IS SMARTNESS THE PRIVILEGE OF CITIES? PILOT DEVELOPMENT AND APPLICATION IN THE HUNGARIAN-SLOVAK BORDER REGION

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Abstract

The objective of the article is to present a new conceptual approach towards the 'Smart City' concept and a potential pilot application focusing on smart rural communities in cross-border environment. The scientific approach is based on the basic concepts of 'smartness' but introduces a new conceptual avenue in connection to small rural communities. The research generally focuses

on mid-size and large cities and discover several aspects of smartness that are connected to size, number of inhabitants, functions and large-scale infrastructure as prerequisites.

The originality of the current paper is twofold as on the one hand it examines the concept of smartness from a yet understudied perspective that is the characteristics and opportunities of small communities,and on the other, it examines the potential adaptation of the concept in a cross-border environment. The presented conceptual model and the pilot application can contribute to policy recommendations and specific interventions in the future and to increased awareness and interest in 'smart ruralism'.

Keywords: smart cities, smart communities, cross-border environment, analytical and empirical research, conceptual model and pilot development

JEL classification: Q01, P25, O18

1.Introduction

Global tendencies represent new challenges to all communities, independently from their size, position in settlement hierarchy or geographical location. Answering these challenges is particularly difficult for small communities at both social, economic and individual levels. Research in the field of 'smartness' generally focuses on mid-size and large cities and discover several aspects of smartness that are connected to size, number of inhabitants, functions and massive 'hard' physical infrastructure as prerequisites.

The main objective of becoming 'smart' is efficiency and technology-related. Our basic concept is that 'smartness' is not the privilege of cities and even rural areas and small settlements can break out from their lock-in situation through activities based on endogenous development and smart communities, instead of placing and connecting ICT systems and infrastructures or promoting intensive industry settlement. We focus on the development of the local 'soft' elements and aim to generate 'smart citizens' instead of 'smart infrastructures and systems'. Thus, the current paper examines the concept of 'smartness' from a yet understudied perspective that is the opportunities of small rural communities in a disadvantaged cross-border environment. Cross-border approach is needed because given the current focus on cities in cohesion policy (Józsa, 2016) when conceptualising 'smart' settlements, national/regional/local level initiatives could further increase regional inequalities that is not an objective neither at policy, nor at project level. By the application of a project-level, case study methodology, research findings will shed the light on the opportunities of small rural settlements and their groupings to become 'smart', a question that has been rarely addressed and analysed before. The geographical focus of the research is a

disadvantaged area in the Slovak–Hungarian border region that could be characterised as 'the periphery of the periphery'.

Economic and social indicators at county and micro-regional level are worsening (eg.: GDP, (un)employment, migration, shrinking communities, inefficient use of natural resources, education level, value-added) despite former, traditional rural development interventions.

Conceptualisation and operationalisation of the ‘Smart City’ concept in case of small rural communities in a real-time cross-border environment are original contributions to the state of the art. On the other hand, our concept builds on two main tendencies in connection to rural areas and industrial processes. Regarding rural areas, there is an attitude and mindset change as former agricultural and underdeveloped character is more and more alternated by a liveable, healthy and innovative character, symbolized by keywords as ‘glocalization’ and ‘rurbanisation’. Regarding industrial processes, Web 2.0, Globalisation 3.0, Industry 4.0, the Internet of Things (IoT) and increasing digitalisation are global trends that shape our future and could generate more flexible employment opportunities to citizens of small rural communities.

Traditional rural development interventions applied in the past decades could not achieve significant results or impacts. The current research and the developed conceptual model are matchmaking tools between local and global processes and constitute an unique opportunity to introduce a radically innovative approach in this disadvantaged cross-border area that could generate a new development path to the regions. It builds on the development of the ‘soft’ elements rather than the digitalisation and connection of large infrastructure systems. The conceptual model could be adapted in a test environment in the cross-border area in the form of a pilot project (maybe as an inter-regional cooperation initiative) and based on the results it could be disseminated as a good practice to other rural communities in the Central and Eastern European Region.

