Prospects for development of "smart cities" in Bulgaria

Nikolay STOENCHEV,
Prof. Dr., University of Forestry, Sofia, Bulgaria
mai4@abv.bg

Yana HRISCHEVA,
Chief. Assist. PhD,University of national and world economy, Sofia, Bulgaria
hrischeva.y@abv.bg

Abstract
This study studies the attitudes of young people in Sofia regarding potential purchase of real estate in highly urbanised city areas, as well as their knowledge and preferences concerning the so called "smart cities". The degree to which young people would be inclined to acquire properties in these particular areas could determine the state of the property market in the long term. Information about young people's preferences would help synchronise the opportunities provided by technologies with the users' needs and their capabilities to adapt and benefit from technologies to their full capacity. An important aspect is the increasing means that need to be invested in a purchase of a home in a "smart city". It is useful to establish what part of the population could afford such an investment. Answering these questions would be useful to property developers and local governments equally, so they can update their priorities and meet the current needs of the population.

Keywords: smart cities, electronic technologies, residential real estate.

1. Introduction
The idea of "smart cities" is a product of the digital "society" which has persistently established itself as a form of organising people's lives in urban areas. The shortage of time, space and resources like water and electricity and the need for an environmentally-protective sustainable development in the cities, has brought about the necessity of optimising each human activity: from transport and administrative services to household equipment and human interaction. CCTV surveillance and electronic traffic light regulation of city roads is completely commonplace. Activities related to trade, marketing, healthcare, education, office work and home life are now completely digitalised. Advancement in telecommunications and digital technologies have brought to existence multiple applications that facilitate our daily activities. However, are people able to adapt and reach a sufficient level comfort in this transformed environment and do they really prefer it to the peace and quiet of a cosy home in the suburbs where they can breathe fresh air, light up the fireplace in the winter and plant flowers in the garden in the spring, far from the bustle of the city? This question does not have a straightforward answer. The notions of home warmth and cosiness do not change with the change of technologies and hence the residential areas in the outskirts of cities remain a sought after location for permanent residence. They offer a sufficient choice of amenities and as long as their residents own private vehicles, allow easy access to the city while at the same time avoid the drawbacks of living there.

The purpose of this study is to research the attitudes of young people in Sofia regarding the potential purchase of properties in highly urbanised city areas, as well as their knowledge and preferences in regard to "smart cities". The degree to which young people would be inclined to acquire properties in these particular areas could determine the state

of the property market in the long term. Information about young people's preferences would help synchronise the opportunities provided by technologies with the users' needs and their capabilities to adapt and benefit from technologies to their full capacity. An important aspect is the increasing means that need to be invested in a purchase of a home in a "smart city". It is useful to establish what part of the population could afford such an investment. Answering these questions would be useful to property developers and local governments equally, so they can update their priorities and meet the current needs of the population.

2. Review of references

If we refer to the definition of the European Commission, the description of "smart cities" sounds promising. It is a "place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business." [1].

In some cases, for the purposes of urban planning [2], smart cities may come under names such as "cities of knowledge", "digital cities", "cyber cities" or "eco cities". In these places, the number of services on offer is constantly increasing, which guarantees a sustainable environment that supports well-being and protects public health. Constant monitoring is provided of the key infrastructure systems – roads, bridges, tunnels, railways, metro lines, airports, harbours, communication systems, water supply, electrical supply – this way ensuring optimal distribution of resources and guaranteeing safety. All these services are based on modern information and communication infrastructure.

