**PLANNING MALAYSIA:**
*Journal of the Malaysian Institute of Planners*
**VOLUME 22 ISSUE 2** (2024), Page 72 – 84

# LESSONS LEARNED FROM COVID-19 PANDEMICS IN MALAYSIA'S FACILITIES MANAGEMENT ORGANISATION

**Siti Nor Azniza Ahmad Sekak[1], Nurul Syahirah Qasrina Mohamad Sha'aizam[2], Suzana C. Alih[3], Yusmady Md Junus[4], Sri Rahayu Mohd Sa'ad[5]**

[1,2,3]*Studies of Quantity Surveying, School of Construction and Quantity Surveying, College of Built Environment,*
[5]*Studies of Parks and Amenity Management, School of Geomatic Science and Natural Resources, College of Built Environment,*
UNIVERSITI TEKNOLOGI MARA (UITM), MALAYSIA
[4]*School of Professional and Continuing Education (SPACE),*
UNIVERSITI TEKNOLOGI MALAYSIA

## Abstract

The COVID-19 pandemic necessitates a significant response from the construction industry. The increasing recognition of the virus's transmission has demanded the enhancement of quality in multiple domains. The primary responsibility of Facilities Management (FM) is to guarantee the operational effectiveness, comfort, security, environmental friendliness, and productivity of the constructed surroundings. This paper seeks to examine the lessons learned from measures implemented by FM organisations during the COVID-19 pandemic. This research employs a quantitative methodology approach. The questionnaires were disseminated to 317 FM firms in Selangor with a response rate of 36%. The results found that most facilities managers had an ample understanding of FM organisation management throughout the pandemic. It is of utmost importance to comprehensively ascertain the lessons learned in FM during the COVID-19 pandemic and proactively equip and strategize themselves to handle future pandemics and disruptions by cultivating the capacity and resilience to respond to environmental shocks. The implementation of the plan is of utmost importance as it serves as a guiding principle for future actions. The endeavour and the knowledge gained from past pandemics have shaped an industry proposition for a fair and impartial approach to addressing future pandemics in Malaysia.

***Keywords***: Facilities Management, Covid-19, Lessons learned

[1] Corresponding Author: syniza@uitm.edu.my

## INTRODUCTION

Covid-19, a global pandemic, has created significant disruption worldwide, leading to lockdowns in various nations, including Malaysia. These measures were implemented to prevent the spread of the virus. The Malaysian government has implemented the Movement Control Order (MCO) as an approach to address the lockdown situation, commencing on 18th March 2020 (Esa et al., 2020) which has had a significant influence on various industries in Malaysia, particularly the construction sector.

Besides, the COVID-19 pandemic has resulted in extensive disruption to enterprises, daily activities, and operations, especially those related to FM. In addition to healthcare personnel, FM professionals and operatives are also part of the crucial workforce at the forefront of the pandemic. They are responsible for meeting the increased demand to maintain a clean, healthy, safe, and sustainable environment (Ling & Tam, 2022).

The objective of this paper is to examine the lessons learned from measures implemented by FM organisations during the COVID-19 pandemic. The outcome of this paper will identify the best strategies based on lesson learned from the covid-19 pandemics for the future reference of FM organisations.

## LITERATURE REVIEW

### FM during COVID-19 outbreak

A study carried out by Mehmood et al., (2023) presents a thorough analysis of the difficulties Malaysia encountered during the pandemic, with a focus on public hospital FM. The research concentrates on enhancing facility administration to guarantee hospitals are prepared to handle COVID-19 situations. It incorporates a critical synthesis of data and information on COVID-19 and service management to offer insights applicable to both the current pandemic and upcoming health emergencies. This research is important because it is one of the first to compile information on FM related to the COVID-19 pandemic in Malaysia. It also provides helpful suggestions for how healthcare management could be handled in underdeveloped nations during such emergencies.

### Lessons Learned from Covid-19 Pandemics in Malaysia's Facility Management Organisation

#### *Preparedness and contingency planning*

A single epidemic preparedness is sufficient. However, the covid-19 pandemic has clearly shown that Malaysia was not adequately prepared. To effectively address future pandemics, it is crucial to implement robust preparedness and contingency planning in accordance with established best practices. According to Leibniz (2021), establishing a robust global communication infrastructure can greatly improve countries' capacity to identify and promptly address ongoing

outbreaks, pandemics, and epidemics. Therefore, it is crucial to maintain existing pandemic preparation plans that clearly define specific roles and duties, communication strategies, and processes for distributing resources. Regularly evaluating and modifying these plans based on knowledge acquired from previous epidemics is crucial.

