

Modernization of Managing a “Smart City” on the Basis of Digital Platforms

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Abstract. The main challenges facing modern cities initiate review of approaches to management of city development. Combining of information systems and “smart” equipment used in various spheres of activity is analyzed. It causes digitization of social and economic processes which are not the optimal ones, and management mistakes are transferred to the sphere of digital transformation. In this research it is proposed to consider the development of digital platforms of a “smart city” according to systematic transformation of social and economic processes into the view optimal for management whilst taking into account psychological and cognitive characteristics of city dwellers. This issue may be solved by creating digital platforms of a new class which are based on neural management of knowledge and artificial intellect.

Keywords: artificial intellect, knowledge neural management, smart city.

1 Introduction

Stable development of a “smart city” must be oriented towards achievement of high living quality level whilst a complex of various indicators of social, ecological and economic character possesses positive dynamics. At present managing a “smart city” demands not only application of new theoretical approaches, but also development of the corresponding methodology and techniques. The suggested research is devoted to development of theoretic and methodological bases and practical recommendations in creation and development of a new class of digital platforms built on the basis of the concept of neural management of knowledge and artificial intellect and increasing efficiency of managing a “smart city”.

2 Problem Statement

The main challenges which modern cities encounter (migration growth, excessive density, transport problems, growing ecological pressure, changing of demands of dwellers and business to the quality of the city environment and provided services) are the reason of revision of approaches to management of the city development which is carried out on the level of a “smart city”, as a rule. Therefore combining information systems and “smart” equipment used in the housing and utilities sector, health care, education, security and other spheres of activity is considered. This often leads to digitization of the social and economic process which is not the optimal one, as a rule, i.e. management mistakes are transferred to the sphere of digital transformation. Therefore using another approach which could bring digitization of social and economic processes to the end user – population - is necessary here. The centre of strategic developments issued the report “A state as a platform. (Cyber)state for digital economics” in May 2018. It states that a citizen that will interact with the digital ecological system and obtain digital services from it in accordance with his demands is located in the focus of development of the state being a platform [1, p 1].

For this very reason in this research it is suggested to consider the development of digital platforms of a “smart city”, as digital platforms serve as catalysers of economy development [2, p.10].

The specific feature of our approach consists in the fact that digital platforms of a “smart city” are created on the basis of systematic transformation of social and economic processes into the view optimal for management, with due regard to psychological and cognitive characteristics of the city dwellers. This problem may be solved by means of creation of new class digital platforms based on neural management of knowledge and artificial intellect. Therefore the main purpose of the research is development of theoretic and methodological fundamentals and practical recommendations for creation and development of the new class of digital platforms built on the basis of the concept of neural management of knowledge and artificial intellect increasing the efficiency of management of a “smart city”.

3 Research Questions

For the purpose of solving the set goal it is necessary to solve the following items: find out and systematize global trends of creation and development of digital platforms of a “smart city” based on the research of international

experience, digital products and services markets; investigate areas of “Neural net” under the conditions of digital economics of a “smart city”; form classification of digital platforms used within the scope of a “smart city” and find out locations and characteristics of use of the new type of digital platforms functioning in accordance with “Neural net” principles; develop the concept of neural management of knowledge and form instrumentation of the artificial intellect realizing its basic principles; form the model of the digital platform of a “smart city” on the basis of the concept of neural management of knowledge and artificial intellect, validate the methodology of the life cycle; develop mechanisms of management of digital platforms development according to the spiral (from a separate digital platform to a bush of platforms, from a bush of digital platforms to the digital ecological system, and from the digital ecological system to new kinds of digital platforms); develop the mechanism of forming the pool of digital platforms of a “smart city” built on the basis of the concept of neural management of knowledge and artificial intellect taking into account demands of all spheres of the city activity; create models of designing digital platforms of a “smart city” on the basis of the concept of neural management of knowledge and artificial intellect; investigate and form instrumentation of designing digital platforms of a “smart city” on the basis of the concept of neural management of knowledge and artificial intellect.

4 Purpose of the Study

For the purpose of solving the set goals global trends of creation and development of digital platforms of a “smart city” based on the research of international experience and markets of digital products and services were determined. Models and algorithms of channels of neural communications in the fields of education, health care, housing and utilities sector, transport are proposed. A concept of neural management of knowledge including principles, priorities, orienting points, criteria, mechanisms, instruments of realization in the fields of education, health care, housing and utilities sector, transport is suggested.

This concept includes models of neural transfer of knowledge, models of neural generation of new knowledge and (or) improvement of available knowledge according to the schemes “man-man”, “man-collective”, “man-digital system”, principally new complex crowd sourcing models of generation of new knowledge synthesizing the schemes “man-man”, “man-collective”, “man- according to the schemes “man-man”, “man-collective”, “man-digital system”, models of search of inanimate sources by a subject, models of search of animate sources of knowledge by a subject, models of finding knowledge in animate sources of knowledge on the basis of neural preferences, models of finding knowledge from network sources, knowledge and data bases on the basis of visual and psycho-emotional characteristics of subjects.

