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Challenges to the measurability of social innovation
Examination of social innovation processes in the Nyírbátor district

Theses of doctoral (PhD) dissertation



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Miskolc, 2020

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I. Explanation of the topic choice

The national and international literature pays increasing attention to the research of social innovation and its impacts. Among the areas to be examined, I deal with **the issues of measurability** within the framework of the doctoral dissertation. The conceptualization of social innovation, the determination of the logic of the social innovation process and the definition of its measurement levels, and modeling based on empirical research are relevant challenges. However, the different sources dealing with the topic examine these issues in a different approach.

In my research, **I was motivated by my personal interest in the topic**. Participating in grassroots social endeavors, supporting disadvantaged communities, and encouraging innovative collaborations and solutions are very close to my mindset. I come from one of the most disadvantaged districts of Szabolcs-Szatmár-Bereg county, as a volunteer I am currently participating in the development processes supporting the settlements of the district. I am primarily involved in helping the career guidance of disadvantaged young people, but I also deal with segregation challenges. My **research credo** is the identification and comprehensive examination of community needs and responses focused on the concept of social innovation through **participatory research**. Meeting the needs of the community is at the heart of social innovation processes, emphasizing the societal benefits of innovative ideas in problem solving that can be interpreted at the local and community level. Social innovation, in cooperation with technical innovations, is able to respond to local challenges at the community level, to find solutions to everyday problems, and thus to increase the well-being of the community. Innovations resulting from the expansion of innovative areas can be interpreted as complementary processes.

The research **examines the measurement possibilities** proposed by the European Union and determined at different levels of social innovation **in the disadvantaged Nyírbátor district to be developed with a complex program**. The examination of the measurement indicators preferred by the European Union includes the examination of the known indicators at the local and regional level, with a view to the indicators at the national level, and the analysis of their applicability within the disadvantaged district.

The aim of the research is to determine the levels of social innovation and the framework conditions of measurement at the local level, and to identify the logical process of social innovation. Within the framework of the research, I examine **social innovation as a process of creative cooperation**, during which I pay special attention to the analysis of social initiatives supported by local governments. The social innovation efforts presented in the framework of the dissertation are multi-stakeholder initiatives based on the involvement of the local population and the researcher. Their good practice analysis makes it possible to map the process of social innovation.

I use **quantitative and qualitative methods** in my research. By statistical analyzes and empirical data revealed by qualitative interviews based on inductive logic, the theoretical framework of each stage of the social innovation process is formed, thus **theory can be connected to practice**. Within the framework of the research, I reached the appropriate “theoretical saturation level” (Glaser-Strauss, 1967, Csedő, 2006). **The novel result of the dissertation is the definition of the adaptive model of the social innovation logic process and the local measurement methodology of the social innovation process**, after the critical analysis of the measurement methods of the European Union.

The identification of possibilities for measuring the social innovation process is justified in particular by the European Union’s cohesion policy, Horizon 2020 (FP8), which is the eighth framework program defining the EU’s research and development and innovation policy for

2014-2020, and the various societal challenges. One of the main objectives of the European Union is to increase the continent's global competitiveness, "smart, sustainable and inclusive growth" (EC, 2014, p. 7). The program connects research and innovation, with particular emphasis on the role of social innovation (in addition to technical and economic innovations), which also requires the definition of framework conditions for measurement. Many of the fundamental problems of the economy and society, such as depopulation, unemployment, migration or lagging regions, require long-term solutions that makes innovative cooperation between societal actors, the direct voluntary participation of citizens in decision-making processes, and the implementation of social innovation efforts essential.

The Nyírbátor district is a district to be developed with a complex program, which, due to its peripheral location, is not or only less characterized by technical innovations. In the core areas, technical and economic innovations can be a solution to develop quality of life, but in lagging, peripheral areas it is necessary to encourage new initiatives based on social innovation. Reducing regional differences and increasing territorial competitiveness are decisive factors in the innovation processes of particular settlements, the emphasized role of which is indisputable. Social innovation can be identified as one of the possible means of catching up for the lagging settlements and districts.

The dissertation depicts exploratory research based on inductive logic, which helps understand the research problem in detail. Within the framework of the dissertation, **in addition to conceptualization issues, I deal with a novel methodological approach in social innovation research and the study that validates it.**

I. 1. The aim and process of the research

During the preparation of the dissertation, I formulated a multi-level target system. The main aim of the research is to examine the indicators defined on the basis of the European Union directives, which help measure the social innovation process at several levels, and to identify the logic of the social innovation process. A further aim of the dissertation is to study the complex social innovation of particular settlements of the Nyírbátor district. In the study, I used participatory action research that results in social change affecting the community. Within the framework of the research, I performed a combination of quantitative and qualitative methods based on the technique of "triangulation". As a "triangulation of measurement" (Webb et al., 1966, Balaton-Dobák, 1991), the given problem can be analyzed in different ways, using several data sources and methods, and the validity of the conclusions can be increased.

In the case of the examined Nyírbátor district - in addition to the spatial statistical methods - I examined my hypotheses by an interview based on inductive logic and by the methods of participatory action research (observation, document analysis, case study). I considered the method of participatory action research to be extremely important based on the specific characteristics of the topic and the examined district. The study of social innovation processes clearly showed that the successful implementation of each endeavor is inconceivable without the active participation of the local population. The basic goal of the initiatives is to raise the standard of living, to meet the needs of the community through innovative collaborations, which requires an examination of the attitude of the local population and conscious participation in local decisions.

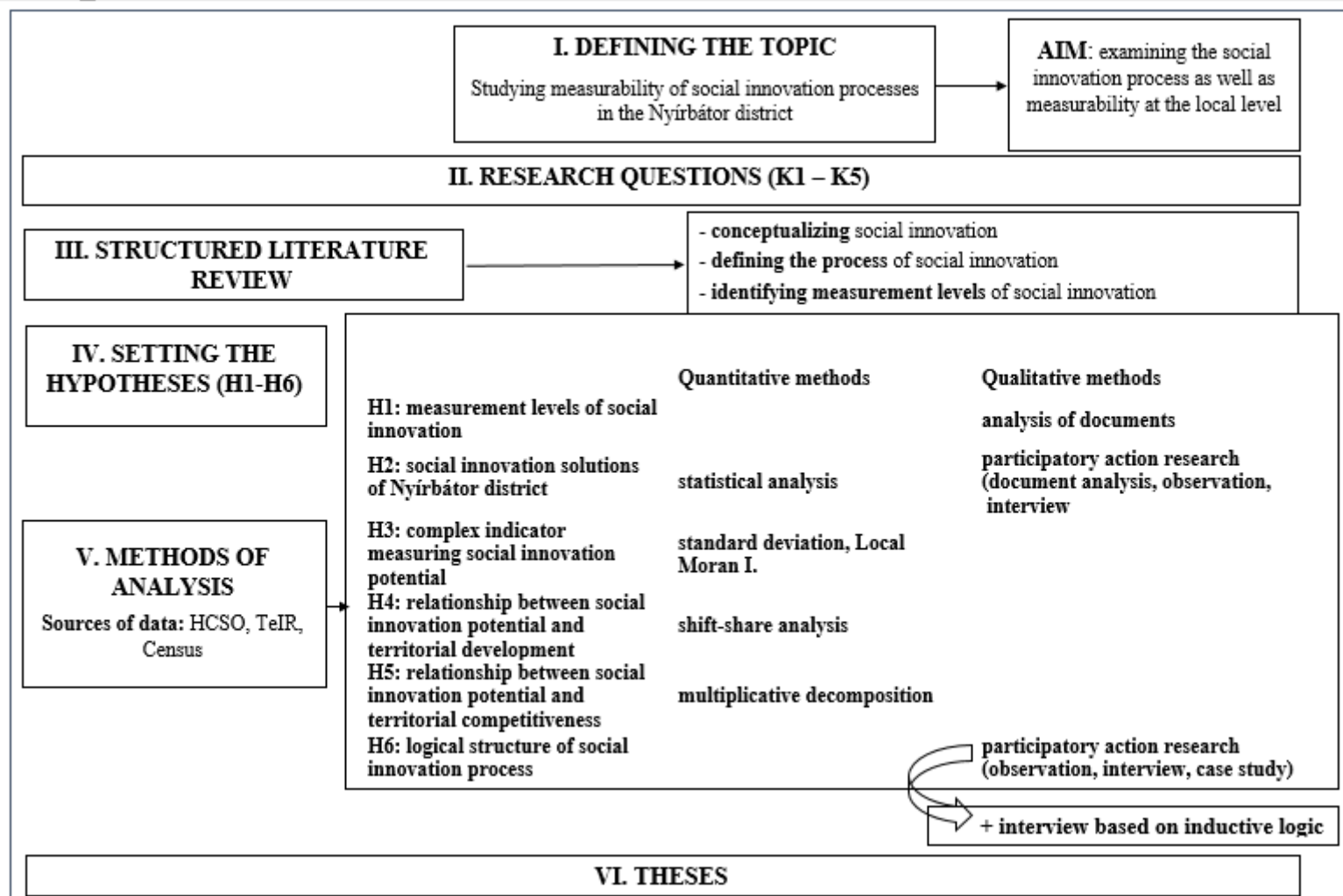


Figure 1 Research process, related hypotheses and research methods
Source: own compilation

In addition to involving the population in decisions, as a researcher I also participated in the social aspirations of the particular settlements of the given district, not only as an observer, but in close cooperation with the participants in the research. In contrast to the traditional researcher attitude and duties, we carried out the pre-defined research tasks, the planning and implementation of social innovation initiatives together with the individuals and organizations involved in the research.

