Technology Transfer Projects Management at Regional Level

V. Omelyanenko*,**, O. Omelianenko*,**, G. Pawłowski***, A. Artiukhov****,*****, S. Lytvynenko *****
* Sumy Makarenko State Pedagogical University, Sumy, Ukraine
** Institute of Industrial Economics of National Academy of Sciences of Ukraine, Kyiv, Ukraine
*** Poznan University of Technology, Poznan, Poland
**** University of Economics in Bratislava, Bratislava, Slovakia
***** Sumy State University, Sumy, Ukraine
omvitaliy@gmail.com

***Abstract* — This article examines the management of technology transfer projects at the regional level, highlighting their critical role in fostering innovation and regional development. Effective project management practices are emphasized as key to bridging the gap between research institutions, businesses and regional authorities. The study explores how technology transfer initiatives contribute to building robust innovation ecosystems, promoting sustainable economic growth and enhancing regional competitiveness. Particular attention is given to the role of public-private partnerships and collaborative frameworks in ensuring project success. Challenges such as resource allocation, stakeholder engagement and the alignment of regional policies with innovation goals are analyzed. Strategies for addressing these challenges are proposed, focusing on optimizing project outcomes and maximizing long-term benefits. The findings provide practical recommendations for regional policymakers and project managers aiming to strengthen technology-driven development.**

Keywords — technology transfer, project management, regional development, innovation ecosystems, knowledge transfer, regional innovation, sustainable development, technological innovation, regional policy.

I. Introduction

In modern conditions it is no longer enough for regions to simply accept innovations. The urgent task is to build holistic strategies for their adaptation and integration into the local economy. One of the most effective ways to manage this process is a project-based approach to technology transfer. It allows systematizing the implementation of new solutions, taking into account the local characteristics of the community, as well as ensuring sustainable development by coordinating the efforts of science, business and the public sector.

Studies [1; 2] analyze the impact of industrial revolutions on economic systems, emphasizing digital transformations and their role in smart specialization and sustainable development. Reports of UNCTAD [3] and OECD [13] highlight digitalization's role in regional integration into innovation networks, key to smart specialization. Research [4; 5] discusses innovation-driven regional development. Study [6] underscores the role of business services in upgrading industries, crucial for local smart specialization efforts. Works [7; 8] explore ICT's role in technology transfer, enhancing innovation networks. Study [9] examines technology transfer in metallurgy, highlighting industry-specific approaches to smart specialization. Research [10] emphasizes digital marketing's role in accelerating technology commercialization and adoption in communities. Reports [11; 12; 14; 15] analyze smart cities' critical success factors, structural transformations, and governance frameworks. Study [16] explores industrial smart cities as drivers of job creation and investment, supporting high-tech economic growth.

Based on the publications mentioned, we can state that technology transfer requires an integrated approach, in particular at the regional level. This determined the purpose of this study in determining promising approaches to managing technology transfer projects at the regional level.

II. Project Approach for Technology Transfer

A technology transfer project based on cooperation with science and business can be defined as a process of mutually beneficial exchange of knowledge, innovations and technologies between research institutions and commercial companies. Such projects are aimed at developing and implementing new technologies to solve urgent problems of the community and the region.

The project begins with identifying the technological needs of the community that can be solved through scientific research. To do this, it is necessary to create close interaction between scientific institutions that are engaged in the development of innovative technologies and local enterprises that are interested in implementing these technologies to increase their competitiveness. It is important that both parties understand that their cooperation will be mutually beneficial. For scientific organizations, this is an opportunity to apply their developments in real conditions, for businesses, a chance to gain access to advanced solutions that will help improve production processes, increase efficiency or reduce costs.

The technology transfer process in this project is based on scientific developments that are adapted to specific needs. For example, this could be the introduction of new environmentally friendly technologies for local businesses

2025 MIPRO 48th ICT and Electronics Convention | 979-8-3315-3597-1/25/$31.00 ©2025 IEEE | DOI: 10.1109/MIPRO65660.2025.11131985

(agriculture, waste recycling, renewable energy sources, etc.). It is important that the technologies are not only scientifically sound, but also economically justified for local businesses. This makes them accessible and effective for implementation. Within the framework of such a project, joint research initiatives between universities, research laboratories and local manufacturing enterprises are also possible. Including local businesses in these studies ensures the practical focus of scientific developments and accelerates their implementation in practice.

Also project approach allows to identify and minimize potential negative outcomes or risks associated with technology transfer projects, such as technological mismatches or resource misallocations.