An effective strategy will provide regular updates of risk assessments and inventory resources to mitigate the risk of shortages and ensure prompt action. Historically, previous pandemic outbreaks have experienced a shortage of personal protective equipment (PPE), leading to disruptions in the provision of follow-up care for patients. Consequently, engaging in early planning allows for the mitigation of future difficulties. Malaysian NGOs played a significant role during the crisis by actively mobilising resources to manufacture and distribute personal protective equipment (PPE) to support the frontline workers. As a result of various circumstances that arose during the previous pandemic, some organisations have experienced delays in initiating corporate and community initiatives aimed at reducing the transmission of the virus (Shaharuddin et al., 2021).

***Enhanced hygiene and cleaning protocols***

FM was obligated to significantly increase the frequency of cleaning, with a specific focus on heavily used locations. Amidst the COVID-19 pandemic, there was a heightened emphasis on the significance of maintaining environmental hygiene. Consistently reviewing cleaning techniques, even in non-pandemic times, can preserve elevated standards of cleanliness. It will be crucial in the future to allocate resources towards training cleaning staff and using advanced hygiene technologies.

The COVID-19 disaster has emphasized the importance of thorough preparedness and contingency planning for future pandemics and similar crises. Dhama et al., (2021) stated that the Environmental Protection Agency (EPA) of the United States has recommended several effective substances for use against covid-19. The use of post disinfection methods and employing safe and ecologically friendly disinfectants are crucial to prevent the emergence of health risks. Due to the extensive utilization of EPA-approved disinfectants in response to COVID-19, there was a high demand for professional cleaning services. Besides, by strategically distributing hand sanitizer stations across the workplace to accommodate a larger number of personnel, this efficient disinfection method efficiently stops the spread of germs (Macleod et al., 2023).

Implementing flexible cleaning contracts is a valuable technique for managing cleaning services. These contracts allow for alterations to be made based on current health conditions and occupancy levels. Safi et al., (2022) state that the provision of cleaning and disinfection services to unemployed individuals

during the COVID-19 pandemic has created prospects for a rapid and enduring economic revival.

***Flexible work environment***

Amidst the COVID-19 pandemic, methods to maintain physical distance have been implemented to reduce the spread of the virus. While these precautions are crucial for protecting public health, they come with a variety of issues. An important issue with this aspect concerns the modification and reorganisation of physical settings to effectively promote and sustain sufficient physical distancing. The current matter concerns the efficient administration of occupancy restrictions in shared spaces, such as elevators, toilets, and restrooms. This location poses a significant concern as it has the potential to rapidly propagate a virus.

According to Liu et al., (2020) during the early stage of the pandemic, there may be a situation where the government either does not adopt or only partially implements preventive measures and quarantine protocols. This can also happen when there are restrictions on remote work. Furthermore, there is a deficiency in the implementation of signage and floor markers to provide guidance for individuals. To alleviate anxiety, companies should implement navigational signals, signage, and posters to prompt individuals to maintain the necessary physical distance. By utilising subtle cues and guiding individuals to explore their workplace in new ways, floor decals, markings, and graphics can effectively shape behaviour.

***Space utilization and management***

Mitigating the impact of COVID-19 on urban green spaces and parks is a growing concern among academics and professionals (Razali & Shukor, 2022). The epidemic has shown the immense value of flexible spaces. It is recommended to reconfigure facilities in a way that allows for quick and efficient setup of areas for social distancing or isolation. By utilising the knowledge acquired throughout this timeframe, it is possible to shape future workplace policies, resulting in improved overall safety and efficiency. Implementing efficient space management strategies helps create physical distance, reducing the risk of employees contracting COVID-19. Efficient utilisation of space could potentially prevent the transmission of the virus. This will have a substantial impact, as the control of space use has been highly beneficial prior to the COVID-19 pandemic (Syed Abdul Aziz et al., 2020).