The logical structure of the research is illustrated in Figure 1. In the literature review, I describe the conceptual definitions of social innovation and the process of theory formulation. I examine the common characteristics and differences of social and technical innovations, and the relationship between innovations. I review the key factors in the process of social innovation, and examine the levels and implementations of social innovation at the different levels. The literature review identifies the measurement methods proposed by the European Union at the local, regional and national levels.

In the following chapter of the dissertation, within the framework of a comprehensive analysis, I describe the factors influencing and reflecting the innovation capacity of the Nyírbátor district to be developed with a complex program. After the statistical analysis - based on previous literature and the cooperation with the supervisor - I determine the social innovation potential of the settlements of Nyírbátor district and its wider environment, Szabolcs-Szatmár-Bereg county. Using a complex indicator of social innovation potential, I examine the extent to which the most important territorial processes are related to the situation defined by the indicator in the county. I put special emphasis on the relationship between social innovation and competitiveness.

Examining and measuring social innovation initiatives is greatly supported by learning about good practices and recording them as a case study. When examining the district, special emphasis is placed on examining (primarily) municipal good practices and their role in generating further innovations. I identify opportunities and constraints related to their transferability that generate further social innovation. In the research, I examine the differences that can be identified between statistical analyzes, and interviews and observations.

The exploration of each social innovation endeavor is carried out through case studies as well as through interviews based on inductive logic, during which it is possible to derive the theory from practice. After reaching the “appropriate saturation level” (Glaser-Strauss, 1967, Csedő, 2006), I identify an adaptive model of the social innovation process.

I. 2. The main questions of the research

General (primary) research questions:

1. How can the logical process of social innovation be characterized and structured?
2. How can social innovation be measured at local, regional and national levels, and how can the interdependence of each level be characterized?

Specific (secondary) research questions:

3. Can the indicator measuring the social innovation potential of the settlements of Nyírbátor be defined and, if so, how?
4. What is the relationship between the settlement social innovation potential of the Nyírbátor district and the territorial development?

5. What is the relationship between competitiveness and social innovation in relation to a settlement in the Nyírbátor district?

I. 3. Hypotheses of the research

I started my research by examining the following conditional statements:

H1: There is no commonly accepted methodology for measuring social innovation at the local, regional and national levels in the literature, the indicators involved in the measurement are diverse, however, the measurement methods are interconnected in a hierarchical system.

To test my hypothesis, I performed an analysis of documents.

H2: Based on the examination of the factors reflecting and influencing the innovation capacity of the Nyírbátor district, the region needs generally applied and specific social innovation solutions.

I tested my hypothesis by the methods of statistical analysis and participatory action research (observation, document analysis, interview).

H3: In the case of settlements (micro-level social innovation) a system of indicators can be defined, based on which an indicator of social innovation potential can be created.

To test my hypothesis, I performed a systematic literature review and analysis, and calculated a complex indicator.

H4: In the case of the settlements of Nyírbátor district and its wider environment, Szabolcs-Szatmár-Bereg county, there is a diverse, complex relationship between the social innovation potential and the territorial development conditions. The development of a settlement is mainly influenced by the spatial structure, to which the social innovation potential contributes.

To test my hypothesis, I calculated the standard deviation for each settlement, quantified the Local Moran indices, and used shift-share analysis to analyze the spatial and structural impacts.

H5: With regard to the Nyírbátor district and its wider environment, Szabolcs-Szatmár-Bereg county, the size of the social innovation potential is a determining factor for the competitiveness of a settlement.

I tested my hypothesis by the method of breaking down into multiplicative factors.

H6: The process of social learning is linked to the process of social innovation. Social learning is a precondition and at the same time a result of the change (learning) process. The analysis of good practices in social innovation makes it possible to define an adaptive model of the process.

I examined my hypothesis by the methods of participatory action research (observation, document analysis, case study) and by an interview based on inductive logic.

II. Theoretical basis of the research

II. 1. Relationship between types of innovation

Based on the literature review, it can be stated that social innovations are inseparable from technical innovations, innovations can be interpreted as complementary processes (Drucker, 1985; Freeman, 1988; Bulut et al., 2013; Kocziszky et al., 2015; Varga, 2017). New innovative bases, such as the field of social innovations, help implement and be effective in technical innovations, while at the same time increasing each other's strength to respond to the current challenges of society (Varga, 2017). Successful implementation of social innovation depends on cultural acceptance, economic sustainability, and technological applicability (Bulut et al., 2013). Together, technical and social innovations are able to ensure the well-being of society. All types of innovation have social implications, different types of innovation interact with each other and lead to the transformation of economic and social relations. According to Bulut et al. (2013), social innovation has a direct impact on technical innovations as it can bring about change in education, health care, employment, and social development in general. In this sense, social innovation is complementary to and a driving force for technical innovation.

II. 2. The evolution and challenges of the social innovation concept

The development and theory formulation of the concept of social innovation started in the middle of the 18th century (Figure 2). Social innovation issues appeared in the pope's encyclicals, in the reflections of sociologists and philosophers, and later in the studies and expert works of academic researchers, non-governmental organizations, governmental and intergovernmental bodies. The first phase of the evolution of the concept (18th-19th centuries) is based on ecclesiastical teachings and sociology, and can be identified as a preliminary stage, the demarcation phase of the concept. In the next stage (20th century), the theory of innovation, the separation of technical, economic and social innovations, becomes emphasized. In the first decade of the 2000s, the importance of solutions that meet the needs of society, innovative ideas, and the phase of innovative collaborations increases. From 2010 onwards, the study of social tasks based on the involvement of the individual and the study of social processes that increase well-being has been emphasized, along the process-oriented approach.

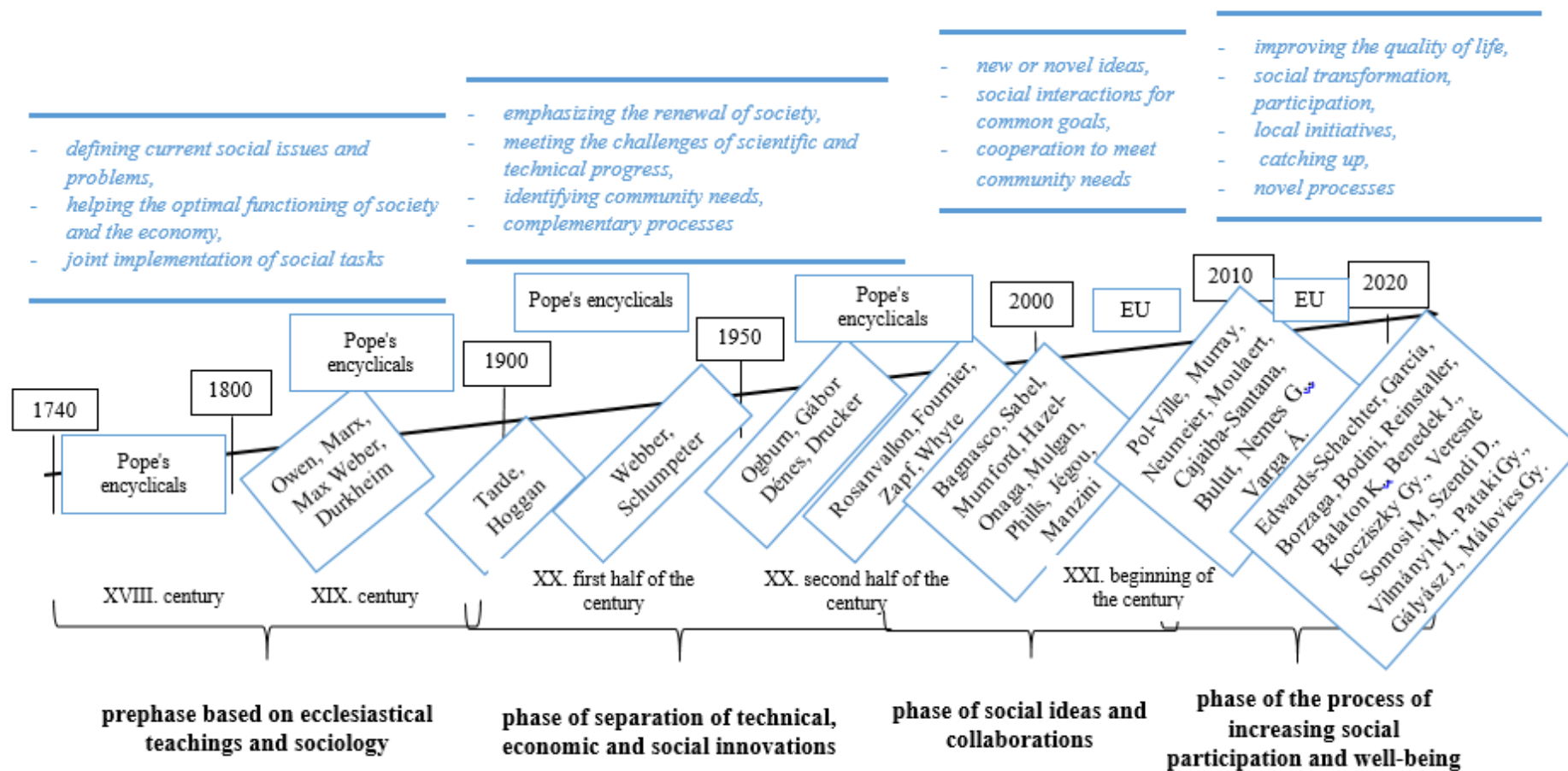


Figure 2 Conceptual evolution of social innovation
 Source: own compilation (based on literature review)

