

UTILISING SMART VISITOR MANAGEMENT SYSTEM TO ENHANCE SUSTAINABLE PRACTICES IN HIGH-RISE BUILDINGS IN SRI LANKA

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ABSTRACT

With the growing importance of sustainability and environmental conservation, effectively managing visitor flows in high-rise buildings poses unique challenges and opportunities. Smart visitor management systems (SVMSs) offer innovative solutions to optimise resource allocation, minimise waste generation, and promote eco-friendly practices in this context. Through an in-depth analysis of relevant data, case studies, and expert perspectives, this study investigates the implementation and potential benefits of smart visitor management systems (SVMSs) in high-rise buildings, with a specific emphasis on sustainability. The findings reveal that the adoption of these systems can lead to significant positive impacts, including improved energy efficiency through intelligent lighting and HVAC controls, reduced carbon emissions by streamlining transportation and parking, enhanced waste management through digital registrations and real-time monitoring, and improved visitor experiences through streamlined check-ins and personalised services. Moreover, the integration of smart visitor management systems (SVMSs) enables high-rise buildings to achieve sustainability certifications and contribute to the overall environmental goals of Sri Lanka. The article also addresses the potential challenges and considerations associated with implementing these systems, such as data security and privacy concerns, initial investment costs, and the need for stakeholder collaboration. The insights derived from this study provide valuable guidance for building owners, facility managers, policymakers, and other stakeholders involved in sustainable practices in high-rise buildings in Sri Lanka and similar contexts.

Keywords: *Barriers; Drivers; High Rise Buildings; Smart Visitor Management System; Sustainable Practices; Visitor Management.*

1. INTRODUCTION

One of the most pressing issues that have prompted the construction of high-rise buildings and are likely to continue is the enormous growth in urban population paired with wealth accumulation (Ali & Al-kodmany, 2012). High-rise structures appear to congregate in the centre of major cities, when land is scarce (Frenkel, 2004). High-rise building development addresses territorial planning difficulties, boosts urban environment diversity, and improves usability (Dement'eva & Dement'eva, 2018). However, the

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environmental implications associated with such urbanisation cannot be overlooked. The massive energy consumption, waste generation, and carbon emissions from these buildings necessitate the adoption of sustainable practices to mitigate their environmental impact (Ali et al., 1995).

One significant aspect of sustainable building management is the effective control and monitoring of visitor activities within these high-rise structures. Traditional Visitor Management System has many drawbacks: they are time-consuming and labour-intensive and often rely on paper based processes (Chiang, 2018). The pen-and-paper visitor record system raised inefficiencies, security concerns, and excessive resource utilisation (Isaiah & Solomon, 2019). A visitor management system is essential because it is capable of streamlining the registration process and providing visitors with accurate and integrated data and enhance sustainable practices in high-rise buildings (Oktaviandri & Foong, 2019).

Al-Ghaithi and Eaganathan (2016) stated that the visitor management systems (VMS) can be implemented by installing the Visitor Management software program on existing computers on the premises. The database-driven visitor management software can be tailored to the organisation's needs (Olhausen-Kaylor, 2019). This password-protected, web-based management system allows authorised users to pre-register visitors before arriving at a facility (Craighead, 2009). This additional information can include a photo of the visitor, the reason for the visit, to what location the visitor is going, a time stamp, and more (G2 track, 2021). (Al-Ghaithi & Eaganathan, 2016). According to Kazlauskas, (2015), many factors are driving the utilisation of VMS to improve security and facility management implementation in high-rise buildings. They are used as tools and as resources to improve quality of life, achieve sustainable development, and create a more open and innovative urban context through the participation of several actors (Asmone et al., 2014). However, only the integration of all of the domains of intervention based on the contribution of SVMSs can help cities to achieve long-lasting and sustainable economic growth and a better quality of life for urban stakeholders in high-rise buildings (Marjaba & Chidiac, 2016). Several barriers are also impacting the implementation of automated VMS.