Other sources describe "smart cities" as "innovative", where the traditional networks and services are made more effective thanks to digital technologies. These cities are more inclusive, sustainable and connected, to the benefit of the citizens, public administration and entrepreneurship alike. A publication argues that "innovative cities" have the potential to improve the quality of life, while at the same time safeguard the present and the future generations from the economic, social and environmental challenges. [3] As telling examples of smart cities in Europe the authors point to Amsterdam, Barcelona, Oslo, Vienna and Zurich. Special emphasis is put on achievements in organising street traffic, maintaining green areas through automated irrigation systems, reducing electricity consumption through the installation of energy-saving street lights technology, optimising the heating and cooling in people's homes via electronic systems which are designed to reduce the greenhouse gas emissions. There is a notable transition from optimising public services and activities in a city to improving people's living conditions by building modern residential complexes which employ "green technologies" like solar energy, recycling of rubbish and waste waters. These new developments aim to create a close-to-nature type environment where neighbours can communicate more directly, park conveniently, commute faster and recreate and exercise near their homes without the need to leave the complex.

It appears that for people it is of key importance not only the incorporation of modern technologies in the administration of the city systems, but to be able to tangibly feel their benefits. With that in mind, a research team from the IMD Business School in Switzerland

and the Singapore University of Technology and Design carried out a massive study where living conditions were compared in 102 cities around the world. They came up with a Smart City Index by which to analyse people's concepts of technologies, and not technologies themselves, and thus assess the "intelligence" of a particular place. The results of this study rank Sofia towards the bottom of the list at number 89, while from the neighbouring countries Bucharest comes at number 85, Ankara at 74, while Athens is at 95. The top 10 of Smart Cities for 2019 is made up by Singapore (1), Zurich (2), Oslo (3), Geneva (4), Copenhagen (5), Oakland (6), Taipei (7), Helsinki (8), Bilbao (9) and Dusseldorf (10) [4]. The study argues that innovations are worth implementing only when they are really useful to people and makes their lives easier. An example is given of how bicycles letting in a municipality only makes sense if the local infrastructure allows for a massive safe use of this particular means of transport. The study also emphasises on the fact that in the different parts of the world people prioritise different facilities.

According to another study by Swiss scientists, Singapore, Helsinki and Zurich are technologically "the smartest" cities in the world. [5] Those three are followed by Oakland, Oslo, Copenhagen, Geneva, Taipei, Amsterdam and New York. At the bottom of the list come Abuja, Nairobi and Lagos. The survey covered 13 000 people from 109 cities. Questions to respondents have to do with the impact of technologies in 6 different fields: healthcare, safety, traffic, mobility, opportunities and government. Anina Santova's publication [5] reviews the first steps of smart cities in Bulgaria. She claims that „there are good examples of smart management in Bulgaria – cities like Sofia, Bourgas and Svilengrad implement innovations which could become a starting ground for a smart transformation". Special emphasis is put on the electrification of city transport, the municipal letting of electrical scooters, setting up charging stations for electro mobiles and etc.

3. Informational provision of the study

For the purpose of analysing the attitudes among young generations in Bulgaria towards the creation and development of smart cities, a survey was carried out amongst university students in Sofia. As a target group for the purposes of the study were selected the students from the largest economics university in Bulgaria – the University of National and World Economy. On one hand their age justifies an attempt to look into their future as real estate consumers, whilst their chosen field of education suggests a certain level of economic competence which would make their responses less based on intuition and more on knowledge and economic deliberations. The survey has more of an illustrative, rather than a representative character, however it encompasses a sufficiently large number of respondents, in order to highlight some significant trends in forming attitudes towards smart cities. We should be mindful of the possibility of an existing internal correlation that would make the expressed views identical to those of a much larger number of students.

The participants in the survey are 174 in total and include students from years 1 to 4 (respectively from year 1 – 7, year 2 – 45, year 3 – 97, year 4 – 25), Bachelor degree programme. The survey was conducted through the online platform Microsoft Teams within the period June – October 2020. The findings of the analysis are approximate and therefore are not followed by a study of the links and correlations between the responses

of the individual questions. The data is processed by the authors via the statistics software product SPSS.

4. Analysis of the findings

Table 1 Breakdown of the responses to the question about the essence of smart cities.

