

Human Element in the Delivery of Facilities Management Services Within Smart Cities Features in Malaysia

Maimunah Sapri^{1*}, Zafirah Ab Muin², Nik Roskiman Abdul Samad³ and Muhammad Yusaimi Abdul Hamid⁴

¹Centre For Real Estate Studies, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia.

^{2,4}Real Estate Department, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia.

³Institute of Islamic Understanding Malaysia.

*Corresponding Author

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ABSTRACT

The vast majority of developing countries' urban areas must provide facilities management services crucial to the community experience. Recent studies in major cities have discovered a massive gap between the expectations and satisfaction of the community regarding the quality of service delivery. Therefore, it is claimed that Smart Cities is a way forward in urban facilities management to change the living environment positively. Innovative technologies within smart city arrangements could boost community comfort, enhance service or community experience, and advocate a more sophisticated living style. However, the issue of integration roles and responsibilities of the city council becomes a major predicament as the department within the city council, exertion in a silo. This paper investigates the human element in managing urban facilities to cater to community demand within a bright city environment. The paper postulated the reality of smart city features as a solution in providing quality facilities management services within an urban setting. The research employs a qualitative design, using interviews and speech analysis with industry experts in facilities management and smart city development. The data was analysed using content and thematic analysis. The findings determined a significant component of human involvement and its importance within the smart city development framework. It discovered that the success of AFM strategies is closely tied to human attitudes and behaviours.

Keywords: facilities management, service delivery, smart city, human element, Malaysia

INTRODUCTION

Recent research has increasingly emphasised the importance of the human dimension in smart city development. Humans are not merely passive recipients of smart city benefits; they are active participants in designing, implementing, and managing these urban environments. The human element is crucial in adapting technological solutions to each city's unique social, cultural, and economic contexts, thereby ensuring that smart city initiatives are genuinely sustainable and inclusive.

Numerous conferences and policy initiatives in Malaysia have invigorated the discourse around smart cities, positioning the country as a leader. The Malaysian government has launched various smart city frameworks and blueprints, underscoring the need for a holistic approach that integrates advanced technologies with human-centric urban management strategies. Smart Cities are urban environments that utilise advanced digital technologies, such as the Internet of Things (IoT) and artificial intelligence (AI). These technologies, often called 'smart technologies', enable real-time data collection and analysis, facilitating efficient management of urban transportation, energy, and public safety management. It connects various devices and systems to a central network, allowing for automated control and optimisation.

In the other hand, facilities management within smart cities is pivotal for ensuring that buildings and public

spaces are managed efficiently and sustainably. By integrating smart technologies into building operations such as HVAC, lighting, and security, facilities managers can monitor conditions in real-time, predict maintenance needs, and optimise resource usage. This approach reduces operational costs and energy consumption and significantly enhances occupant comfort and safety, providing a sense of security and peace of mind to the residents. In smart cities, facilities management extends beyond individual buildings to encompass entire infrastructure networks. This includes managing public facilities such as parks, transportation hubs, and street lighting systems. The overarching goal is to create a seamless, efficient urban environment where resources are used optimally, and residents' needs are met proactively, not just reactively, ensuring the city is prepared for future challenges.

This paper seeks to explore the evolving role of facilities management within the context of smart cities, focusing on integrating human-centric approaches. By analysing recent developments in Malaysia and drawing on international research, this study aims to contribute to the ongoing discourse on how smart cities can be made more efficient, sustainable, and responsive to the needs of their inhabitants. Through this lens, the paper will examine the critical intersection of technology, human skills, and urban management practices essential for successfully realising smart city objectives.

BACKGROUND

Cities have to face significant changes and challenges resulting from global environmental shifts, abrupt urbanisation, and older infrastructure (Hajduk, 2016). Day by day, it gives new challenges for cities to create prosperity and ensure a good quality of life for their citizens by adopting advanced communication infrastructures and technologies that are increasing worldwide (Oliveira & Campolargo, 2015). As such, in response to the imminent challenges of sustainability and urbanisation, intelligent, sustainable cities are gaining increasing consideration and prevalence worldwide (Bibri, 2018).

In recent years, many governments have launched various smart city or smart infrastructure initiatives to help city managers or planners optimise urban infrastructure operation and management (Ng et al., 2017). The attribute includes the use of smart cameras for traffic monitoring (Calderoni et al, 2014), to reduce energy use (Kramers, et al., 2014) and many more. "By deploying internet of things (IoT) to infrastructure systems, high-volume and high-variety of data pertinent to the condition and performance of infrastructure systems along with the behaviours of citizens can be gathered, processed, integrated and analysed through cloud-based infrastructure asset management systems, ubiquitous mobile applications and big data analytics platforms" (Ng et al., 2017,p.939).