The number of studies related to social processes and innovation activities has been steadily increasing since the 1970s. The number of publications providing theoretical and practical guidance on social innovation increased significantly in the 2010s. There is currently no commonly accepted definition of social innovation (Moulaert et al., 2005, Mulgan et al., 2007, Pol-Ville, 2009, Rüede-Lurtz, 2012, Kocziszky et al., 2015, Balaton-Varga, 2017, Szendi, 2018, Eichler-Schwarz, 2019, Nagy-Tóth, 2019). The different approaches and meanings of the concept require a structured literature review according to the issues related to the main emphases, results, and process or result orientation.

The conceptual definition of social innovation requires a structured examination of the literature. During the systematic review, in accordance with the recommendations of the literature, I conducted the research according to the following steps (Kunz, 2003; Adams et al., 2016; Eichler-Schwarz, 2019):

- Phase 1: planning an overview,
- Phase 2: systematic examination,
- Phase 3: publication of results.

During the planning phase (Phase 1), I selected the chosen database (Scopus), which also required the examination of the definitions of social innovation included in the initial selection. The main goal was to examine a total of 200 definitions and approaches. After comparing the approaches examined during the initial selection and the studies available in the Scopus database, I determined the scope of the Hungarian language publications and EU guidelines to be included, as well as the inclusion and exclusion criteria. During the systematic selection phase (Phase 2), I examined the remaining studies after the removal of duplications under selection conditions. I evaluated the studies included on the basis of the full text, and summarized the results in the publication phase of the systematic research (Phase 3).

Table 1 Inclusion and exclusion criteria for the systematic literature review

Inclusion criteria	Exclusion criteria
Studies from 1970 to 2018	Studies before 1970, and after 2018
Publications in Hungarian and English language	Non-Hungarian or English language publications
The term “social innovation” in the title, abstract, and keywords	The term “social innovation” is not found in the title, abstract, keywords
Own definition in the text	

Source: own compilation

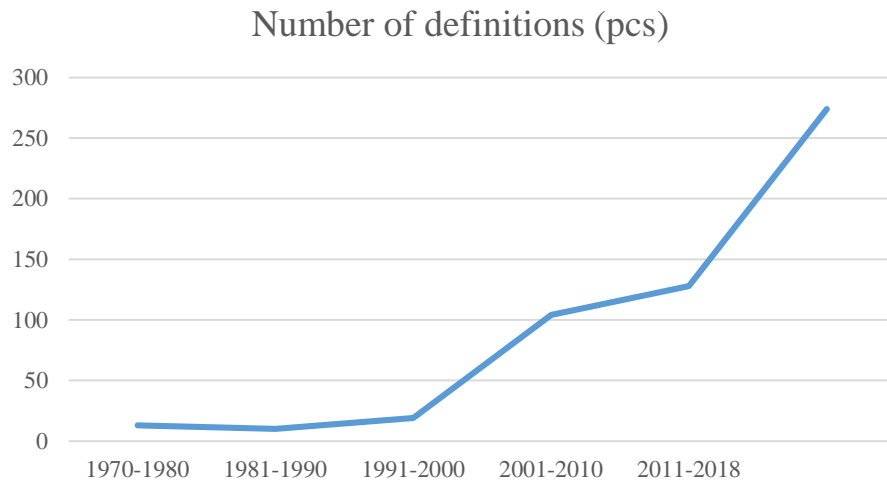


Figure 3 Increase in the number of social innovation definitions included in the study between 1970 and 2018

Source: own compilation

Based on the study, between 1970 and 2018, nearly 4,600 studies on social innovation were conducted based on the Scopus database, for which the term was included in the title, abstract, and keywords. I included 450 studies in the research, nearly two thirds of which were made in the last ten years (2008-2018). Within the framework of my research, I identified 262 studies containing independent definitions, which were supplemented with the definitions found in the examined EU guidelines and Hungarian language publications (the former means 1, the latter 11 definitions). In the research, I examined a total of 274 definitions, significantly (37%) exceeding the examination of the 200 definitions set as the initial goal.

After a systematic review of the literature and a complex examination of social innovation approaches, I consider the tendency that focuses on the process of efforts to increase social well-being to be significant. In my research, I identify social innovation as “providing new or novel responses to a community’s problems with the goal of increasing community well-being” (Kocziszky et al., 2017, p. 16). In addition to raising living standards, the emergence of new structures and the encouragement of society’s capacity for action are emphasized. According to my research, “social innovation is a process that increases the willingness of the community to act in the form of new or novel collaborations” (Balaton-Varga, 2017).

II. 3. The process of social innovation

Different actors are involved in each social innovation process, focusing on tackling different challenges with different solutions. The implementation of the micro-level social innovation initiative is an unforeseen process, during which a group of citizens and local inhabitants perform a simulation study of the new solutions. Social innovation is a dynamic process based on creative, proactive activities and resulting in complex outcomes.

After a structured examination of the literature, it can be stated that the models of the micro-level social innovation process are diverse and complex. After presenting and examining the models, and knowing the key factors of the social innovation process, I defined the process of social innovation, with the help of which I examined the social innovation aspirations of the Nyírbátor district.

Table 2 Models of the social innovation process

MODEL	AUTHOR	PROCESS				
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Basic model (3 steps)	Mulgan, G. (2006), Kunze, C. – Becker, S. (2015), Seyfang, G. - Longhurst, N. (2016), Hatzl, S. et al. (2016)	idea generation	innovation	sustainability, diffusion		
Extended model (4 steps)	Barroso, J. M. (2011), Reeder, N. et al. (2012) EC (2013), Bund, E. et al. (2013), Dainienė-Dagilienė (2016)	suggestions (brainstorming)	prototype (situation and risk analysis)	sustainability	performance evaluation	
Complex model (4 or 5 steps)	Tardif, C. – Harrison, D. (2005), Mulgan, G. (2010), Neumeier, S. (2012), Nemes, G. – Varga, Á. (2015), Baltazar Herrera, M. E. (2015), Edwards-Schachter, M. – Wallace, M. L. (2017), Döringer, S. (2017)	idea generation	prototype (pilot program)	diffusion, performance evaluation	adaptation (social learning)	
		situation assessment	idea generation	prototype	performance evaluation	institutionalization (social learning)

Source: own compilation (based on literature review)

When defining the adaptive process model of social innovation, I tried to integrate the key factors formulated in the literature into the model, but at the same time, with the help of interviews based on inductive logic, the factors that are prominent elements of the process in practice also appear. The results of the interviews also became part of the process model, thus making it possible to connect theory and practice.

The starting point of the models of the social innovation process is the response to the needs appearing in the society (idea generation), innovation as a transformation process, and sustainability and diffusion. In the case of extended models, feedback (performance evaluation) appears, which is supplemented by the processes of situation and risk analysis. Complex models in the process analysis pay special attention to social learning, which can be both a starting point and a result of social innovation.

III. New and novel findings of the research

The social and economic challenges of the 21st century go beyond the issues of previous innovation research and require a novel, well-conceived analysis of different types of innovation. Today's prominent innovation research also requires the examination of innovations related to social issues.

Based on the questions and guidelines on the measurement methodology of innovation (OECD, 1963, EC, 2006, 2012, Schmitz et al., 2013, Bund et al., 2015, Veresné Somosi-Varga, 2018), the definition of the measurement methodology developed very differently in case of scientific, technological and social innovation. A number of methodological recommendations have been made for measuring technical innovations (eg. the Community Innovation Survey, a biennial innovation survey in EU member states), but the framework conditions for measuring social innovation are not yet clear. The basic objective of the research is to define a measurement structure that can provide a micro- and meso-level measurement of the social innovation process and to analyze the relationship between each activity level. The measurement framework conditions are expected to allow the generation of social innovation efforts and the "transfer" of good practices that can be adapted to the most disadvantaged areas through the analysis of measurement results.

Defining a measurement structure for social innovation is a complex task that requires an examination of the opportunities and limitations offered by methodologies for measuring technical innovations. When measuring social innovation - in accordance with the systemic nature identified in technical innovations - the starting point is the definition of indicators and their identification as input, output and impact indicators.

Based on a review of the literature, it can be stated that social innovation efforts at the micro, meso and macro levels can be examined in a complex way, and the generation of measurement methods plays a key role in their measurement.

