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PREFACE

Two years have passed and, once again, we are here with our international meeting of academics and professionals – the conference on Strategic Management and its Support by Information Systems (SMSIS). This year, the conference is held for the 13th consecutive year and, again, we are glad for the support from the dean of the Faculty of Economics, VŠB – Technical University of Ostrava, prof. Zdeněk Zmeškal.

The first SMSIS conference has been held in 1995 and, to this day, it continues as a traditionally bi-annual platform for professional discussions and exchange of experiences between research teams from various countries and institutions around the world, namely from the Czech Republic, Hungary, Iran, Spain, Slovakia and the United Kingdom. The conference focuses on a relatively broad scale of topics that are associated with:

- strategic management,
- quantitative methods and their applications in management issues,
- trends and issues in information systems design, management and security,
- and applications of new media and intelligent tools in the Digital Economy.

This year, several new hot topics are presented and discussed, namely, social dimension of strategic management, benchmarking in supply chain management, spatial econometrics, cybersecurity for industry 4.0, or artificial neural network and machine-learning with human-in-the-loop.

The SMSIS 2019 conference is organized in cooperation with the Czech Society for Systems Integration (CSSI) and three Czech universities: VŠB – Technical University of Ostrava (Faculty of Economics), University of Economics in Prague (Faculty of Informatics and Statistics) and Masaryk University in Brno (Faculty of Informatics).

The SMSIS conference proceedings usually contains about 50 carefully selected scholarly and professional papers, which are double-blind reviewed by members of the programme committee, who certainly deserve thanks for their devoted work. I would like to thank the members of the organizing committee as well, for their dedication and hard-work during the preparation and organization of the SMSIS 2019 conference event.

I wish all of us to be successful in the presentation of our work, our contributions to be beneficial to conference participants and that the event will meet everyone's expectations.

To a successful conference!

Jana Hančlová

May 2019

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SECTION

D

APPLICATIONS OF NEW MEDIA AND INTELLIGENT TOOLS IN THE DIGITAL ECONOMY AND MODELLING

Collecting and systematizing "smart solutions" for residential real estate, especially in Central and Eastern Europe, with special regard to the Visegrad countries

Daniel Orosz[1]

Abstract. The first smart home controller computer or program was designed in the second half of the 60s, it was far ahead of its time and was not commercialized. More than five decades had to wait more significant spreading of these systems, which thanks for the internet widespread availability and reliability. While in just a fragment of the traditional property real estate owners have been using the smart apps, in the case of newly built real estate, it is almost essential to have some clever features. The benefits are clear, in the long run, initial surplus investments are likely to return, the overhead costs of housing may be reduced, their comfort levels and their viability can be significantly improved. It is likely that in almost all residences in the future there will be some clever function. I would like to give a brief overview of what we mean by smart city and smart home terms and illustrate the situation in some of the cities in the Central and Eastern European region, what is the situation of becoming a smart home in this area.

Keywords: smart city, smart home, smart solutions, Visegrad countries.

JEL Classification: R11, O18, O33

1 Introduction

Urban development increasingly requires the use of advanced technologies, with a particular focus on the range of tasks to be solved. In developing countries, the problems identified by the rapidly growing population are dominant, while in developed countries, whose populations are mostly aging, they are more focused on improving quality of life, reducing social inequalities and developing sustainable structures. These problems can be solved by applying the smart city concept in cities, as the rapid development of technology offers new development paths for cities that can handle the problems, the challenges of competitive and sustainable cities at the same time. In this paper, I would like to give a brief overview of what we mean by smart city and smart home terms and illustrate the situation in some of the cities in the Central and Eastern European region, what is the situation of becoming a smart home in this area.

2 Smart City concept

The smart city concept appeared in the 1980s and '90s, thanks to the widespread use of information and communication technologies (ICT). In the 2000s, the increasing use of the internet made it possible for cities to make more and more electronic services available to their citizens (e-government, e-learning, etc.), while nowadays the revolution of intelligent wireless sensors is taking place (Bizjan, 2014).

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The term "smart city" is used more and more often, but there is no uniform concept for this, often there are unique solutions per settlement. In recent years, many definitions have been formulated for the "smart city" - but yet there is no uniform, universally accepted definition - and I will quote some of them.

