

Infrastructure Development as Innovation Diffusion Environment within a State Policy

Vladimir M. Bukharaev, Bulat R. Nabiyev and Rinat A. Nabiyev
Kazan Federal University, Kremliovskaya Str. 18, 420008 Kazan, Russian Federation

Abstract: The relevance of the topic is conditioned by the scientific and practical significance of the study and the understanding of effective ways for economic development, among which the most important one is the development of infrastructure and its impact on the diffusion of innovation. The study is devoted to the study of innovation distribution environment which is seen as social communication channels, based on the infrastructure created in a particular area. The aim is to identify the main effects of the infrastructure impact on a sustainable spreading of innovations. Among many interrelated elements of the infrastructure-social, financial, credit, market, transport, information, industrial, institutional elements are revealed. The study considers social, transport and information element as the key to ensure the innovation diffusion environment. The role of the social infrastructure is demonstrated for reliable communications provision in society due to the combination of actual and potential resources. The effects of investments are revealed within a transport infrastructure. The importance of a developed transport and information infrastructure for the “smoothing” of geographical gaps in interpersonal contacts is stated. This infrastructure increases the speed and volume of provided information relating to the new ideas and innovations. The government policy is characterized as mobilization resource for the infrastructure development which has a long-term socio-economic effect, developing a “growth point”, as well as creating the conditions for innovation diffusion acceleration.

Key words: Diffusion of innovations, infrastructure, competitiveness, innovation adopter, social capital, economic policy, network economy

INTRODUCTION

The adoption of a new economic paradigm, developed by F. Roosevelt and avoiding the USA Foreign policy principles proclaimed in 1823 (“Monroe Doctrine”) characterize the beginning of a economic model implementation sufficiently enough. The basis of this geo-economic model are domestic financial assets and the global economic market. Accordingly, the level of territory socio-economic development is achieved under the influence of global processes and adaptive capacities of regions. These features are largely related to the quality of the innovation diffusion environment, a created state policy on the development of major infrastructure projects. Therefore, the consideration of infrastructure influence as a medium tied to a specific geographic space on the processes of innovation diffusion in the context of public policy seems an urgent scientific issue.

Meanwhile as is clear from the research of the research of who share the so-called non-price approach to competition (Cairncross, 1997; Friedman, 2005) that the processes of globalization in many ways weaken the

causality between competitiveness and the territorial factor. However, there are other tendencies opposing to globalization, manifested in increased protectionism, including the developed countries, in the strengthening of national economy orientation to domestic markets, etc. (Ghemawat, 2009) that allows you to talk about the infrastructure space as a significant competitiveness and development factor of innovation diffusion environment.

MATERIALS AND METHODS

The concept of diffusion was originally developed by the French sociologist Tarde (1903). who introduced the diffusion curve “S” to explain the main elements ensuring economic progress. He considers innovations as a person's ability to adapt to changing environmental conditions and the ability to imitate. An important point in the study of diffusion studies were Hagerstrand (1967) studies where he formulated the statement on the diffusion of innovations and applied mathematical modeling techniques to study the effect of the space factor on it. In his research, the diffusion of innovations

as a spatial process, he proved time and space as the important elements affecting the process of innovation diffusion. So, his model has a neighbor effect as one of the elements which is expressed in the tendency of innovation adoption from an adopter to an adopter at their close geographic location.

According to Hagerstrand (1967) theory the diffusion process begins with the development of a concentrated cluster of innovation adopters. The expansion of this cluster takes place so that the probability to accept an innovation by those who are the closest ones to earlier adopters is more likely than by those who are not so close. He found that a number of communication links for an average person is reduced with the distance. This observation made by T. Hagerstrand is relevant to an anisotropic innovation diffusion model, according to which you may determine certain geographical boundaries, preventing the diffusion of an innovation. These include insurmountable or hardly insurmountable geographic features as well as the obstacles arising from the uneven development of transport infrastructure which may affect the habits of people in the establishment of communication links. The theory of T. Hagerstrand innovation diffusion is close to Kondratievs theory of large cycles (Granberg, 2004).

The next step in the development and popularization of the diffusion concept was the research written by E. Rogers, the diffusion of innovations which summarizes the main achievements in this area at the beginning of the 1960s. E. Rogers defines the innovation diffusion as a special type of communication where the data being the subject of circulation and exchange refers to new ideas and innovations.

The term infrastructure refers to a large-scale, interconnected system of services, communications and constructions in a certain area that are necessary for human activity. The analysis of existing infrastructure classifications as well as their constituent elements leads to the conclusion that the objects and industries included in various types of infrastructure, have a certain flexibility and their division into different classes and types is quite conventional. Therefore, any such classification from the standpoint of the used concept is an instrumental one.