At the micro level, the examination of organizations implementing social innovation efforts and their network of contacts is essential. The number of measurements at the local level is small, although empirical examination of these initiatives is significant to increase the social innovativeness of local decision-makers in order to generate local-level initiatives.

At the meso level, social innovation initiatives of the area – which is the district as the subject of the dissertation - can be examined through network analysis. The measurement method at the regional level is expected to pay special attention to the collaborations and qualitative examination of the stakeholders of the social innovation process, in addition to the quantitative analysis.

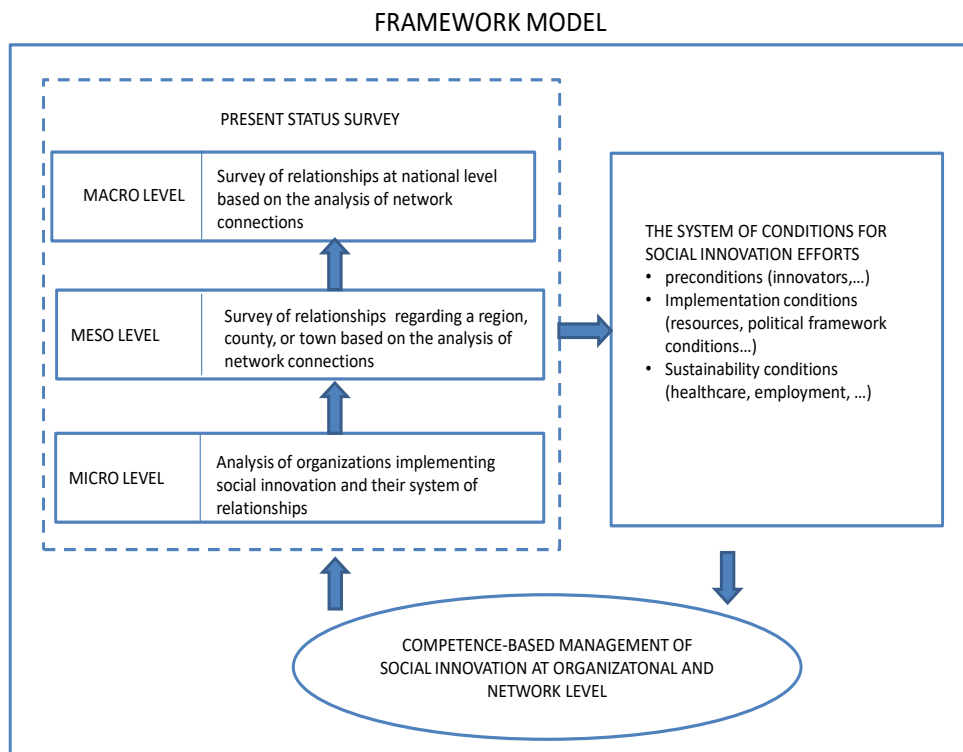


Figure 4 Examination of a multilevel social innovation process

Source: Veresné Somosi-Varga, 2018

In the case of examining macro-level social innovation efforts, the analysis of national contexts is essential. It is necessary to apply a measurement methodology at the national level, which - in line with the data available for the given country - is suitable for performing comparative analyzes.

The literature pays increasing attention to the study of social innovation potential due to its active contribution to competitiveness. Social innovation processes play a particularly important role in the catching-up processes of peripheral areas. Supporting the catching-up of disadvantaged areas is a key priority in the policy of the European Union, so many projects and research tasks are related to the identification of measurement framework conditions. Innovation is a key factor in reducing regional disparities (Nemes Nagy, 1990; Ewers-Brenck, 1992; Kocziszky et al., 2015; Szendi, 2018; De Palo, 2018; Widuto, 2019). Social innovation, based on socio-economic indicators, can be identified as a new tool and model for disadvantaged, peripheral regions, examining its process and defining its measurement methodology is especially justified in order to promote the overall harmonious development of the European Union.

Within the framework of the dissertation, I examined 4-4 methods from local, regional and national measurement methods. Based on the examined measurement methods at the local, regional and national level, it can be stated that several experiments can be identified, which focus on measuring the social innovation process and determining social innovation capabilities, however, there is no commonly accepted methodology. As in the case of the concept of social innovation, the examination of social aspirations and the definition of its measurement indicators require a comprehensive analysis. After reviewing the above methods, it can be stated that the methodology of measuring social innovation is based on the use of different indicators at different levels. Each method may vary from country to country, mainly

due to the different range of available data. There are general recommendations, however, which are mainly applicable to measurements at the national level. Most studies defining a method for measuring social innovation suggest examining case studies for micro-level measurement and a statistical study for analyzing macro-level aspirations. They emphasize the need to quantify the involved indicators, which, however, is not even possible at national level for some indicators (eg. volunteering). The use of different conceptual frameworks and the dynamic formation of different legal frameworks for organizations make it particularly difficult to define measurement methodology. The measurement method itself can also be defined as a result of a learning process.

The predominance of the examination of macro-level initiatives is still typical, but the methods aimed at quantifying the process and effects of local-level efforts are appearing with increasing intensity. A significant part of these calculations attempts to fit the indicators involved in the macro-level study to the local measurement. Based on the examination of the above methods, it can be stated that the different levels of measurement methods are connected in a hierarchical system, however, there is a difference in the case of indicators.

III. 1. A complex indicator measuring the social innovation potential

In defining the framework conditions for measuring the social innovation process, I attempted to use a measurement method for the Nyírbátor district as a synthesis of the methods examined in the research, which quantifies the social innovation potential of the particular settlements of the district. Few recommendations can be identified that are coupled with a specific calculation procedure at the local level, however, the studies of Kocziszky et al. (2015) and Szendi (2018) provided an adequate basis for answering research questions on measurement. The primary reason for this is that the mentioned studies focus on peripheral areas, which is a decisive study aspect in the case of the Nyírbátor district. In my research, based on the above studies and the proposals and methodology developed by my supervisor (Nagy-Tóth, 2019, Varga et al., 2020), I examined the social innovation potential of the settlements of Nyírbátor and its wider environment, its relationship with the statistical indicator and competitiveness. In the study, focusing on the process of social aspirations, I identified the input, output and impact indicators on the basis of which a complex indicator of social innovation potential can be determined. Social innovation potential, as highlighted in previous chapters, refers to the set of abilities that help create social innovations (Kocziszky et al., 2015; Szendi, 2018; Kleverbeck et al., 2019; Nagy-Tóth, 2019).

The system of indicators can be divided into input, output and impact indicators in accordance with the systematic nature of the social innovation process. In case of Szabolcs-Szatmár-Bereg county, especially during the examination of the Nyírbátor district, I included 8 indicators in each indicator group.

In order to thoroughly examine the ability to innovate socially, the following measures are justified (Nagy-Tóth, 2019):

- the source of the indicators is the database of the Central Statistical Office (2015-2018, except for the indicators from the last census)
- for indicators, a four-year average is included in the analysis, thus allowing for the elimination of year-on-year fluctuations,
- when compiling the system of indicators, it should be taken into account that the indicators do not point in the same direction, so in the case of indicators where a low value is favorable, the indicators should be reciprocally examined (eg. unemployment rate - lower value, or per capita amount paid - higher value means more favorable position for social innovation),

- normalization of indicators in the indicator groups is necessary in order to compare them to each other,
- in the measurement process, the average of the normalized data in the input, output and impact indicator groups is calculated,
- deviations from the mean (standard deviation) and Local Moran I clusters are presented to characterize the indicators.

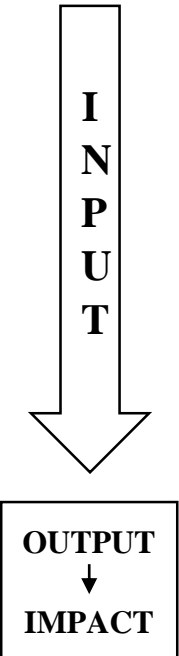
From the average of the input, output and impact indicator groups, a complex indicator measuring social innovation potential can be determined.

The calculation of the complex indicator requires the normalization of each indicator. I averaged the values of the indicators for each factor. From the average of the factors, the complex indicator can be determined with an arithmetic average. The method is the same as the Central Statistical Office’s calculation related to district development. The advantage of the calculation is easy interpretation and reproducibility. An additional advantage of the method is that it does not apply weighting (thus not highlighting any of the factors to the detriment of the others), which would open more criticism. The disadvantage is that in some cases it is not possible to determine which indicator played a decisive role in the development of the certain factors and the complex indicator.

