Title: ***Data-Driven processes design for Real-Time Service Provisions in Urban Computing Environment.***

Supervision team:

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Background:

Liveability in fast-growing cities depends on the ability to address urbanisation issues such as traffic congestion, pollution, health, infrastructure, and waste management (Chourabi et al., 2012). However, rapid urbanisation has led to a deficiency in service provisions, as transforming these services is time-consuming. To address these issues and for sustainable living in these fast-growing urban environments, changing the method of performing urban activities and functions is necessary, to provide agile and efficient services to the citizens in real-time (Javidroozi et al., 2019). Urban computing technologies ameliorate the change from traditional services to data-driven services. Thus, urban computing as a technology is utilised to address the complexity of providing adequate services to citizens through facilitating cross-sectoral collaboration and enabling the integration of various city sectors/systems.

Motivation

The rate of change and fluctuating citizensâ€™ demands in all areas of city management, such as living, economy, people, governance, mobility and environment is increasing, and the technologies of generating data that can be used to improve the service provisions are being enhanced. As a result, we are facing a big amount of data, which can also be converted to information and knowledge in various contexts. However, nearly all smart cities and urban computing events worldwide discuss that the data is not being applied to improve the quality of current city services. This requires flexible, efficient, and integrated processes across various city sectors that effectively respond to the changing environment. As a result, this would allow for agile and efficient services that are supported by seamless communication amongst city components, sectors, and systems and availability of real-time information.

Proposed research

Urban computing uses ubiquitous computing technologies to gain a better understanding of how to improve our cities (Marciniak and Owoc, 2013). Urban Computing consists of four layers sensing, data management, analytics and service provision. While the sensing and data management layers are well established, it can be argued that to date there is a limited effort in utilising the data analytics layer to inform the design of processes to influence the service provision. It is propositioned that continuous analysis of data in real-time, allows immediate action to be taken when attempting to improve service provisions.

Several techniques can be used to bridge this gap by utilising the structured and unstructured data to design processes, referred to as Data-driven Process Design. Thus, it facilitates identifying process changes in real-time to improve performance and how we can offer service provisions. However, the lack of process layer in urban computing frameworks averts the efforts of sensing, analysing, and managing data to be practically applied for improving service provisions in urban areas. In addition, data-driven approaches can identify complex and non-linear patterns in data that can be utilised to design processes and process modelling, data management, and process mining. Process mining is useful for conformance checking,

performance analysis and predictions, which help diagnose problems and improve processes. Hence, this research will explore some of these data-driven techniques, develop a model including algorithms for mining processes in order to offer a systematic approach for designing processes to support real-time service provisions.

Potential impact

Based on the principles outlined earlier, the outcome of this research will have the following potential implications through designing city services using real-time data:

- Utilising valuable real-time data generated from IoT devices, sensor technologies, citizen inputs, etc. for improving service provisions in cities, especially urgent services such as ambulance and fire services;
- Providing real-time service provisions based on immediate citizens needs;
- Improving the communication across city stakeholders as a whole and bringing them together as part of the decision-making process;
- Improving the decision-making processes and proposing an automated application of decisions in service provisions
- Suggesting significant progress towards urban computing objectives including energy efficiency, waste management, economic growth, reducing carbon emission, crime rates, and managing traffic congestions;
- Managing the resources for planning, designing, funding, and operating timely services.

References:

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