- A Smart City performs outstandingly in the following six areas: economy, people, governance, mobility, environment, living conditions. (Giffinger et al., 2007),
- a smart community is a community that makes conscious efforts to use information technology to make life and work in the area significant and essential is, rather than as ancillary. (California Institute, 2001)
- "The concept of smart city, where citizens, objects, utilities, etc. are perfectly interconnected with the use of everyday technologies to significantly improve the experience of a 21st century urban environment" (Northstream, 2010).
- The smart city is the product of a combination of the digital city and the 'Internet of Things' (Su et al., 2011),
- The smart city monitors and integrates all critical infrastructures (including roads, bridges, tunnels, railways, subways, airports, harbors, communications, water, energy, and major buildings) to optimize its resources, plan its activities with respect to safety while maximizing services for the population. (Hall, 2000).

2.1 Measuring the performance of smart cities

The ISO is an international standardization organization, has identified factors that can measure the performance of a smart city. A smart city index is a summary of many indicators, and the city's 'intelligence' is characterized by a number of different practices. Smart cities can be compared based on these indices. I briefly introduce two indexes, because with these rankings I will select the cities that I will examine in a later chapter in terms of which level they are in the process of becoming a smart home (Bakonyi P. et al. 2018).

2.2 Global Cities Index

The Global Cities Index is a smart city index that examines the performance of cities around the world in 27 terms, in five categories: business activity, human resources, information exchange, culture, policy (ATKearney 2016).

Components of the Global Index examining the current situation and their weights:

- business activity (30%): capital flows, market dynamics, presence of major companies;
- human resources (30%): quality of education;
- cultural experience (15%): access to major sporting events, museums and other exhibitions;
- political situation (10%): political events, prominent thinkers, embassies.
- information exchange (15%): access to information through internet and other media sources

Components of the Global Index for Future Situation:

- personal well-being (25%): security, health, social tensions, environmental protection;
- economy (25%): long-term investment and GDP;

- innovation (25%): proportion of patent-based businesses, non-governmental investments, incubation, startups;
- Governability (25%): transparency, quality of bureaucracy, simplicity of business

2.3 European Smart Cities Index

Five aspects of Europe's medium-sized cities and their evaluation factors are the follows:

- Smart economy: innovation ability, entrepreneurial ability, external thinking of the economy, productivity, flexibility of the workforce, integration into the international world, ability to transform.
- Intelligent population: level of education, attitudes to lifelong learning, social and ethnic plurality, flexibility, creativity, openness, participation in public life.
- Intelligent urban management: participation in decision-making, public and social services, transparent city management, forward-looking strategies, sustainable, innovative and secure transport system, availability of info-communication infrastructure, availability of local and international access.
- Intelligent environment: environmental protection, low pollution, sustainable resource management, attractive natural conditions.
- Quality of life: cultural facilities, conditionality of health care, safety of individuals, housing conditions, educational infrastructure, attractiveness of tourism, social cohesion

European cities perform excellently in many areas, such as traffic management, emissions, culture. (smart-cities.eu, 2014)

3 Definition of Smart Home

Smart Home does not have a general definition yet, there are many different definitions, and there some expressions in the literature, which only partly covers or is similar to Smart Home for example: remote home, home automation system, automated home, home energy management system, etc. While the concept of a smart home or smart house is already well-known to most people, but there is no unified definition yet available.
In the following, I cite some "smart home" definition:

- “Smart home” or “smart house” is a home that includes advanced automation systems to provide the public with sophisticated supervision and control over building functions. For example, a smart home can control lighting, temperature, multimedia, security, window and door, and many other features (smarthomeenergy.co.uk, 2017).
- "Smart home" is a home equipped with lighting, heating and electronic devices that can be controlled remotely from a smartphone or computer: our smart home can be tracked over the Internet to ensure, for example, that central heating is on or the gas stove is turned on by the time we get home (oxforddictionaries.com 2017).
- “Smart Home is a private home with many home automation tools, consumer electronics, and more. Networking these tools provides new services and benefits to residents” (H. Strese, U. Seidel, T. Knape, and A. Botthof, 2010).
- “The controllable and intelligent home, where every system, including heating and lighting, communicates with each other, and can be controlled from anywhere, anytime

from a phone, tablet or computer, for the main goal for energy efficiency" (honeywell.com, 2016).

3.1 A general introduction to Smart Home systems

A smart home consists of three main parts. These are the following:

- communication channel: wired, wireless,
- peripheral devices: sensors, actuators,
- central control unit.