However, global research has been conducted on the design and development of VMS (Mahmud, 2018). There is a lack of evidence on the utilisation of SVMS to enhance sustainable practices in high rise building drivers and barriers to applying the VMS system at high-rise buildings in Sri Lanka. To this end, this paper aims to identify the need for VMS, enablers, and barriers to the application of VMS systems to improve sustainable practices at high-rise buildings in Sri Lanka.

2. SUSTAINABLE PRACTICES VS SMART VISITOR MANAGEMENT

Sustainable practices are activities and policies that strive to reduce negative environmental, social, and economic impacts while maintaining long-term viability (Marjaba & Chidiac, 2016). It promotes low-cost energy and technological advancements in lighting and HVAC, waste reduction, potable water conservation, and awareness of material use and waste disposal issues in order to persuade designers to incorporate more sustainable elements into high-rise structures (Ali et al., 1995). Despite meeting the issues

of the increasing population in such locations, a sustainable solution and assistance in transitioning to a low-carbon economy are required (O'Dwyer et al., 2019).

While technological knowledge on how to achieve this goal is growing, it is critical to understand the relationship between technology improvements in sustainable structures and the behaviours and impacts of building users (Wener & Carmalt, 2006). Organisations reshape their processes in line with on-premise technologies such as SVMSs (Gökalp & Martinez, 2021).

Typically, a VMS is a structure that keeps track of visitors' activities in an organisation or public building (Oktaviandri & Foong, 2019). Visitor management is a modern-day problem, and with its use, various frauds, privacy concerns, and other difficulties may be readily discovered and avoided (Makwana et al., 2019). An organisation's operations depend on visitor management (Phua, 2009). The focus on security, data integrity, and compliance has shifted from simply digitalisation procedures like paper logbooks and manual security checks to a greater emphasis on security, data integrity, and compliance (Traction Guest, 2020).

Integrating sustainable practices with smart visitor management can lead to more efficient resource use, reduced environmental impact, enhanced visitor experiences, and improved overall sustainability (Wener & Carmalt, 2006).

3. APPLICATION OF VMS TO IMPROVE SUSTAINABLE PRACTICES IN HIGH-RISE BUILDINGS

VMSs are essential because they allow organisations to track who is on the premises at any given time (Redyref, 2020). Additional layers of advanced visitor management safety, such as kiosks and visitor management software, are critical in keeping personnel and intellectual property safe (Traction Guest, 2020). The impact of VMS on stakeholders continues to be positive (Bonne et al., 2013). In addition to security, advanced digitalisation capabilities can provide scope for new functionality, higher reliability, greater efficiency, and optimisation opportunities that exponentially increase the value companies deliver to customers (Annarelli et al., 2021). A well-implemented VMS can enhance the visitor experience by providing a seamless and efficient check-in process. By reducing waiting times and minimising manual paperwork, it contributes to a positive impression of the building and promotes visitor satisfaction (Noorhuzaimi-Karimah et al., 2008).

VMS enhances security and safety measures, which indirectly contributes to sustainability (Weingart et al., 2006). Because the pen-and-paper visitor record system lacks a mechanism for recycling prior visitor records for new input, statistical reports cannot be generated. It is disorganised, incomplete, and difficult to find information. The data acquired in the prior system is stored in a book (Isaiah & Solomon, 2019). Instead of pen and paper visitor record, VMS generates digital reports that assist in waste reduction efforts by promoting digital communication and documentation (Isaiah & Solomon, 2019).

To improve operational efficiency, it may handle facility booking, approval, and billing procedures across enterprises (Sierra ODC Private Limited, 2020). In advance, the meeting organiser can provide visitor information and requests such as parking space, allergens, and accessibility needs (Shackley, 2009). Other than making a reservation,

meeting rooms, conference halls, office space, auditoriums, sports facilities, high-cost equipment, and training facilities can all be reserved via the system to efficient space utilisation (Sierra ODC Private Limited, 2020).