III. Lean Approach for Technology Transfer Projects Management

The development of territories based on innovations is increasingly associated with the concept of smart specialization. It involves the strategic use of unique resources and competitive advantages of regions. The concept does not simply provide for the selection of promising areas of the economy, but includes a dynamic process in which technology transfer plays a key role. Innovations are considered as a tool for forming competitive advantages and maximizing the use of resource efficiency. The effectiveness of the technology transfer process largely depends on how quickly and flexibly the community can adapt innovations. At the same time, there is a need for an approach that minimizes risks, accelerates the implementation of new solutions and ensures sustainable economic growth. Lean startup approach is focused on rapid testing of hypotheses, iterative improvement of products and adaptation of technologies to the real needs of users.

Lean startup is a business development methodology that aims to reduce product development cycles and quickly determine the viability of the proposed business model. The main idea of the "lean startup" method is to quickly test ideas for a finished product on a real consumer and constantly adjust the business model. To work according to the Lean startup method, it is necessary to immediately and in practice make sure that the product will be in demand and useful, and not hope that after the launch of sales there will be demand for it.

In the traditional model of technology transfer, there is often a gap between scientific developments and their practical application. Research institutes create innovations, but the process of their adaptation in the business environment is delayed, since it requires significant investments, lengthy testing and approvals. As a result, communities seeking to develop smart specialization face barriers: even promising technologies may prove ineffective due to a mismatch with the real conditions of the region. This is especially important in the context of smart specialization, where technologies should be as close as possible to the needs of the region, its economy and social structure.

Technology transfer to the community, based on the principles of Lean Startup, involves working with a minimum viable product. For example, if a community is betting on the development of sustainable energy, instead of a large-scale and expensive implementation of microgrids, it is possible to first deploy a pilot project based on one social facility, such as a school or a hospital. This small experiment will not only test the technology's performance, but also obtain valuable data for its further scaling. Flexibility and adaptability are key characteristics of startup approach for technology transfer.

Smart specialization is not a static strategy – it requires a constant review of priorities and a search for new growth points. This is especially important for small communities, where economic and social conditions can change quickly. Instead of long-term and rigidly fixed planning, the community gets the opportunity to work in a constant experiment mode, quickly responding to market changes, availability of funding and new challenges. The smart specialization ecosystem requires close interaction between science, business and government.

Traditional technology transfer is often viewed as a one-way process – from universities to enterprises and the public sector. However, the Lean Startup approach makes this process more flexible and two-sided: the community gets the opportunity not only to adapt existing developments, but also to form a request for specific innovations based on real needs. Instead of waiting a long time for ready-made solutions, local entrepreneurs themselves can become initiators of technological changes, and scientific institutes can flexibly adjust research to market demands. This approach also helps reduce risks when implementing technologies. Smart specialization involves choosing niches in which the region has competitive advantages, but the traditional process of their development may require significant investments. Using the Lean Startup methodology allows the community to minimize possible losses, since each new technology goes through a stage of early testing, iterative improvement, and only then is it scaled. This makes the technology transfer process more sustainable and economically viable.

Thus, the combination of smart specialization with the Lean Startup principles allows communities not only to receive technologies from outside, but also to dynamically develop their own innovative ecosystem. This approach makes technology transfer more flexible, focused on real demand and capable of rapid scaling. As a result, the community not only becomes a consumer of innovations, but also turns into an active player in the technology market, creating new economic opportunities and ensuring sustainable development of the territory.

IV. Package Approach for Technology Transfer

The package approach for technology transfer involves the introduction of several interconnected technologies into the community at the same time. This allows for a synergistic effect and maximization of results. Within the framework of smart specialization this approach is an important element is the coordination of technologies with the needs of a specific territory, taking into account its economic, social and environmental characteristics. The package approach helps communities not only to adapt the latest technological solutions, but also to effectively use

them within the framework of local development strategies, increasing their competitiveness. The package approach to technology transfer into the community includes:

1. Comprehensive implementation of interconnected technologies, when not individual, but several interdependent technologies are introduced into the community that work in tandem. For example, smart lighting systems, smart water supply, smart heating, energy-efficient solutions for municipal buildings and an intelligent energy flow management system (microgrid).

2. Within the framework of the technology package, a unified infrastructure is created that allows for effective coordination of the use of various technologies. The creation of a unified infrastructure requires smart platforms for data management that analyze needs and optimize resources (e.g. solar panels, energy storage systems).

3. Smart specialization implies the selection of technologies that meet the specific needs of the region. The community must determine which technologies can be most useful in its conditions. If the region specializes in agriculture, the technology package may include smart greenhouses, crop monitoring and data analysis systems, as well as a local power grid to provide them.

4. The implementation of the technology package promotes innovative development. In turn, this helps the community reach a new level in economic, environmental and social terms. This may be associated with an improvement in the quality of life, improved energy efficiency and a reduction in the ecological footprint.