Employing technology to monitor places in real-time can streamline the management of building occupancy and enhance rules for social distancing. The monitoring of space utilisation and management can be made easier through the use of IWMS (Integrated Workplace Management System) or CAFM (Computer Aided FM) software. Integrating software with sensors enables the efficient

utilisation of space. Therefore, intelligent building technology is deployed. The data collected on the real usage of a space by occupancy sensors is used to guide challenging decisions (Morley, 2023).

***Improve Indoor Air Quality (IAQ)***

The significance of indoor air quality (IAQ) has escalated, particularly considering the COVID-19 pandemic. Effective maintenance management is essential for keeping a hygienic and secure indoor environment. An important advancement in maintenance management with regards to IAQ is the implementation of sophisticated air filtration devices. These systems have the capability to eliminate airborne pollutants, such as viruses, from the air inside buildings. Consistent maintenance of these systems guarantees their optimal performance and efficacy in enhancing indoor air quality (IAQ) (Mata et al., 2022). The COVID-19 pandemic has highlighted the importance of indoor air quality in the spread of illnesses. To prevent this danger, it is crucial to prioritise the incorporation of ventilation and air filtration technologies in future facility designs and improvements to current infrastructure by employing effective maintenance strategies and utilising state-of-the-art technologies, the indoor air quality (IAQ) can reduce the risk of diseases being transmitted through the air. (Hamad, 2021).

***Health monitoring and reporting***

To address future pandemics in Malaysia, it is crucial to implement proactive health monitoring and reporting systems as a key component of a comprehensive approach. Clear and open health screening and reporting procedures need to be created and shared. In addition, this includes procedures that protect privacy when conducting contact tracking within facilities. According to Dar et al., (2020), proficient contact tracing can enable societies to lift lock-down measures even prior to the availability of vaccines. The goal of mobile contact tracing is to expedite the manual interview-based contact tracing process to contain an outbreak effectively and expeditiously.

The utilisation of information technology in the medical domain has recently been seeing rapid growth. The ability to make informed decisions in the fields of planning, administration, health care, and policy relies heavily on the acquisition of dependable information (Yeong et al., 2021). Health informatics can assume a leading role in tackling a wide range of concerns associated with possible pandemics.

Partnerships with health authorities have the capacity to accelerate the sharing of information and the response to new health hazards. Korri (2023) suggests that implementing policies to consistently improve the performance of the healthcare system and achieve its full potential. Malaysia is committed to

achieving Health for All through the implementation of Universal Health Coverage (UHC). The accomplishments achieved so far have been driven by the continuous multisectoral activities and unwavering political dedication, which will continue to propel progress.

***Supply chain resilience***

During the COVID-19 pandemic, depending on external sources for crucial supplies posed a vulnerability. This issue can be alleviated by establishing supply chains that are more resistant and by maintaining strategic stockpiles of essential resources. The use of supply chain resilience helps a country ensure a consistent supply of imports under unexpected situations. For instance, stockpiling all crucial resources such as key medical supplies, personal protective equipment (PPE), and pharmaceuticals is done to guarantee a prompt reaction in the event of a pandemic. Formulate agreements with suppliers to ensure a dependable network for the distribution of goods. Accenture, (2023) state that manufacturing organizations can promptly tackle the issue of suboptimal manufacturing by utilizing the available data to perform a retrospective analysis of the fluctuating supply and demand.

To anticipate future demand and ensure the smooth operation of an organization, contemporary forecasting methods establish a connection between sales needs, operational capabilities, the availability of raw materials and components, and projected future demand (Frank McKay, 2023). Nevertheless, organizations want more than just these interdisciplinary understandings confined to their internal operations, considering the intricacy of contemporary worldwide supply networks.

***Technology and innovation***

Raising awareness of green technology and its societal applications can improve understanding and prevent negative environmental effects (Abdullah, et al., 2024). The utilization of technology for FM was crucial during the outbreak such as contactless entrance, digital occupancy tracking, online reservation systems for shared venues, and mobile health screening applications. New technologies, such as the internet of things (IoT) and artificial intelligence (AI), are crucially involved in several areas, including healthcare, economics, and education, to monitor and reduce the effects of the COVID-19 pandemic.

Mondal & Mitra, (2022) define the Internet of Things (IoT) as a technology that involves equipping physical objects with sensors, software, and network connectivity. This enables these objects to perceive their surroundings, analyse and interpret real-time data, and communicate and share information with each other through a wireless network.