2. Literature review

Smart, creative, sustainable or liveable cities are keywords in contemporary urban management language, framing how cities are understood, conceptualized and planned (Söderström et al., 2014). Literature on smart cities can be divided into two main categories as studies focusing on the technological side seeking to develop smart technologies for cities (Bakici et al., 2013; Paskaleva, 2011; Rat-Fischer et al., 2012), and studies defining the smart city as an assemblage of technologies (Allwinkle-Cruickshank, 2011; Caragliu et al., 2011).

Simplifying urban challenges and questions to binary language and engineering problems is quite common. These could be solved with the three Is of IBM (Instrumentation, Interconnection and Intelligence) which reduces the necessary expertise to data mining and programming.

Critical literature is relatively rare and has been developing from 2011, except for Hollands (2008) who pointed out some negative effects of the development of new technologies on cities, such as growing social polarization. Recently, Söderström et al. (2014) traced the emergence of the term 'smart city' in the public sphere and examined and described in detail IBM's influential and global story about smart cities and the way how the company attempted to become an 'obligatory passage point' or OPP (Callon ,1986) in the transformation of cities into 'smart' ones. The authors claim that the 'Smart City' concept is based on the problematization of the situation of the cities, then comes the presentation of the only solution and the OPP that is unavoidable.

Even critical literature has not yet paid too much attention to two basic questions. The first one is the fact that 'smartness' is not the privilege of cities but small rural communities can also become 'smart' settlements through investment in and focus on 'soft' elements with a citizen-based approach instead of 'hard' infrastructure. The second one is that in the new, networked economy, although cities are the nodes of the economic network, they can not and should not be handled separately from their agglomeration and rural environment. If we close the 'circle of smartness' with the administrative borders, system-level operation would be negatively affected and inequalities between the city and its surrounding would even increase instead of stabilization and equalization.

As a very relevant literature for the current research, Vanolo's (2014) paper should be highlighted that shifted the focus from 'data to citizens' to the shaping of 'smart citizens' who are technologically literate. The author calls for 'smart mentality' instead of (or complementary to) algorithms.

This is the research avenue that we follow in our research. If there is smart urbanism, is there smart ruralism too? If we move back to the origins of the smart city concept, that is the creation of new relations between technology and society, we can conclude that this could be possible in rural communities also. What is the reason for not involving rural communities in the 'smarting up' process worldwide, then? One possible reason could be that there is no interest in the 'smarting up' of villages based on the new 'economy of worth' (Boltanski-Thévenot, 2006).

The other reason could be that it is much simpler to translate the operation of infrastructures into binary language than the actions and expectations of citizens. The most popular 'smart' models take for granted the existence of (large-scale) infrastructures. Sustainability, eco and smart homes, bio-farming, self-sustaining, optimization and automation could be easily managed in rural

communities also, sometimes even easier than in case of large, overcrowded urban public utility, transport and housing infrastructure. Based on the example of recent critical work exploring some alternatives for urban futures (Townsend, 2013),we would like to present an alternative for rural communities in the followings.

3. Concept and methodology

The overall objective of the research and the model development is to generate a significant contribution to enhanced intellectual property in the cross-border area of Southern Slovakia and Northern Hungary and thus, to provide a new development path to the disadvantaged area through the development of 'soft' elements of smartness. The objectives are based on major, structural problems and challenges of the target area and on global (industrial) trends such as Industry 4.0 and the Internet of Things (IoT).

The relevance of the research is supported by the continuously decreasing economic and social county and micro-regional level indicators (eg.: GDP, employment/unemployment, inhabitants, shrinking communities, inefficient use of natural resources, education level) despite of former, traditional rural development interventions. Industry settlement (eg.: manufacturing industry) is not a realistic option that could lead to the necessary structural changes in the area, but a new, radical approach is required.

This new approach, based on increased 'smartness' of local communities, is introduced in the current paper. Instead of focusing on the development and integration of large-scale physical infrastructure, the current research focuses on 'soft' elements and aims to generate a mindset change in the local population from early childhood. Thus, the developed model could provide real, practical alternatives for the socially marginalised inhabitants in the border region.