Facility managers may find it difficult to manage several tenant organisations and their visitors, off-site personnel, deliveries, and vendors (Veristream, 2020). Using VMS can simply and efficiently make data driven decisions (Thoti et al., 2009). A VMS is a system that encompasses all of an organisation's processes and practices for managing the movement of visitors from beginning to end as part of the visitor experience (Veristream, 2020). VMS generates valuable data about visitor patterns, preferences, and facility usage. This data can be analysed to identify areas for improvement, optimise operational efficiency, and make informed decisions regarding resource allocation, space utilisation, and sustainability initiatives (Cooman, 2019).

4. DRIVERS AND BARRIERS OF VMS TO IMPROVE SUSTAINABLE PRACTICES IN HIGH-RISE BUILDINGS

Tables 1 and 2 summarise the enablers and barriers of VMS to improve sustainable practices in high rise buildings, respectively.

Table 1: Drivers of VMS to improve sustainable practices in high-rise buildings

Drivers	Description	Sources
Enhance company image	A competent VMS demonstrates that the facility takes security seriously. A strict security system will impress the visitors who enter an organisation, allows to improve the company's image.	(Kazlauskas, 2015); (Bosstab, 2020)
Accuracy and productivity	As visitor particulars do not have to be manually typed in, having an electronic way to capture visitor information ensures accuracy for all types of visitors. Because they have a system monitoring security, it will only take a few minutes to verify the identity of a visitor, and productivity will improve.	(Kazlauskas, 2015); (Penarubia, 2020)
Security	A formal visitor check-in system and a designated point of entry/exit work hand in hand with access control to improve overall site security.	(Harrison, 2018); (Raker, 2019)
Efficient site control/customisable	This technology allows an organisation to efficiently manage the site by quickly tracking who is where and who enters and exits the premises.	(Fadiyah, 2019)
Cost-saving	VMS is more cost-effective and efficient than security solutions that rely on scanning technology. One of the strengths of this system is how adaptable and scalable it is. Organisations can choose only the elements that are required.	(Fadiyah, 2019); (Zaman et al., 2017)
Resource Conservation	Sustainable practices aim to minimise resource consumption and waste generation. VMS can contribute to these efforts by optimising energy usage through features like automatic lighting and HVAC controls. By ensuring that spaces are only active, when necessary, these systems help conserve energy and reduce environmental impact.	(Khalid et al., 2018)

Table 2: Barriers of VMS to improve sustainable practices in high rise buildings

Barriers	Description	Sources
Interruptions	As most systems rely on electricity to operate, they will be disrupted if there is a power outage.	(Penarubia, 2020); (Tarco marketing, 2018)
High cost	Owing to system's benefits, it can be costly to purchase, and additional components will raise the cost of maintaining a VMS, especially if they perceive a lack of immediate cost savings or return on investment.	(Penarubia, 2020); (Starter story, 2017)
Technical support	The smart VMS requires technical assistance to resolve a VMS software issue.	(Kazlauskas, 2015); (Starter story, 2017)
Unawareness	Not aware of the benefits and potential of visitor management systems in improving sustainability practices. Learning how to use a software program is a little more complicated, and because it is new, a training program is required to increase awareness.	(Kazlauskas, 2015); (Visipoint, 2021)

5. METHODOLOGY

A qualitative approach is used for this study, considering the data gathering method and the research kind (Punch, 2005). The installation of VMS to improve sustainable practices in high-rise structures is a new concept to Sri Lanka. This data was captured by expert interviews. As a result, a thorough literature review was undertaken to determine the reasons for the necessity for a VMS and the usage of a VMS to improve sustainable practices and identify the drivers and barriers to utilising VMS for improving sustainable practices in a global context through books, journals, and conference proceedings.

As the second method, the expert interview method was used, one of the most used data collection methods for conducting qualitative approach research (Punch, 2005). Among the many interview formats, semi-structured interviews were chosen because they allow the researcher to ask both organised and unstructured questions and allow for the clarification of doubts. Since the VMS is a novel idea and only a few industry practitioners know it, expert interviews were chosen as the best data collection strategy. Further, VMS and sustainable practices are grooming areas, hence, the number of experts was limited. As a result, expert interviews were performed with six experts.