Furthermore, it is necessary for ventilation technologies to incorporate HVAC systems with sensors and monitoring tools to enhance ventilation, regulate humidity levels, and ensure that air quality meets industry standards. (Santos et al., 2020).

Mukherjeereduce, (2021) asserted that the utilization of contactless services reduces interpersonal contact, hence mitigating the transmission of the virus. IoT sensors can be utilized to monitor the levels of hand sanitizer, assuring a continuous and readily available supply at the stations.

***Communication and training***

During periods of health crisis, timely, effective, and transparent communication methods are essential. Staff and guests rely on accurate information concerning facility operations and safety measures. Research has demonstrated that transformational leadership, training and development, and communication have a good effect on employee engagement. This research offered significant theoretical contributions by investigating the aforementioned factors as integral components of the reciprocal interaction between employers and employees, and their impact on employee engagement during the COVID-19 pandemic (Mustaffa et al., 2022).

Organizational culture should encompass routine training sessions on health and safety protocols, which should also cover potential outbreak situations. According to Yeong et al., (2021) risk assessment and hazard identification methods are crucial elements of workplace health and safety measures. If an organization fails to properly identify risks, it runs the risk of not recognizing potential dangers within its premises that could put its employees and anyone nearby at risk.

***Psychological support and employee Well-being***

The COVID-19 lockdown is anticipated to have a substantial effect on the psychological well-being of employees. This impact is likely to be influenced by various aspects, including as perceived workplace stress, the response of the organization, conflicts between work and home responsibilities, and the level of flexibility provided (Al-Jubari et al., 2022). The challenge of establishing a healthy work-life balance is intensified during a pandemic when employees are required to work remotely from their homes.

Kundi et al., (2020) found that affective commitment in employees may serve as a mediating element in the relationship between job performance and psychological well-being. Effective psychological support for employment enhances job performance. By prioritizing and implementing strategies in these specific areas, employers can effectively promote the psychological well-being

of their employees both during and after the COVID-19 pandemic by fostering a work environment that is healthier and more supportive.

## RESEARCH METHODOLOGY

This research aims to investigate lessons learned from covid-19 outbreaks in FM organization in Malaysia for future strategies improvements. The scope of the research includes the 317 FM firms in Selangor, retrieved from CIDB website 2023. The author selected a sizable sample with a 36% response rate to gain an understanding of the whole issue. As a method for collecting quantitative data, the research employs a questionnaire survey. Then, the data were analysed using a 5-point Likert scale to measure their agreement on each statement related to the issues. The analysis is then conveyed using charts and tables.

## ANALYSIS AND DISCUSSION

This section has been specifically developed to achieve the objective of this research, which is to ascertain the FM measures for future outbreaks based on lessons learned. The survey consists of thirteen (13) questions that require participants to rate their agreement on a Likert scale from 1 to 5, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree".

**Table 1:** Lesson Learned for Future FM Strategies Towards Covid-19 Outbreaks

| Lesson Learned: Strategies Towards covid-19 Outbreaks | Ranking | Mean Value | Standard Deviation (SD) |
|---|---|---|---|
| Improved indoor air quality for future facilities and improved existing infrastructure. | 1 | 4.22 | 0.82 |
| Design spaces and buildings to allow rapid changes in layout for areas of social distancing or isolation. | 2 | 4.21 | 0.79 |
| Implement a flexible work environment for employees and enhanced protective measures. | 3 | 4.20 | 0.82 |
| Enhance new technologies and innovations to solve unprecedented crises. | 4 | 4.15 | 0.86 |
| Contingency planning incomprehensive pandemic preparedness plan. | 5 | 4.15 | 0.82 |
| A support system for employee mental health and well-being when working remotely. | 6 | 4.14 | 0.85 |
| Recommendations for good communication and training to facilitate safety measures and facility operations. | 7 | 4.14 | 0.80 |
| Provides a more resilient supply chain and maintains strategic stockpiles. | 8 | 4.11 | 0.77 |
| Good network with health authorities for information and quick response. | 9 | 4.08 | 0.85 |
| Enhanced hygiene and cleaning protocol by investing in training for staff and technology. | 10 | 4.08 | 0.84 |

| Lesson Learned: Strategies Towards covid-19 Outbreaks | Ranking | Mean Value | Standard Deviation (SD) |
|---|---|---|---|
| Establish clear protocols for health screening. | 11 | 4.04 | 0.91 |
| Update preparedness regularly to avoid shortages and ensure a quick response. | 12 | 4.01 | 0.90 |
| Improve the IT infrastructure and policies required to support a smooth transition from face-to-face to remote operations. | 13 | 3.99 | 0.86 |