III. 1. 1. Input indicators of the social innovation process

Input indicators measuring social innovation are indicators that are inducing factors in the social innovation process. The group of indicators can be quantified according to the following indicators divided into groups of factors (Benedek et al., 2015; Nagy-Tóth, 2019):

Table 3 Input indicators of social innovation

	FACTOR GROUPS	INDICATORS
	institutional factors	- - number of non-governmental organizations (pcs / 10,000 inhabitants)
	site factors	- number of active companies (pcs / 1,000 inhabitants) - number of non-profit organizations (pcs / 1,000 inhabitants)
	human factors	- proportion of children in the population (%) - elderly per 100 children (persons) - dependency ratio: children (aged zero to 14) and elderly (over the age of 65) as a percentage of the total population aged 15 to 64 - average number of completed classes (class)
	activity factors	- activity rate (taxpayers / population * 100;%)

Source: own compilation (based on Benedek et al., 2015 and Nagy-Tóth, 2019)

III. 1. 2. Output indicators of the social innovation process

Output indicators measuring social innovation are indicators that can be identified as a result of the implementation of the social innovation process. The group of indicators can be quantified according to the following indicators divided into groups of factors (Benedek et al., 2015; Nagy-Tóth, 2019):

Table 4 Output indicators of social innovation

	FACTOR GROUPS	INDICATORS
	economic factors	<ul style="list-style-type: none"> - payout per capita(thousand HUF) - ratio of public employees compared to the population aged 15-64 (%)
	cultural factors	<ul style="list-style-type: none"> - number of participants in cultural events (persons / 1,000 inhabitants) - proportion of people living in segregation (%)
	social factors	<ul style="list-style-type: none"> - number of persons receiving social catering service (persons / 1,000 inhabitants) - number of persons receiving home care assistance (persons / 1,000 inhabitants) <ul style="list-style-type: none"> - unemployment rate (%)
	health factors	<ul style="list-style-type: none"> - patient turnover per GP and pediatrician (persons)

Source: own compilation (based on Benedek et al., 2015 and Nagy-Tóth, 2019)

III. 1. 3. Impact indicators of the social innovation process

Impact indicators measuring social innovation are indicators that show the sustainability and long-term results of the social innovation process. The group of indicators can be quantified according to the following indicators divided into groups of factors (Benedek et al., 2015; Nagy-Tóth, 2019):

Table 5 Impact indicators of social innovation

INPUT ↓ OUTPUT	FACTOR GROUP	INDICATOR
↓ I M P A C T ↓ I M P A C T ↓	factors of social conditions	<ul style="list-style-type: none"> - per capita income (thousand HUF) - percentage of population with primary education over 7 years (including early school leavers) (%)
	factors of family relationships	<ul style="list-style-type: none"> - proportion of one-person households (%) - - proportion of families with three or more children (%)
	factors of sense of security	<ul style="list-style-type: none"> - - number of registered crimes (pcs / 1,000 people)
	social infrastructure factors	<ul style="list-style-type: none"> - number of beds in institutions providing long-term residential care (pcs / 1,000 persons)
	factors of living conditions	<ul style="list-style-type: none"> - proportion of taxpayers earning in the 0-1 million HUF income band (%)
factors of environmental conditions	<ul style="list-style-type: none"> - proportion of regularly cleaned public areas (%) 	

Source: own compilation (based on Benedek et al., 2015 and Nagy-Tóth, 2019)

To calculate the complex indicator, after the normalization of the particular indicators, the social innovation potential indicator can be determined on the basis of the arithmetic average of the average of the factors.

III. 2. Summary of research results - theses

I summarize the main results of the research along the hypotheses that serve as the starting point of the research. During the research I started from the following hypothesis:

H1: There is no commonly accepted methodology for measuring social innovation at the local, regional and national levels in the literature, the indicators involved in the measurement are diverse, however, the measurement methods are interconnected in a hierarchical system.

To test my hypothesis, in Subchapter III.4.3., **I performed an analysis of documents.**

Table 6 Methods included in the study measuring social innovation

	LOCAL MEASUREMENT	REGIONAL MEASUREMENT	NATIONAL MEASUREMENT
METHODS	Social Innovation Indicators (IndiSI)	Regional innovation capacity (IndiSI)	European Social Innovation Index (ESII)
	Social innovation capacity (Bund et al.)	Regional Vulnerability Index (SIMPACT)	Blueprint of Social Innovation Indicator (TEPSIE)
	Measurement of social innovation process according to TBL (Dainienė-Dagilienė)	Regional social innovation potential (Benedek et al.)	Measuring social impact (OECD)
	Complex social innovation index (Szendi)	Regional social innovation index (RESINDEX)	Social Innovation Index (SII, The Economist Intelligence Unit)

Source: own compilation

Based on the literature review, it can be stated that social innovation efforts at the micro, meso and macro levels can be examined in a complex way, during their measurement, the overlapping of the measurement methods plays a key role. The examined measurement methods at the local, regional and national levels focus on determining social innovation capabilities. Based on the reviewed methods, it can be stated that there is no commonly accepted methodology for measuring social innovation, and each method is based on the use of different indicators at different levels. Each method may vary from country to country, mainly due to the different range of available data. The predominance of the examination of macro-level initiatives is still typical, but the methods aimed at quantifying the process and effects of local-level efforts are appearing with increasing intensity. A significant part of these calculations attempt to fit the indicators involved in the macro-level study to the local measurement, however, specific calculations were made in only a few cases. Based on the examination of the above methods, it can be stated that the different levels of measurement methods are connected in a hierarchical system, however, there is a difference in the case of indicators.

Based on the study, **I accepted Hypothesis 1** and formulated the following thesis:

T1: Methods of measuring social innovation basically focus on measuring macro-level social innovation processes. Based on the local, regional and national level indicators used in the measurement methods, a set of indicators can be developed, which can be defined as the lowest common denominator of the different territorial levels. The amount, type and weight of indicators involved in the measurement of different levels of processes can be determined depending on the data that can be interpreted and available at the given level.

I examined the measurability challenges of social innovation processes in the disadvantaged Nyírbátor district. The starting point of the study was the assumption that it is necessary to encourage new initiatives based on social innovation in lagging, peripheral areas.

H2: Based on the examination of the factors reflecting and influencing the innovation capacity of the Nyírbátor district, the region needs generally applied and specific social innovation solutions.

My hypothesis presented in Chapter V.2. is tested by the methods of statistical analysis and participatory action research (observation, document analysis, interview). The Nyírbátor district is ranked 13th in the list of districts to be developed with the complex program, it includes three cities (Nyírbátor, Nyírlugos, Máriapócs) and 17 villages. Its complex indicator is 27.15, which is less than 60% of the average of 46.68.

Overall, the districts to be developed with the complex program are characterized by a higher proportion of children (0-14 years old) and a lower proportion of the elderly (60-x) (HCSO, 2016). The indicator measuring aging (the number of 60-year-old people per 100 0-14 years old from the population) in the case of districts to be developed with a complex program is significantly lower than the national average. The exceptionally high proportion of children is typical of the districts of Szabolcs-Szatmár-Bereg county, including the district of Nyírbátor. The proportion of the elderly is lower in these areas, and the districts have a youthful age structure. The demographic characteristics of youthful districts (such as the Nyírbátor district) are influenced by ethnic characteristics, ie. a significant proportion of Roma people.

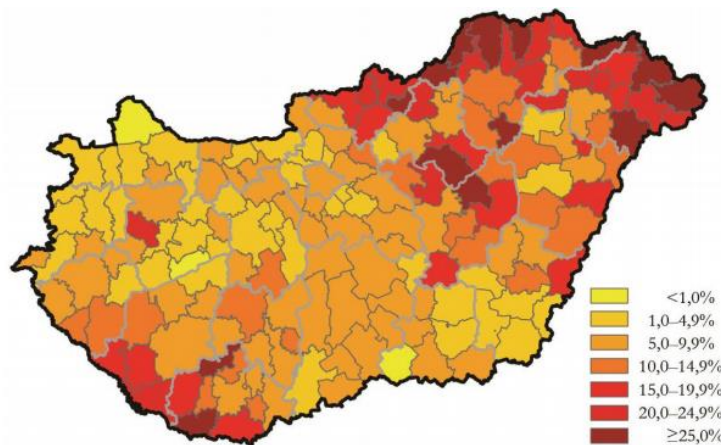
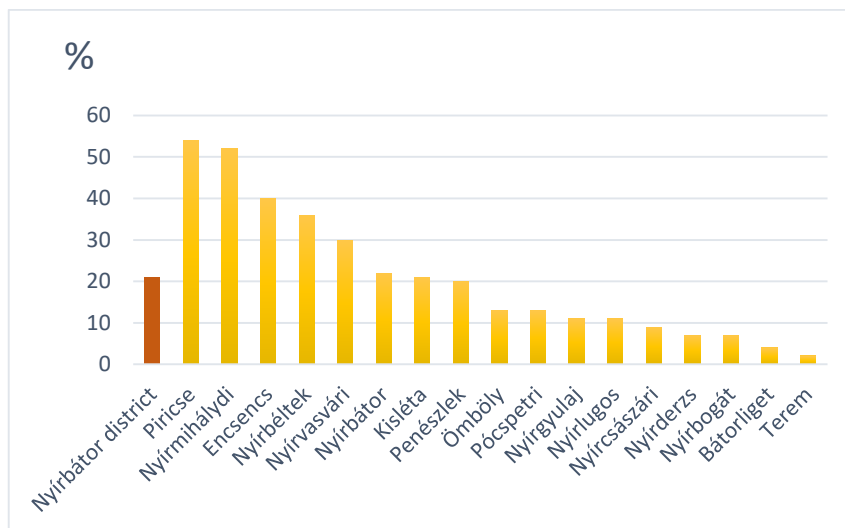


Figure 5 Proportion of Roma population within districts,
(Survey of the University of Debrecen, 2010-2013)
Source: Péntes et al., 2018

Based on the notaries' estimates of the number and proportion of the Roma population, it can be said that in at least eight settlements of the Nyírbátor district, one fifth of the population is of Roma origin (Farkas, 2012). The notary data sheets are incomplete in the case of three settlements (Máriapócs, Nyírgelse, Nyírpilis), so the range of the above settlements is expanding. During my field research I clearly identified that Nyírpilis is also a segregated settlement. According to the database of the CSO, there are a total of 18 segregates in 7 settlements in the area of Nyírbátor district (Encsencs, Máriapócs, Nyírbátor, Nyírbétek, Nyírbogát, Nyírgyulaj, Nyírlugos). In addition to the significant share of the Roma population, the acceleration of the emigration of the non-Roma population is a critical factor (Havas, 1999).



