ICT Solution of Soil and Landscape Suffers from Uncontrolled Urban Sprawl in the Central Bohemia

Iveta Merunková[1], Vojtěch Merunka[2]

[1]National Heritage Institute in Prague, Czech Republic
e-mail: merunkova.iveta@npu.cz
[2]Czech Technical University in Prague and Czech University of Life Sciences in Prague
e-mail: vmerunka@gmail.com

Abstract. The paper addresses the problem of the soil and landscape suffers caused by an uncontrolled urban sprawl in the Central Bohemia and proposes an innovative ICT-based solution of the use of computer simulation tools to increase the level of process-based and law-based knowledge of the concerned local persons, which makes the effect of greater participation of these local people involved and responsible for decision-making processes and negotiation with external developers. This hypothesis was confirmed experimentally by our project in several settlements of Central Bohemia.

Keywords: lost of soil, landscape suffers, urban sprawl, process-based knowledge, decision-making.

1 Introduction

Uncontrolled housing development around big cities in the Czech Republic since the 1990s has resulted in an "urban sprawl" devastating the landscape that has brought about more problems than benefits. Since the collapse of the communist regime in 1989, thousands and thousands of Czechs have fulfilled their dream about an own nice house outside the urban tumult in the wild but that is yet close to the "civilization". In the recent 15 years, more than 100,000 family houses have been built in the 10-million Czech Republic, mainly in former high-quality soil on the outskirts of big towns. This trend accelerated along with property restitution when land confiscated by the previous communist regime was returned to a number of original owners. Extensive housing development was also encouraged by a new law enabling to easily change agricultural land into building plots that could be sold for a 100 times higher price per hectare.

Unfortunately, the local authorities were often very tolerant to building plans. At present, however, some mayors of the villages close to cities are more skeptical and they often strictly demand high sponsors' gifts or investments in the municipality from developers in exchange for a building permit.

Proceedings of the 8th International Conference on Information and Communication Technologies in Agriculture, Food and Environment (HAICTA 2017), Chania, Greece, 21-24 September, 2017.

2 Urban Sprawl

Urban sprawl is a phenomenon that emerged in the last decades in the advanced industrial countries (USA, France, Great Britain) and recently also in our country. It can be described as an uncontrolled expansion of certain kind of urban build-up into the free landscape caused by favorable land prices, demand for cheap but modern estates, etc. Dualny and others write (Dualny, 2001; Frumkin 2004) about harmful absorption of original small settlement structures, which causes following negative effects, like the loss of the quality agricultural soil and disruption of the cultural and historical value of the settlement, disruption of the ecological stability of the area, deconstruction of the transport infrastructure, loss of touristic attractiveness and pawning of infrastructure development of the original settlement. While the population in European cities has risen by 5 percent on average in last 20 years, the built-up area has increased by 20 percent. This trend is also reflected in the Czech Republic where the built-up area is now twice larger than in 1930, but with the almost the same population.

3 Hypothesis

There is a very low level of knowledge in the area of participation in the processes of landscape planning. But everybody together with many political declarations by the European Union, like Aarhus agreement and European Regional and Spatial Planning Charter by the European Council, agree that computer technology can solve the problem of low community participation of people, which decreases the quality of life of these people.

BORM (Business Object Relation Modeling) innovation is based on the reuse of old thoughts from the beginning of the 1990s regarding the description of object properties and behavior using finite state machines (FSM). Taylor an Goldberg wrote one of the best books speaking about the applicability of OOP to the business modeling (Taylor, 1995; Goldberg 1995, Knott 2000).

3.1 The role of territorial planning

Territorial (e.g., urban or spatial) planning is a strategic tool for any construction and development activities in the landscape. Unfortunately, the public is not concerned with territorial planning (from the perspective of its impact on the specific life situations). Citizens and other local actors do not understand it sufficiently. There are also related subsequent processes of zoning and building permission, which depend on the territorial planning. In addition, the Czech Republic, several amendments to the relevant law during the consolidation of Czech legislation with EU legislation have been performed. Unfortunately, the legal awareness of the local citizens did not yet fully accept all these changes. Local citizens involved in these processes lack knowledge about the real impact of territorial planning on their life situations. They do not know how these processes can be used in their favor, and how these territorial

activities affect the quality of both private and public life in the settlement. Local citizens are only dependent on the biased interpretation of various professionals from external companies representing their interests. Therefore, it is necessary to allow and encourage the active participation of citizens in these planning decisions that have a direct impact on the quality of life of affected citizens.