Table 1 presents the lesson learned from the knowledge gained from past experiences for the purpose of developing future strategies in FM in response to a pandemic. The highest mean value is that of the *Improved indoor air quality for future facilities and improved existing infrastructure,* which is 4.22, (SD:0.82). The statement by Mata et al., (2022) provides support for the existence of instances that can enhance indoor air quality. For instance, regularly maintaining the systems to ensure their appropriate functioning and efficacy in improving indoor air quality (IAQ). The mean value for the statement *design spaces and buildings to allow rapid changes in layout for areas of social distancing or isolation* is 4.21, (SD:0.79). This is the second highest mean value. The utilisation management has been highly beneficial prior to the COVID-19 pandemic. The research additionally discovered that implementing a one-meter distance between individuals will effectively halt the transmission of the disease. *Implement a flexible work environment for employees and enhanced protective measures*, has been rated as the third highest mean value of 4.20 (SD:0.82). Hamingson, (2023) asserted that the adoption of a remote working strategy enables organisations to achieve cost savings by eliminating the necessity for costly office space or satellite offices. Moreover, this strategy grants employees the autonomy to select their own schedules and operate remotely from any place. Additionally, it facilitates the mitigation of virus transmission to all regions.

The third lowest ranked for lessons learned strategies towards covid-19 is to *Establish clear protocols for health screening* with an average value of 4.04 (SD:0.91). Malaysia is committed to achieving Health for All by implementing policies outlined by Korri, (2023) to enhance the functionality of the healthcare system and completely achieve Universal Health Coverage (UHC). This allows health authorities to enhance their ability to expedite the transmission of information and respond to emerging health risks. Consequently, proactive health monitoring and reporting systems are crucial component of a comprehensive plan. The key takeaway is the importance to continually *Update preparedness regularly to avoid shortages and ensure a quick response*. This second to last ranking has a mean value of 4.01 (SD: 0.90). Hazell et al., (2019) have provided evidence that SODIS (solar disinfection and disinfection) is beneficial in combating various viral diseases. Currently, this cleaning robot stands as the sole

recipient of third-party safety certification. Consistently demonstrating preparedness will be essential for optimal readiness in the face of future pandemics. The lowest mean value of 3.99 (with a standard deviation of 0.86) is that of *Improve the IT infrastructure and policies required to support a smooth transition from face-to-face to remote operations*. Alghamdi & Alghamdi, (2022) have recognised the utilisation of digital technology as a crucial measure in mitigating the transmission of the coronavirus. This includes employing digital tools for providing aid, medical consultations, healthcare services, and monitoring the spread of the virus. Amidst the COVID-19 pandemic, digital technology was employed to mitigate the transmission of the virus, and its implementation has aided in curbing the infection's spread.

## CONCLUSION

The research provides a thorough examination of how FM organisations in Malaysia adjusted to the challenges presented by the COVID-19 pandemic. The statement emphasises the significance of thorough preparation for unexpected events, seamless incorporation of technology, and prioritisation of employee welfare. It also highlights the imperative for FM organisations to improve their crisis management capabilities, strengthen supply chain resilience, and prioritise safety and health measures. The research concludes that the knowledge gained from the pandemic is extremely helpful for better preparing and responding to future crises, not just in the FM sector but also in various other industries.

However, it is important to recognise that every paper has its own set of limitations. The research utilises a quantitative approach, employing surveys that were given to FM firms in Selangor. This method may not adequately encompass the qualitative dimensions of FM concerns and solutions amidst the pandemic.

To streamline further investigation, the researchers propose the following recommendations:

- The incorporation of several geographical regions in the research will offer a broad outlook on the ways for lessons learned during pandemics.
- Employing various methodologies, including the integration of mixed-method research that combines qualitative and quantitative approaches, can lead to more profound insights.
- Examining stakeholders is essential for understanding the perspectives of diverse individuals involved in a particular context, from workers to senior executives. This thorough investigation expands the range and complexity of available information, therefore providing a comprehensive knowledge of the industry's readiness towards pandemics.