Note: No data available for Máriapócs, Nyírgelse, Nyírpilis

Figure 6 Estimated proportion of Roma population in settlements (notarial data sheets)
 Source: own compilation (based on Farkas, 2012)

In addition to the significant share of the Roma population, the acceleration of the emigration of the non-Roma population is a critical factor (Havas, 1999). The low level of education of the population of the district (Figure 7) is due to the fact that the skilled labor force emigrates from this area (the domestic migration balance of the district is negative, in 2018 there were 16 emigrants per 1000 inhabitants).

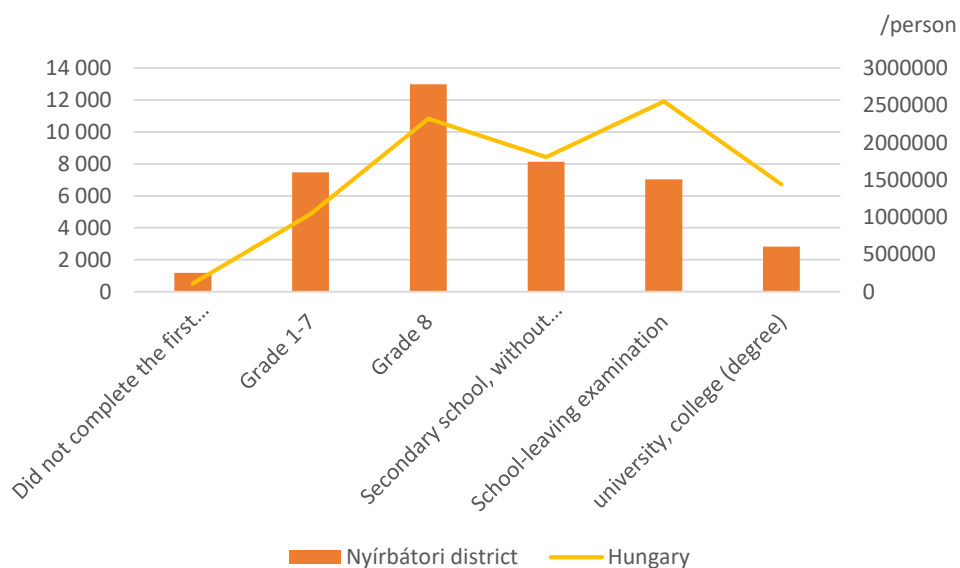


Figure 7 Population aged 7 and over by highest level of educational completed¹
 Source: own compilation (based on HCSO data)

¹ Based on census data (2011).

The more unfavorable labor market and income situation of the population than in the country plays an important role in emigration. One of the most significant challenges for the region is the retention and employment of young people and skilled labor. At the same time, low-educated inhabitants in the district have limited opportunities in the labor market.

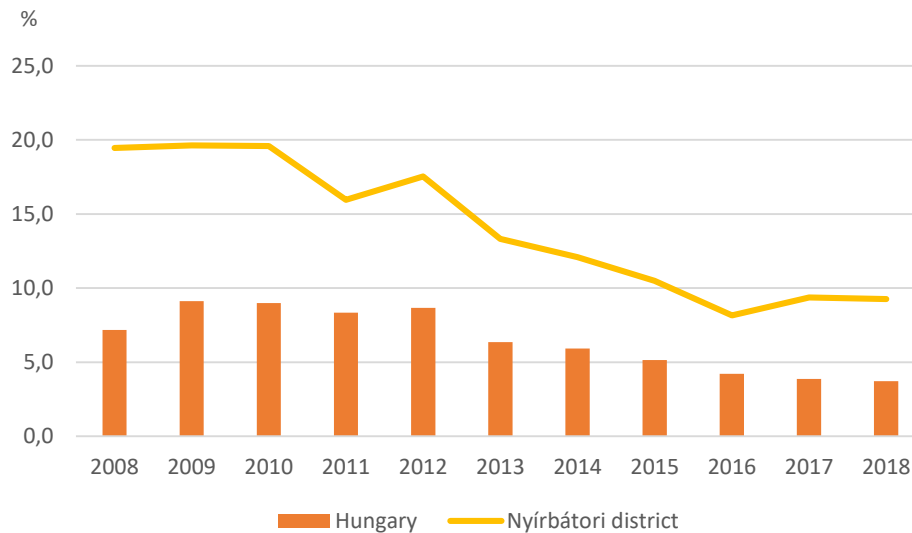


Figure 8. Development of the proportion of the unemployed in the Nyírbátor district
Source: own compilation (based on HCSO data)

The share of the unemployed in 2018 was 3.7% nationwide, in the Nyírbátor district it was 9.3%. Between 2008 and 2016, the number of registered jobseekers as a percentage of the working age population decreased both nationally and in the district, but after 2016 the value increased again.

To resolve this contradiction, it is necessary to introduce generally applicable complex education and employment programs, the preparation of which started in 2015 at the headquarters of the Nyírbátor district in Nyírbátor. The district center's complex program targets education and employment at the same time, focusing on the benefits of specialized training (eg. new university training), scholarship and mentoring, and housing benefits (eg. rented dwelling program). Among the first results of the program is the halting of population decline.

Based on the study, **Hypothesis 2 was partially accepted**, and I formulated the following thesis:

T2: Based on the examination of the factors reflecting and influencing the innovation capacity of the Nyírbátor district, it can be reasonably stated that the development of the innovation capacity of the region can be supported by general social innovation solutions. Based on the research, the commonly used social innovation tools can be adapted and no specific social innovation solution can be identified that improves the social innovation capacity of the Nyírbátor district as a single solution.

In order to determine the potential for social innovation, I started from the following assumption:

H3: In the case of settlements (micro-level social innovation) a system of indicators can be defined, based on which an indicator of social innovation potential can be created.

To test my hypothesis in Supchapter III.4.3., **I performed a systematic literature review and analysis**, and in Chapter V.3., **I calculated a complex indicator**. Based on previous literature (Kocziszky, 2004, Benedek et al., 2015, Kocziszky et al., 2015, Nagy-Tóth, 2019, Varga et al., 2020) and my supervisor's suggestion, I defined an indicator system and a social innovation measure to support the measurement of social innovation potential indicator. The method is presented in Chapter III.1. of this thesis booklet in detail. Overall, the Nyírbátor district is in a good position in terms of the average of the input indicators (0.338), which is higher than the county average. In 13 of the 20 settlements of the district, we can see higher values than the county average (0.327). In terms of the input indicator, settlements performing below average can be considered unfavorable mainly due to the low number of non-governmental and non-profit organizations and active enterprises. On average, the Nyírbátor district is in a slightly more favorable position in terms of output indicators (0.094) than the county average, in half of the settlements of the district the value of the output indicators exceeds the county average. The highest values can be seen for Nyírbátor (0.150), Nyírlugos (0.149) and Máriapócs (0.142), which is in line with the favorable situation of the larger settlements (cities) mentioned above (there are these three cities in the district). In contrast, Nyírdersz (0.046), Piricse (0.046) and Nyírvasvári (0.058) show the lowest values. With regard to disadvantaged settlements, the value of the output indicators is significantly lower than the county average, especially with regard to the low per capita payments of grant applications and the high proportion of segregated people. The Nyírbátor district is also in a better position on average (0.275) than the county average in terms of impact indicators. The highest values were observed in Nyírpilis (0.357), Máriapócs (0.321) and Kisléta (0.318). Nyírpilis has high values mainly in terms of the proportion of large families (however, based on the field research, it can be stated that a significant number of disadvantaged large families of Roma origin live in the settlement). The favorable position of Máriapócs is due to a higher per capita income, a lower number of crimes and a higher proportion of regularly cleaned public areas, as well as a high number of places in institutions providing long-term residential accommodation (there are also two nursing homes in the settlement). In the case of Kisléta, the number of places in institutions providing long-term residential accommodation is more than ten times the county average (the settlement accommodates a nursing home). The lowest values can be observed in Önböly (0.223), Penészlek (0.224) and Bátorliget (0.227). In the case of Önböly and Penészlek, lower per capita income and a higher proportion of one-person households lead to an unfavorable situation. Although there is a residential institution in Penészlek, which is four times the county average value of the indicator in relation to the settlement, the proportion of earners under HUF 1 million is extremely low, and thus the overall situation is unfavorable. In Bátorliget, the situation is more unfavorable, mainly due to the low proportion of large families.