What are Smart Cities in your opinion?	**Relative share in %**
Urban areas whose infrastructure and communications are managed by means of information technologies	47.10
Administrative system linked to the implementation of the idea of digital municipality and digital government, providing services to citizens and business people electronically	31.60
Artificial intelligence created to maintain the monitoring and stability of vital parameters	21.30
Total	100,00

Source: Authors' own study

There is an evident scattering between the different response options, which leads us to believe that the concept of smart cities does not yet have a uniform interpretation in people's minds. Therefore, we see the need for a massive information campaign about the essence, advantages, risks and disadvantages of lives in smart cities and smart residential complexes. Generally, the maintenance of a large number of electronic systems by different producers for local and domestic use, creates difficulties for the users, especially when the warranty period of the systems expires. That necessitates that the electronic systems are supplied with instruments for conventional manual operation for emergency situations like power cuts, natural disasters or failure of other electronic systems.

The majority of the respondents in the survey are convinced that the existing infrastructure is outdated and would prevent the realisation of the idea for smart cities. The breakdown of responses is presented in Figure 1.

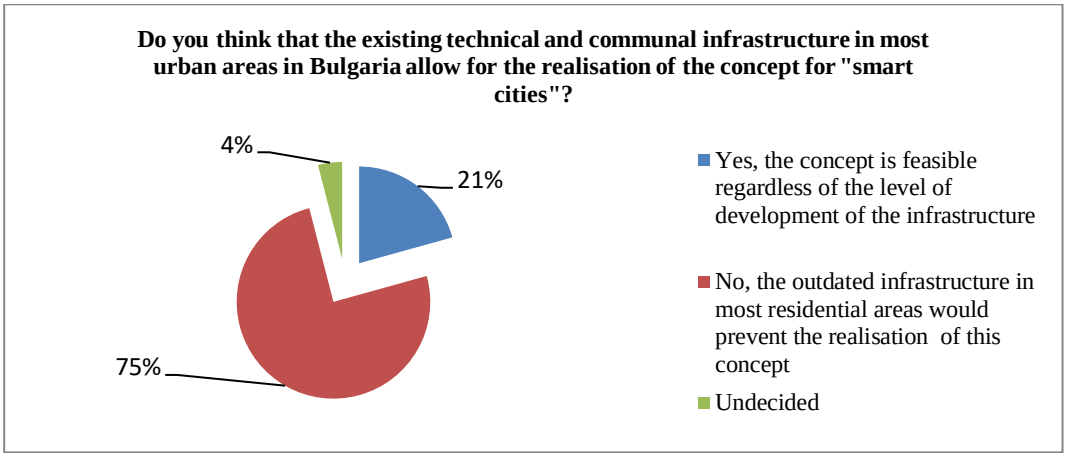

Fig. 1. Respondents' answers regarding the adequacy of infrastructure in terms of potential realisation of the idea for smart cities

Source: Authors' own study

The majority of respondents support the view that outdated infrastructure is an obstacle for the realisation of the smart cities concept, however we should aware that an instant total overhaul of the infrastructure is not possible, hence digitalisation would potentially be introduced in incremental stages. It is worth mentioning that this process has its opponents. Fast digital services require ultra-fast internet connections, whose existence gives rise to controversial views regarding their impact on public health in the long run. We are referring to the planned launch of the 5G networks and the potential risks involved, which have not been studied in full extent. In this context there is a visible rise of technologies designed for "anti-electronic" rehabilitation of homes or particular premises, in order to protect them from the influence of the multiple antennas and routers set up within any large urban building, at least while the individual is offline and is trying to rest.

The respondents' opinions regarding the preparedness of the population to actively participate in the utilisation and development of the electronic systems related to the realisation of the idea for smart cities, is presented in Table 2.

Table 2. Breakdown of responses to the question regarding the population's readiness to utilise and maintain electronic systems, typical for smart cities

Smart cities, after they are created, need to be maintained and developed. Do you think the population is prepared to actively participate in the realisation of this concept?	**Relative share in %**
Yes, people respond positively to everything that would provide a better quality of life without endangering the resources of the future generations	18.39
No, many people would put conditions regarding the price of these projects when it is comes to spending a limited amount of public funds	37.93
This process can be started in incremental stages while simultaneously running an information campaign	43.68
Total	100.00

Source: Authors' own study.