RESULTS AND DISCUSSION

Transport infrastructure for example, impacting on economic development as a whole, accelerates the business activity of firms and individuals, creates social ties and influences on the process of innovation distribution. Besides, the development of transport

infrastructure in the framework of local, regional and national strategies allows to achieve the solution of such socially important problems as the population income and the level of its employment increase (Littman, 2015). The world experience shows that a well-developed transport infrastructure contributes to a more efficient use of existing potential and helps to accelerate the economy circulation (Anonymous, 2014).

The economic effects of investments in various types of infrastructure have a similar structure in most cases. Let's define the general structure of the economic effects on the example of transport infrastructure development (Lindfors, 2011).

Direct effect an increase of workplace number and the welfare of the population through the construction of transport infrastructure objects, the reduction of time and financial costs. The regional companies will get a better access to markets and resources and the transportation costs will be reduced:

- Indirect stimulating effect on secondary companies for example, local companies that provide the means of production
- Stimulating effect: the population income increase leads to the consumption increase and, consequently, to demand increase
- An innovative impact related primarily to the need of new technologies introduction in the regions, the training of staff for the development and maintenance of infrastructure

The dynamic effect: the result of long-term changes in economic development, in the development of social communications, in the growth of wages and prices, the changes in land use, the structure of places favorable for doing business which in its turn influences the prosperity of the region. The economic impact of investments in infrastructure investment may also be considered in terms of its length and divided into short and long term one which are associated with the investment multiplier and the economic growth in the region, respectively (Berechman, 2009).

A short-term multiplier effect: the changes in economic activity related to the investments during the investment period. As a rule, the multiplier effect of large investments is quite high. For example, Roosevelt's program for the construction of roads, bridges, airports, the development of Tennessee River Valley as well as other programs of fiscal stimulation created a strong multiplier effect for the US economy. It is clear that

not only transport projects but also any major infrastructure projects that have the potential for long-term socio-economic effects, create the points of growth.

A long-term effect is associated with direct effects (time, changes in transportation costs) as well as with long-term changes in the structure of the markets affected by the development of infrastructure. So, the saving of time on business trips directly influences productivity. For transport companies the saving of time means the benefits from fuel or energy cost reduction, main asset depreciation, cost of labor. All this influences the quality and efficiency of transport services in a region and a country (Kernohan and Rognlien, 2011). The increase of transport infrastructure reliability for manufacturers and the increase of delivery speed enables you to plan the production process and organize careful production due to the logistics concept “just to time”.

The Canadian researcher McLuhan (1962) likened the modern world to a global village. His ideas are the basis of the network economy determination (Bugorski, 2008), operating through electronic networks, the basis of which is information infrastructure.

An efficient transport and information infrastructure allows to smoothen the geographical gaps in interpersonal contacts and thereby increase the speed and volumes of provided information. Naturally, transport and information infrastructure does not exclude the factors of geographical gaps between actors. It is related not only with the ever-present influence of the distance, but also with geohistorical prevailing differences between countries such as faith-based, traditional, linguistic, cultural ones; the differences in the disposition of intellectual resources as well as in total social capital of actors ensuring a stable network of relationships in the community.

Firstly, the functioning of the social infrastructure is aimed at public and private social needs satisfaction that is it occurs as the response to the needs of society in the increase of living standards, social welfare, stability, justice and law and order (Anonymous, 2009). At the same time, one cannot ignore the impact provided by social infrastructure on the rate of innovation diffusion. In particular, the mobilization effect strategy implemented by the government mobilization effects of federal universities on the implementation of science results in the production, the development of high-tech and knowledge-intensive sectors of the economy. This trend is manifested in public policy for the development of new areas of training such as engineering and technical areas of education (Shchelkunov *et al.*, 2014).

In the scientific literature, social infrastructure is usually subdivided into soft and hard infrastructure (Casey, 2005). Hard social infrastructure is the basic area where the population carries out the biological, economic and social activity and which appears as a material base for the diffusion of innovation. Generally, the concept of soft infrastructure is used for the service sector which is the way of distinguishing it from the hard infrastructure. We can say that the soft infrastructure provides not only economic but also cultural and social benefits. It is responsible for the welfare of an individual and society as a whole through the development of individual skills, knowledge, available social services, local networks and relationships.

An important element of the soft social infrastructure is the social capital which is a set of real or potential resources that provide reliable communication in society in other words, the membership in a social group (Bourdieu, 2005). Social capital can not be reduced to a set of private capital, the total amount of purchasing power or real goods, belonging to all people but this is rather a system of common values which is actively involved in the whole economic life although it is not the means of payment.

The analysts of the world bank define social capital as the set of institutions, beliefs, attitudes, values that contribute to social and economic development by controlling the interactions between people. It includes the general national values, civic responsibility, the rules of behavior in society, social identity due to all this the society is becoming something more than a number of individuals.

According to numerous studies, most people accept innovations without the evaluation of objectively rational factors such as the results of scientific research, practicality and efficiency. Instead, they rely mostly on a subjective evaluation of innovations which is provided to them from the early adopters (Everett, 1971). Interpersonal communication channels provided by social capital which are usually associated with the ideal model of communication are more effective in persuading an individual to adopt a new idea or an innovation, especially if interpersonal communication occurs between geographically close actors.