The research findings assert that the pandemic had significant impacts on FM in Malaysia, which calls for a reassessment of practices and policies in the future.

## REFERENCES

Abdullah, S. N. F., Kamarudin, M. K. A., Abd Wahab, N., Purba, N., & Sanopaka, E. (2024). Enhancing quality of life in the campus community: the effectiveness of the green campus initiative. *Journal of the Malaysian Institute of Planners. Planning Malaysia* 22(1).

Accenture. (2023). Supply chain disruption. https://www.accenture.com/my-en/insights/consulting/supply-chain-disruption

Al-Jubari, I., Mosbah, A., & Salem, S. F. (2022). Employee well-being during covid-19 pandemic: the role of adaptability, work-family conflict, and organizational response. *SAGE Open*, *12*(3). https://doi.org/10.1177/21582440221096142

Alghamdi, N. S., & Alghamdi, S. M. (2022). The role of digital technology in curbing COVID-19. *International Journal of Environmental Research and Public Health*, *19*(14). https://doi.org/10.3390/ijerph19148287

Dar, A. B., Lone, A. H., Zahoor, S., Khan, A. A., & Naaz, R. (2020). Applicability of mobile contact tracing in fighting pandemic (COVID-19): Issues, challenges and solutions. *Computer Science Review*, *38*, 1–31. https://doi.org/10.1016/j.cosrev.2020.100307

Dhama, K., Patel, S. K., Kumar, R., Masand, R., Rana, J., Yatoo, M. I., Tiwari, R., Sharun, K., Mohapatra, R. K., Natesan, S., Dhawan, M., Ahmad, T., Emran, T. Bin, Malik, Y. S., & Harapan, H. (2021). The role of disinfectants and sanitizers during COVID-19 pandemic: advantages and deleterious effects on humans and the environment. *Environmental Science and Pollution Research*, *28*(26), 34211–34228. https://doi.org/10.1007/s11356-021-14429-w

Esa, M. B., Ibrahim, F. S. B., & Kamal, E. B. M. (2020). Covid-19 pandemic lockdown: The consequences towards project success in malaysian construction industry. *Advances in Science, Technology and Engineering Systems*, *5*(5), 973–983. https://doi.org/10.25046/aj0505119

Frank McKay. (2023). How to build supply chain resilience before the next disruption. *Https://Www.Jabil.Com/Blog/Successful-Supply-Chain-Resilience-Strategy.Html*.

Hamad, K. (2021). Indoor air quality in buildings: a comprehensive review on the factors influencing air pollution in residential and commercial structure. *University, Qatar Foundation, Doha*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8004912/

Hamingson, N. (2023). Communication technology and inclusion will shape the future of remote work. *Business News Daily*.

Hazell, L., Braun, L., & Templeton, M. R. (2019). Ultraviolet sensitivity of WASH (water, sanitation, and hygiene)-related helminths: A systematic review. *PLoS Neglected Tropical Diseases*, *13*(9), 1–19. https://doi.org/10.1371/journal.pntd.0007777

Korri, K. El. (2023). Working together to ensure a future with health for all. https://www.who.int/malaysia/news/detail/08-04-2023-working-together-to-

ensure-a-future-with-health-for-all#:~:text=07%20APRIL%202023%2C%20PUTRAJAYA%20%E2%80%93%20The,the%2075th%20anniversary%20of%20WHO.

Kundi, Y. M., Aboramadan, M., Elhamalawi, E. M. I., & Shahid, S. (2020). Employee psychological well-being and job performance: exploring mediating and moderating mechanisms. *International Journal of Organizational Analysis*, *29*(3), 736–754. https://doi.org/10.1108/IJOA-05-2020-2204

Leibniz-Association Europe. (2021). *COVID-19* and lessons learned-Preparing for future pandemics. http://apps.who.int/iris/bitstream/10665/70810/1/WHO_HSE_GAR_ARO_2012.1_eng.pdf

Ling, F. Y. Y., & Tam, J. Y. (2022). Agility of facilities management organizations during the COVID-19 pandemic: lessons learnt for future pandemics. *Facilities*, *40*(13–14), 862–878. https://doi.org/10.1108/F-02-2022-0032

Liu, X. Y., Zhang, Y., Tu, H. X., & Leck, A. (2020). Cleaning and disinfection in health care settings during the COVID-19 outbreak. *Community Eye Health Journal*, *33*(109), 30–31.