The above responses are completely realistic and reflect the current social structure of the Bulgarian population. Students evaluate their potential engagement with the idea of setting up and developing smart cities influenced by the living conditions in the social group they belong to. Since people of medium to higher income in Bulgaria are not a majority of the population, the prevailing view amongst students is that society as a whole is not prepared to embrace without reservations the idea for the creation and utilisation of smart cities. Possibly impact on these responses has had the traditional proclivity towards calm and quiet life in an uncontrolled environment. The increasing number of CCTV cameras in public areas are a point of concern for most people who see them as potential instruments for intrusion in their private lives. The strict control over road speed, the demand to use digital banking devices for which there are lengthy and complicated instructions that sometimes involve a catch, naturally cause people to be apprehensive. Road signs are often out-of-date and do not meet the requirements of the busy city traffic, while installing new digital applications, to compensate for that, requires purchase of higher class smart phones for each member of the household, which naturally becomes a burden for the family budget.

While the idea for smart cities might look quite attractive to some, it requires people who are ready and willing to initiate its organisation. In Table 3 we present the responses to the question about the moving force behind this process.

Table 3. Breakdown of responses to the question about the realisation of the idea for creating smart cities.

Who in your opinion has to engage with the realisation of the concept for smart cities?	**Relative share in %**
Municipalities, with the financial support of the state and the European funds for regional development	64.4
Private businesses would initially develop separate residential complexes incorporating this concept, which would expand at a later stage.	25.29
Individual citizens who would incorporate electronic systems for running most of the functions in their homes, thus achieving convenience combined with resource saving	10.34
Total	100.00

Source: Authors' own study

The responses to this particular question demonstrate that the majority of respondents perceive smart cities as urban environments equipped with digital regulating systems and electronic administrative services, facilitating people's lives, and not so much as digitalisation of the household, the home or the office. Creating such environments is indeed within the competences of local governments, although private businesses should be the ones to provide investment when it comes to office buildings and private residential complexes. The dream of a whole generation, born before 1990, for "smart" traffic lights equipped with timers counting the seconds one has to cross on green light, have long come true and do not impress most people. The current innovations are the smart systems which re-direct busy city traffic to transport routes which are more relieved, smart devices incorporated into traffic lights capable of regulating the switch time depending on traffic congestion at any given time. Other measures, which do not necessarily involve smart digital systems, are building "smart" road infrastructure like underpasses, tunnels and overpasses which save time and do not stop traffic.

The question about the price of some of these conveniences have always been crucial. Figure 2 illustrates the responses, which in their majority are rather vague, leading us to believe that a relatively high price with a long pay-off period is unacceptable. The low level of home security within the younger demographics, especially when a spacious home is of ultimate value for raising children, naturally shifts the priority from digital technologies to conventional comforts like enough living space, good location, favourable exposure, modern building materials and insulation, parking spaces, floorage of the building and etc.

The question whose responses are presented in Figure 3 is elaborating on the previous question and also concerns the price of conveniences.

