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Post-industrial university towns and the triple helix concept: case studies of Bristol, Sheffield, Novosibirsk and Tomsk

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Abstract. The paper examines the role of universities in city development under the Triple Helix model through case studies of Russian and British cities. The cases of Bristol and Sheffield illustrate that the implementation of the Triple Helix model can be achieved through different approaches. In Bristol, universities reached beyond their campuses to create a ground for cooperation with partners. In Sheffield, there was a platform for interaction with partners using the brand of a top university. Meanwhile, the examples of Tomsk and Novosibirsk provide some evidence for the growing importance of universities in the innovative urban economy. The comparative analysis provides recommendations for Russian universities, whose application of the Triple Helix model is prevented by the lack of experience in developing an effective marketing strategy and weak interactions between research and enterprises.

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1. Introduction

Changes in society through technological breakthroughs suggest that our contemporary society is moving towards a Fourth Industrial Revolution (Schwab, 2016). The Knowledge Society concept (Drucker, 1968; Machlup, 1962; Bell, 1973; UNESCO, 2005; Dinu, 2008) as well as the Triple Helix model (Lowe, 1982; Etzkowitz, 1993; Etzkowitz, Leydesdorff, 1995; Etzkowitz, 2008) are increasingly used in the academic literature (Solovieva, Shamardin, 2015). The Triple Helix model offers a pattern of a dynamic triad – University, Business, and Government. In addition to their traditional functions, each member also adopts another role: Universities market and commercialise scientific achievements, Government supports new forms of enterprise and Business plays an active role in education (Pakhomova, 2012). The successful development of such cooperation between these three actors seems crucial for any city or state to move forward to the next stage of technological development. Therefore, research into the possible ways to succeed in developing the Triple Helix model in reality is now considered urgent. The research is especially useful for towns that are not national capitals and thus do not have the opportunity to force the whole country – or use the resources of the whole country – to ensure their development. Most provincial towns need to look for new solutions and additional resources in order to apply the Triple Helix model. Therefore, this article provides some analysis in the opportunities and difficulties provincial towns in two different countries face while applying the model.

The images of many post-industrial towns are defined today by their universities. At the same time, the more universities there are in a city, the more they determine the socio-economic and cultural environment: social values, local traditions, nightlife and the intellectual capacity of the town's human capital. University towns have a remarkable atmosphere. A university town allows the co-existence of both innovative ideas and conservatism: research conducted there gives the opportunity to invent new ideas while the elitist character of science and higher education in leading universities limits the number of people allowed entry to it. However, nowadays the university has been transformed from a closed space for communicating knowledge into an open space aimed at active engagement in the social life of cities and regions. In accordance with the Triple Helix model, the "urban" space is a region where the University interacts with Government and Business (Etzkowitz, 2008). Nowadays, universities provide an innovative economy of Knowledge Society with highly-qualified personnel, and they organise an innovative urban community culture by actively forming civic institutions and preparing a new elite. The boundaries of those universities' activities are therefore widening in post-industrial cities. It is this process that we are observing in Europe, and particularly in the United Kingdom. The process demonstrates that the higher education system in the UK has been – and remains – a factor in the successful socio-economic development and stability of the country's political system (Chertovskikh, 2013).

2. Literature review and theoretical framework.

The ideas of the Knowledge Society date back to the 1960s, when they appeared in works by Machlup (1962), Bell (1973). However, the term itself was used for the first time by Drucker (1968). Between the 1990s and in the early 2000s the concept became universally acknowledged (UNESCO, 2005). However, it was at first mainly applied to the analysis of the highly developed societies of Western Europe, the US and Canada. The same statement is true for the Triple Helix model. The background of this idea may be traced to works by Lowe (1982), as well as Sábato and Mackenzi (1982). However, the idea of university–industry–government cooperation in its modern interpretation was initiated in the beginning of the 1990s by Etzkowitz (1993), then developed by Etzkowitz and Leydesdorff (1995). However, the neo-institutional perspective of the concept was further provided by numerous case studies that covered the role of universities in disseminating innovations not only in Europe (Inzelt, 2004) or the US, but also in Africa (Konde, 2004; Booyens, 2011) and Latin America (Mello, Rocha, 2004; Etzkowitz, Mello and Almeida, 2005).