The Nyírbátor district - similarly to the input, output and impact indicators - has on average a higher complex indicator value (0.236) than the county average (0.227).

Based on the examinations, **I accepted Hypothesis 3** and formulated the following thesis:

T3: The social innovation potential of a settlement (micro level process, local level measurement) can be determined from the average of the input, output and impact indicator groups and can be quantified with a complex indicator measuring social innovation.

With regard to the wider environment of the Nyírbátor district, Szabolcs-Szatmár-Bereg county, I also examine the relationship between the social innovation potential and some statistical indicators. In connection with the study, I formulated two hypotheses. One of the hypotheses concerns the relationship between social innovation potential and territorial development conditions:

H4: In the case of the settlements of Nyírbátor district and its wider environment, Szabolcs-Szatmár-Bereg county, there is a diverse, complex relationship between the social innovation potential and the territorial development conditions. The development of a settlement is mainly influenced by the spatial structure, to which the social innovation potential contributes.

To test my hypothesis, in Chapter V.3. I calculated the deviation from the mean (standard deviation) for each settlement, I quantified the Local Moran indices, and in Subchapter IV.4.1. I used shift-share analysis to analyze spatial and structural effects. During the examination of the Nyírbátor district, the ranking of the settlements can be determined on the basis of the complex indicator of the social innovation potential, which, supplemented by the participatory action research method (interview, case study), gives a comprehensive picture of the districts.

Based on the examination of the deviation from the mean, it can be stated that Nyírbátor (0.290), Máriapócs (0.280) and Nyírpilis (0.265) have the highest values for the complex indicator. According to the indicator, settlements in a more favorable position have the potential for change, which is a positive shift, but at the same time the territorial processes are basically unchanged in the short run (Nemes Nagy, 2009). Adapting to slowly changing territorial processes, it takes 5-10 years to move.

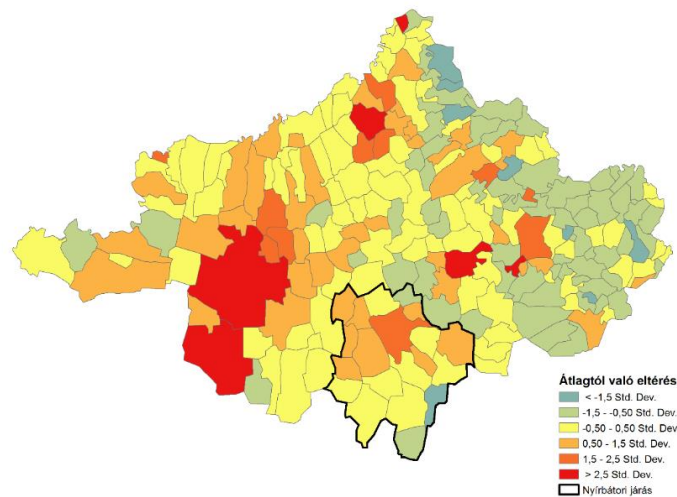


Figure 9 Development of a complex indicator measuring social innovation potential in Szabolcs-Szatmár-Bereg county

Source: own compilation (based on HCSO data, 2015-2018)

The lowest values of the complex indicator belong to Ömböly (0.170), Nyírdersz (0.186) and Penészlek (0.196). Ömböly and Penészlek show a significant lag in terms of their input and

impact indicators, while Nyírderzs can be considered unfavorable mainly on the basis of the output indicators.

During the study, I used the local method of spatial autocorrelation, Local Moran I statistics. In the calculations, the result of Local Moran can be compared with the absolute data, and thus it can be examined whether “a high degree of similarity is the concentration of high or low values of the variable, and vice versa” (Tóth, 2013, p. 62). In the case of the Nyírbátor district, the Máriapócs area belongs to the most favorable high-high cluster. The high value of output and impact indicators is emphasized in the region, especially in terms of the number of places per thousand inhabitants of institutions providing long-term residential accommodation (in Máriapócs and in the neighboring settlements - Kisléta, Pócspetri, Nyírbátor, Nyírbogát, Nyírgyulaj).

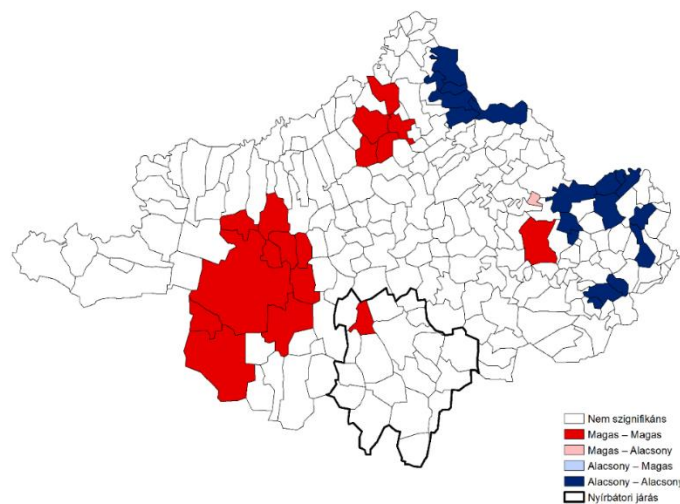


Figure 10 Local Moran I. of the complex indicator measuring social innovation potential in Szabolcs-Szatmár-Bereg county

Source: own compilation (based on HCSO data, 2015-2018)

As a starting point, I ranked the settlements on the basis of the complex indicator, and with the increase of the indicator I divided them into five equal number groups (quintiles). In the research, I examined the relationship between the size of per capita income and the settlement groups (quintiles) formed with the help of the social innovation potential indicator. According to my main research question, I examined the extent to which the size of the per capita income of the settlements of the county, as well as the change in income and population is justified by the social innovation potential and the population size of the settlements. According to my hypothesis, the development of settlements is primarily influenced by the spatial structure. I used shift-share analysis to test the hypothesis.

Table 7 Surplus / deficit of income change and its components in the settlements of the county, 2001-2018 (%)

Social innovation categories	Total	Social innovation impact	Impact of settlement size
First quintile	-100	-51	-49
Second quintile	-100	-40	-60
Third quintile	-100	-39	-61
Fourth quintile	-100	75	-175
Fifth quintile	100	29	71

Source: own calculation

Table 8 Share of social innovation categories in the surplus / deficit of income change and its components, 2001-2018 (%)

Social innovation categories	Income surplus	Income deficit	The impact of social innovation is positive	The impact of social innovation is negative	The impact of settlement size is positive	The impact of settlement size is negative
First quintile	0,0	27,2	0,0	36,7	0,0	18,8
Second quintile	0,0	30,1	0,0	31,8	0,0	25,4
Third quintile	0,0	30,8	0,0	31,5	0,0	26,5
Fourth quintile	0,0	11,9	23,4	0,0	0,0	29,3
Fifth quintile	100,0	0,0	76,6	0,0	100,0	0,0
Total	100,0	100,0	100,0	100,0	100,0	100,0

Source: own calculation

Table 9 Surplus / deficit of population change and its components in the settlements of the county, 2001-2018 (%)

Social innovation categories	Total	Social innovation impact	Impact of settlement size
First quintile	100	90	10
Second quintile	-100	-1031	931
Third quintile	-100	-141	41
Fourth quintile	100	-834	934
Fifth quintile	-100	-26	-74

Source: own calculation

Table 10 Share of social innovation categories in the surplus / deficit of population change and its components, 2001-2018 (%)

Social innovation categories	Income surplus	Income deficit	The impact of social innovation is positive	The impact of social innovation is negative	The impact of settlement size is positive	The impact of settlement size is negative
First quintile	97,9	0,0	100,0	0,0	16,6	0,0
Second quintile	0,0	2,6	0,0	30,3	40,0	0,0
Third quintile	0,0	16,2	0,0	26,1	11,2	0,0
Fourth quintile	2,1	0,0	0,0	19,6	32,2	0,0
Fifth quintile	0,0	81,2	0,0	24,1	0,0	100,0
Total	100,0	100,0	100,0	100,0	100,0	100,0

Source: own calculation

Based on the study, it can be stated that the basic processes are determined by the conditions of the basic spatial structure (reflected in the population distribution), as their share in absolute value lags behind the size of the settlement. Social innovation can only modify the processes fundamentally determined by spatial structure.

Based on the research related to the complex indicator of the social innovation potential of the settlements, **I accepted Hypothesis 4** and formulated the following thesis:

T4: In Szabolcs-Szatmár-Bereg county, the development of settlements is primarily determined by population size, which is weakly influenced by social innovation potential. The social innovation potential of the settlements and their current development situation are moving together, however, social innovation - in line with the slowly changing territorial processes - can create a positive shift in the medium term.

My other hypothesis regarding the relationship between social innovation potential and some statistical indicators is:

H5: With regard to the Nyírbátor district and its wider environment, Szabolcs-Szatmár-Bereg county, the size of the social innovation potential is a determining factor for the competitiveness of a settlement.