Smart cities, which are the result of knowledge-intensive and creative strategies aiming at enhancing the socio-economic, ecological logistics and competitive performance of cities (Kourjit and Nijkamp, 2012), can be defined as urban areas that use different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently. Intentionally, smart infrastructure initiatives also help to improve the quality of citizens' life (Ng et al., 2017).

In earlier adaptation, the scope of smart cities is mainly limited to constructing a technology park converting the industrial real estate to the state-of-the-art information technology using the evolution in the telecom and internet protocol (IP) networks, including insignificant asset management automation system (Al-Hader & Rodzi, 2009).

Although there is no official or universally agreed-upon definition of a smart city (Bibri, 2018), the necessity of adopting the latest technology in urban development and management is crucial. In fact, the facilities management (FM) sector also faces increasing pressure to adapt to the fast-evolving workplace and regulatory requirements (Kang, 2018). This paper discusses the problem regarding the strategic roles of facilities management in the context of urban facility management (UFM) and emphasizes the crucial role of the human element in the facilities management services within a smart city. It underscores the value of human skills and quality in the smart city management process, making the audience feel integral to the process.

Problem Statement

Cities, however, can only be smart if there are intelligence functions that are able to integrate and synthesise the

data to some purpose, ways of improving the efficiency, equity, sustainability and quality of life in cities (Batty et al., 2012). Such an effort is perceived as a quality approach, and it stands to reason that the smart cities should therefore adhere to the principles of integrated facilities management services delivery within technology advancement.

Moreover, the issue of integration roles and responsibilities of the city council become a major predicament as the department within the city council, exertion in a silo. Therefore, this paper investigates and discusses the role of facilities management in the conduct of facilities services delivery within a smart cities environment. Furthermore, within the global vision, FM has taken a new dimension in integrating and enlarging Facilities Management to become Urban Facilities Management that enhances human element to encourage community participation within smart cities features.

In an industry that requires careful management of physical property operations, personnel, and finances, facilities management planning within a smart city environment provides the necessary direction for successful real estate management. The problematic aspect often faces to associate the quality of services within a smart cities features will take into consideration by the Integrated Facilities Management process.

REVIEW OF LITERATURE

The Importance of Facilities Management Services to a Smart City

Facilities management (FM) plays a critical role in developing and operating smart cities. As urbanization continues to accelerate, the complexity of managing the infrastructure and services that underpin city life has increased. Additionally, Facilities Management (FM) is a multifaceted discipline combining various elements such as people, processes, places, and technologies to ensure the built environment is safe, efficient, and sustainable. Urban Facilities Management (UFM) is instrumental in addressing these challenges by providing integrated facilities services, either through in-house teams or outsourced providers, that cater to the diverse needs of a city's inhabitants. The FM function is positioned within a service management context, where citizens are considered assets whose needs and well-being are prioritized. This aligns closely with the goals of a smart city, which emphasize not just technological advancement but also the enhancement of human and social capital.

The Role of FM in Smart Cities

It is well discussed that FM is fundamentally about integrating people, processes, and places. In a smart city context, this integration becomes even more vital as cities strive to become more efficient, sustainable, and responsive to the needs of their populations. FM services are essential at various stages of infrastructure development, including the strategic, tactical, and operational phases. These services ensure the city's infrastructure operates optimally, from initial planning and construction to ongoing maintenance and eventual upgrades.

Smart cities are urban areas that integrate digital technologies and data-driven solutions to improve residents' quality of life, optimise resource use, and enhance the efficiency of urban services. Facilities management plays a crucial role in the successful implementation of smart city initiatives. By incorporating technologies such as IoT sensors, AI, and big data analytics into building operations, facilities managers can achieve significant improvements in energy efficiency, maintenance efficiency, and overall operational effectiveness.

For example, smart buildings within smart cities use IoT sensors to monitor and control HVAC systems, lighting, and security systems in real time, leading to optimised energy use and reduced operational costs (Batty et al., 2012). The data generated from these systems provides facilities managers with valuable insights that can be used to predict maintenance needs, improve occupant comfort, and enhance the overall sustainability of the building (Omar et. al., 2015).