The accumulated data confirm the relationship between social capital and economic growth, the spread of innovations, crime rate decrease and public health improvement (Casey, 2005). Without the development of social capital, incorporated and institutionalized cultural capital of the population as well as the

development and effective functioning of the material-technical base of infrastructure it would be difficult to imagine the deployment of scientific and technological revolution.

The development of institutional infrastructure acts as a management system and has a decisive influence on the development and functioning of the communication channels. For example, the procedures of certification and standardization reduce the uncertainty and create the network of effects that increase the benefits from the adoption of innovation. The economists David "P" and "S" Greenstein who made a great contribution to the understanding of standardization and certification and their impact on the sectors of economy, concluded that the compatibility of standards serves as the factor contributing to the diffusion of innovations (Paul and Greenstein, 1990).

CONCLUSION

Infrastructure, arising as the result of socio-economic and political processes, provides the conditions for the existence of the communication phenomena in which the maintaining of the traditional senses and values is possible. Thus, the infrastructure creates the conditions for the innovation diffusion, in its turn, the diffusion of innovation influences the social environment, changing people attitude to innovations and the world.

The rate of innovation diffusion depends not only on the properties of innovation (the consumer and technical qualities) and in this dependence the role of an adopter irrational choice is not a decisive one, since the rationality choice is a situational one. In order to keep competitive advantages in terms of developed infrastructure and at efficient public contribution to business the process of innovation development will be accelerated, this process will be determined by the intensification of entrepreneurial activity.

In our view, during the solution of economic growth acceleration issues the public policy is the basic one, in particular, the development and the implementation of development programs, taking into account the specifics of regional and ethno-cultural diversity of diffusion environment, based on a nation unity and aimed at the development of major infrastructure projects that create the growth points improving the regulatory environment which include the procedures for certification and standardization, the insurance system, an effective protection of intellectual property rights.

ACKNOWLEDGEMENT

The research is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University.

REFERENCES

- Anonymous, 2009. South East Queensland Regional Plan 2009-2031. http://www.ipswich.qld.gov.au/_data/assets/pdf_file/0005/7916/seq-regional-plan-2009.pdf.
- Anonymous, 2014. Transport Infrastructure Investment: Capturing the Wider Benefits of Investment in Transport Infrastructure. Royal Town Planning Institute. http://www.rtpi.org.uk/media/816110/capturing_the_wider_benefits.pdf.
- Berechman, J., 2009. The evaluation of transportation investment projects. New York. Routledge Advances in Manage. and Busin.
- Bourdieu, P., 2005. Forms of capital. Translated by M.S. Dobryakova. Economic sociology. www.ecsoc.msses.ru.
- Bugorski, V.N., 2008. Network economy: Textbook. V.N. Bugorski (Eds.) M.: Finance and Statistics, pp: 256.
- Cairncross, F., 1997. The Death of Distance: How the Communications Revolution Will Change Our Lives. Harvard Business School Press.
- Casey, S., 2005. Establishing Standards for social infrastructure. The University of Queensland.
- Everett, M.R., 1971. Diffusion of Innovations. Rev. ed. of: Communication of innovations. 2nd Ed. New York. The Free Press.
- Friedman, T., 2005. The World Is Flat: A Brief History of the Twenty-First Century. N.Y.: Farrar, Straus and Giroux.
- Granberg, A.G., 2004. Fundamentals of regional economy. M.: Higher School of Economics publishing house, pp: 495.
- Ghemawat, P., 2009. Why the World isn't Flat. <http://for eig npolicy.com/2009/10/14/why-the-world-isnt-flat/>.
- Hagerstrand, T., 1967. Innovation Diffusion As a Spatial Process. University of Chicago Press.
- Kernohan and Rognlien, 2011. Wider economic impacts of transport investments in New Zealand September.
- Lindfors, J., 2011. The wider economic impacts of transport investments. http://www.helsinki.fi/ruralia/asiantuntijapalvelut/yt_p_fin/pdf/BGLC_WP_53_report_Final_12022014.pdf.
- Littman, T., 2015. Evaluating Transportation Equity. Victoria Transport Policy Institute.

- McLuhan, M., 1962. The Gutenberg Galaxy: The Making of Typographic Man. University of Toronto Press.
- Paul, A.D. and S. Greenstein, 1990. The Economics Of Compatibility Standards: An Introduction To Recent Research. <http://www.kellogg.northwestern.edu/faculty/greenstein/images/articles.html>.
- Shchelkunov, M.D., V.M. Bukharaev and D.I. Lukshin, 2014. KFU: from idea to practice: Kazan Federal University as the center of education modernization in Tatarstan. Kazan: The Publishing House of Kazan University, pp: 100.
- Tarde, G., 1903. The laws of imitation. Henry holt and company, pp: 404.