4 The project

We mapped the state of knowledge about territorial planning and building development among the inhabitants of a very small villages in the Central Bohemian Region near to Prague megapolis. These people were 8% from the total working-age population and also did have an experience with the local government. These people were current of former members of the municipal councils. For comparison reasons, similar small villages but far from megapolis were also included into our project.

We performed preliminary research on the documentation from these villages. The results were alarming. The local people did not participate at all in the agendas, where they have had the last opportunity to comment or protest anything. They participated only sporadically in the closing phase. Even worst, this inactivity was also visible in the requirement-gathering phase when the entire planning project has been started. The alarming situation is seen best in figure 1, which shows the overall average rate of participation of local citizens in those 40 agendas of their village development.

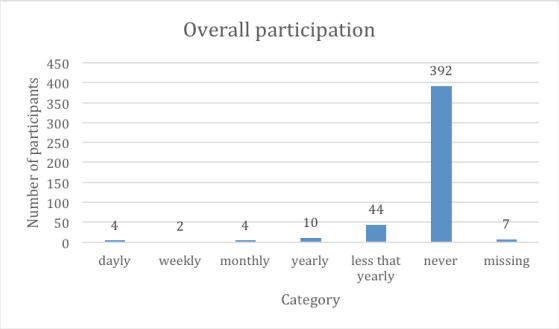

Fig. 1 - Preliminary survey - participation on the territorial planning decisions.

4.1 Training our method

We have prepared a set of knowledge maps and simulation models of business processes created using special computer software for knowledge modeling and simulation. We have created process models showing the most frequent agendas in the village, which are related to the problem of the urban sprawl. Also, we identified three procedural areas, which are included in the agenda of planning, re-planning,

and land management (which result is zoning). The total number of process models was seven. (See an example, in figure 2)

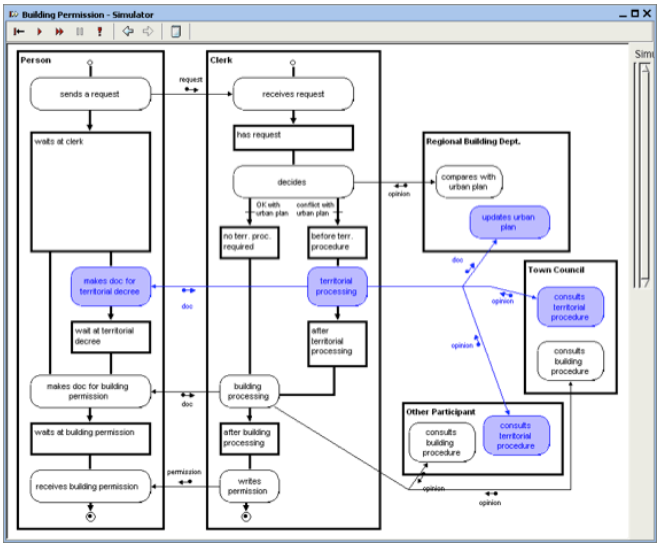

Fig. 2 - process step-by-step tracking example

Our approach using process models and their visual simulation helps the officials (especially in the smallest settlements) to clarify the legislation and shows them possible ways of its usage. Our models and their visual simulation show how the BORM can be used to improve the process of decision-making on the level of mayors and local administrations. It offers the possibility to model and simulate real life situations in small settlements. BORM is an object-oriented and process-based analysis and design methodology, which is proven to be effective in the development of business systems. Further development and recent practical projects in BORM has been carried out with the support of Craft.CASE Ltd. - the British software consulting company supporting innovative technologies.

4.2 Method verification

Our method was verified through semi-structured interviews, which were attended by 57 people successively from the same 13 communities, such as municipalities, which were in the first survey. For each community, it was a group of 2 to 5 people who were recruited by the snowball technique. Each interview lasted a maximum of 20 minutes including time also time spent for the demonstration of our method so that the total time for each respondent ranged from about 10 minutes to about 50 minutes. Because respondents disagreed with a video camera and audio recording on a sound recorder, there was created a paper sheet with preformed major three issues:

1) The first set of prepared questions was involved to the current level of knowledge about the processes of territorial planning and building development before the application of our method. The difference was in the content of the questions that were focused more on the subsequent classification of the existing level of knowledge of the CMM approach (Christiansson, 2011), which can be used for quality assessment of public administration processes.