In the worldwide model of IBM, the city is based on three main pillars as planning and management services; infrastructure services; and human services (people). These main pillars are sub-divided into others, in case of human services these are social programs, education and healthcare. In our conceptual model, we focus on this third pillar, namely people, and on social programs and education as sub-pillars. We do not question that a city is a 'system of systems', but state that (1) a city as a system should be examined and handled in connection to its environment (rural surrounding), and that (2) small rural communities can be 'smartened up' also.

Systems thinking should go hand in hand with network thinking. As Mehmood (2010) quotes Churchman (1968) there are four different approaches in systems thinking as efficiency, scientific, humanistic and anti-planning. In our conceptual model, we prioritize the humanistic approach over the efficiency approach which recently is the most popular.

Specific objectives of the developed concept model are:

- rehabilitation of the environment and economy of rural communities (local settlements and their agglomeration) with the generation and propagation of local sustainable employment;
- establishment and operation of a long-term knowledge (intellectual property) attraction and integration programme with the involvement of external and internal actors;
- development of the attitude of local civil communities (inhabitants) with the elaboration and dissemination of new life career models, options and new conceptual avenues, mainly in the field of sustainability and information and communication technologies.

Cross border cooperation is needed for three basic reasons:

- same problems, challenges, and characteristics that generate the need for common solutions;
- the critical mass of resources could only be ensured through cross-border cooperation considering Nógrád county' relative size, position and hierarchical situation;
- the sustainability and international visibility of the research results and the model could be significantly increased by the application of the economies of scale in the cross-border area.

4. Results and discussion

Basic statistical data and characteristics of the examined area

The examined area can be characterised as 'the periphery of the periphery'. The concerned NUTS3 level territorial units belong to the least developed areas of the EU based on almost all indicators, such as GDP/capita, unemployment, migration, low education level of population and intellectual capital. A short, non-extensive status report:

- depressed former industrial area in crisis;
- low foreign direct investment attractiveness;
- low number and share of the area from EU co-financed initiatives;
- small number of large companies, SMEs are lacking capital;
- dissolution of traditional communities and cooperation systems;
- migration of the young and talented people, ageing population and marginalised groups;
- very low level of integration, cooperation or networking;
- the lack of higher education institution in Nógrád county;
- the lack of intellectual property and well-trained population.

The negative spiral of the cross-border area is worsening year by year and the lock-in situation can not be replaced with new development paths.

The Hungarian-Slovak is one of the longest internal land-locked borders of the European Union, with a total length of 679 km (INTERREG, 2016). Although the border area is extremely heterogeneous considering its economic and social situation, the geographical scope of the research constitutes a homogenous unity as regards its geographical, economic, soci(et)al, cultural, historical and environmental characteristics. This homogenous area could be developed in the most efficient way with a joint strategy and joint interventions.

A good example for this kind of cooperation was the preparation of the Cross-border Regional Innovation Strategy in the 5th EU Framework Programme, that resulted in several more successful initiatives as a spillover effect. EU level policies (the 'Four Freedoms') and global tendencies (globalisation) point to the same direction: the connecting function of national boundaries instead of the separating one.

A further speciality of the border region is the significant Hungarian ethnic population on the Slovak side of the border and the increased integration of the population and the economic actors. More than 30 thousand employees from Slovakia work in Hungary, and commuting vice-versa through the border is a common practice. Agglomerations and gravity areas of the two country capitals and the commuting area of the largest employers go beyond the borders. Shopping tourism flourishes and due to common past, there are also family and friendly relations (Hardi, 2008).

We examined three NUTS3 level regions ('megye' in Hungary, 'kraj' in Slovakia) as Nógrád county (HU313) in Hungary, and Banskobystrickýkraj (SK042) and Košickýkraj (HU032). The population of these areas is 1,643,620 inhabitants and except for Kosickykraj, it shows a decreasing tendency (Table 1).

