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APPLICATIONS OF SMART BUILDING TECHNOLOGIES IN THE COVID-19 ENVIRONMENT

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The article is devoted to the ways of application of smart building technologies in the COVID-19 environment, which will help prevent the spread of infectious diseases and improve the efficiency of property management.

COVID-19 has caused massive upheaval around the world. Many people have started working from home to prevent the spread of the virus. However, as people return to their workplaces, property owners need to prepare for this, including controlling and limiting the spread of infectious diseases. The use of smart building technologies can help solve the problems of adjustment to the conditions created by COVID-19.

Companies feel the impact of the global spread of COVID-19 in different ways, depending on the type of property and location. Currently, property owners are concerned about preserving the value of real estate [1], ensuring the safety of people during a period of infection with the virus [2] and reducing the cost of cleaning measures.

One of the long-term consequences of COVID-19 has been the need for more flexible systems. Property owners have focused on finding technologies that will help re-open the property while respecting certain restrictions. In this regard, smart building technologies are becoming an increasingly important element of the building. Take, for example, an office building. Thousands of people enter and leave such a building every day. The use of smart cameras equipped with video analytics can help maintain optimal occupancy in a building, distance people from each other and ensure that masks are worn. The data provided by these devices can help the security service and property owners more effectively guide visitors in lobbies, stairwells, and escalators.

An example of successful implementation of smart technologies is the hotel business and healthcare. In the hotel business, the installation of "smart" lighting in the rooms, as well as the provision of contactless room keys using QR codes on smartphones, has become widespread.

In the health sector, with the increasing spread of infectious diseases, the priority tasks of hospitals have become to reduce the risks of infection, improve the air quality in the premises of the building and eliminate problems with the supply of medicines. An intelligent hospital can solve all these problems much better than a traditional one. For example, a mobile application can be integrated into a hospital management system, allowing doctors to simplify interaction with drug suppliers, know about the state of health around the clock, and individualize medical care for each patient. The leading providers of mobile healthcare applications are AirStrip, Airstrip/Cardiology, Epic Systems, and MyChart, which provide secure two-way messaging and interactivity between the patient and the doctor based on data collected in the hospital information database [3].

However, with the introduction of intelligent systems in buildings, the quality of cleaning during the spread of viral infection is an important issue. Based on smart construction technologies, it is possible to achieve control over places with a large crowd of people by combining information about employment and job reservations. This information will allow to determine the frequently used spaces and the time of intensive flow of people. It should also consider using QR codes in the building to track the time and frequency of cleaning through the mobile app. This technology is used at the University of Stirleng [4].

The pandemic has also increased the need for improved air quality. To solve the problem, it's possible to create an air filtration system. This system will use data from indoor air quality sensors and analytical data on the presence of people. Besides to improving air ventilation, organizations should pay attention to HVAC (heating, ventilation and air conditioning). To improve the efficiency of these systems, it should use an automatic fault detection and diagnosis system. In addition, air quality sensors should be used, which collect information about CO2 and volatile organic compounds.

To prevent the risk of the spread of COVID-19, it is necessary to constantly monitor the interaction of employees in the office. The solution to this problem may be to track the health status of people and their recent contacts with each other using smartphones. An example of such a technology is the joint development of Apple and Google. When the function is activated on the smartphone, the disease status is entered: positive or negative. Upon receiving a positive test, the user changes his status and a notification about the need for a medical examination is sent to the smartphones of people with whom they have recently been in contact. In addition, using the latest technology, it is possible to check for infection in large crowds of people at a relatively low cost. An example of such technology is CoTest, which can be used to test up to 40 people on COVID-19 with results obtained in 30 minutes. Significantly reducing the burden on centralized testing services, CoTest quickly and accurately provides results on the health status of employees to health authorities [5].

Due to non-compliance with COVID-19 guidelines in team workplaces, organizations need to rethink the concept of the workplace. In the short term, it should pay attention to the use of sensors to measure the employment of the workplace (for example, presence and light sensors), as well as programs to track the movement of employees around the office. For example, TEECOM has created a Room Search app for its headquarters in Auckland, New Zealand, which is one way to manage a workplace based on measuring room occupancy [6].

Nevertheless, smart buildings have their drawbacks. To improve the well-being and safety of people, they collect huge amounts of information, which increases the level of service, reduces the cost of operating the building and helps reduce the spread of COVID-19. However, the collection of people's data may also violate the personal data protection and privacy rules. Barclays Bank faced this in early 2020 [7]. In accordance with the EU General Data Protection Regulation (GDPR) [8] the processing of personal data requires an appropriate legal framework. To ease privacy and data protection concerns, smart building technology is built with privacy in mind to ensure it complies with GDPR requirements and national data protection laws.

Along with the issue of personal data protection, one of the important issues is the allocation of costs for the modernization of buildings when implementing smart building technologies. Even if the investment costs are initially covered by the property owners, they are likely to pass them on to tenants and residents who may find this unacceptable. However, realizing that the use of smart technologies leads to lower utility costs and helps prevent the spread of infectious diseases, authors believe that the initiative to introduce smart technologies in buildings should receive the support of society, including with a certain possibility of a financial initiative.

The above-mentioned issues are just some of those that smart building technologies can solve. COVID-19 has accelerated the adoption of smart building technologies and associated plug-in equipment. This is mainly due to the new conditions that have emerged as a result of the emergence of a viral infection and the ability of intelligent technologies to ensure that the necessary rules are followed and enforced, as well as to improve the efficiency of construction and property management. At the same time, smart building technologies have solutions to such problems as:

1. Ensuring the safety of people at a time of high risk of COVID-19 infection.
2. Changing attitudes towards the quality of cleaning in buildings.
3. Improved air quality and more efficient ventilation in buildings to minimize virus survival.
4. Monitoring the interaction of employees in the office in order to minimize the risks of spreading a viral infection.
5. Changing the design of the workplace if individual and team workspaces are too densely populated for requirements or recommendations against COVID-19.

Investment in smart building technologies is expected to rise in the near future, which will not only better prepare for future outbreaks of viral infection, but also increase the comfort of being in the premises and the level of maintenance of buildings.

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