Table 3: Summary of interview respondents

No	Interview Participant	Profession	Designation	Years of experience
01	IA1	Facilities Management – Residential	Front office manager	11
02	IA2	Engineering – Hotel	Chief engineer	14
03	IA3	Engineering – Hospital	Assistant Manager IT	11
04	IA4	Facilities Management – Commercial	Senior Manager - Premises	28
05	IR1	Facilities Management	Managing director	15
06	IR2	Facilities Management	Director	13

Hence, all the participants in the sample have more than 10 years of experience in the industry, and the collected data can be considered reliable data. Both literature findings and data gathered from interviews were used to analyse the data.

6. FINDINGS AND ANALYSIS

According to the findings of a comprehensive literature review, many researchers worldwide identify the enablers and barriers to implementing VMS to improve sustainable practices. However, there is a lack of specific literature resources related to the Sri Lankan context. Therefore, to determine the application of VMS to improve sustainable practices in high-rise buildings in Sri Lanka investigated the knowledge of the professionals in organisations that have experience using VMS and professionals of VMS software and component suppliers. In this section, research- findings on drivers of VMS to improve sustainable practices in high-rise buildings, barriers, and strategies to minimise identified barriers are discussed.

6.1 APPLICATION OF VMS IN HIGH-RISE BUILDINGS TO IMPROVE SUSTAINABLE PRACTICES IN SRI LANKA

The findings of the existing literature were directed to an expert via a semi-structured interview guideline to determine the demand for VMS, as well as the drivers and barriers impacting the implementation of VMS for improving sustainable practices in high-rise buildings. The findings from both expert interviews and a comprehensive literature review are presented in the sections that follow.

The experts' opinion on sustainable practices encompasses a wide range of activities, such as reducing resource consumption, minimising waste generation, conserving energy and water, promoting renewable energy sources, supporting social responsibility, and fostering ecological conservation. Therefore, experts explain that the goal of sustainable practices is to create a harmonious balance between environmental protection, social well-being, and economic development for long-term sustainability.

VMS explores features such as pre-registration, identity verification, badge printing, and access control integration. Experts expressed the benefits of VMS in preventing unauthorised access and ensuring a secure environment. According to all the experts, VMS can streamline visitor processes in high-rise buildings, reducing waiting times and improving overall efficiency. It explores features such as self-registration, automated check-in/out, appointment scheduling, and digital notifications. The potential for reducing queuing time, enhancing visitor experiences, and increasing operational efficiency is emphasised.

Interviewees mentioned that reducing manual processes and increasing digital efficiency can identify significant drivers. The concept of digital efficiency is based on the elimination of manual processes and workflow components that require multiple touches. As experts mentioned, VMS to reducing resource consumption and waste generation in high-rise buildings. It discusses how digitalising visitor processes through VMS can significantly reduce paper waste, including visitor badges, registration forms, and logbooks. The potential for optimising resource allocation and achieving cost savings.

According to the experts, VMS can integrate with building automation systems to control lighting, HVAC, and other energy-consuming devices based on visitor presence and occupancy. This improves energy efficiency and reduced the carbon emission. High-rise

buildings often have limited space, and efficient utilisation is crucial. VMS can provide real-time insights into visitor traffic and occupancy patterns, enabling facility managers to optimise space allocation. By understanding peak and off-peak periods, building operators can implement strategies like shared workspaces or flexible seating arrangements, reducing the overall footprint and maximising space utilisation.

As per the interviewees, VMS can be used to improve sustainable practices by collecting and analysing visitor data, such as visitor demographics, entry/exit patterns, and occupancy trends. Experts mention that the generation of comprehensive reports and actionable insights for building managers to optimise operations and resource planning.

