

Smart Solutions For Future Cities

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Abstract

The new trend of our society is the use of smart solutions in every part of our life. This trend will change quality of life and the city will become smarter. In this case it is an essential step to developing a city strategy. To realize a strategy for city development we must to analyze the cost of these solutions. This strategy will help determine where and when to invest. The paper highlights the implications of smart solutions in city development. We have in view to determine if these solutions are an important part of urban development.

Keywords: smart planet, smart cities, urban development, regional development

1. Introduction

Paper aims to highlight the necessity of smart solutions for communication, use and storage of data in all the core area (education, health, transportation and administration) of the city.

The first part presents the elements of smart city putting emphasis on the European model and China model. This part will highlight the advantages and the significant changes brought to the society through a smart system. The second part presents the smart cities projects from the entire world. And this will help us to highlight the cost of a smart solution. The third part is an identification of cost of a smart solution like a software solution and we try to highlight if this is the real cost or we can define yet only a trend. The fourth part presents the conclusions and the necessity of use smart solution in our city.

Technologies have become necessary in all levels of our society. The smart planet is a significant concept that is base on use of new technologies in our world. A lot of researchers believe that this solution will introduce new important changes in our society. Only few years ago, smart planet was an unknown concept now it is used frequently in every important project that have in view the sustainable development of our society. We can see smart planet like a planet in which we utilize the advance of new technologies to make the world to work efficiently.

To realize a smart planet we need smart cities. Smart city can integrates and optimizes different systems in order to achieve a new level of productivity, quality and efficiency. In our vision a smart city is based on use of the new technologies in all activities to improve the quality of work and life, to reduce cost and to increase general efficiency. We need to invest in our city for improve quality of life. In smart cities technical progress is the support for a less consume of resources.

In our age, the cities tend to be large consumers of goods and services, but they don't have in view the limits of resources and technological progress. Because of this we must use a specifically smart solution for every area of our cities. Smart solutions involve the use of technological progress for improve the citizens' quality of life, but also for more efficient consumption of natural resources deemed to be limited.

2. Smart city

The transformation of city in smart city has been recognized as a new stage of urban development. Its construction has become an international trend. Several ongoing projects around the world illustrate the opportunities and challenges of this transformation.

Many cities from Europe are implementing smart cities by starting with a transformation of a vertical, which includes: public safety, education, transportation, water, smart grid, reduced natural energy consumption and is focus on: to be more environmental sustainable, creating new jobs to build economic growth.

On the other hand is China, which building smart cities, are in view the all the core systems of a city. They start to create a strategic development plan for a smart city through surveying, analyzing, summarizing and other methods. In China, many cities have committed themselves to the construction and development of smart city. To build a smart city, they invest in a big number of projects in all categories and they have in view to make new cities. In China smart cities are seen as the solution to their urban growth woes. They start to use the technologies to build greener cities.

We can say that in our age cities are complex systems—systems of systems like mentioned the Chen-Ritzo (2008) in his research. The smart city can integrate and optimize all the systems to achieve a new level of productivity, quality and efficiency. We can have a solution for all the cities, but we can't have the same solution.

In our vision a smart city is based on use of the new technologies in all activities for improve the quality of work and of life, to reduce cost and to improve the efficiencies.

Our society is characterized by urbanization – a large number of people live in our days in urban area; technological progress – in every day we can see new solutions for communication, transmission and storage of data; environmental changes – every activity in our day is characterized by the important impact on natural resources how in fact are limited; economical growth – the gross domestic product of our world is substitute by the big cities how bring the people together and stimulate creativity and efficiency.

A question of our day is how do the cities smarter and what are the step and principles outlined above in the most cost-effective and productive fashion? The answer is to focus initially on four high-impact areas of improvement, mentioned Dirks et al. (2010): reduce congestion in transport systems – a smart system for traffic; improve government services and public safety – a smart system for government services; improve education systems – a smart system for education; enable appropriate access to healthcare data for better quality of care – a smart system for health.

The entire elements who characterized our society drive us to implement solution for infrastructure, for manage the resources and to cater to existing and future needs of citizens. It can take a lot of time for a city to become really smart. Sometime, the transformation is difficult to do because the mentality of citizens, or other time the evolutions can be stop by the natural disasters. But, to reduce costs, improve efficiencies, and life quality, citizens need the implementing of smart city.

The urbanization without precedent of our cities and the technological progress on the hand, and on the other hand for a sustainable progress and for economic growth we need smart solutions for water, energy, transportation, healthcare, education, and safety or we can say we need smart solution for new cities.

3. Smarter cities projects

In the entire world we can find a lot of cities who implemented different solutions for become smarter. We can find examples of cities of various size, geography, and economy that implementing smart solutions in one or more area.

Dubuque, Iowa is an example of smart city. They use the new technologies to optimize resources and operations for citizen. They have in view three major themes: economy prosperity, quality of life and environmental integrity. The model in a research study by Kim et al. (2009) was based on 11 core principles including smart use of energy, water, and other resource like green buildings and great community knowledge. Dubuque has been a pioneer in putting citizens at the centre of smarter city transformation and encourages economic growth.