Table 1: Population in the examined NUTS 3 regions (on 1 January, in number)

Area/Year	2014	2015	2016
Nógrád	198 392	195 923	193 946
Banskobystrický kraj	656 813	655 359	653 024
Kosický kraj	794 756	795 565	796 650

Source: Eurostat, 2017

The area of Nógrád county is 2,544 km^2 (the second smallest county in Hungary), Banskobystrickykraj 9,454 km^2 (the largest from the 8 regional municipalities in Slovakia) and Kosice kraj 6,754 km^2, a total of 18,752 km^2 (Figure 1).

Figure 1. Presentation of the examined area

Source: own compilation based on INTERREG V-A Slovakia-Hungary Cooperation Programme, 2017

With regards to population density, we experience the same tendency whereas Banskobystrickykraj has the lowest density and only Kosickykraj exceeds the national and the EU level average data (Table 2).

Table 2: Population density by examined NUTS 3 region (per square kilometre)

Area/Year	2011	2012	2013	2014	2015
Nógrád	78,7	79,3	78,4	77,5	77
Banskobystrický kraj	69,9	69,7	69,6	69,4	69
Kosický kraj	117,2	117,5	117,6	117,7	118

Source: Eurostat, 2017

Regarding the Gross Domestic Product (GDP) in the examined NUTS3 areas, Nógrád has the lowest data that is the lowest in Hungary also, and although the two examined Slovak regions are also below the national average, their data are two times higher than Nógrád county's figure. We can add that the national average data of Hungary and Slovakia are about 50% of the EU average (Table 3).

Table 3: Gross domestic product at current market prices by NUTS 3 regions(in Euro/inhabitant)

Area/Year	2011
European Union average (28 countries)	25,100
Hungary average	9,900
Nógrád	4,400
Slovakia average	12,800
Banskobystrický kraj	9,000
Kosický kraj	9,900

Source: Eurostat, 2017

Pilot model development

'Smart' development of rural communities is not in the specific focus of any policy. On one hand, 'smart' policies focus on medium or large cities, while traditional rural development initiatives focus either on exogenous or endogenous development, such as foreign direct investment and low-cost employment mainly in the manufacturing sector.

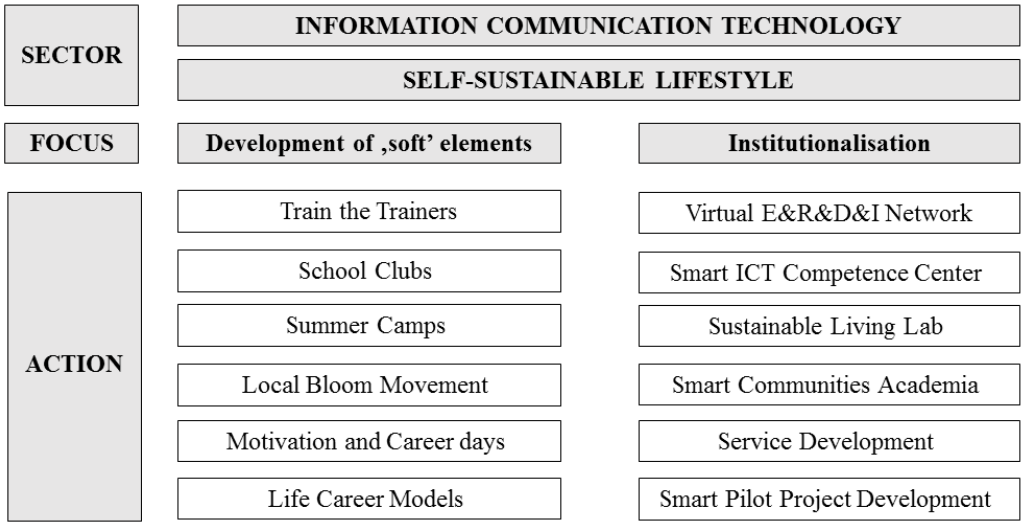
Our model matches endogenous and exogenous development; local specifics and global tendencies. We focus on higher local level resiliency, intellectual capital and attitude change from the childhood, that could result in higher employability in the mid-term. Rather than investing in infrastructure development we focus on investment in local human resources, and we do not aim to attract industry settlement but to attract intellectual capital instead. Thus, our model can result in higher efficiency in a sustainable manner.