Over the last decade, some studies on the opportunities for application of the Triple Helix model in Russia have appeared (Lisinchuk, 2013; Polutin, 2013), paying much attention to entrepreneurial universities (Kuftyrev, 2012; Latuha, Pushkarev, 2012). The particular focus on entrepreneurial universities in Russia is caused by a reform of higher education and the need for increased university competitiveness and for enhancing activities aimed at the development and distribution of innovation in the economy.

However, since Russia turned to the Triple Helix model later than most Western European countries, the case studies and best practices from the Western experience could provide useful recommendations for Russian universities and university towns' administrations. The cases of Bristol, Sheffield, Tomsk and Novosibirsk were chosen for this research because the four of them are considered large university cities with high positions in national and international rankings. For instance, the University of Sheffield is ranked 10th among British universities for industry income, the University of Bristol is ranked 18th in 2019, which means they managed to developed rather strong links with business – and with local authorities, which provide the right conditions for developing such interactions. Tomsk and Novosibirsk are the only university cities in Russia behind the Urals that were included in the 2018 QS Best Student Cities Ranking. The cities strive for high positions in world rankings but face certain difficulties in entering into cooperation with local authorities and business and, therefore, are looking for foreign success stories they can emulate. Additionally, these university towns are provincial ones, but their universities have good reputations and strive for worldwide competitiveness.

3. Case study of Bristol and Sheffield

Bristol is a leading city in such areas as public access to information, energy innovation and public participation, thanks to the *Bristol Is Open* project, a joint venture between Bristol City Council and the University of Bristol. This has resulted in a Smart City Research and Development network platform. Three networks are currently integrated through software controls: fibre optics; a wireless net along the Brunel Mile area of Bristol (with Wi-Fi, 3G, 4G and 5G experiments); and a radio frequency mesh network deployed on 2,000 of the city's lampposts. This platform allows companies to test new technologies in a real-world environment. The Engine Shed incubator is another interesting project in Bristol, the result of the successful SETSquared partnership of six universities across the south-west of England (Clark, Williams, 2014). The Engine Shed incubator ranks 8th among 64 of the best university business-incubators in the world, and 14th among 64 cities by growing small and medium enterprises (University Business Incubator, 2014). It supports key knowledge-intensive industries and is primarily funded through a long-term (15-year) loan from Bristol City Council. The initiative of the Engine Shed is based on an existing network of key players and is focused on establishing and sustaining relationships between those working in growing and priority industries in Bristol. The Engine Shed provides a dedicated networking space located in Bristol's Temple Meads railway station, outside the university campus. The business centre benefits from good transport links and constitutes a ground for dealing with potential partners. The project aims to commercialise technologies and allows universities to become part of urban societies (Bristol is Open, 2017).

Sheffield is a vivid example of an old city that has nonetheless developed rapidly in the north-east of the UK in the beginning of the 21st century. Sheffield University is one of the 24 leading UK universities referred to as the Russell Group (Russell Group, 2019), and it is in the world's top 100 universities. The success story of Sheffield University can be traced back to the achievements of local industry and investments in research by industry partners. Compared to Bristol, Sheffield University went with a different approach for enhancing cooperation between business and universities and expansion of the partner network. University of Sheffield Enterprise (USE) uses the university's brand to attract business communities to the campus. For this purpose, USE took into account the reasons behind falling interest in previous networking events from the business community and adapted accordingly. Currently, USE combines the typical activity of business incubators (funding, workshops,

business coaching and advice) with informal networking evenings and brunches. Sheffield's Warwick Manufacturing Group (Jaguar Land Rover) makes it through the Knowledge Transfer project, which involves more than 1,700 small and medium enterprises with access to WMG experience and a global network of suppliers. Boeing's Advanced Manufacturing Research Centre, a long-standing partner of Sheffield University, includes representatives of small business (more than 300 projects within the Yorkshire and Humber) (Clark, Williams, 2014). Thus, the Bristol and Sheffield universities perform their functions as business incubators, generating innovative ideas, and as centres of dialogue with the business community.