Seoul, South Korea capital is among the first city who offers solution for universal connectivity like mentioned Washburn et al. (2009). The many benefits of this solution are the access of administrative information and the transparency of services. In Seoul are developing a project for individual apartments. They use the future panels in each the room that control lighting, temperature and access to media. The effect of this new solution is immediately and it can see in consume of water and energy.

In Bari, Italy using a touch screen installed on fishing boats, local fishermen can immediately determine demand in local fish markets that on average handle 100 thousand tons of fish per year. Directly from the boats, using simple touch screen systems, fishermen enter the type of fish caught just minutes ago and instantaneously start a virtual auction with wholesalers on the docks.

In a research study by **Favali (2010)** the University of Bari has also developed systems focused on wine production. Winemakers at up to 60 cooperative wineries are able to determine market demand for various types of wines by accessing the cloud computing-based systems, then package and ship wines demanding the highest price.

A smart traffic system helped the city of Stockholm, said Palmisano (2008), to reduce traffic by 20%, to reduce emissions by 12% and to increase public transportation. Stockholm has implemented a system that automatically charges drivers a fee based on how much they drive (using control points and camera) to reduce congestions and greenhouse gas emissions.

In Brasov we can find a plan to transform the city in the first smart city from Romania, by creating a platform for integrated management of public lighting services, traffic control, video surveillance and wireless internet access road. This system was presented as the first national and even European solution and consists of a series of high-tech equipment connected to existing lighting, which made the optimal management of power consumption and instant location of any defects, fluctuations and disruption, and possible theft of electricity. The main asset of this solution is a reduction of up to 35% of electricity consumption on night, without affecting visibility for drivers and pedestrians.

In the entire world we can find a lot of examples of implementing smart solutions and it is essential to generate a model for a smart city.

All the research highlight that we can implementing smart solutions in our city to become smarter. For this we can start from four areas (transportation, education, healthcare and public administration) that are the core system of the city.

For a smart city we must have in view to interconnect all the city systems. This can be do step by step start from one system and then extended to the entire city.

Every system can be characterized by some function: sensing, information management, analytics and modeling, and influencing outcomes. For best results these systems must to be

integrated in one system.

The first step for a smart city is to observing and understanding city activity. In this case we will know where to implementing the smart solutions. For a city who have a big problem with traffic we consider that is a good idea to start with a model for traffic congestion, and on the other hand in a city with a lot of consume of water we will start with a smart solution for reduce the water consume. For this we must to analyze all the important areas of the city. The second step is to select the primordial area of the city and implement smart solution. The third step is to extend the smart solutions to other areas of the city and to manage information across all the city systems. The last step is to optimize the solutions for improve the quality of life.

4. Smart city cost

Analyzing the models of smart cities that exist among the world we identified some priority categories: model for resource consumption, model for traffic congestion, model for health and model for educational system. All the models have in view to optimize control of the city systems and to offer citizens better outcomes and a quality life.

Before starting the modeling a smart city should study the cost elements of implementing a smart solution. Using the models of smart cities that exist we can highlight the cost elements and we can define a trend for

To determine the advantages of smart solution for one area of the city, should try to set the cost of that project. There is a strong similarity between costs of achieving a smart solution to the level of local government and the need for a smart city.

In the economic literature Troie et al. (2006), cost is defined as the effort made by money, time and resources used to reach the desired result. If this project desired result is an information portal for better communication, storage and processing information

Total costs are defined in accounting as the sum of fixed costs, variable costs and semi-variable costs, but from the point of view of investors' total costs is the total expenditure made by the including project inception investment price, commissions, fees and other costs transaction mentioned Troie et al. (2006).

Cost evaluation is a complex and difficult activity. It can be addressed several methods and methodologies based on team design, implementation, maintenance and development.

Without going into the privacy of determining precisely the elements of cost, we propose the structure of this for a smart city. A smart solution for the administration of the city involves the following high categories of costs:

analysis, design, development, testing, implementation and maintenance (Figure 1).

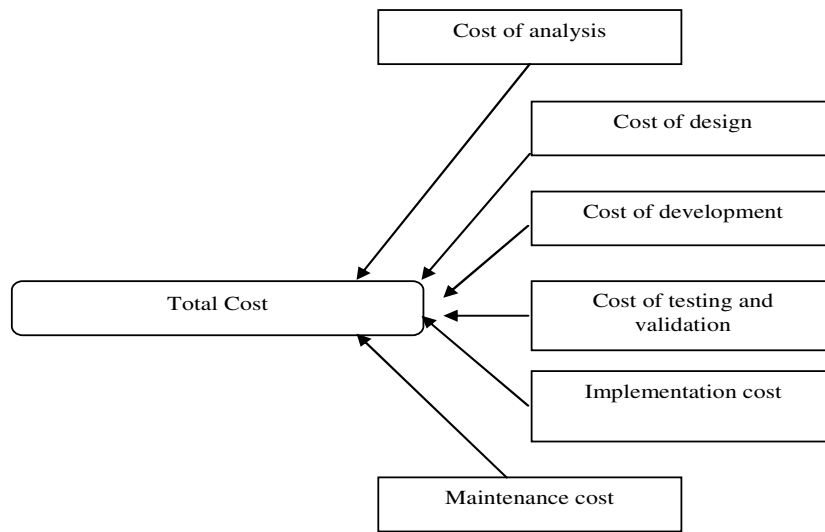


Fig 1. : Cost of a smart solution

The cost of analysis phase (CA) is defined as:

$$CA = Ci + Cu + Cot1$$

where:

Ci - the cost of hardware and software infrastructure;

Cu - the cost of human resources available;

Cot1 - other costs.