Integrating advanced information and communication technology (ICT) with FM services is a crucial enabler of smart city development. Smart cities rely on ICT to monitor and manage urban infrastructure, including electricity, water, gas, district cooling, irrigation, sewerage, and communication networks. These services'

continuous monitoring and management are essential for optimizing resource use and ensuring the city's smooth operation. Accurately capturing, assimilating, and analysing static and dynamic data about urban infrastructure facilities is crucial for informed decision-making and efficient city management (Ng, 2017, Razali et. al, 2020).

However, the human element remains critical in the management of these intelligent systems. Facilities managers must interpret the data generated by these technologies and make informed decisions that balance the technical capabilities of intelligent systems with the needs of building occupants. Integrating smart technologies in FM also requires facilities managers to address ethical considerations, such as data privacy and security, ensuring that the benefits of smart technologies do not come at the expense of occupant trust and well-being (Kitchin, 2014).

Human-Centric Approach in Smart Cities Incorporating Facilities Management

A human-centric approach is central to the concept of a smart city. While technology is a significant enabler, the true essence of a smart city lies in its ability to improve the quality of life for its citizens. As Oliveira and Campolargo (2015) aptly stated, "people" are the true actors of urban smartness rather than technology," underscoring the importance of community needs and social development in smart city initiatives. This perspective is further supported by Lee (2019), who emphasized that people are crucial to the success of any intelligent city.

As cities grow and evolve, the uncertainty surrounding the social models that emerge from the digitalization of society necessitates proactive participation from both public and private city authorities. The relationship between the infrastructure of smart cities and their operational functioning and planning is deeply interconnected, requiring effective management, control, and optimization (Batty et al., 2012). Therefore, it is argued that, the human element is required in the integration of FM-smart cities implementation.

The human element in FM is vital in ensuring the operational success and strategic alignment of facilities with organisational goals. Furthermore, the human element within FM is crucial, encompassing facilities managers' skills, expertise, and decision-making processes. As cities increasingly adopt smart technologies, the role of the human element in FM becomes even more significant, especially within the context of smart cities where technological integration is at the forefront of urban management. According to Roper and Payant (2014), facilities managers are responsible for the day-to-day management of building operations and for making strategic decisions that impact long-term sustainability and efficiency. These decisions include energy management, space utilisation, and maintenance planning. The ability to anticipate future needs and adapt to changing environments is crucial to effective facilities management, which relies heavily on the human element.

Furthermore, communication and interpersonal skills are central to the human element in FM. Facilities managers must interact with various stakeholders, including building occupants, service providers, and senior management. This requires strong communication skills to effectively convey and implement FM strategies that align with operational needs and organisational objectives. As suggested by Chotipanich (2004), facilities managers serve as the critical link between an organisation's operational and strategic levels, necessitating a deep understanding of both the technical and human aspects of facilities management.

FM services must adapt to these changing dynamics by incorporating innovative approaches that leverage technology and data to meet the evolving needs of urban populations. One of the significant challenges FM faces in smart cities is the need for more clarity about the role and timing of FM services. While there is a common perception that FM is only needed after the completion of infrastructure development, in reality, FM services are required throughout the entire lifecycle of urban infrastructure. The strategic, tactical, and operational stages all demand different FM inputs to ensure that infrastructure assets are designed, built, and maintained in a way that aligns with the broader goals of the smart city.

The discussion postulated that facilities management services are indispensable to the success of smart cities. By integrating people, processes, places, and technology, FM plays a pivotal role in ensuring that urban infrastructure is functional and aligned with the needs and aspirations of the city's residents. As smart cities continue to evolve, the importance of FM services will only grow, providing new opportunities to enhance the

quality of life for urban populations and ensure the sustainable development of our cities.

Research Gap

Despite the growing body of literature on facilities management (FM) and smart cities, several gaps remain unaddressed, particularly concerning the human element in the context of advanced technological integration. Most studies have focused on the technical and operational aspects of FM within smart cities, such as energy management, IoT implementation, and data analytics (Batty et al., 2012; Kitchin, 2014). However, there is limited research exploring how the human element—specifically the skills, decision-making processes, and interpersonal dynamics of facilities managers—interacts with these technologies to influence the overall success of smart city initiatives. Additionally, while the ethical and social implications of smart technologies have been acknowledged (Allam & Newman, 2018), there is a lack of empirical studies that examine how facilities managers navigate these challenges in practice.

Furthermore, the existing literature does not sufficiently address the impact of human-centered approaches on the long-term sustainability and occupant well-being in smart cities. While some studies highlight the importance of human-centered design (Geissler et al., 2018), there is a need for more comprehensive research that investigates the direct contributions of the human element to the effectiveness and acceptance of smart city technologies in FM. This gap suggests a need for further exploration into how the human element can be leveraged to optimize both technological and human outcomes in the management of smart city facilities.