4. Case study of Tomsk and Novosibirsk

Tomsk and Novosibirsk are the only university cities of Russia behind the Urals that were rated high and included in the 2018 QS Best Student Cities ranking. Nowadays, the Tomsk region holds 1st place in Russia for the number of highly qualified scientific personnel (16 people per 1,000), 3rd place on inventive work and 7th place in the innovative region ranking. High-level research is conducted in Tomsk by research organisations and universities. The former include the Tomsk Scientific Centre of the Siberian Branch of the Russian Academy of Sciences (SB RAS), the Tomsk National Research Medical Centre of the Russian Academy of Sciences (six research institutes with clinics), and others. The top scientific and educational institutions are the National Research Tomsk State and Polytechnic Universities (TSU and TPU, respectively) which are in the top 10 of the national ranking and hold significant positions in the international ranking (Scientific and education in Tomsk Region, 2017).

Tomsk is a good example of successful cooperation between government, academic organisations and industry. In addition to the TSU and TPU, other major universities operate in Tomsk. In 2017, the Tomsk State University of Control Systems and Radioelectronics (TUSUR) was given the status of a Federal Innovation Platform. Opened at the TUSUR, the business incubator "Friendship" is a starting point in information technology and electronics. The business incubator has a professional team specialised in business planning, full-service support of business projects, intellectual property protection, etc. A resident company of the business incubator, 50ohm Technologies, has become an official partner of National Instruments Applied Wave Research, a world leader among solutions providers for test, measurement and control systems (Portal TUSUR University, 2017). A special economic zone of the technical innovation type "Tomsk" has been created in the city. In 2015, the number of its residents reached 63. It includes 10 offices of scientific development commercialisation, 13 business incubators, and more. One of the aims of the strategic socio-economic development of the Tomsk Region until the year 2030 is the realisation of its scientific and educational potential (Strategy for socio-economic development of the Tomsk Region, 2017). A particular role in the development of the city and region's infrastructure is played by the innovation portal inotomsk.ru: it is a platform for dialogue between the authorities and businesses.

Interest in expanding innovative development on the basis of scientific capabilities increases with growing competition from neighbouring regions. One of the negative factors affecting the development of the Tomsk region is the ability of nearby competitors to provide better conditions for the training and employment of highly-qualified personnel (Strategy for socio-economic development of the Tomsk Region, 2017). Examples of interaction with small and medium-size innovative enterprises in Sheffield University can be put forward for closer examination by the Tomsk authorities and the academic community. The campuses of major Tomsk universities are conveniently located in the city centre, which helps organise a platform for interaction between all three key stakeholders: universities, businesses and the authorities.

Science in Novosibirsk and the surrounding Region is represented by 43 academic institutions, 7 international research centres and 3 technology parks. The city has leading scientific schools responsible for developing world-class technologies, for instance, in inventing and testing new catalysts, elaborating nanotechnologies, etc. (Science in Novosibirsk, 2018). A combination of powerful scientific and research foundations with the good material and technical base of the Novosibirsk Academgo-

rodok (university district) creates an environment conducive to the development of technologies and prototypes in such areas as information and telecommunications technologies, biomedicine and biotechnology, instrumentation and knowledge-intensive equipment, nanotechnology, and power electronics (Technopark, 2017).

