Smart Thermal Scanner Camera Implementation for Primary Screening of Covid-19 Suspects at Financial Planning Office’s Lobby

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Abstract. The rate of Covid-19 spreading and sufferer are increasing. It has been infecting many people from various countries, including Indonesia. It needs efforts and community participation to minimise the COVID-19 virus spreading. One of the efforts that can be done is to utilise technology development. Implementing it in the office may be more efficient, effective, and improved to achieve maximum outcomes, particularly in terms of COVID-19 transmission in the office area, ensuring that performance processes run smoothly and maintain a healthy and conducive office atmosphere. By embedding the Smart Thermal Scanner Camera technology directly into the door sensor, it will determine who is susceptible to COVID-19 and thus minimise its spread. The methodology in this research is using descriptive qualitative methods. The modern technology implementation in this office is located in the lobby area, aims to facilitate communication and operational processes. The technology applied in the lobby area is a UV lamp air purifier, touchless door sensor, and thermal scanner. These three technologies support the situation during the COVID-19 pandemic so that workers or guests can use in-office services more safely and comfortably.

Keywords : COVID-19, modern technology, lobby, office, smart thermal scanner camera

1. Introduction
The World Health Organization (WHO) declared the COVID-19 outbreak a pandemic on March 9, 2020. It is because it is rapidly spreading around the world. Indeed, Indonesia was not an exception [1]. Covid 19 is a respiratory illness. It can be transferred via infected human droplets [2,3]. To interrupt the chain of covid-19 transmission, the government launched a campaign in August 2020 encouraging people to wear masks, keep a safe distance, and wash their hands [4]. In January 2021, the government increased the campaign to minimize Covid 19 patients by adding the steps. They were evading crowds and limiting movement [5].

COVID-19 has spread to various clusters, including education, restaurants, families, villages, and markets [6]. The government requires the public to help reduce the spread of disease by using health protocols in their daily activities. It changes many aspects & arrangements in society, so it requires adaptation in its activities [7]. In Indonesia, the new normal is governed by the Minister of Health's Decree HK.01.07 / MENKES / 328 / 2020, which details the guidance on COVID-19 office and industry prevention and management [8]. In the new-normal era, offices are still running by implementing health protocols. In addition, operating hours are also different from before the pandemic. WHO urges the
public to protect themselves and others by washing their hands frequently and practising social distancing [9].

Technology is needed to suppress the spread of COVID-19 in offices. It aims to make the office more effective, get maximum results, and develop and advance. The spread of viruses in offices is often encountered by touching objects around, such as doors and money, even when driving and indoors [10].

The technology used in this office environment has the potential to prevent the transmission of the coronavirus effectively. One of the technologies adopted is a thermal scanner connected to the door, preventing it from being opened/accessed by anybody with temperatures over normal. It is what differentiates the technology utilised in this consulting firm from the technology used in general in Indonesia. By implementing this technology, coronavirus management in the workplace can be more stringent, minimising the likelihood of the virus spreading further.

2. Literature review
The literature review will discuss three parts: the office and what space is in it, the smart technologies applied in the office, and previous research that have already been conducted.

2.1. Office
An office is a place where people come to work in order to achieve their objectives. In the office, employees can accomplish a variety of things. According to [11], there are actions such as information handling that range from collecting, receiving, processing, and channelling information. Meanwhile, according to [12], the office is a place for administration, creating system dependence between people, technology, and procedures to process data. From several opinions regarding the definition of an office, it is concluded that an office is a place where activities like handling information and data happened, starting from receiving, collecting, processing, storing, and distributing it. One factor influencing workers' success in the office is office layout, such as the arrangement of furniture, sound, light, colour, and air [13].

Depending on the type of office, there are some places and facilities that support office activity. Space in the office is closely tied to employees since they undertake various jobs at their disposal [14]. The rooms in the office usually include: meeting room, division room or workspace, CEO or manager room, kitchen or pantry, restroom or toilet, storage room, rest area or relaxing room, lobby area and receptionist.

2.1.1. Meeting room. It is one of the essential rooms in an office. Meeting rooms are needed to discuss business and work either by office employees or with clients. For this reason, the interior design of the meeting room must provide comfort to increase work productivity [15]. Meeting rooms are usually not too large, with room sizes starting from 2.5m x 2m can be used as an area for small-scale meetings. The meeting rooms are usually only used by certain office employees. The size of the meeting room should also be adjusted to the number of room users so that it can be used appropriately.

2.1.2. Division room or workspace. Employee workspaces are classified into two types: team workspaces and individual workspaces. A cooperation space is an open office, whereas an individual workstation is more cubical or personal in style. As the name implies, personal space provides employees with privacy to facilitate employees whose jobs require a certain level of privacy. Private cubicles also provide a calm setting where employees may concentrate on their work without being distracted by their surroundings [16].

