higher education leave much to be desired. This imbalance is one of the most important strategic tasks for Kuzbass as part of the Siberian conurbation: how can we bridge the gap between our superior real economy and our inferior academic potential? In this regard, the Kuzbass Network University is a realistic goal on the roadmap.

The current concept of the Network University features a regional center of excellence that creates, accumulates, and transfers advanced knowledge and world-class competencies in the most relevant areas. In the spatial logic of the Siberian conurbation, the Network University has a good potential for sustainability and competitiveness. It is a center of attraction for academic personnel that strive to master frontier science and technology in priority areas

in order to boost the development of Kuzbass. The Network University develops a scientific, innovation, and academic agenda in order to fulfill these functions. Its campuses stimulate urban development in Kemerovo, Novokuznetsk, and Sheregesh recreational cluster. Ultimately, the network will also generate new urban environment. Figure 2 shows that the southern campus is designed as a "green field" university town.

The tools that ensure the new quality of education include:
1) *a wide network collaboration* in the development and implementation of educational programs, including partnership with foreign universities;
2) *developed, well-equipped, and advanced research and development sector* that converts new breakthrough knowledge into educational products to be exported onto international higher education markets;
3) *product-orientated key processes* aimed at creating and promoting new science-intensive products and industries;
4) *space density* for informative communication and generation of new meanings;
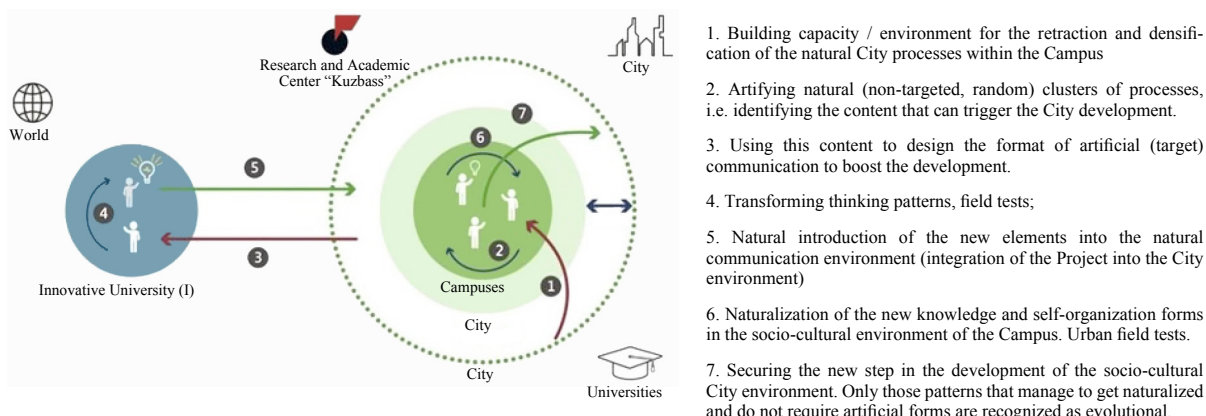5) *flexibility* of educational products and high-speed response to market demands.

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1. Building capacity / environment for the retraction and densification of the natural City processes within the Campus

2. Artifying natural (non-targeted, random) clusters of processes, i.e. identifying the content that can trigger the City development.

3. Using this content to design the format of artificial (target) communication to boost the development.

4. Transforming thinking patterns, field tests;

5. Natural introduction of the new elements into the natural communication environment (integration of the Project into the City environment)

6. Naturalization of the new knowledge and self-organization forms in the socio-cultural environment of the Campus. Urban field tests.

7. Securing the new step in the development of the socio-cultural City environment. Only those patterns that manage to get naturalized and do not require artificial forms are recognized as evolutional.

Fig. 2. Network University model
Рис. 2. Модель сетевого университета

The Kuzbass Network University is to start operating at full capacity by the end of the execution period of the World-Class Research and Academic Center "Kuzbass" project. By then, its key formal metrics should correspond to the mean indicators of research, innovation, and academic activities of benchmark universities.

To a large extent, the concept core and model of the network university will depend on its infrastructure, flexibility, and compliance with the increasing rate of global changes. This capability largely depends on both university campuses that are to be located in the city of Kemerovo and in the south of Kuzbass, near the popular Sheregesh ski resort.