The main intention of the research and the developed conceptual model is to change the situation of the 'soft' elements, with special respect to local citizens in a way that generates increased resiliency of local communities and individuals. A high percentage of local inhabitants is socially marginalised local population in the 3 examined counties/krajs of the cross-border area. Roma population constitutes a significant proportion, and the focus of the developed conceptual model is on population between the age of 5-18. A test environment should also be identified as implementation site of the pilot model including a few villages on both sides of the border, 3-4 microregions in total. During the development of the conceptual model we followed a citizen-focused approach.

The main activities of the model could be grouped into two main domains as (1) development of the soft elements and (2) institutionalisation that includes some small-scale infrastructure development (eg. hardware purchase, a living lab and a competence centre) also. Institutionalisation is important as a separate sub-pillar as it ensures the sustainability of the results of the application of the conceptual model in real-time environment. For each main domain, we specified six actions that aim to include the local inhabitants from a very early age. We hypothesize that through the involvement of the young generation, the adults - as relatives - could be also approached and involved.

We identified two main sectoral focuses based on global tendencies and the main characteristics of the area as (1) Information and Communication Technologies and (2) Self-Sustainable Lifestyle (Figure 2).

Figure 2: Conceptual model of Smart Rural Communities Development



Source: authors' compilation

The starting point of the model is in the junction of global and local level tendencies as

- global level: intensive industry settlement is not a realistic option for the examined area and with special respect to industrial tendencies as Industry 4.0 and connected digitalisation, Internet of Things (IoT), technologically literate workers will be the most important assets in the next decades, and distant working (teleworking) will become more and more popular;
- local level: with the long-awaited accessibility of ICT tools and high-speed internet connection in the rural areas, teleworking opportunities and innovative and flexible employment solutions will outperform the 'traditional' infrastructure and workplaces that could ensure more equal opportunities for marginalised groups for higher and sustainable living standards, employment and becoming a 'smart' citizen.

Thus, there is a clear need for intervention at local level to create the necessary connection between ICT and local society. Another intervention should aim higher awareness towards (self)-sustainable living style and environment. As there is a strong need for attitude change, the primary target group of the interventions should be the young generation starting from early childhood, meaning primary school students and kindergarten children, if possible.

The model's two focus areas (as development of soft elements and institutionalisation) are strongly interconnected. In the followings, we describe the specific actions of the model. As local communities do not have the competence to generate and implement these interventions, the attraction and involvement of external actors are necessary.

These organisations and individuals should not be technology providers - as the aim is to invest in human and intellectual capital - but knowledge providers, such as secondary and higher education and research institutions. These actors should work together with local civil actors, associations, government, primary schools, kindergartens and committed individuals and should form a sustainable, preferably institutionalised network of knowledge and competence. This element of the conceptual model is called the Virtual Education & Research & Development & Innovation Network. This is a prerequisite for further actions.

The first major step in the development of the 'soft' elements is to establish the local knowledge and competence base in the two selected sectoral areas (ICT and sustainability) through 'Train the Trainers' activities (Action 1) that focus on primary school teachers. These local actors can start knowledge transfer activities through the coordination of school clubs (Action 2) and summer camps (Action 3) for the period when there is no education activity. The target group for these activities is children between the age of 7-14.

The second step is the organisation, launching and operation of a mentoring scheme called Local Bloom Movement (Action 4) that links college/university students (eg. from Szent István University and the Technical University of Kosice) and children in the disadvantaged area, living in socially marginalised families. In the framework of the mentoring activities, a bilateral relationship should be established and maintained between the students and the children (Szabó et al., 2009) and they can interact continuously through the usage of ICT and in person, in the form of sessions, study visits, competitions and special courses. The target group for these activities is the children between the age of 11-17.

As infrastructural background for the specified activities, a small-scale, targeted local infrastructure development is necessary, including the purchasing of the necessary ICT tools for the school clubs and the summer camps and the formation of an ICT Competence Centre on both sides of the border (Filakovo and Salgótarján) and a Sustainable Living Labin a small village next to the border (Somoskőújfalu) that could be easily approached by all targeted inhabitants.

