Workforce mobility: Contributing towards smart city

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Abstract. Smart cities gained importance as a means of making ICT enabled services and applications available to the citizens, companies and authorities that form part of a city's system. It aims at increasing citizen's quality of life, and improving the efficiency and quality of the services provided by governing entities and businesses. This perspective requires an integrated vision of a city and of its infrastructures in all components. One of the characteristics of a smart city is mobility. The concept of mobility, especially for the workforce, is studied through a research carried out on a daily work undertaken as a prototype in the administrative town of Putrajaya, Malaysia. Utilizing the location track from GNSS integrated with mobile devices platform, information on movement and mobility was analysed for quality and efficiency of services rendered. This paper will highlight the research and outcomes that were successfully carried out and will suggest that workforce mobility management can benefit the authorities towards implementing a smart city concept.

1. Introduction

The concept of smart city has been introduced as a strategic device to encompass modern urban production factors in a common framework and to highlight the growing importance of Information and Communication Technologies (ICT), social and environment capital in profiling the competitiveness of cities. The deployment of ICTs in a smart city is an innovation where it will improve capacity and solving the problems.

The concept of Smart City is gaining increasingly high importance and popular. A City has an impact in the economic development of a country, where services provided to the citizen in a wide range. It also relies on the technologies that prioritize the citizens and promise social, environmental, and economical sustainability. Information and Communication Technologies (ICT) plays an increasing role to the public and so privet entities. Technical trends such as displays and mobile devices everywhere that connect to human-centric computing and continuous access to massive amounts of data will make the citizens especially the city workers more efficient at work and at the same time continuously get connected to family, friends and information This smart concept aims to increase citizens' quality of life and improve the efficiency and the quality of the services provided by the governing entities and businesses. This perspective requires an integrated vision of a city and its infrastructure, in all components and extends beyond the mere digitalization of information and communication. Smart city can be identified and ranked based on these six characters. They are economy, people, governance, mobility, environment and living.

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2. Objective

This study will only focus on the mobility character, where the definition and concept of mobility will discuss further. For better understanding of this research, a sample of mobile workforce has been conducted and applies in the territory of Putrajaya, with *Bahagian Pengurusan Hartanah* (BPH) maintenance as a model. The traditional practice, including workflow and task deploy, from the management to field work has been study and understands and the mobility concept is the value added. At the end of this research, a prototype of mobile workforce for contributing a smart city (in this case is BPH maintenance) is produced.

3. Mobility in a "Smart City"

Since the beginning of urbanization, mobility has been an important issue, for growth and progress. The words mobile is referring to the technology that can travel with the user, but not necessarily in real-time. Smart mobility has to do with providing the public with access to new technologies and the use of these in everyday urban life. The infrastructure must provide the ability for all users to share and process any information instantly from anywhere.

During past time, mobility has only stood for the freedom of the people to move around using the means of transportation in growing cities. But nowadays, the lifestyle has changing. Mobility is not only refers to transportation facilities, but it also means the ICTs and embedded with the new technology such as Global Positioning System (GPS), and they becoming increasingly important and demanding.

Figure 1. Shows the mobility of workforce.
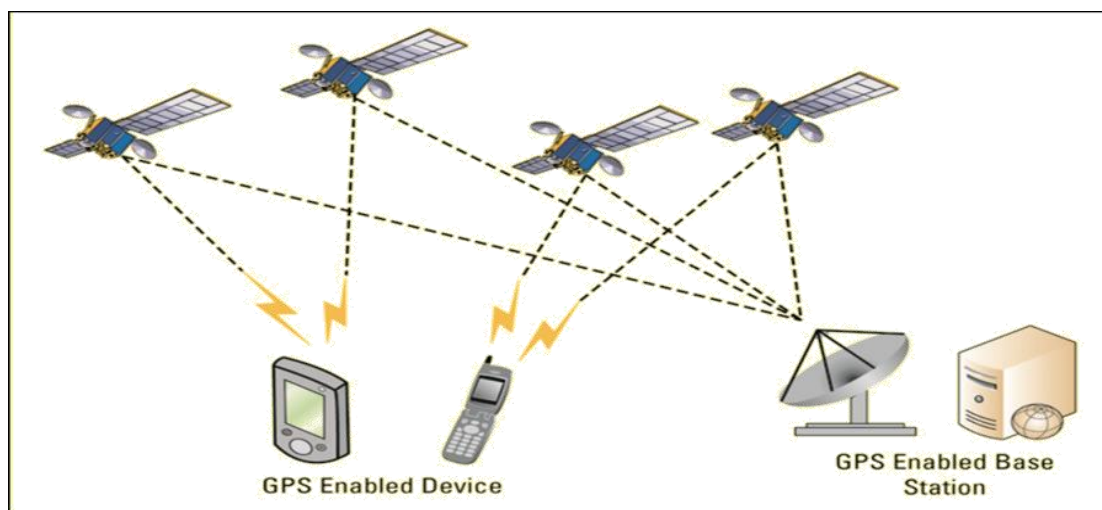
4. The workforce and the mobility