The activities of Novosibirsk State University (NSU) and Novosibirsk State Technical University (NSTU) show the innovative role that universities play in city development. NSU is in the top 20 major universities in BRICS countries according to QS Rankings. Research activities at NSU are carried out in close connection with SB RAS institutions, and the university's development strategy implies further integration with the Russian Academy of Sciences by creating joint laboratories. According to the 2017 progress report, the NSU hosts 12 start-ups, 3 of them interact with the Skolkovo Innovation Centre, and another 3 of them are residents of the Technopark at Novosibirsk Akademgorodok (Innovative products of NSU, 2012). The Centre for Technology Transfer and Commercialisation is launched at Novosibirsk State University (Centre of a transfer of technologies, 2017). It provides an opportunity for closer interaction between NSU staff and entrepreneurs in preparing investment projects and commercialisation strategies for high-tech development (Science in NSU, 2017).

The NSTU has long cooperated closely with the city's businesses. Its activities were included in the Programme for Reindustrialisation of the Novosibirsk Region, which supported breakthrough projects in the economy and sought out the most successful organisations capable of realising these projects. The results of academic activities are successfully dispersed from the University. In 2009, an independent testing site for Industrial and Ecological Safety was opened on the grounds of 12 laboratories. It provides a suite of services at facilities controlled by the Federal Service for Environmental, Technological and Nuclear Supervision (Scientific education centres and laboratories of NSTU, 2017). A regional centre of normative and technical support for innovations of Novosibirsk Region was also created on the grounds of NSTU. Its activities include the provision of services in matters of standardisation in innovation and organising the testing of nanotechnology products before release onto the market. In December 2017, two testing laboratories received certificates of compliance with the requirements of the voluntary product certification system "Nanosertifica" (Agency for formation of innovative projects in Novosibirsk region, 2017). The University has scientific training centres in such areas as new materials and technologies, mechatronics and automation, information technologies, etc., which provide the training of qualified specialists for Novosibirsk Oblast (Scientific education centres and laboratories of NSTU, 2017).

Novosibirsk City Hall has implemented a policy of financially supporting research and innovation through grant competitions for young scientists and prize competitions in science and innovation for young scientists and specialists (Regulations in science and innovation, 2017). Novosibirsk City Hall adopted a decision on regulations on awards from the City Hall of Novosibirsk in science and innovation. The programme, entitled "Municipal support of activities in industry and innovation within Novosibirsk", aims to support the high-tech industry – which is facing stiff competition – for the years 2016–2020 (Municipal support, 2016). Since 2008, the city's Electronic Novosibirsk programme has aimed to use telecommunication technologies for more effective interaction between the city authorities and the local population (Program Electronic Novosibirsk, 2010). Thus, mechanisms for direct interaction of universities, business and authorities are formed. Bristol's experience is of interest to Novosibirsk. NSU and NSTU campuses are located in different parts of the million-strong city. It would be appropriate to create a ground for cooperation for the partners concerned.

5. Conclusion

The comparative study proved that the significant factor behind the socio-economic development of university cities in the UK is high-tech enterprises and business that are able to react quickly to the demands of an innovative economy and ready to interact with universities as centres of ideas-generation. The universities of Bristol and Sheffield demonstrate a willingness to overcome barriers arising from the perception of higher education insti-

tutions as being elite and closed. The examples of Tomsk and Novosibirsk indicate the willingness of local universities to act as ideas generators. However, problems complicating the implementation of the Triple Helix model prevent them from playing that role: the stakeholders in local economic activities do not always have the capacity to apply the research capabilities of universities, which is partly a problem inherited from the Soviet era (Mingaleva, 2012). Difficulties in introducing prototypes elaborated at the universities, as well as in commercialising research, arise due to the outdated technical basis of local enterprises and lack of investment. The Russian universities' lack of an effective marketing strategy also prevents effective interactions between enterprises and the universities that could allow for quick implementation of research results. There is a gap between the research development and the readiness of universities to function as ideas generators, and the ability of the economy to absorb these innovations. Partially, this gap in Russia is caused by the traditionally strong governmental participation in the economy, which is not the case of the UK. Therefore, the recommendation for Russian universities that are willing to proceed with the Triple Helix model implementation may be to interact actively with local communities, to become an integral part of their towns and to find common grounds with local businesses and authorities to negotiate mutually beneficial opportunities as soon as possible.

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