Figure 3 illustrates the concept of the first campus to be located in Kemerovo. In addition to its direct functions, it will act as a driver of urban development organized and maintained by three cores: the university itself that generates new knowledge, the campus environment that produces sustainable sociocultural communities and practices, and the city environment. In the scheme below, the university campus is organized as a club-type space.

The basic principles that shape the campus environment include:

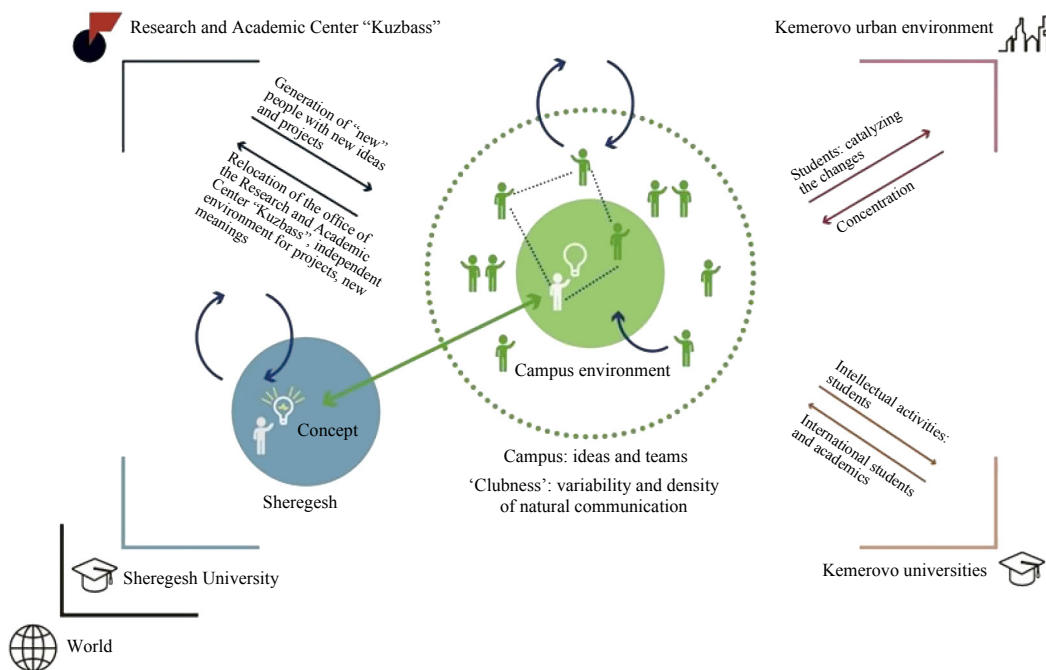• multifunctionality, flexibility, and transformation;
• climate awareness;

Fig. 3. Conceptual diagram of the Network University campus in Kemerovo
Рис. 3. Концептуальная схема университетского городка г. Кемерово

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- advanced and relevant architecture (architecture of the future);
- logistics/navigation/communication;
- sustainability and energy efficiency;
- inclusive environment (barrier-free environment, etc.);
- uninterrupted green belt;
- fuzzy boundaries, i.e. the surrounding urban area is involved in the campus life;
- safety;
- transport and pedestrian accessibility;
- smart city technologies;
- Healthy Campus system;
- digital education.

Figure 4 shows the concept design of the university campus.

Immediate tasks of the project include:

- seven technical assignments for contractors;

- negotiations with major investors (8 billion rubles of investment portfolio);
- public discussions of the project;
- application for the Priority 2030 strategy.

All these questions are important research prospects for the Network University of the World-Class Research and Academic Center "Kuzbass".