There are widely varying definitions of mobile work. Remote work, virtual work, telework and telecommuting are just a sample of the terms used to express mobility. To simplify matters, all these terms have at least one thing in common: employees are performing tasks normally done at an assigned 'desk' at a location other than that desk. Mobility, in the broadest sense, implies a substitution of place. The deployment of this system in daily routine work, are able to simplify many field services processes for example in conducting data collection. The active mobile worker requires mobile element or the technologies to make them mobile. Here are the examples of devices that contribute to mobility:

- Mobile services — wireless internet, broadband, Bluetooth, infrared, communication link;
- Location-based services – satellite, INS;
- Tracing services – RFID, barcode;
- Devices such as smartphones, personal digital assistants (PDAs), notebooks, wireless cards, GPS receiver, RFID and barcode reader, data storage;
- Service control — system integration, management center allowing real-time connectivity.

Figure 2. Sample of devices that support workforce mobility.

Satellite tracking is use to provide the location and navigation in mobile workforce management. The most popular location based service used today is Global Positioning System (GPS). The GPS is owned and operated by the U.S. Department of Defense but is available for general use around the world. In 1993, the Defense Department made this global positioning technology available for commercial use to anyone who has a GPS device. GPS devices have special microprocessors that analyze satellite signals.
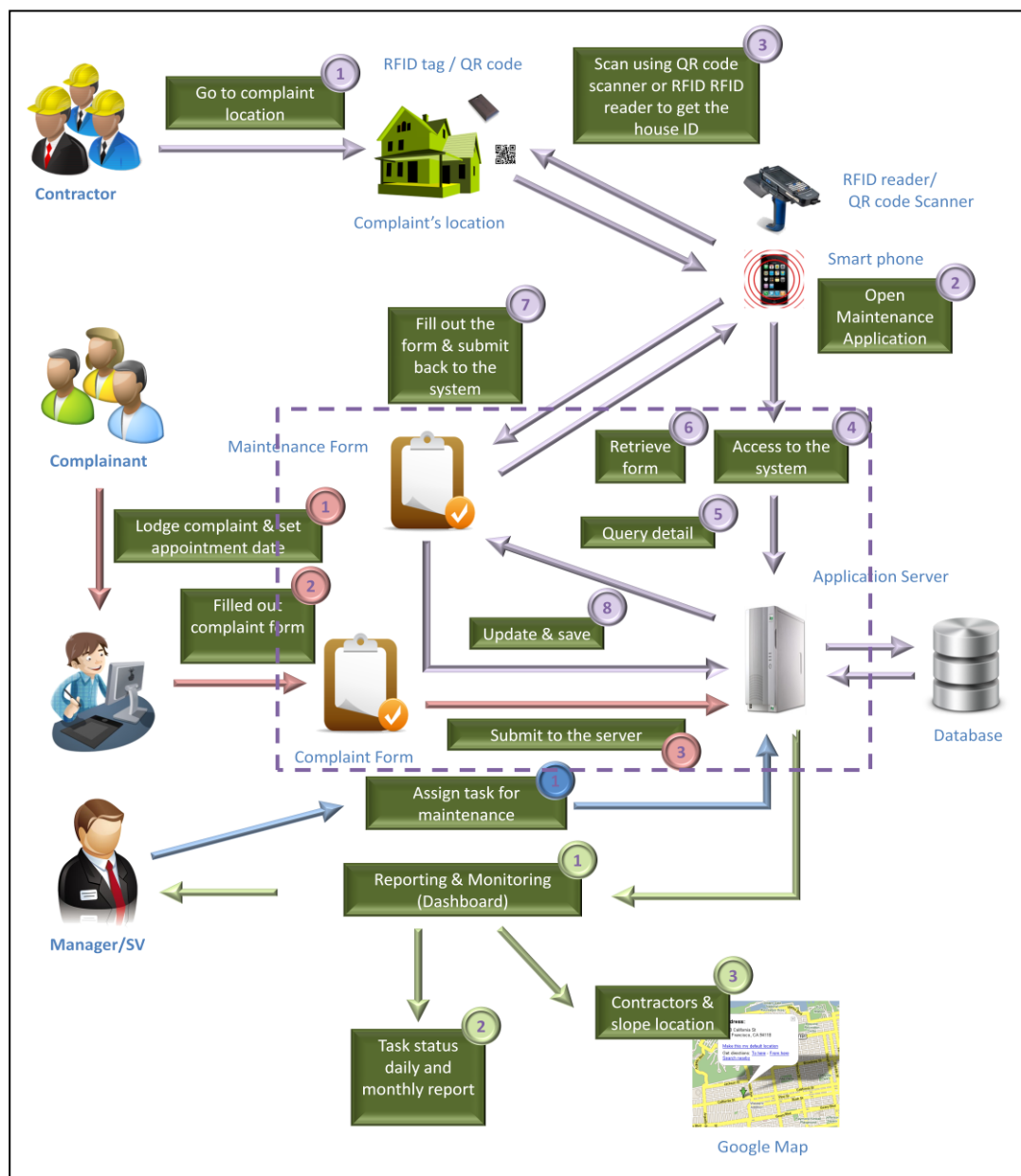

