Opportunities for IoT-based smart platforms for intelligent management of waste systems in Bulgarian municipalities

NIKOLAY TSONKOV, KAMEN PETROV

DEPARTMENT OF REGIONAL DEVELOPMENT, FACULTY OF MANAGEMENT AND ADMINISTRATION

UNIVERSITY OF NATIONAL AND WORLD ECONOMY,

Main assumptions of the research

The digitalization of economic processes implies the transition to smart management tools. To meet these challenges, Bulgarian municipalities need to adapt and implant smart management in their systems. One very important system is waste management. The bigger a city is the more serious the problem of efficient waste collection, treatment, and management becomes. In this sense, the main objective of the authors is to analyze and evaluate the possibilities of implementing smart solutions in the field of urban environment and waste. These solutions are related to the implementation of platforms based on the Internet of Things. The study provides a new systematic approach to adapting new information and communication technologies to the Bulgarian municipalities' waste management system

INTRODUCTION

In today's society, with the introduction of new technologies in people's socio-economic life, it is possible to increase the awareness of the population regarding the key policies of the municipalities

- The combination of these processes leads to the development of smart cities and the application of more and more intelligent management systems.
- The modern city needs urban planning, and digital and technological equipment to optimize waste collection routes through the use of garbage sensors
- This initiative requires close cooperation between local public administration, urban planners, service providers, civil society, entrepreneurs, businesses, and citizens.

METHODOLOGICAL ASPECTS OF THE RESEARCH

The main objective of the authors is to analyze the possibilities for the application of smart solutions in the management of environmental infrastructure and specifically the waste management system in Bulgarian municipalities. The authors propose the introduction of the ANGIE platform through which the waste management system in Bulgarian cities will be transformed into an electronic one. The expected result of the introduction of smart solutions in the field of urban environmental infrastructure is to significantly improve the quality of the urban environment. Analytical and comparative methods as well as expert evaluation are used

LITERATURE REVIEW

- Demographic dynamics in the population are causing several landfill-related issues to emerge.
- Some studies in the US indicate that nearly 75% of waste can be recycled, but there is no proper mechanism for the real-time separation of waste, so currently only 30% of waste is recycled
- Such smart solutions are linked to IoT trash monitoring technologies, an extraordinary way to help maintain urban areas as smart cities
- In this regard, a study can be pointed out on the methods of garbage monitoring, waste disposal techniques, and technologies used to develop a system to deal with waste management
- Spatial technologies include Geographic Information Systems (GIS), global positioning technology, and remote sensing. With these technologies, spatial modeling of the environment is done