The main advantages of a package approach to managing technology transfer at the local and regional levels include:

1. Implementation of several interconnected technologies leads to more efficient use of resources. For example, solar panels and a smart energy management system work together, reducing dependence on external energy sources and increasing the sustainability.

2. Instead of investing in individual technologies that may not produce the expected effect, a package approach allows the community to save money by implementing a whole set of technologies that support each other and ensure sustainable development.

3. A package approach helps the community develop in an environmentally sustainable way. Also, package approach provides adaptation and scaling of technology solutions depending on the needs of the community.

5. A community that implements a set of technologies becomes attractive to investors and government support programs, which contributes to further development.

A package approach for technology transfer within the framework of smart specialization allows communities not only to implement innovations, but also to effectively integrate them into the economy and infrastructure of the region. This approach ensures sustainability, economic efficiency and environmental safety, creating a basis for smart development and improving the quality of life of local residents.

V. Pilot Project of Technology Transfer

Microgrid technology with solar panels and batteries is important for small communities for a number of reasons. The impact of this technology model is important both from an economic point of view and from a social and environmental sustainability point of view. The project can be supplemented by the inclusion of smart greenhouses. This expands the community's capabilities in the field of sustainable agriculture and food security.

First of all, small communities often have problems with the reliability of external power grids. The creation of a local power grid in conditions of frequent outages or unstable power supply allows the community to become energy independent. Intelligent power grid management allows to optimize consumption and redistribute energy depending on the actual needs of the facilities. This ensures their uninterrupted operation. With solar panels and batteries, a community can efficiently use the energy generated during the day for night-time needs, reducing the need to use traditional energy resources.

A small community can reduce its energy costs through the use of renewable energy sources. The technology makes it possible to ensure long-term savings on utilities and reduce dependence on traditional energy supplies. Technologically, the "smart" energy management system effectively redistributes flows and the community can reduce the cost of purchasing electricity and at the same time avoid the cost of connecting to external networks. When we supplement the project with smart greenhouses that use solar energy for heating and lighting, it allows farms to grow products all year round, which reduces dependence on traditional energy sources and improves the financial sustainability of agriculture.

The project reduces the community's carbon footprint. Solar panels generate energy without CO2 emissions. The use of batteries for storage allows minimizing energy losses. For small communities that have chosen to prioritize sustainable development, this technology becomes an important part of the strategy to reduce the impact on the environment. The inclusion of smart greenhouses in the project adds another environmental component. Such greenhouses use energy to create optimal conditions for plant growth, reducing the consumption of fossil resources, and ensuring the efficient use of water and energy.

The introduction of such technologies attracts the attention of investors and helps to create new jobs. For small businesses and farmers, technology opens up new opportunities for expansion. For example, smart greenhouses allow the production of environmentally friendly products that are in demand on the market. Also, the introduction of solar stations and batteries helps create jobs in the field of installation and maintenance of equipment. In addition, such projects can apply for funding from state and international programs that support sustainable development. This contributes to the development of infrastructure and increased funding at the community level.

Having uninterrupted power supply and stable utilities, especially in remote areas, significantly improves the quality of life of local residents. This is important for areas

with a loss of human capital. In particular, for schools and medical institutions, this means uninterrupted operation of heating, lighting and other vital technologies. The introduction of smart greenhouses not only helps solve the problem of energy supply to agricultural facilities, but also creates additional sources of income for farmers. We should also note the access to fresher and higher-quality agricultural products for community residents.

In the context of climate change the importance of these technologies is also increasing. Solar energy and other renewable energy sources, which are included in the project, are an important tool for increasing the community's resilience to climate change. The smart greenhouse project allows farmers to implement innovative farming methods. Smart greenhouse technology allows optimizing resource consumption, while increasing crop yields, which is especially important for small communities where land is limited and food needs are high.

Thus, the proposed technology package of a local energy grid with intelligent control and the integration of smart greenhouses can be considered as an important solution for the sustainable and environmentally friendly development of small communities.

VI. Conclusion

Technology transfer requires an integrated approach, in particular at the regional level. A technology transfer project based on cooperation with science and business can be defined as a process of mutually beneficial exchange of knowledge, innovations and technologies between research institutions and commercial companies. The combination of smart specialization with the Lean Startup principles allows communities not only to receive technologies from outside, but also to dynamically develop their own innovative ecosystem. This approach makes technology transfer more flexible, focused on real demand and capable of rapid scaling. As a result, the community not only becomes a consumer of innovations, but also turns into an active player in the technology market, creating new economic opportunities and ensuring sustainable development of the territory. A package approach for technology transfer within the framework of smart specialization allows communities not only to implement innovations, but also to effectively integrate them into the economy and infrastructure of the region. This approach ensures sustainability, economic efficiency and environmental safety, creating a basis for smart development and improving the life quality of community.