Figure 3. GPS providing location to the workforce.

5. Putrajaya as a Smart City

The introduction of new mobile work environments in practice has attracted researchers in ANGKASA to carry a research that able to integrate the ICT and space technology in Malaysia with focus to promote the smart city. A sample prototype of workforce mobility has been conducted in order to understand more the effectiveness of mobility concept and to promote the workforce mobility concept in Putrajaya. In addition, this study was undertaken just to support Putrajaya as a smart city.

Putrajaya is a planned city which located at 25 km south of Kuala Lumpur. It served as Malaysia federal administrative centre. The development of Putrajaya started in early 1990s, and being pointed as Malaysia Smart City and bound by a fibre-optic network that provides high-speed computer links. Bahagian Pengurusan Hartanah (BPH) is one of government agency that running maintains and supports the government facilities in Putrajaya. They plays a huge role in order to keep government
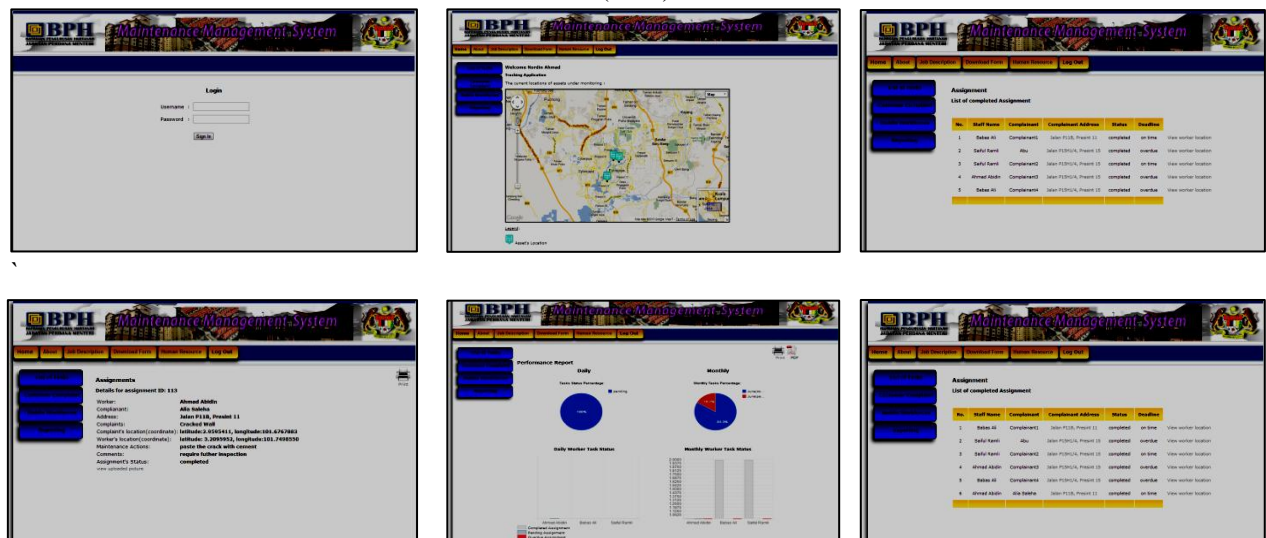
asset save and well maintain. An approach to the BPH maintenance team has been made. Below is the sample of workflow proposed to the BPH.
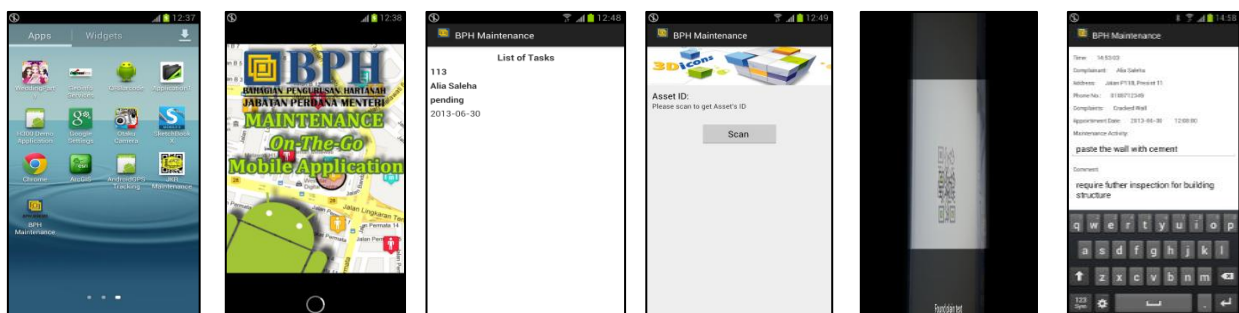

Figure 4. Proposed workflow for pilot study BPH-maintenance activity.

The workflow in figure 4 shows how the mobility concept being embedded in maintenance daily activity. From the traditional practise, where forms and papers being use, turns to fully digital and technology implementation. In short, the caller (house owner reporting for any defect) do the reporting via SMS, and the report are immediate stored into system.

The mobile workforce will received the work task via mobile phone or any mobility devices and proceed to the location based on the location given. As proved the work been done, the mobile worker need to send their location and reporting to the office on time, and proceed to next task. An application has been develop to support the BPH mobile workforce activity. The management may view their worker in the system online and able to assign job for the worker at any time. They are also able to perform the reporting based on the data updated frequently by the worker in field.