Another critical motivator is that technology such as VMS can improve employee well-being by providing a safer workplace and making a pleasant first impression. According to the experts, VMS can be used to send out a branded invite. Therefore, that advises visitors where to go and highlights the organisation's identity and branding and a QR code to scan on arrival in an invite to boost customer and tenant satisfaction. Visitors can add the details to their calendars with a single click, and host contact information is available. Experts mentioned that digital transformation models like VMSs are very novel to Sri Lanka. Therefore, there is high unawareness regarding most of the new technology advancements come under digitalisation. Experts stated that VMS offers vivid, robust, and adaptable solutions that assist to reducing carbon footprint, minimising waste generation, and optimising resource utilisation and optimising day-to-day activities while still offering better service to visitors.

6.2 DRIVERS OF USING VMS TO IMPROVE SUSTAINABLE PRACTICES IN HIGH-RISE BUILDINGS IN SRI LANKA

VMS technology enables an organisation to manage the site more efficiently by rapidly tracking who is where and who enters and departs the premises. VMS enhances security and safety measures, which indirectly contributes to sustainability. Interviewees identify that VMS generates valuable data about visitor patterns, preferences, and facility usage. This data can be analysed to identify areas for improvement, optimise operational efficiency, and make informed decisions regarding resource allocation, space utilisation, and sustainability and initiatives. Interviewees highlighted that VMS reduces coronavirus transmission by keeping track of who comes into your company and protects your premises from unwanted visitors who may spread the virus. Experts mentioned that “*A visitor management system could provide businesses with health and safety elements to help fight COVID*”. It enables online booking, for example, offers COVID solutions, including health screening for guests. Experts identified that requesting guests to complete a questionnaire based on COVID-related health issues and a copy of their completed questionnaire can be stored securely in the online portal and can be set up notifications, this function helps to reduce COVID infection and spread. Experts also noted that there are features in automated VMS to automatically check the temperature at the entrance and provide a sanitizer, all above improve the health and safety of the workplace.

In addition, they stated that “*VMS allows an organisation to keep track of occupancy levels while also offering real-time data and insights on the safety of the facility*”. Further, “*The visitor management system will digitise the entire process, saving money in the long run*”. High-rise buildings often have limited space, and efficient utilisation is crucial. VMS can provide real-time insights into visitor traffic and occupancy patterns, enabling

facility managers to optimise space allocation. By understanding peak and off-peak periods, building operators can implement strategies like shared workspaces or flexible seating arrangements, reducing the overall footprint and maximising space utilisation.

As per the experts, VMS systems can integrate with many services like housekeeping, car parking, security, food, and beverage, room service, gymnasium, pool, and spa, from that organisations can easily do the billing and payment process of services that guests consume. Energy-efficient measures, optimised resource utilisation, and waste reduction can result in lower utility bills, reduced maintenance costs, and improved operational efficiency, motivating organisations to adopt sustainable practices.

According to the experts, “*A visitor management system provides a mobile dashboard with essential data*”. It can enhance the organisation’s public image because of the first good impression mentioned by the interviewees. The availability of a visitor management system might provide a great first impression of the organisation to a digitally savvy guest. Experts stated that “*VMS can promote branding on the solution's front end*” Company colours may be shown on hardware devices, logos uploaded to the solution's front end, and can be made screensaver rolls to follow corporate rules. These elements are sometimes necessary to catch the attention of potential clients, who may have a higher opinion of the company. Embracing sustainability can enhance the reputation and brand image of high-rise buildings and organisations. Sustainable practices aligned with VMS can attract environmentally conscious tenants, investors, and customers who value responsible and sustainable operations.

In addition to things found in the literature, most experts emphasise that VMS can assist in waste reduction efforts by promoting digital communication and documentation. Instead of printing visitor badges or passes, the system can generate digital credentials or QR codes that visitors can store on their mobile devices. This reduces the production of physical waste associated with traditional badge printing.