My hypothesis is presented in Subchapter V.4.2., I tested it by the method of **multiplicative decomposition**. As a research question, I examined the relationship between competitiveness and social innovation potential in relation to the given settlements of the county. In my study I used the approach of Nemes Nagy (2005), the method of breaking down into factors. By applying a multiplicative decomposition, economic development, that is, GDP per capita, can be broken down into other components in several ways. Starting from the research of Nemes Nagy, I compared the lag or advantage in the field of each factor to the national average, and I used the following notations:

- 1 - above the national average,
- 0 - indicates factors below the national average.

The first numerical value indicates household income, the second productivity, the third employment, and the fourth the age structure factor.

Table 11 Competitiveness in settlement groups formed with the help of the complex indicator, 2001-2018

Years	First quintile	Second quintile	Third quintile	Fourth quintile	Fifth quintile
2001	0000	0000	0000	0000	1111
2002	0000	0000	0000	0000	1111
2003	0000	0000	0000	0000	1111
2004	0000	0000	0000	0000	1111
2005	0000	0000	0000	0000	1111
2006	0000	0000	0000	0000	1111
2007	0000	0000	0000	0000	1111
2008	0000	0000	0000	0000	1111
2009	0000	0000	0000	0000	1111
2010	0000	0000	0000	0000	1111
2011	0000	0000	0000	0000	1111
2012	0000	0000	0000	0001	1111
2013	0000	0000	0000	0001	1111
2014	0000	0000	0000	0001	1111
2015	0001	0000	0000	0001	1111
2016	0001	0000	0000	0001	1110
2017	0001	0000	0000	0001	1110
2018	0001	0000	0000	0001	1110

Source: own calculation

Based on the study, it can be stated that a competitive advantage can be observed in Szabolcs-Szatmár-Bereg county only in respect of the settlements belonging to the fifth quintile, which are the most favorable from social innovation point of view, which was complex between 2001 and 2015. Then, however, due to the deteriorating demographic image, it is only a multifactorial competitive advantage. In the case of the other settlement groups, there is a complex or multifactorial competitive disadvantage in the county.

Based on the study, **Hypothesis 5 was accepted** and I formulated the following thesis:

T5: With regard to the settlements of Szabolcs-Szatmár-Bereg county, in economic terms only settlements with the most favorable social innovation condition are competitive, the other groups - determined on the basis of a complex indicator - are clearly competitively disadvantaged. In the case of settlements with a value different from the highest social innovation potential, the competitive disadvantage is multifactorial or complex.

A novel result of the dissertation is the definition of an adaptive model of the logical process of social innovation. As the starting points of the research, I formulated the following hypothesis regarding the social innovation process:

H6: The process of social learning is linked to the process of social innovation. Social learning is a precondition and at the same time a result of the change (learning) process. The documentation and analysis of good practices in social innovation on the basis of specific criteria makes it possible to define an adaptive model of the process.

My hypothesis is tested in Chapter V.5. by qualitative methods using **participatory action research (observation, document analysis, case study)**, as well as **interviews based on inductive logic** enriched the theoretical framework previously outlined by the hypothesis. During the definition of the model, I tried to define the social innovation process by integrating the elements of the social innovation process models revealed through the literature review. Examining the social innovation processes of the district, it became clear that the successful implementation of each endeavor is inconceivable without the active participation of the local population. In addition to statistical analyzes, the specific characteristics and disadvantage of the district justify a participatory study. In addition to the participation of the population in decisions, I participated in my research role not only as an observer in the development processes, but also in close cooperation with the participants in the research. In contrast to the traditional researcher attitude and tasks, we carried out the pre-defined research tasks, the planning and implementation of social innovation initiatives together with the persons and organizations involved in the research. The joint work took place mainly in the framework of discussions, conciliation forums and workshops. In social innovation research, I presented a novel methodological approach (participatory action research) and the study validating it. In order to connect theory and practice, the results of interviews based on inductive logic have also become part of the process model. The research has reached a state of “theoretical saturation” (Glaser-Strauss, 1967; Csedő, 2006), further interviews and case studies are no longer able to expand the theoretical framework.

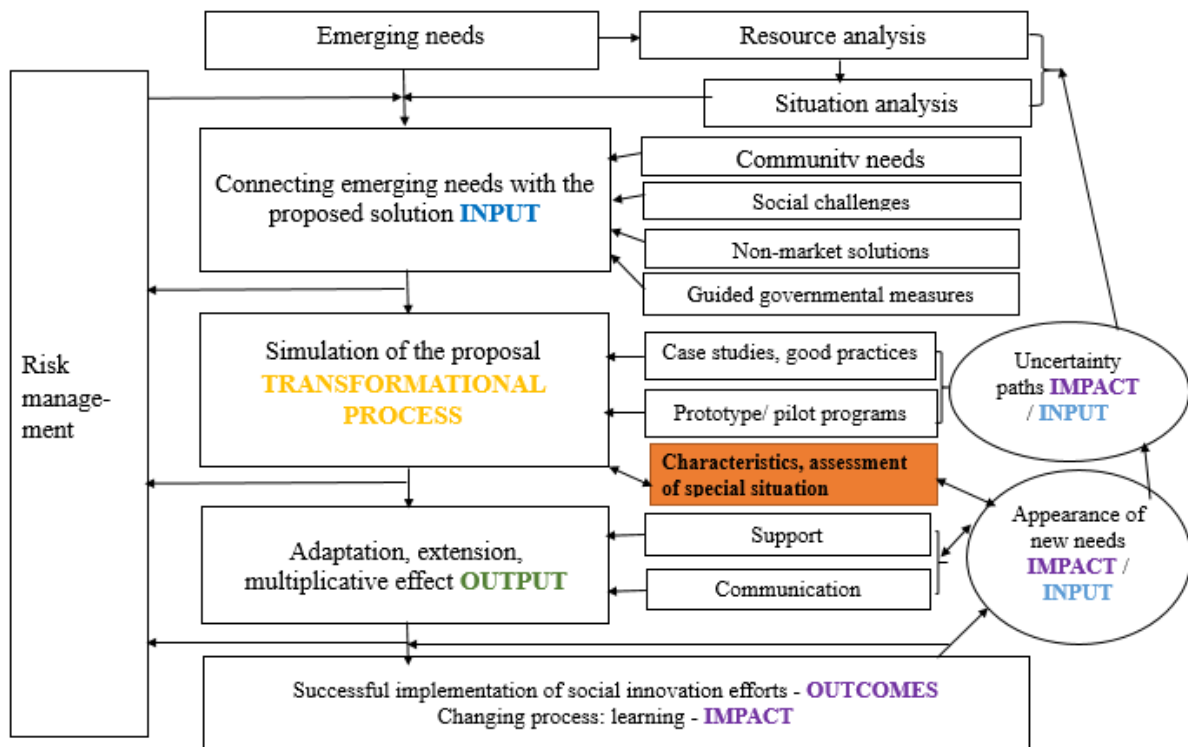


Figure 11 The adaptive social innovation process model

Source: own compilation

Based on the study, it can be concluded that social innovation is a dynamic spiral process that is based on and results in social learning through a kind of feedback loops and constant risk assessment. At the same time, the outcome of social innovation efforts depends on risk management and the luck factor (Vilmányi, 2019).

Based on the research, **I accepted Hypothesis 6** and the following thesis was formulated:

T6: The adaptive process model is suitable for defining the logical structure of the social innovation process and for identifying the social learning process, which is also the starting point and result of social innovation. The process model - focusing on the characteristics of the Nyírbátor district - pays special attention to the challenges and treatment of disadvantaged groups.

III. 3. Usability of the results, further research directions

Within the framework of the research, I mainly examined the measurement challenges of micro-level social innovation processes. A limitation of the research in terms of generalization is that I conducted my research in the Nyírbátor district to be developed with the complex program, starting from the assumption that in the case of multiple disadvantaged areas, social innovation as a new tool and model offers solutions to social challenges and problems. The adaptive model of the social innovation process and the definition of a complex indicator at the settlement level also designated new research directions for me.

On the one hand, the determination of the relationship between the individual measurement levels and the interconnection of their measurement methods require further investigation.

On the other hand, the development of a database of good practices is an additional research task. Based on the research, it can be stated that the commonly used social innovation solutions are suitable for developing the innovation capacity of the Nyírbátor district. There is no single good solution, any of the examined practices can be adapted to other settlements. All these findings predict that a so-called library of good practices can provide practical advice to decision-makers, participants in the social innovation process.

Third, in line with the above, further research is needed to support the generation of social innovation efforts. In our previous research (Veresné et al., 2019) we came to the conclusion that due to the huge amount of data in the database supporting the generation of social innovation, it is expedient to use an IT solution, ie. it is necessary to introduce a support system. As a result of our methodological study, we support the application of fuzzy logic. The fuzzy system can handle multiple data types simultaneously and can be perfectly combined with decision trees. The database needs to be constantly updated with new good practices and statistics and can be documented along a defined set of criteria.

Further investigation of the above research directions may result in the exploration of important connections, which may complement the investigations carried out in the framework of the present dissertation.

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Acknowledgement

“The described dissertation was carried out as part of the EFOP-3.6.1-16-2016-00011 “Younger and Renewing University – Innovative Knowledge City – institutional development of the University of Miskolc aiming at intelligent specialisation” project implemented in the framework of the Szechenyi 2020 program. The realization of this project is supported by the European Union, co-financed by the European Social Fund.”