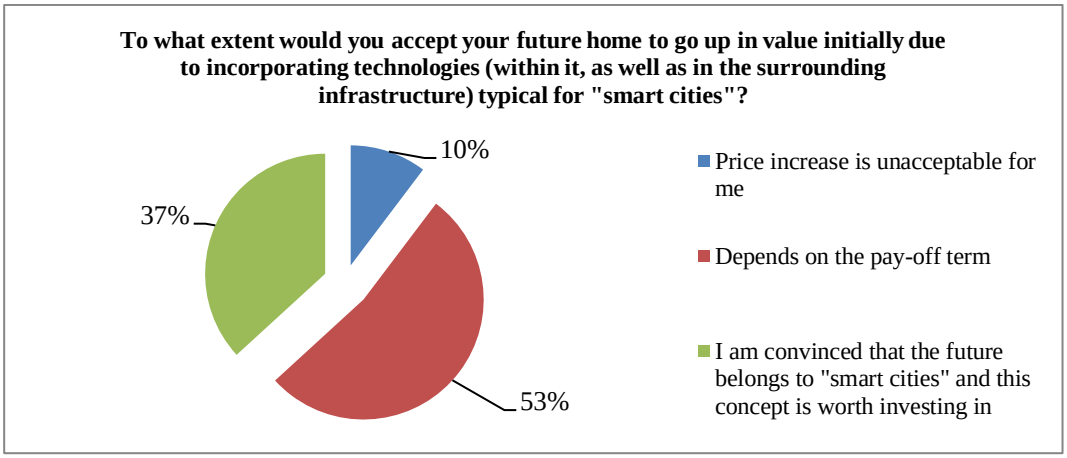

Fig. 2. Breakdown of responses to the question regarding the degree of acceptance that conveniences come at a price

Source: Authors' own study

Responses presented in Figure 3 give some clarity regarding people's inclination to take part in a new project set to create a prototype of a smart city. Significant part of the responses are undecided and associate making a decision about participating in the realisation of a smart city pilot project with the pay-off term of their investment. Considering the potential long period of use of a real estate and the unpredictability of expenses necessary for the maintenance of a "new" type home, there isn't a clearly pronounced willingness to invest. An additional factor causing reservations is the unclear parameters regarding the location of the project, the size of homes, impossibility to predict the future income of the individuals, mortgage rates in the long term and etc.

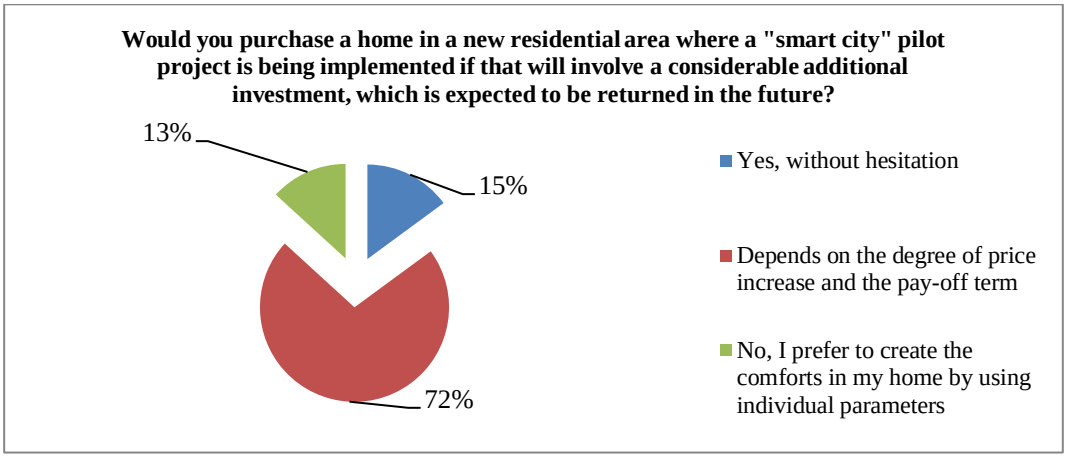

Fig. 3. Inclination of respondents to participate in a pilot project for the realisation of a smart city
Source: Authors' own study

