# A Conceptual Model of Big Data for Electrical Energy Management in Smart City

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***Abstract*** **- Smart City was the new age technological system for management and admin the facilities system control with Information technology. But, only general information technology incommensurate and not cover the requirement of city processes. So, Big Data could reserve and cover all the process of collected data, computation, prediction and others. And in Smart City impel with energy that the most important energy was electrical energy. Then the Big Data of Smart City must focus on electrical energy the first. Conceptual model of Big Data for Electrical Energy Management in Smart City design and analyzing on all of stakeholder of the city.**

***Keywords*** **- Big Data, Smart City, Electrical Energy Management**

## I. INTRODUCTION

Smart City was the new plat from, new technology and new management of the city in age. Smart City used many technologies, innovations, computation for manage the facilities of the city that control by artificial intelligence or A.I. The A.I. used the Big Data or Data Analytic concept for computed and solved the problems, described the events, predicted and decision for support ant people in Smart City.

Big Data was the important conceptual for analyze the data. It same the brain of human for thinking, learning, memorize and decision everything. Big Data could support the Mayor of city or Government when got the problems and development process.

In Smart City, the electrical was the most important energy of city because every unit in smart city used electric. So electrical energy management must use the Big Data decision on every automatic command.

## II. THEORY AND REVIEWS

### *A. Big Data*

Wikipedia had define the meaning of Big Data was " Big data is data sets that are so big and complex that traditional data-processing application software are inadequate to deal with them. Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source. There are a number of concepts associated with big data: originally there were 3 concepts volume, variety, and velocity". The three concepts of Big Data were:

***Volume:*** Organizations collect data from a variety of sources, including business transactions, social media and information from sensor or machine-to-machine data. In the past, storing it would've been a problem – but new technologies (such as Hadoop) have eased the burden.

***Velocity:*** Data streams in at an unprecedented speed and must be dealt with in a timely manner. RFID tags, sensors and smart metering are driving the need to deal with torrents of data in near-real time.

***Variety:*** Data comes in all types of formats – from structured, numeric data in traditional databases to unstructured text documents, email, video, audio, stock ticker data and financial transactions.

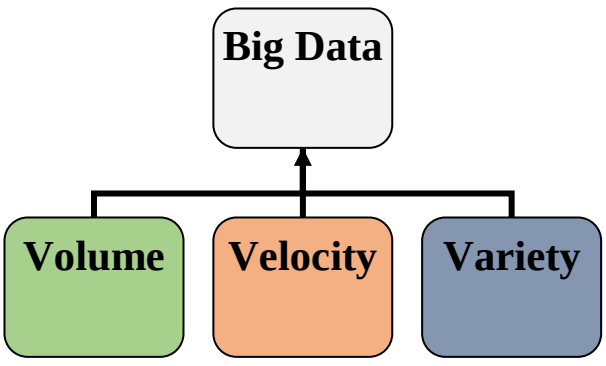


**Fig. 1** Big Data Concept

### *B. Smart City*

A smart city was new idea of city that different from the city in present. Smart City used computer technology, information technology, network technology, IoTs and any innovation included the data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services.

The smart city concept had been integrated information and communication technology (ICT), and various physical devices connected to the network (the Internet of things or IoT) to optimize the efficiency of city operations and services and connect to citizens. Smart city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving.

### *C. Big Data in Smart Energy*

Kaile Zhou, Chao Fu, and Shanlin Yang "Big data driven smart energy management: From big data To big in sights" this research design amounts of data are increasingly accumulated in the energy sector with the continuous application of sensors, wireless transmission, network communication, and cloud computing technologies. To fulfill the potential of energy big data and obtain in sights to achieve smart energy management.

Paul A. Mathew, Laurel N. Dunn, Michael D. Sohn, Andrea Mercado, Claudine Custudio, and TravisWalter "Big-data for building energy performance: Lessons from assembling a very large national database of building energy use" shown about Building energy data has been used for decades to understand energy flows in buildings and plan for future energy demand. Recent market, technology and policy drivers have resulted in widespread data collection by stakeholders across the buildings industry.

From the research reviews the big data was the important component in energy management of smart city. So, conceptual model of Big Data that could reserve, managed and covered all of the process and any activities in Smart City.