2.1.3. CEO or manager room. Manager's room is the room occupied by the head in an office. This space was designed just for one individual and only one person, ensuring a high level of privacy. Manager rooms usually have sizes ranging from medium to large. The design is also varied, adapting to the overall theme of the office. Some have simple designs, while others have rich designs. In general, the furniture
in this space consists of work desks, work chairs, sofas, storage shelves, and some decorative items to add to the room's appeal.

2.1.4. Kitchen or pantry. It is a space where food and drinks are prepared, pantry supplies are stored, and pantry equipment is cleaned [17]. A pantry's role in the office is crucial, as a clean and comfortable pantry encourages employees to relax in the pantry. The pantry's principal duty is to assist employees' food intake demands and supply various equipment needs for the worker to create and prepare food and beverages.

2.1.5. Restroom or toilet. It is a private area, where it is used for self-cleaning or for personal needs. This area does look trivial but has enormous benefits for the office. Toilets must have good standards of comfort and cleanliness so that the health of employees can be achieved. In large-scale areas such as offices, these toilets are distinguished between men's and women's toilets. The toilet size usually adjusts the size of the building, although the majority of the toilets that can be found are not too big.

2.1.6. Storage room. According to [18], a warehouse is a room used for storage. Objects stored in warehouses can be in the form of spare parts, raw materials, semi-finished goods, or goods that are being prepared for the production process. The purpose of the storage area and the function of warehousing, in general, is to maximize the use of existing goods and improve service to customers with limited resources.

2.1.7. Rest area or relaxing room. The break area can be defined as a place for employees to relax, have lunch and even hold informal meetings. Giving employees a break from computer screens also complies with health and safety laws that require staff to take frequent breaks from their workplace when computers are in use.

2.1.8. Lobby area and receptionist. The lobby is a public area with access to enter the office. The lobby usually has a larger size than other rooms. The standard size is 11-18 square meters for 2-4 people and 18-28 square meters for a capacity of 6-8 people. The reception area is an area that is in the lobby as a place to greet, serve, provide information to guests and employees and is also used to take care of administration. It can be said that the reception area becomes a bridge between the company management and guests. At the same time, the facilities are offered in the form of electronic devices (laptops, computers, TVs), modern technology such as doors with sensors, to spaces that can support and improve office workers' performance.

2.2. Technology in the office
The office is a place to increase effectiveness both in terms of quality, cost and time. If in the construction world is the proper utilization of technology [19]. With the right technology, office activities can run efficiently so that guests and employees can move comfortably. Of course, different technology is required depending on the type of office and the room within it. In the office environment, the most commonly used technology is information technology. It is identical to computer equipment [20]. Information technology can be applied internally and externally. Internally, information can be applied to both the organization and management. In business organizations, the organizational functions are accounting, HR, marketing, and finance [21].

2.2.1. Smart Thermal Scanner Camera. It is a device that detects the temperature of the human body. There are two types of this tool: Thermal Scanner Gun and Thermal Scanner Camera (TSC). The Thermal Scanner Gun is a handheld gadget with a camera that detects human body temperature. The TSC, on the other hand, is a body temperature measuring device with a screen and a body temperature monitoring camera [22]. This tool is highly beneficial in a consulting office, especially for filtering those who have a fever of more than 37oC as one of the indications of COVID-19.
2.2.2. **Touchless Door Sensor.** It is a sensor-based device installed in the door area to allow people to enter a room without opening the door handle. It works simply by bringing a hand palm closer to the sensor, and the door will open on its own.

2.2.3. **UV Lamp Air Purrifier.** It is a technology that uses ultraviolet (UV) light to purify the air around it. UV air purifiers are intended to inactivate airborne diseases and germs such as mould, bacteria, and viruses using short-wave ultraviolet light (UV-C light). This device seeks to filter polluted air and reduce indoor air pollution [23]. This technology can be installed in a variety of ways. There are some in the form of a standing product or a technology attached to the HVAC unit. However, the technology applied to a standing product usually necessitates using multiple additional systems to maximize its performance.

2.2.4. **Finger print attendance.** It is a technology that uses fingerprint verification as a detector to meet the needs of attendance data. This tool is simple and effective to use. This tool is also extremely safe to use and is ideal for keeping various data in the firm, such as personal information and staff attendance. Attendance via the fingerprint approach is also exceedingly accurate because no one else can represent finger-based attendance save the person in question. Because the fingerprint is a fingerprint attendance application, no one can manipulate it because everyone's fingerprint is unique.

2.3. **Previous research**

Many types of research or inventions, such as the addition of features or changes in shape, are designed and modified to follow the evolution of the world in the realm of technology. The existing discoveries are dependent on humans' abilities and development in creating and developing technology.

2.3.1. **Smart Thermal Scanner Camera.** According to the journal entitled Prevention of the Spread of Corona Virus at Airports Using Artificial Intelligence, this Thermal Scanner Camera has been installed at 135 international arrival airport entrances in Indonesia. This tool works by detecting a person's temperature passing in front of the device by using infrared rays. This tool is set to scan body temperatures above 38°C. A person with a body temperature higher than this number can be sure that the person is infected with either bacteria or viruses [22].