The digital system of neural management of knowledge is a complex system functioning on the basis of self-organization and evolution approach. Self-organization is carried out by means of coordinated two-sided interaction of digital platform users on the basis of incoming neural signals. The evolution approach consists in gradual self-training of a digital platform on the basis of incoming neural signals and support of decision-making on the basis of the usefulness function.

The digital platform of neural management of knowledge is convenient for the user from the cognitive point of view, it also decreases transaction costs. Structures and properties of digital platforms containing channels of neural communications in the fields of education, health care, the housing and utilities sector and transport are summarized [3, p.55]. In connection with the fact that non-verbal meta communication is an essential addition to verbal communication, models of digital platforms of a “smart city” based on neural management of knowledge for the fields of education, health care, the housing and utilities sector and transport are proposed [3, p.55].

The life cycle of a digital platform with channels of knowledge neural communications and neural management, as well that of a bush of digital platforms with channels of knowledge neural communications and neural management and a digital ecological system with channels of knowledge neural communications and neural management are shown. An algorithm of planning the pool of digital platforms of a “smart city” built on the basis of the concept of knowledge and artificial intellect management is developed in accordance with demands of all spheres of the city activity. Notations (models) describing designing of digital platforms using knowledge and artificial intellect neural management are developed. Instrumentation of designing digital platforms of a “smart city” on the basis of the concept of neural management of knowledge and artificial intellect is proposed.

5 Research Methods

In this research a complex of economic methods and methods concerning artificial intellect and data analysis was considered. We investigated digital platforms, the use of which decreases transaction costs, connection with voluntary mutually profitable cooperation and transaction costs is described as Coase theorem. In accordance with the latter “it is always possible to change the initial legal rights differentiation with the help of market transactions. It goes without saying, if such transactions are concluded without excessive costs, this rights differentiation will always take place, in case it opens the way to the growth of production value” [4, p. 100].

Methods of bilateral markets are also considered, because any digital platform of knowledge neural management functions under the conditions of the bilateral market, and the platform is capable of influencing the volume of transactions by increasing the price on one side of the market and reducing it on the other one- in other words, the pattern of prices is of great importance in such market [5, p. 385].

Approaches of organizational transformation taking place when developing and introducing digital platforms of knowledge neural management were used. The essence of organizational transformation consists in closer involvement of the electronic site into the organization of interaction of government customers and suppliers. This will increase the cost of its services for both parties, but we believe that costs growth will be compensated due to the improvement of interaction quality [6, p.57].

Out of fields of the artificial intellect and data analysis, possibilities of application of various neural networks – multilayer perceptrons, recurrent neural networks, radial basic functions – were considered. Characteristics of direct methods based on direct management and indirect methods when the neural network is used for performing auxiliary management functions are investigated [7, p.79]. One of the popular approaches to the management systems synthesis is the predictive control named in foreign literature as «Model-Based Predictive Control» (MPC) [8, p. 110].

Artificial Neural Networks are artificial and simplified models of the neurons that exist in the human brain. They can be used as a black box approach to create models of systems profiting of the facility to model non linear (as well as linear) systems [9, p.251]. Artificial Neural Network (ANN) is a set of artificial neurons which are mutually connected similar to the biological neural network [10, p. 20]. Artificial neural networks are a flexible instrument for solving a lot of problems including non-linear regression, supervised learning and pattern recognition, unsupervised learning, associative memory, optimization tasks etc. [11, p.186]. Most neural network researchers would agree that the question of whether batch or on-line training is faster and/or ‘better’ has been settled [12, p.1429].

According to its composition and designation each system is functionally restricted, as it solves certain tasks and requirements [13, p.62]. Many methods of inductive learning were developed as an alternative to classical statistic approaches and are closely connected with the methods of information extraction and methods of intellectual data analysis (data mining) [14, p.66].

6 Findings

Models and algorithms of neural communications in the fields of education, health care, the housing and utilities sector and transport are investigated. The concept of knowledge neural management is formulated. Digital platforms are treated as the main digital object of a “smart city” due to the fact that one of the advantages of the platform business model is provision of direct cooperation and exchange between subjects and decrease of their transactions and other costs [15, p. 22]. Generalized structures of digital platforms including neural communications channels in the fields of education, health care, the housing and utilities sector and transport are developed. These digital platforms are defined as digital platforms of knowledge neural management. Their life cycle and algorithms of development management are described. New models describing designing of digital platforms using artificial intellect are created.

7 Conclusion

Thus, in this research global trends of creation and development of digital platforms of a “smart city” based on thorough analysis of world trends are analyzed. Variants of new solutions application based on the principles “Neural net” are proposed. Of special importance is the concept of knowledge neural management. These developments may be useful in the modern environment of transformation of RF cities into “smart” ones; they will facilitate realization of the program “Digital economics of RF” and will form the basis of further research in this aspect.

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