The cost of design (CP)

$$CP = Ca + Cpa + Cpd + Cot2$$

consists of costs related stage design phases, namely:

architectural design (Ca), which establishes the general architecture of future smart solution in conjunction with local wishes;

overall design (Cpa), which sets modular structure, the departments of smart solution;

detailed design (Cpd), which sets on each module / department components;

Cot2 - other costs.

The cost of development (CD) is calculated as:

$$CD = Cih + Cis + Cru + Ccd + Cid + Cot3$$

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where:

Cih - cost of hardware necessary to create infrastructure for development smart solution;

Cis - costs for purchasing and installing the software needed to make the smart solution;

Cru - costs for writing code, debugging;

Ccd - costs to collect and verify accuracy;

Cid - costs for data integration;

Cot3 - other costs.

Development cost can be calculated in two ways:
 cost developer is required by society;
 cost is calculated according to the steps taken to develop smart solution, when using their own resources.

The costs of verification and validation (CVV) are specific for activities necessary to ensure that the smart solution is working properly according to customer specifications.

To implement a smart solution is identified following implementation costs (IC):

$$CI = C_{instal} + C_{instru} + Cot4$$

where:

C_{instal} - installation costs;

C_{instru} - training costs;

$Cot4$ - other costs

Once smart solution was implemented, the next step is to be maintained by the developer team which also means errors correction, but also constant updating according to needs. It can thus identify and maintenance costs (C_{in}), which are important for the proper functionality of the smart solution.

Almost all of these costs for a smart solution for administration can be identified in all the area where we want to improve the efficiency. These solutions help as to develop the urban zone and to have a smart city.

But because every city have a specific evolution determinate by the specific geographic area, demography and development, we can't say that the real cost is the same for the entire cities. Figure 2 depicts the trend of costs.

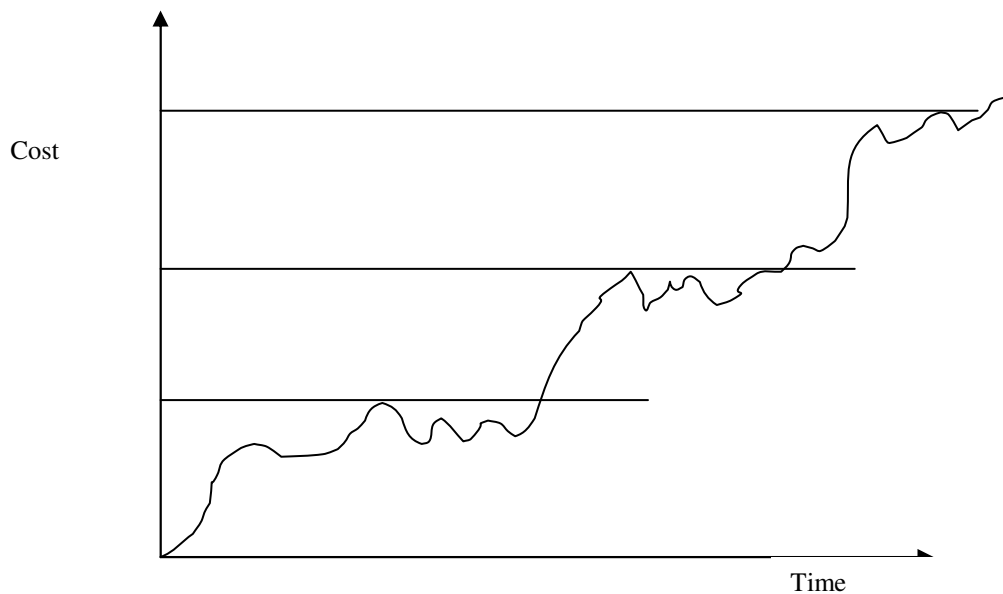


Fig2.: Trend of cost

In this kind of solution we pay what we use (in past we pay for all the resource even if we didn't used all of them) first for one solution and then for every other application.

6. Conclusions

The use of smart solutions efficiently in our society is an important part of innovation, evolution and sustainable development. Our world today is more interconnected, intelligent and the information is positioned in the middle of it. In our age the development of city depends on the use of more and more smart solutions. For smart and sustainable growth of cities are important to use efficient the new technology and resources.

The city development depends on the efficient use of smart solutions on the one hand to produce renewable resource and on the other hand to improve the quality of life.

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