SCOPE OF STUDY & METHODOLOGY

The research adopts a qualitative approach, focusing on understanding the human element in facilities management (FM) within the context of smart city development. This methodology is chosen to gain deep insights into the perceptions, experiences, and strategies of industry experts and stakeholders involved in smart cities in Malaysia. As described by Creswell (1994), the qualitative approach allows for a constructivist or naturalistic examination, where the researcher interprets the realities constructed by the individuals involved.

Sampling Criteria

The study's sampling criteria are designed to select participants who have direct experience and expertise in facilities management and smart city initiatives in Malaysia. The sampling includes:

1. **Industry Experts:** The primary participants are professionals and experts in the fields of facilities management and smart city development. These individuals were selected based on their involvement in relevant projects, leadership roles in organizations that manage smart city infrastructure, and participation in policy-making or strategic planning for smart cities. The selection is based on purposive sampling, which is particularly effective in qualitative research in identifying and engaging with participants who can provide rich, detailed, and relevant data (Patton, 2002).
2. **Speakers at Smart Cities Conferences:** Additionally, the research involves analyzing speeches from invited speakers at several Smart Cities conferences organized in Malaysia. These speakers are chosen based on their recognized authority in the field and their role in influencing smart city policies and strategies. The speeches are transcribed, and content analysis is conducted to extract relevant themes and insights related to FM services and the human dimension of smart cities.

Data Collection Methods

1. **Interviews:** The primary data collection method is semi-structured interviews with selected experts. This method is chosen because it allows for flexibility and depth, enabling the researcher to explore complex issues and obtain detailed responses. Interviews are a universal and powerful fact-finding technique that can be tailored to suit the specific context of the research (Mason, 1996). The interviews aim to uncover the experts' insights into the challenges, opportunities, and strategies related to the human element in FM within smart cities.

2. **Speech Analysis:** In addition to interviews, content analysis is performed on speeches delivered at smart city conferences. This involves transcribing the speeches and systematically analyzing the content to identify themes, patterns, and strategies related to the human element in FM. This method provides a broader understanding of the public discourse and policy directions related to smart cities in Malaysia.

Data Analysis

The qualitative data collected through interviews and speech analysis is analyzed using thematic analysis, a method that involves identifying, analyzing, and reporting patterns (themes) within the data (Braun & Clarke, 2006). The analysis seeks to understand how the human element is integrated into FM strategies in smart cities and how different stakeholders communicate and implement these strategies.

Potential Limitations

The research has several potential limitations:

1. **Subjectivity:** Given the qualitative nature of the study, the findings are inherently interpretive and may be influenced by the researcher's perspectives and biases. Although every effort is made to ensure objectivity, the subjective nature of qualitative research means that different researchers might interpret the same data differently.
2. **Sample Size:** The research relies on a relatively small sample of experts and speeches, which may limit the generalizability of the findings. While effective for gaining in-depth insights, the purposive sampling method needs to provide a broad representation of all stakeholders involved in smart cities.
3. **Access to Experts and Speeches:** The availability of and access to relevant experts and speeches may be constrained by factors such as time, geographic location, and participants' willingness to engage in the study. This could potentially limit the scope of the research and the diversity of perspectives captured.

Despite these limitations, the research methodology is robust and well-suited to exploring the complex and nuanced role of the human element in facilities management within the context of smart cities in Malaysia. The findings are expected to provide valuable insights that can inform policy-making and strategic planning in this emerging field.

FINDINGS

The research highlights the significant role of human involvement in smart city development. Below are the key insights, organized by theme, with direct quotes to provide depth to the qualitative findings.

i. Human Dimension in Asset and Facilities Management

The National Asset and Facilities Management Convention 2018 emphasized the critical importance of the human dimension in Asset and Facilities Management (AFM). A central takeaway was the principle: **"Human beings are assets to any organization"**. This view underscores that human interaction with assets and facilities as users, suppliers, and owners is crucial. The effectiveness and efficiency of AFM strategies are deeply influenced by human attitudes and behaviors.