The third step in the development of the soft elements is the organisation of Motivation and Career Days (Action 5) and the development and presentation of Life Career Models. The target group for these activities ranges from the age of 5 to 99 as we expect to include through the young generation their adult relatives also.

Regarding the sustainability of the model and institutionalisation, in order to attract intellectual capital and to position the border region on the global academic landscape, a Smart Communities Academia would be organised in the examined and targeted area.

In the framework of this event external and local actors from academia to civil actors, practitioners and local inhabitants could meet and exchange ideas, and research results (for example the results of an attitude survey of the inhabitants in the test environment), and the specific results of the application of the pilot model could be presented and disseminated.

In parallel, service development includes the development of all connected education and training materials, software, models. The development of smart pilot projects ensures the elaboration of further pilot actions to go along on the development path introduced by the pilot model and to sustain the achieved results.

Impact assessment and synergies

The research and the developed conceptual model contributes to the achievement of the strategic EU 2020 targets, regarding smart and inclusive growth. In connection to these targets, based on historical links and geographical proximity, economic cooperation and joint R&D directions should be elaborated for the future in the Visegrad group (Káposzta-Nagy, 2015) and in the CEE region. Moreover, a particular synergy exists with the Smart Specialisation Strategies for Hungary and Slovakia, focusing on the creative industry area and involvement of young people in creative activities, and the development of their own business. Rehabilitation, catching-up potential and increased resiliency are prerequisites of measurable and sustainable results.

By the realisation of the conceptual model in a pilot environment we expect the following specific benefits:

- increased integration into global tendencies;
- strengthened consciousness, alternative options (life career models);
- openness towards new technologies and global trends as Industry 4.0 (teleworking, digital nomads);
- higher value-added and critical mass of intellectual resources (Virtual network);
- increased reputation and visibility of local social, economic and natural environment;
- higher attractivity of the area to all kind of investment (financial, human, intellectual).

Main mid-term impacts for the disadvantaged target group could be the followings:

- increased employment and employability in both qualitative and quantitative terms;
- advanced environment for sustainable (distance) employment;
- positive attitude change, strengthened consciousness and life-style;
- innovative ‘smart’ interventions for cross-border development;
- increased networking and internationalisation, community development.

5. Conclusion and directions for further research

The objective of the article is to present a new conceptual approach towards the 'Smart City' concept and a potential pilot application focusing on smart rural communities in cross-border environment. The geographical focus of the research is the disadvantaged area of the Slovak–Hungarian border region, that could be characterised as 'the periphery of the periphery' with continuously worsening economic and social indicators (eg.: GDP, (un)employment, migration, shrinking communities, inefficient use of natural resources, education level, value-added) despite former, traditional rural development interventions.

In line with recent critical literature, our concept focuses on the development of the 'soft' elements. We aim to shape 'smart citizens' instead of the most common efficiency and technology-oriented approach to the 'smart city' concept, that often tries to simplify local processes and challenges to binary language and engineering problems.

The paper poses two basic questions and targets to provide specific answers. The first one is that 'smartness' is not the privilege of cities but small rural communities can also become 'smart' through investment in 'soft' elements with a citizen-based approach, instead of focusing on 'hard' infrastructure. The second one is that in the new, networked economy, cities should not be handled separately from their rural environment.

With the presentation of a new conceptual model and its potential pilot application in a test environment, the research matches endogenous and exogenous development; local specifics and global tendencies. Based on the developed conceptual model, potential directions for the socially marginalised inhabitants in the examined area are the combination of local food industry and agricultural innovation, or the combination of ICT with liveable environment. Both directions require investment in human capacity and ICT.

The research and the model both focus on higher local level resiliency, intellectual capital and attitude change from the childhood, that could result in higher employability in the mid-term and thus, more sustainable and 'smarter' rural communities. Directions for further research with an applied character are the widening of the geographical scope by the practical adaptation of the model in other areas, and the widening of the sectoral scope to other elements of 'smartness'.

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