   (a) Do you have sufficient information on process participants, relevant legislation, documentation, so that you could initiate such a process and instruct your fellows how and where to participate?
   (b) Do you think that your fellows have sufficient information on these processes, their participants, etc. so that they can provide information on how and where they can involve?
   (c) Do you think that the quality of execution of these processes is primarily dependent on the knowledge and skills of the municipal council?
   (d) Do you have in your community some extraordinary person whom you can ask for expert knowledge? Do you think it is good that the success of the processes depends on this important person and you do not need to understand?
   (e) Do you think that the processes performed in your community formerly in a "firefighting" way would be performed in the same unaware way if repeated?

2) In the second set of questions, we focused on the training of the new method.
   (a) How much time did you spend to understand this method?
   (b) Do you find this method useful in comparison with just reading texts of the relevant laws?
   (c) Did you expect these processes are easier or more difficult?
   (d) Now, if you know more about these processes, do you remember some event from the past in which you would behave differently?
   (e) Do you want to add something you are missing in our method?

3) Finally, we asked about the effect of the new knowledge about the processes of territorial planning and building development.
   (a) Will you more involve in these processes?
   (b) Do you know how these processes can be used better for your and community benefit?
   (c) Do you think that these processes can be used to prevent problems and conflicts?
   (d) Do you think that people outside your community (investors, government bodies...) who participated formerly in processes, did inform you in agreement with your interest?
   (e) Do you think that now you can perform these processes with less uncertainty than before?

Our results were obtained from 8% of the total entire population of all working-age people in these small villages, where they live just hundreds of total residents, including small children and pensioners. The selection of respondents was random, and we tried to cover all kinds of residents of working-age. The citizens' interest was focused mainly on understanding and possibilities of their role in the private building permit process, but public interests have had lower priority.

- Processes were carried out flexibly and ad-hoc. **Citizens were "event-driven" by the competent external authorities**. (39 respondents, 68% from total)
- From the past, **citizens remember situations**, in which they could behave differently, but **they did not have knowledge**. (39 respondents, 68 % from total)
- In the past citizens were misinformed by biased officials and other external authorities. (38 respondents, 67 % from total) **State officials have acted against the interests of the state for the benefit of private investors.**
- About the method and simulation tool, people would like to add more functionality of document repository and timing and tracking of a specific process to remember who and why decided incl. personal contacts. (26 respondents, 46 % from total) **ICT skills were not any problem in this community**.

Very interesting is the finding that there is almost no difference between the two monitored groups of settlements. The results differ only in the statistical error.

5 Conclusion

The submitted work is interdisciplinary and is focused narrowly on one particular problem area of deteriorating environmental quality caused by low knowledge of residents of small villages. Big cities always have enough university-educated residents who can help their community, but this experience cannot be expected elsewhere. A little knowledge of legislation and little knowledge of computer-based skills make the lack of participation in public life. We believe that giving local people the opportunity of their independent decision via some education is much better approach than to provide "charitable" consulting services by external experts.

Acknowledgments. The author would like to acknowledge the support of the research grant SGS17/3T OHK4-011/17.

References

1. Craft.CASE analytical and modeling tool, Craft.CASE Ltd. Torriano Avenue London, http://www.craftcase.com
2. Dualny A.: Suburban Nation (2001) The Rise of Sprawl and the Decline of the American Dream, North Point Press, ISBN 978-0865476066
3. Eriksson, H. and Penker, M. (2000) Business Modeling with UML, John Wiley and Sons, ISBN 0-471-29551-5
4. Frumkin H. et al.: Urban Sprawl and Public Health (2004) Designing, Planning, and Building for Healthy Communities, Island Press, ISBN 978-1559633055
5. Goldberg, A. and Rubin K. (1995) Succeeding with Objects — Decision Frameworks for Project Management, Addison Wesley, ISBN 0-201-62878-3
6. Christiansson M. T. (2011) A Common Process Model to Improve e-Service Solutions – the Municipality Case, in proceedings of the 11th European Conference on e-Government ECEG 2011, Ljubljana, Slovenia
7. Knott, R. P., Merunka, V., Polak, J. (2000) Process Modeling for Object Oriented Analysis using BORM Object Behavioral Analysis, in Proceedings of Fourth International Conference on Requirements Engineering ICRE 2000, Chicago, USA, IEEE Computer Society Press, ISBN 0-7695-0565-1
8. Taylor, D. A. (1995) Business Engineering with Object Technology, John Wiley ISBN 0-471-04521-7

9. Shlaer, S. Mellor, S. (1992) Object Lifecycles: Modelling the World in States, Yourdon Press, ISBN 0136299407