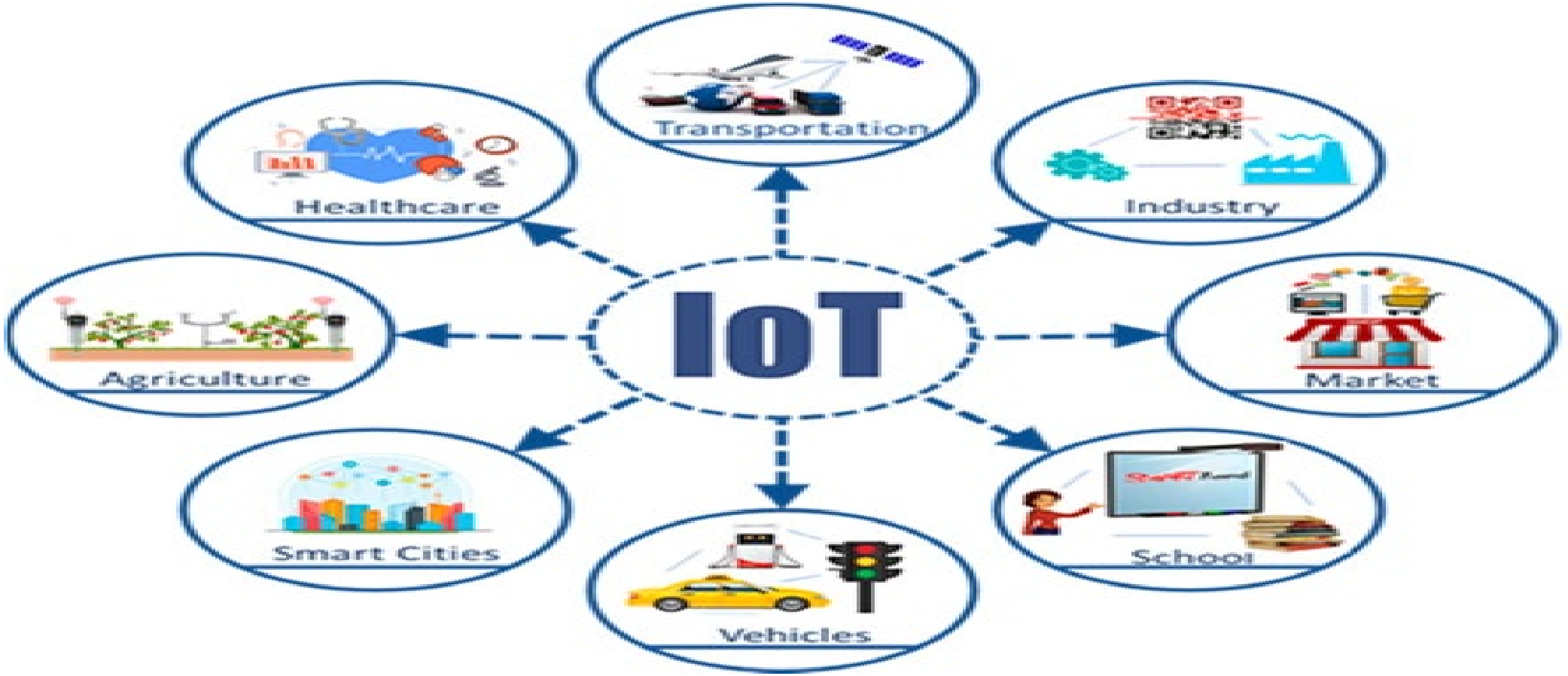
MUNICIPALITIES' PROGRESS TOWARD SMART WASTE MANAGEMENT

- Bulgarian municipalities are obliged to collect and provide information on waste.
- Analyses of municipalities' progress in implementing smart waste management show a serious backlog in this area of municipal governance
- In the municipality of Montana, smart waste management is being implemented, covering 2,000 containers in different areas of the city, with 220 of these containers fitted with active sensors and detectors. These automatically report the level of refuse fill.
- In Vidin, the smart solution covers a total of 2075 containers equipped with sensors. The majority - 1976 of the smart containers - are placed in the city of Vidin, while the remaining 99 are distributed in several settlements in the municipality
- medium-sized municipalities in Bulgaria must try to introduce Easy Pac™. It is a solution for the storage and management of recyclable or reusable containers, where containers are essential through solutions linked to intuitive technologies and functional design that enable new spatial solutions. In this direction, Easy Pac™