Macleod, C., Braun, L., Caruso, B. A., Chase, C., Chidziwisano, K., Chipungu, J., Dreibelbis, R., Ejemot-Nwadiaro, R., Gordon, B., Esteves Mills, J., & Cumming, O. (2023). Recommendations for hand hygiene in community settings: A scoping review of current international guidelines. *BMJ Open*, *13*(6), 1–14. https://doi.org/10.1136/bmjopen-2022-068887

Mata, T. M., Martins, A. A., Calheiros, C. S. C., Villanueva, F., Alonso-Cuevilla, N. P., Gabriel, M. F., & Silva, G. V. (2022). Indoor air quality: a review of cleaning technologies. environments. *MDPI*, *9*(9). https://doi.org/10.3390/environments9090118

Mehmood, W., Fareed, M., Mohd-Rashid, R., Ashraf, M. U., & Aman-Ullah, A. (2023). The role of facilities management in fighting covid-19 outbreak evidence from malaysian public hospitals. *Frontiers in Psychology*, *13*(January), 1–9. https://doi.org/10.3389/fpsyg.2022.1045972

Mondal, S., & Mitra, P. (2022). The role of emerging technologies to fight against covid-19 pandemic: an exploratory review. *Transactions of the Indian National Academy of Engineering*, *7*(1), 157–174. https://doi.org/10.1007/s41403-022-00322-6

Morley, I. (2023). What's new in smart building tech: space utilization sensors. SpaceIQ. https://spaceiq.com/blog/smart-building-technology-occupancy-sensors/#:~:text=Tracking utilization using occupancy sensors, utilization data with allocation data.

Mukherjee, S., Baral, M. M., Venkataiah, C., Pal, S. K., & Nagariya, R. (2021). Service robots are an option for contactless services due to the COVID-19 pandemic in the hotels. *Decision*, *48*(4), 445–460. https://doi.org/10.1007/s40622-021-00300-x

Mustaffa, A., Lajuma, S., & Wider, W. (2022). Employee engagement during COVID-19 in Malaysia. *Frontiers in Sociology*, *7*. https://doi.org/10.3389/fsoc.2022.976966

Razali, I. A. K. M., & Shukor, S. F. A. (2022). Comparison of Malaysian urban green spaces use prior and during the COVID-19 pandemic and preferences for post-pandemic design improvements. *Journal of the Malaysian Institute of Planners.*

*Planning Malaysia* 20(5).

Safi, N. W., Nasir, S. B. S., & ... (2022). Relevancy of malaysian in the post-pandemic and digital era: balanced and digital education, community engagement. *Journal of Information,* *4*(2), 146–159. https://journals.iium.edu.my/kict/index.php/jisdt/article/view/286%0Ahttps://journals.iium.edu.my/kict/index.php/jisdt/article/download/286/204

Santos, A. F., Gaspar, P. D., Hamandosh, A., de Aguiar, E. B., Filho, A. C. G., & de Souza, H. J. L. (2020). Best practices on HVAC design to minimize the risk of covid-19 infection within indoor environments. *Brazilian Archives of Biology and Technology*, *63*, 1–11. https://doi.org/10.1590/1678-4324-2020200335

Shaharuddin, B., Sany, S., & Hasan, N. N. N. (2021). Challenges and solutions to shortage of personal protective equipment during covid-19 pandemic: case research on corporate and community response. *Journal of Sustainability Science and Management*, *16*(8), 248–255. https://doi.org/10.46754/jssm.2021.12.018

Syed Abdul Aziz, S. H., Khalid, E. Y. binti, & Jasman, J. (2020). Prosedur operasi standard (SOP) langkah kawalan dan pencegahan penularan think safe act safe be safe. *Universiti Malaya.*

Yeong, C. H., Azhari, H. A., Parveen, S., Juyena, N. S., Nahar, N., Islam, M. A., Mysore Kempegowda, S., Karmaker, N., Mumtaz, T., & Stoeva, M. (2021). Health management during COVID-19 pandemic—contribution of women health informaticians, medical physicists and veterinarians from Bangladesh and Malaysia during the world crisis. *Health and Technology*, *11*(5), 1149–1163. https://doi.org/10.1007/s12553-021-00588-w

Received: 28th Jan 2024. Accepted: 3rd May 2024

 