Figure 5. Interface for BPH manager assign, view and reporting the mobile workforce.

Figure 6. Samples of mobile workforce application develop for BPH maintenance pilot study.

Figure 6 show the samples of application being develop during the pilot study for BPH maintenance. Where the mobile worker received their job task and all the information are retrieved immediately.

6. Findings

Few finding and issue has been raise up before and after the deployment of BPH maintenance pilot project. This project is expected to provide a total wireless solution that allow mobile worker to capture and transfer data efficiently and economically. Some of the findings:

- Before the pilot project customers (house owner) always claim that the worker did not meet the time as they proposed but with the system developed, there is no issue of punctuality or misunderstanding because they have to send their location and scan the owner details through QR code.
- With the proposed pilot project, the maintenance group are able to schedule their work smartly
- The mobile workforce manager able to track and monitor the field worker real-time .
- They can use the data reporting for claim purposes and for them to measure the company performance.
- They can cut short, time to deliver work as they are not reporting to the main office.

- The management able to measure or control their travel claim and this may contribute to the company's saving

7. Conclusion

Smart city is another way to overcome the needs of the citizen in next few years. The modern city is turning into a central hub of human life which depends on the information and communication technologies. In this case, the rulers of Putrajaya should tackle this matter seriously since Putrajaya's running more than half government agencies and should put the nation's need in first. Mobility workforce is one of the samples that can be proposed in order to show the smart city characteristic in Putrajaya.