The drivers of application of SVMSs in high-rise buildings can optimise energy consumption, improve resource utilisation, reduce waste, enhance security, and enable data-driven decision making. These benefits collectively contribute to improving sustainable practices and promoting a more environmentally friendly and efficient operation of high-rise buildings.

6.3 BARRIER OF USING VMS TO IMPROVE SUSTAINABLE PRACTICES AT HIGH-RISE BUILDINGS IN SRI LANKA

Visitors can be registered, employees can be contacted promptly, visitor badges can be printed, eSignatures on legal documents can be captured, and a digital visitor logbook can be created. That is readable and available from anywhere; therefore, for that high technology is needed. Experts stated that there should be standard hardware devices that support the VMS software. “Unawareness about the software program” was another barrier. Organisations may be unaware of the specific ways VMS can contribute to sustainability or may underestimate its impact on resource conservation and operational efficiency. Experts mention that “*VMS is a new concept to Sri Lanka and most organisations are not familiar with technologies like VMS*”. Therefore, they may need technical support until they are familiar with modern technology. Security issues indicate that data about visitors is confidential. If a visitor's driver's license or ID is scanned, the

data can be used to steal their identity, therefore, encryption is required. Otherwise, data can be hacked, and data must also be backed up.

Experts mentioned that one of major barriers is technological limitation. There may be technological limitations that hinder the implementation of specific sustainable practices. For example, certain energy-saving features may require integration with building management systems or the availability of advanced sensors and control. Resistance to change from building owners, staff, or visitors can pose a significant barrier to the successful adoption of sustainable practices through VMS.

Apart from the GDPR, in Sri Lanka, there are no legal requirements or regulations to follow when implementing the VMS with visitors' private information. The absence of standardised sustainable practices or guidelines specific to VMS in high-rise buildings, can make it challenging for organisations to develop and implement consistent sustainability strategies. This can lead to uncertainty and delays in decision-making and implementation, when dealing with many visitors, passes. Some organisations have different passes for different departments, floors, and buildings. Therefore, staff or tenants must use many keys to visit various departments, and floors and that decreases tenant, and staff satisfaction.

In addition to those findings, almost every expert identified "High investment cost due to numerous advantages" as a common barrier. Integrating sustainability practices through VMS may require upfront investments in technology, infrastructure upgrades, and employee training. The initial costs involved can be perceived as a barrier, particularly for organisations with limited financial resources. Due to VMS's many features and technological advancements, hardware equipment and software can cause high costs. Organisations need to request for awareness programs and training due to lack of technical knowledge. Cost for those added to the investment cost and errors may happen at the beginning of the operation period, which will increase costs and interruptions.

As per the experts, a smaller number of VMSs existence can discourage organisations from establishing VMS and make less trust in the business of VMS. Since VMS is not common in Sri Lanka, some organisations don't like to take risks in establishing VMS. The expert mentioned that few examples exist on VMS, so most organisations are worried about the investment outcome. Some experts stated that "*automated VMS rely entirely on machines, and frequent machine breakdown hugely impacts the entire process of visitor management*". Sustainable practices often require the collaboration and participation of multiple stakeholders, including building owners, tenants, employees, and visitors. Limited engagement or resistance from stakeholders can impede the successful implementation of sustainable practices through VMS.

Overcoming these barriers requires a comprehensive approach involving education and awareness campaigns, financial incentives, stakeholder engagement, clear communication of the benefits, and demonstration of successful case studies. By addressing these drivers and barriers, organisations can better implement sustainable practices through VMS and foster a more environmentally responsible operation in high-rise buildings.

6.4 STRATEGIES TO OVERCOME IDENTIFIED BARRIERS

Based on the identified barriers, this section offers recommendations and strategies to overcome these challenges and promote the successful integration of VMS technologies

for sustainable practices in high-rise buildings in Sri Lanka. The recommendations may include raising awareness through education and training programs, incentivising sustainable initiatives, addressing financial concerns through cost-benefit analyses, fostering collaboration between stakeholders, and advocating for supportive policies and regulations.