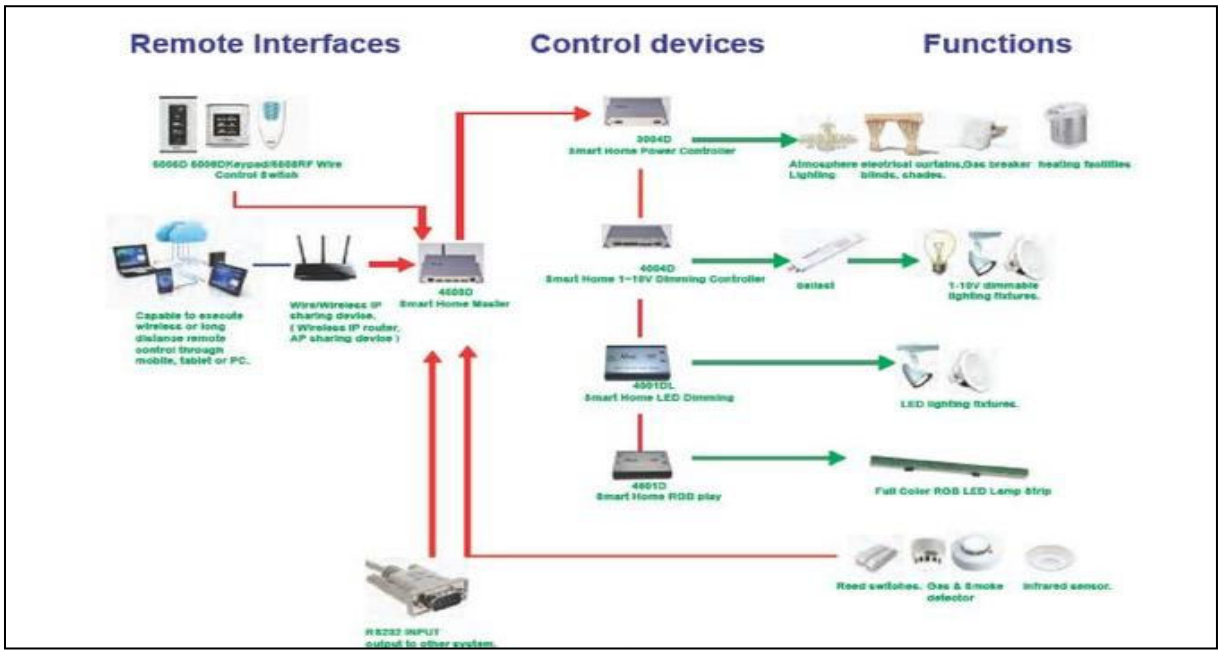

Figure 1 Typical structure of Smart Home systems [G. Chong et al. (2011)]

Usually, among the main benefits of "smart homes", three are highlighted. In the first place, optimized energy use is usually included, as the system can be taught according to our habits, so we can easily control, for example, the heating or cooling of our apartment, which can greatly reduce our costs.

In second place, there is the convenience feature, as the learned features let the system know exactly when and what device to turn on.

The third major benefit is security, as we can remotely observe our home and control our smart tools. Other benefits include monitoring your health.

Among the drawbacks are the high cost of systems, and the fact that there is not enough experience for users in this area, so they are afraid to start building a smart home system. This is also due to the fact that the whole system itself is very complex (incompatibility between the devices of different manufacturers, it is worth to choose a complex system of one manufacturer), and it involves significant risks if used without expertise.

The benefits and disadvantages of "smart home" are summarized in the following table:

Advantages	Disadvantages (possible barriers)
Optimized energy consumption	Relatively expensive
Real Estate Value Added Effect	Lack of experience
Increased sense of security	Hacker danger
Quality of life increasing effect	Complexity
Saving (time, money, energy)	Any damage to the interconnections can disrupt the system
Possibility of convenience features	The technology takes time to learn and get used to. Some people believe it makes life too complicated.

Table 1 The possible advantages and disadvantages of "smart homes" [Mussab A., et al. (2017), K. Hanly (2017), D. Mocrii et al. (2018), Biljana L. et al. (2017), own edition]

4 Popular companies of smart home systems and good practices for the 'smart home' developments in the Visegrad countries

4.1 Popular companies of smart home systems

I have examined the situation of the smart home market in the Visegrad countries. I've been examined the ten most popular companies by google rank and I wanted to know what services they offer (table 2), for what price, where can we buy the products.