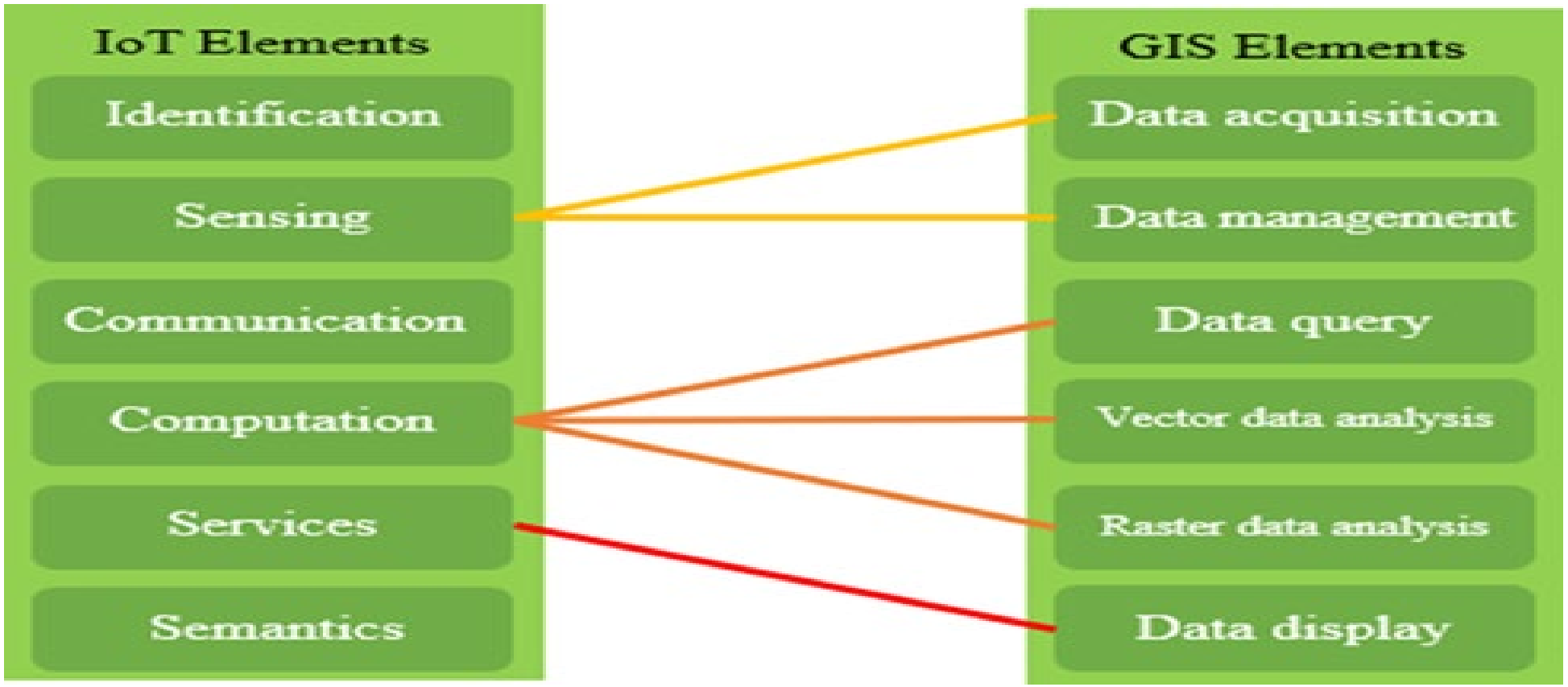
SMART PLATFORMS FOR BULGARIAN CITIES' WASTE MANAGEMENT SYSTEMS INCORPORATION

- The authors' analysis shows that there is a clear necessity to create a software application for each municipality, which would have as its main objective to inform the citizens about the state of waste, the municipality's policy in this area, containers and installations for waste collection and treatment, and in general the state of the environment and environmental infrastructure throughout the territory
- Smart development in the field of urban ecology can be seen in two directions - smart management platforms based on the Internet of Things; and informative platforms increasing transparency and citizen awareness regarding systems related to urban ecology

ILLUSTRATION OF AN INTERNET OF THINGS (IOT) GENERAL FRAMEWORK WITH SEVERAL VERTICAL APPLICATIONS



Connection between GIS and IoT



CONCLUSION

In modern settlements, it is necessary to achieve comfort and quality of life that has a high level. This means prompt and adequate action by the local authorities responsible for public works within the settlements. On the other hand, the progress of becoming a smart city can only happen when there is access to big data analysis. Quality information assessment can help improve operations and monitoring by creating long-term benefits for society, smart waste management is as important as smart security, smart traffic, or smart energy. Building a smart environment within municipalities means forming an ideal smart system for all indoor and outdoor installations.

ACKNOWLEDGMENT

THANK YOU FOR YOUR ATTENTION!

FEEL FREE TO ASK YOUR QUESTIONS!

- The paper is financed by the UNWE. The report presents the results from the realization of the university scientific project N 5/2022.