According to the experts, to overcome high investment costs, it can be arranged loan facilities for VMSs. Sri Lankan government can reduce taxes for hardware equipment that are used for VMS to support local manufacturers and distributors of VMS. Experts mentioned that developing a comprehensive financial plan that outlines the costs and potential long-term savings associated with implementing sustainable practices through VMS can manage the high cost and explore government incentives, grants, or financing options available for sustainability initiatives to alleviate the initial financial burden.

Encourage technology providers to develop user-friendly, cost-effective, and scalable VMS solutions that align with sustainability objectives, get support from experts, assess the technological capabilities of the VMS and identify any limitations that may hinder sustainable practices fulfil the lack of technological knowledge and support. According to the experts, exploring opportunities to upgrade or integrate VMS with building management systems, advanced sensors, or controls enable more sophisticated energy management and resource optimisation.

According to the experts, it can conduct awareness campaigns and training programs to educate stakeholders about the benefits of sustainable practices and how VMS can contribute to achieving those goals and provide clear information on the positive impacts of sustainable practices on cost savings, energy efficiency, and environmental stewardship. Experts mentioned that VMS suppliers can provide free trials to the organisation to check the suitability and improve the awareness of stakeholders that help organisations to evaluate the needs for the VMS and accordingly choose VMS software with the required features and build a good co-relationship with the client and other regulatory bodies.

In addition, every expert identified implementing effective change management strategies such as communication plans, involving stakeholders in decision-making processes, highlighting the benefits of sustainability, and providing training and support for employees during the transition addressed the resistance to change. The expert mentioned that working with industry organisations, regulatory bodies, and sustainability experts to develop standardised best practices specifically for sustainable practices through VMS in high-rise buildings encouraged the adoption of these standards to provide clarity, guidance, and benchmarks for organisations to follow. To obtain stakeholder engagement and collaboration organisations can create forums for open dialogue, seek feedback and suggestions, and establish collaborative partnerships with stakeholders to jointly develop and implement sustainable practices. According to experts, organisations can share successful case studies and examples that have implemented sustainable practices through VMS in high-rise buildings and highlight the positive outcomes, cost savings, and environmental benefits to inspire and motivate other organisations to follow suit. Implement a robust monitoring and evaluation system to track the progress and effectiveness of sustainable practices through VMS. Regularly review and analyse data on energy consumption, resource utilisation, waste reduction, and stakeholder feedback to identify areas for improvement and make informed decisions.

By adopting these strategies, organisations can address the barriers and create an environment conducive to the successful implementation of sustainable practices through VMS in high-rise buildings. It requires a combination of financial planning, stakeholder engagement, technological enhancements, and a focus on education and awareness to foster a culture of sustainability.

7. CONCLUSIONS

The utilisation of a smart VMS presents significant opportunities to enhance sustainable practices in high-rise buildings, particularly from the perspective of Sri Lanka. By adopting a holistic approach that integrates technology, energy efficiency, waste management, and occupant satisfaction, VMS can contribute to creating environmentally responsible and socially conscious building operations.

The implementation of a smart VMS enables efficient energy management by optimising lighting, HVAC systems, and other energy-consuming equipment based on real-time occupancy data. Furthermore, VMS facilitates effective waste management by monitoring and managing visitor access. The system also provides valuable data and analytics to support efficient waste disposal strategies, minimising waste generation and promoting sustainable waste management practices. Occupant satisfaction is a key aspect of sustainable practices, and a smart VMS enhances the overall experience of building occupants. Satisfied occupants are more likely to support and engage in sustainable behaviours, fostering a culture of sustainability within high-rise buildings.

In the context of Sri Lanka, where sustainability is gaining increasing importance, the adoption of smart VMS can play a crucial role in promoting sustainable practices in the facilities management of high-rise buildings. However, careful planning, effective implementation strategies, and stakeholder collaboration are essential for successful integration. Embracing the potential of smart VMS can pave the way for a more sustainable and environmentally responsible future of high-rise buildings in Sri Lanka.

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