CONCLUSION

The concept of the Kuzbass Network University introduces a systematic approach to the full life cycle of academic personnel training. The Network University will reduce the time and cost of training and increase its efficiency while providing human resources to the regional products and solutions in the field of smart energy. Eventually, it will help Russian enterprises to take leading positions in the global high-tech market and increase interest margins by offering
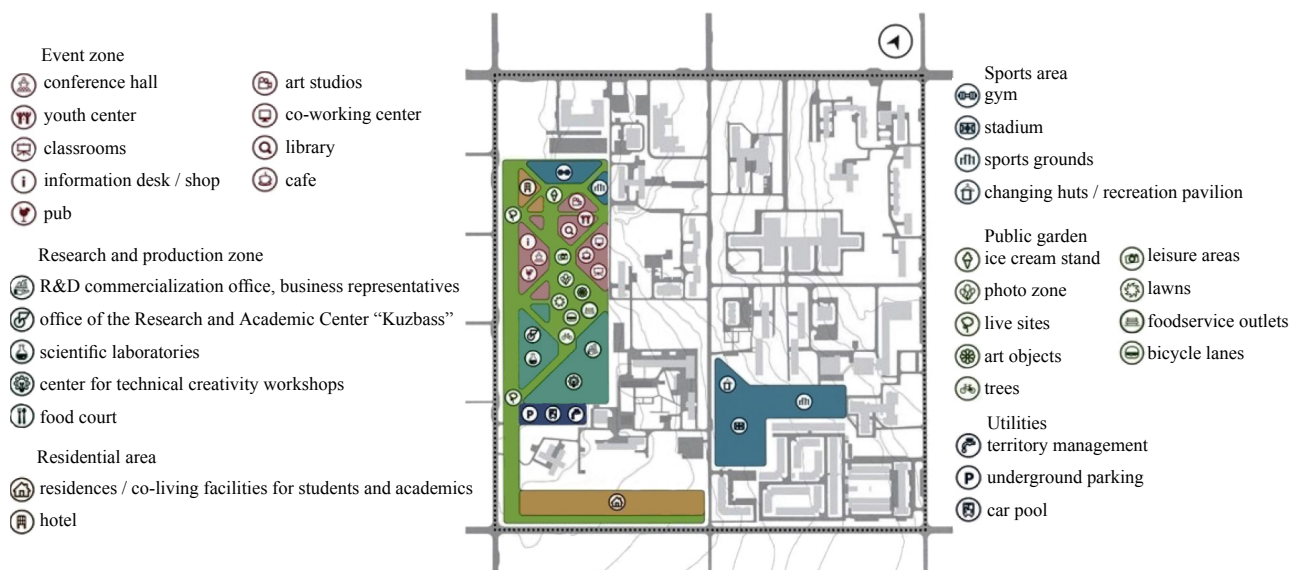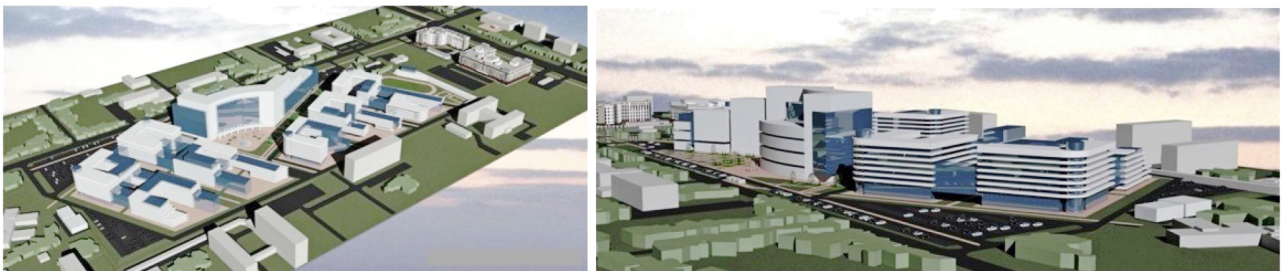

Event zone
- conference hall
- youth center
- classrooms
- information desk / shop
- pub

- art studios
- co-working center
- library
- cafe

Research and production zone
- R&D commercialization office, business representatives
- office of the Research and Academic Center "Kuzbass"
- scientific laboratories
- center for technical creativity workshops
- food court

Residential area
- residences / co-living facilities for students and academics
- hotel

Sports area
- gym
- stadium
- sports grounds
- changing huts / recreation pavilion

Public garden
- ice cream stand
- photo zone
- live sites
- art objects
- trees

- leisure areas
- lawns
- foodservice outlets
- bicycle lanes

Utilities
- territory management
- underground parking
- car pool

Fig. 4. Visual representation of the Kemerovo campus
Рис. 4. Визуализация кампуса г. Кемерово

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online courses of product operation tools and conducting product promotion via educational services. Global experience shows that this market can trigger irreversible positive events for the entire region. The Network University will promote the idea of obtaining higher education not for the sake of certificate but as a conscious choice that enables self-development in the digital economy. Guaranteed education and employment make can turn the trajectory of human development into an object of attracting investments.

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