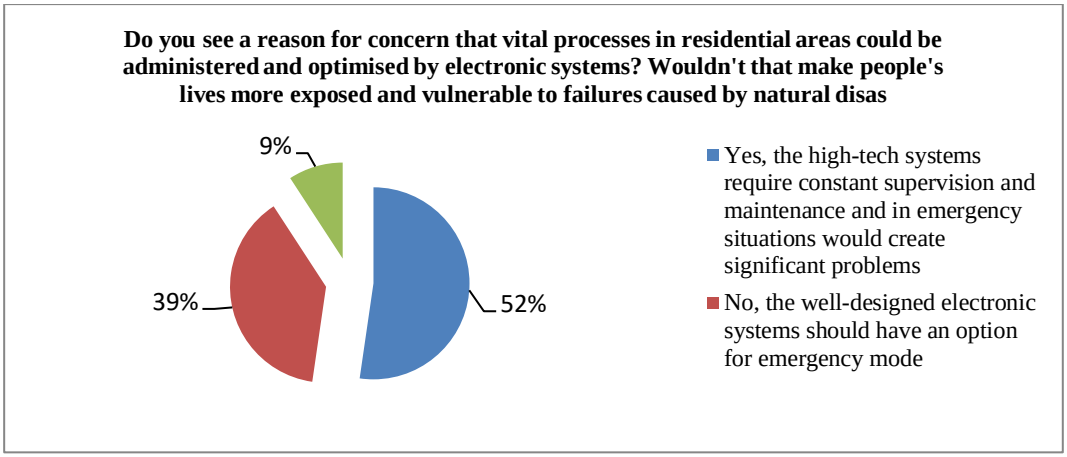

Fig. 4. Views of the respondents regarding the risk involved in an investment when purchasing a home in a smart city
Source: Authors' own study

The breakdown of responses regarding the risk of investment in a home located within a smart city, demonstrate a high level of scepticism about the capacity of the contemporary digital technologies to ensure complete safety in an emergency situation. Examples of serious technical failures in installations with high level of security, which we have heard about over the years, are a cause of concern for most people. We are referring to accidents that have happened with nuclear power plants, terrorist attacks and overloading of energy transmission networks, which especially during the cold part of the year, jeopardises the smooth functioning of the electronic systems.

5. Conclusion

There is a cautious interest demonstrated, but not a outright refusal of the possibility to implement the concept for setting up smart cities in Bulgaria. It is up to investors to begin the incorporation of those innovations which bring a guaranteed positive effect, do not have weak points in emergency situations and do not require substantial maintenance expenses. There is a clear need to employ PR campaigns to work towards informing the public that the future belongs to smart cities, and not because they are the latest hype or trendy thing to do, but because they would make people's lives easier, better organised and predictable in terms of preferences and possibilities.

It is of key importance to correctly define the priorities in the needs of urban dwellers in Bulgaria within their areas, so that the smart innovations are put into use promptly and tangibly improve people's quality of life.

The relatively limited number of the urban population in Bulgaria could be viewed as a good premise for swift and successful transition to electronic administration of key public services and activities and the realisation of the idea for smart cities. The only constraining factor is the relatively low living standards of the population and the scepticism related to that when it comes to participating in the realisation of pilot projects.

References

[1] European Commission, https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en, date: 31.10.2020.

[2] CIOMedia,https://cio.bg/management/2015/06/22/3438658_umnite_gradove_budeshteto_na_gradskoto_planirane/, date: 31.10.2020

[3] Urban Europe Statistics on cities, towns and suburbs, https://ec.europa.eu/eurostat/statistics-explained/index.php/Urban_Europe_%E2%80%94_statistics_on_cities,_towns_and_suburbs, pp.102

[4] Tsaneva, P. Which are the most successful smart cities and where is Sofia in the rankings? https://money.bg/charts/koi-sa-nay-uspeshnite-umni-gradove-i-kade-se-narezhda-sofiya.html, date: 01.11.2020.

[5] Anonymous, Which are the first three "smartest cities" in the world? https://www.actualno.com/europe/koi-sa-trite-naj-umni-gradove-v-sveta-news_1502277.html, date: 01.11.2020.

[6] Santova, A. The smart cities. https://urbact.eu/%D1%83%D0%BC%D0%BD%D0%B8-%D0%B3%D1%80%D0%B0%D0%B4%D0%BE%D0%B2%D0%B5, date: 04.11.2020.