## III. CONCEPTUAL MODEL

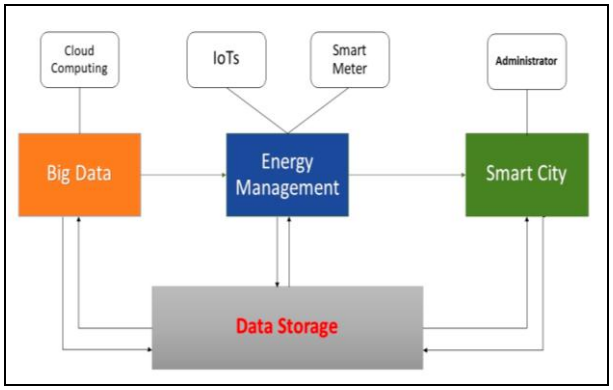


**Fig. 2** Conceptual Model of Big Data for Electrical Energy Management in Smart City

From Fig. 2. shown, the component of Conceptual Model of Big Data for Electrical Energy Management in Smart City. In fig. 2, had four elements in flow of management control.

***Big Data*** was the main process for compute, predict, control, and management the system flow and had cloud computing for collected data online.

***Energy Management*** was the control system in energy system of smart city that had smart meter for send-receive the electrical used unit from every home in city and IoTs were the sensors for checking the security.

***Smart City*** was the sector of management of city administrator to control system of every unit in flow of city.

***Data Storage*** was the storage of electrical used data and linking between any unit in conceptual model. Data Storage of Smart City stored the data of people, facilities, city zone, factor of management.

## IV. CONCLUSIONS

The Conceptual Model of Big Data for Electrical Energy Management in Smart City could help the administrator of Smart City to define the management system, control system, energy storage unit and the others unit for facilitate the facilities of smart city to comfort people. The flow applied the framework of big data and adopt the smart city concept and cover the security unit with IoTs. Then Smart City concept must use big data, energy management, Data Storage and cloud computing to control the city automatically. In future, the robotic system will be the effective component in Smart City with concept no workers in industry unit and can work 24 hour every day. In this conceptual model can adapt the robotic system in smart city.

## REFERENCES

**(Arranged in the order of citation in the same fashion as the case of Footnotes.)**

[1] Luangnaruedom, N., Yimcharoenpornsakul, N., and Apinawin, W. (2016). "A Framework of Green & Smart IT Management for Teacher". The International Journal of the Computer, the Internet and Management (IJCIM), Vol. 24(1), January - April 2016, ISSN 0858-7027, p. 42-46.

[2] Luangnaruedom, N., Yimcharoenpornsakul, N., Apinawin, W., Rodruksa, T., and Limoransuksakul, M. (2017). "Digital Business Model on Internet Governance". The International Journal of the Computer, the Internet and Management (IJCIM), Vol. 25(1), January - April 2017, ISSN 0858-7027, p. 136-140.

[3] Luangnaruedom, N., Yimcharoenpornsakul, N., Apinawin, W., Rodruksa, T., and Limoransuksakul, M. (2017). "The Use of Digital Business Model on Internet Governance in the business organization". The International Journal of the Computer, the Internet and Management (IJCIM), Vol. 25(3), September - December 2017, ISSN 0858-7027, p. 96-99.

[4] Zhou, K., Fu, C., and Yang, S. (2016). "ScienceDirect: Big data driven smart energy management: From big data to big insights". Renewable and Sustainable Energy Reviews, Vol. 56, p. 215-225.

[5] Mathew, P.A., Dunn, L.N., Sohn, M.D., Mercado, A., Custudio, C., and Walter, T. (2015). "Big-data for building energy performance: Lessons from assembling a very large national database of building energy use". ScienceDirect, Applied Energy, Vol. 140, p. 85-93.

[6] Kontokosta, C.E. and Tull, C. (2017). "A data-driven predictive model of city-scale energy use in buildings". ScienceDirect, Applied Energy, Vol. 197, p. 303-317.

[7] Wikipedia. "Big data". <https://en.wikipedia.org/wiki/Big_data>.

[8] SAS. "Big Data What it is and why it matters". <https://www.sas.com/en_us/insights/big-data/what-is-big-data.html>.

[9] Wikipedia. "Smart city". <https://en.wikipedia.org/wiki/Smart_city>.