Further studies would benefit from more clearly outlining differences between projects targeting enterprises, public sector and community, considering their different capabilities and constraints.

Acknowledgment

The paper is prepared within the scientific research projects “Organizational and economic support of the post-war sustainable development of territories based on the infrastructure and service methodology of innovation communities development” (№ 0123U100271) and “Modeling and forecasting of socio-economic consequences of higher education and science reforms in wartime” (№ 0124U000545).

References

[1] L. Melnyk, O. Kubatko, I. Dehtyarova, O. Matsenko, and O. Rozhko, “The effect of industrial revolutions on the transformation of social and economic systems,” *Problems and Perspectives in Management*, Vol. 17 (4), pp. 381–391, 2019.

[2] L. Melnyk, O. Kubatko, V. Piven, K. Klymenko, and L. Rybina, “Digital and economic transformations for sustainable development promotion: A case of OECD countries,” *Environmental Economics*, 12(1), pp. 140–148, 2022.

[3] UNCTAD, “Information Economy Report 2017: Digitalization, Trade and Development,” United Nations publication. Sales No. E.17.II.D.8. New York, Geneva, 2017.

[4] L. Zhang, Zh. Cao, G. Chen, and Zh. Wang, “A study of China’s inter-city networks for innovation cooperation within software and service firms,” *Eurasian Geography and Economics*, Vol. 60, Iss. 5, pp. 582–615, 2019.

[5] A. Aine, T. Björkroth, and A. Koponen, “Horizontal information exchange and innovation in the platform economy – a need to rethink?” *European Competition Journal*, Vol. 15. Iss. 2–3, pp. 347–371, 2019.

[6] R. Huggins, “The growth of knowledge-intensive business services: innovation, markets and networks,” *European Planning Studies*, Vol. 19. Iss. 8, pp. 1459-1480, 2011.

[7] O. Prokopenko, O. Kazanska, I. Deineha, N. Butenko, V. Omelyanenko, O. Bovkun, “Communication Business Processes of Industrial Enterprises in the Conditions of Globalization,” *International Journal of Management*, 11 (5), pp. 884–895, 2020. https://doi.org/10.34218/IJM.11.5.2020.081

[8] T. Tirto, Y. Ossik, V. Omelyanenko, “ICT Support for Industry 4.0 Innovation Networks: Education and Technology Transfer Issues,” In: Ivanov, V., et al. Advances in Design, Simulation and Manufacturing II. DSMIE 2019. *Lecture Notes in Mechanical Engineering. Springer*, Cham, 2020.

[9] V. Omelyanenko, “Analysis of strategic aspects of technology transfer in metallurgy,” Metallurgical and Mining Industry, Vol. 7, Iss. 12, pp. 394–397, 2015.

[10] Y. Robul, I. Lytovchenko, L. Tchon, O. Khanova, and O. Omelianenko, “Digital marketing tools in the value chain of an innovative product,” *International Journal of Scientific and Technology Research*, 9(4), pp. 158–165, 2020.

[11] *GVR Report. Smart Cities Market Size, Share & Trends Report Smart Cities Market Size, Share & Trends Analysis Report*. Accessed: 27.01.2024 [Online]. Available: https://www.grandviewresearch.com/industry-analysis/smart-cities-market

[12] F. Anindra, S. H. Supangkat, and R. R. Kosala, "Smart Governance as Smart City Critical Success Factor (Case in 15 Cities in Indonesia)," *2018 International Conference on ICT for Smart Society (ICISS)*, Semarang, Indonesia, pp. 1–6, 2018.

[13] OECD, “*OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*,” OECD Publishing, Paris. 2018.

[14] S.-S. Jo, H. Han, Y. Leem, and S.-H. Lee, “Sustainable Smart Cities and Industrial Ecosystem: Structural and Relational Changes of the Smart City Industries in Korea,” *Sustainability*, Vol. 13, Art. 9917, 2021. https://doi.org/10.3390/su13179917

[15] J. G. P. Negara and A. W. R. Emanuel, “A Conceptual Smart City Framework for Future Industrial City in Indonesia,” *International Journal of Advanced Computer Science and Applications*, Vol. 10, Iss. 7, 2019. http://dx.doi.org/10.14569/IJACSA.2019.0100762

[16] R. Dwivedi, “Industrial Smart Cities to Create Jobs, Attract Investors,” *InvestIndia*, September 13, 2024. [Online]. Available: https://www.investindia.gov.in/blogs/industrial-smart-cities-create-jobs-attract-investors

[17] O. Nifatova, Y. Danko, S. Petrychuk, and V. Romanenko, “Modern Bioeconomy Measurement in the Green Economy Paradigm: Four Pillars of Alternative Bioeconomy,” *Sustainability*, 16(22), 9612, 2024