Each of the companies has a complex system, which means that there is a central control unit that can be connected to various smart home devices. Most of the companies offer similar services, such as: control light, temperature, security, entertainment and shadow. Only two companies were found which offer healthcare or solar energy products related to smart home systems.

Firm	Light control	Heat/cool control	Security	Entertainment	Health monitoring	Shadow technique	Solar energy	Complex system
FIBARO	x	x	x	x		x		x
Chameleon	x	x	x	x		x		x
Quantum - Studio	x	x	x	x		x	x	x
Somfy	x	x	x			x		x
INELS	x	x		x				x
INCELOR	x	x	x	x		x		x
Legrand	x	x	x	x	x	x		x
iSTYLE	x	x	x	x				x
Xiaomishop	x	x	x	x		x		x
Conrad	x	x	x	x		x		x

Table 2 Popular Smart Home companies in the Visegrad countries [own edition]

I was categorized by price and subdivided into four groups: low (0-850 EUR), medium (850 to 1600 EUR), high (1600 to 3300 EUR) and overpriced over 3300 EUR. Products usually can

be purchased online, but one or two companies have their own shop. The companies are advertising themselves mostly online, in one case we found traces of TV commercial.

4.2 Good practices for the 'smart home' developments

In the **Global Cities Index 2018** ranking of Prague (47th), Warsaw (54th) and Budapest (62nd) are included, so I was looking for examples of smart home developments in these cities and I would like to present the following good practices.

4.2.1 Prague

The Smart Home Care pilot project in Prague was approved by the mayor in 2017. This project is part of the European Union project, called 'Triangulum', in which Prague is actively involved. The whole project is linked to the Smart City concept, based on ICT infrastructure. The main goal of the Prague project is to test a smart system implemented in Prague's 7th District using the LYSE BLINK video communication tools (triangulum-project.eu, 2017).

Many other companies in the city are also installing smart home systems. One of the most well-known is the Domat Control System, which focuses on energy efficiency, but T-Mobile also has such a system in the city (domat-int.com, 2018).

4.2.2 Budapest

In Budapest, many companies have recognized the business potential of smart homes, and many of them have developed their own systems. Such companies include Cordia, FIBARO, iNELS, Innospot, Chameleon Smart Home… etc. Cordia has completed the biggest smart home development project:

"The development of 1500 new smart homes has been announced by Cordia, which is one of the largest real estate developments in the period since the change of regime. New projects were planned for 8 different locations in Budapest. According to the analysis of the company, there is now a significant demand for new homes, which the supply cannot keep up to now" (portfolio.hu, 2016).

In 2014, the **Europen Smart Cities Index** ranked several cities in the Visegrad countries. These are: Plzen (50th), Usti nad laben (51st), Banska Bystrica (54th), Rzeszow (55th), Szczecin (56th), Nitra (59th), Kosice (60th), Bydgoszcz (62nd), Győr (63rd), Pécs (64th), Bialystok (66th), Kielce (68th), Miskolc (69th), Suwalki (70th).
In the above-mentioned cities, I also looked for examples of smart home improvements, some of which are highlighted in the next section.

4.2.3 Kielce

A conference was held in April 2018 - How will the homes of the future look like in smart Kielce, and the company FIBARO, which deals with smart home developments, took part in it. In the framework of this, it was examined how much the city residents spend on heating for a year and concluded that using smart thermostats could reduce their costs by up to 42%. This will also be taken into account in the future for residential developments in the city (fibaro.com, 2017).

4.2.4 Kosice

"Since October 3, 2018, a successful Smart Project is supported also by SmartHome Lab, which Fpt Slovakia decided to open. The lab will allow you to simulate use of various common household devices in Smart Home environment, thanks to the interaction of IT specialists with the system, it will be possible to improve existing smart household features. The bonus of the system's practical use in the lab will also be the possibility of adding new features or commands that will further enhance the comfort of a "smart" user." (fpt.sk, 2018)

Conclusion

Based on the Global Cities Index and the European Smart Cities Index examined, the cities of the Visegrad region are not among the European leaders in the process of becoming a smart city, but they have recognized the potential of this in several cities. In the study, I examined a small part of the smart city concept and what smart home initiatives have been in the cities of the Visegrad region which are ranked in one of the examined indexes. In recent years, several such smart home projects have been launched in the region, one of the largest in Budapest, where demand for smart homes is such that supply cannot keep pace. I have also examined the smart home systems market in the Visegrad countries, and I highlighted ten companies. Each of the companies has a complex system and various services.

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