Tun Abdullah Ahmad Badawi, the Fifth Prime Minister of Malaysia, highlighted the potential pitfalls of a 'third-class mentality' despite having 'first-class infrastructure.' He stated that for a nation to achieve sustained growth, it must strengthen its moral and ethical foundations, fostering a mindset geared toward excellence and performance (Nik Roskiman, 2018). This perspective illustrates that human factors are as vital as physical infrastructure in realizing the goals of AFM and the broader objectives of smart cities.

ii. Human Skills for Data Analytics in Integrated AFM

Another key insight from the convention was the importance of human skills in data analytics for integrated

AFM. Kang (2018) noted, **"The evolving nature of facilities in today's digital world demands that FM professionals possess the skills to efficiently collect, store, and analyze data."** This highlights the necessity of skilled professionals in managing and utilizing data effectively for smart city sustainability.

Three critical criteria for managing large datasets were identified: people, process, and technology. The **'people'** aspect refers to the capability of staff to analyze data and implement optimization strategies. The **'process'** aspect involves ensuring data quality, measurement, and project tracking, which are essential for accurate decision-making. Finally, the **'technology'** component is crucial for securing systems and infrastructure and for data visualization. Advanced software and tools are required to handle data effectively and align with internal goals.

Integrating data analytics with facility platforms offers numerous benefits, including simplified Building Management Systems (BMS) integration, comprehensive facility views, proactive field servicing, optimized maintenance costs, reduced risks, and access to customized sensors. These advantages underscore the critical role of human skills in leveraging data analytics to enhance facility functionality and sustainability within a smart city framework.

iii. Human Element in Smart Cities: Insights from Recent Conferences

The importance of the human element in smart cities has been consistently highlighted in various conferences. The Seventh Asia-Pacific Urban Forum (APUF 7), held in Penang Island, Malaysia, in October 2019, focused on **"human quality and data-centric approaches"**. The forum emphasized the integral role of human factors in smart city initiatives, aligning with insights from the National Asset and Facilities Management Convention 2018. APUF 7 also covered thematic areas such as Urban and Territorial Planning, Urban Resilience, and Urban Finance, advocating for a holistic approach to smart city development that incorporates human elements alongside technological advancements and infrastructure.

The Digital Putrajaya Exhibition & Conference (DiPEC, 2019), with the theme **"Building a Smarter City for the People"**, addressed various smart city issues, including Smart Transportation, Smart Government Services, and Smart Infrastructure. During this event, the Putrajaya Smart City Blueprint was launched to enhance services and position Putrajaya as a model smart city. The inauguration of the Putrajaya Command Centre as a centralized hub for urban activities, such as safety monitoring and traffic management, further exemplifies the integration of human-focused services with technological innovation (Khalid, 2019).

DISCUSSION

The findings from the National Asset and Facilities Management Convention 2018 and insights from recent conferences emphasize the critical role of the human dimension in AFM and smart city development. Human quality, attitude, and skills are integral to the success of AFM strategies, particularly in the context of data analytics and sustainability. As smart cities continue to evolve, the integration of human factors with technological advancements will be crucial in achieving sustainable urban development and enhancing the quality of life for city residents.

CONCLUSION

The increasing focus on smart cities in Malaysia is reflected in the growing number of conferences and forums dedicated to this topic. These events highlight the critical role that smart cities play in the nation's urban development strategy. As Malaysia continues to urbanize, the authorities responsible for urban development are tasked with integrating new knowledge and technologies to address the evolving challenges of urban management. This involves adopting innovative solutions and rethinking traditional approaches to the operation and governance of cities.

A key aspect of smart city initiatives is the central role of human factors. Citizens are not only the beneficiaries of smart city developments but also active participants in their planning, design, and management. The end-users, the residents of these cities, are at the heart of these initiatives. Therefore, any successful implementation of smart city strategies must prioritize human needs and ensure that technological advancements enhance the

quality of life for all citizens.

The evaluation of presentations and discussions from recent smart city-related conferences in Malaysia has provided valuable insights into the government's initiatives and strategies. These efforts, led by the government, aim to ensure that the delivery of services within smart cities is not just efficient, but also effective. By focusing on the human element, smart cities in Malaysia are being positioned as a forward-thinking approach to urban facilities management. This approach seeks to leverage technology and emphasizes the importance of creating a living environment conducive to human well-being.

In conclusion, smart cities represent a significant step forward in Malaysia's urban development. By integrating human-centric design with advanced technologies, Malaysia aims to create urban environments that are not only smart but also sustainable and inclusive. The success of these initiatives will bring about a future where urban living is more efficient, comfortable, and inclusive, depending on the continued collaboration between government agencies, stakeholders, and the communities they serve. This future promises a more efficient, comfortable, and inclusive urban living experience, ensuring that the human element remains at the core of smart city development.

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