2.3.2. **Touchless Door Sensor.** This sensor works based on light waves. This sensor detects movement as it approaches the door and sends a signal to the Arduino process unit, which contains a microcontroller chip [24]. The data will be sent to the servo motor by the microcontroller. As a result, it can open and close the door automatically [25]. Door opening with PIR sensor makes use of human voice to open the door. Only the voice saved in the data will be recognized by this system [26,27]. On the other hand, RFID is an automatic identification procedure that uses a radiofrequency system [28]. RFID cards are used in this method. RFID gets information from the tag when it is within a few millimetres of the reader. The data is then forwarded to the database for confirmation. The door will open if the information on the tag is verified [24].

3. **Methodology**

This research utilises qualitative methodologies using primary data collected in the office through surveys and field observations. Literature studies obtain secondary data. It consists of journal references on technology in pandemic times, related technological developments, pandemic-related phenomena, and general office understanding. The literature will be strengthened and will serve as the foundation for concept research. The object of the research is the office of PT. RifaN Financindo Futures. This study focuses on the office lobby area because it is a public space and serves as the main entrance to the building. As we approach the new normal focused on health regulations, this region requires special attention to early detection of COVID-19 spread throughout the office environment. The main topic of discussion in this study is the application of technology.
4. Result and Discussion

In this research, the authors take an office of PT. Rifan Financindo Futures for a case study. This company works as a financial planning consultant. This office is located on the 16th floor of the Sinarmas Land Plaza Surabaya building. With so many users and existing facilities, this office relies on technology to support office functions. This study attempts to explain two things: the lobby area as the main gate of the public area and the use of technology in the office lobby to discover COVID-19 suspects early.

4.1. Financial Planning Consultant Office

A financial planning institution (Financial Planning) is a procedure carried out to address various financial needs with the Financial Planning Consultant Office. Investopedia states that a financial planner is a person or professional institution qualified to help individuals and companies meet long-term financial goals [29]. According to SmartAsset, a financial planner is someone who concentrates on developing a financial plan to assist clients in achieving their ultimate goals (Lake, 2020).

A financial planner's role is to provide advice and financial analysis to clients, including developing a savings, expenses, and taxes strategy. Most financial planners plan money in general, although some specialize in specific areas such as retirement planning and investment [30]. Financial advisers are required for both small and large-scale businesses to assist with their financial challenges. Financial planning aims to help a person or corporation distinguish between what is a need and what is merely a wish [31].

4.2. Lobby Area as Main Gate of Public Area

This office's lobby dimensions 15 m X 5 m and can accommodate 6-8 persons. There is a lobby table that is large enough to accommodate several items, as well as two chairs for personnel in the reception area. The technology is located in the lobby area, considering it is a part of a public area where guests or employees who enter the office must first pass through. The lobby area is defined as having a pretty wide space because there is usually also a reception area and a waiting room in the lobby area, allowing the lobby area to be inhabited by many people, resulting in high interactions throughout the lobby. It is what underpins the development of technology in this field.

A waiting space with a sofa and table is located in the right corner of the reception area. The entrance to the lobby area is also created broad, with glass door material, to provide the sense of a larger and cleaner room. Furthermore, the background behind the lobby space is constructed with a type of brown partition wall with a rhythmic vertical line theme, which adds to the attractiveness of this lobby area, as seen in figure 1.

![Figure 1. Office Lobby of PT. Rifan Financindo Berjangka](image)

4.3. Technology implementation in the new-normal era in the office lobby

The use of technology in the office is required, especially in the new-normal era, to make it easier for visitors and employees. Information technology, synonymous with computer equipment, is the most often used technology in the office [20]. One of the techniques utilized in offices to minimize the spread
of the COVID-19 virus in the new-normal period is to use technology support in UV Lamp Air Purifier, Thermal Scanner, and touchless door sensors seen in figure 2. The technology employed focuses on reducing the COVID-19 virus spread in office locations in the office lobby area (as the main gate of the workplace).

4.4. Thermal Scanner Camera as a trigger
This device is divided into two types: Thermal Scanner Gun and Thermal Scanner Camera (TSC). The Thermal Scanner Gun is a tool that may be held and has a camera to detect human body temperature. At the same time, the TSC is a body temperature measuring device with a screen and a camera for monitoring body temperature [22]. This tool is particularly beneficial in a consulting office, especially for filtering those who have a temperature of more than 37°C, which is one of the signs of Covid-19. This device is placed at the front of the entrance as the first screening of suspects Covid_19, as seen in figure 3.

One of TSC's brands, Foscam, has Artificial Intelligence (AI) that can recognise a person's face even if the individual is wearing a mask [32]. In order to implement this feature for the attendance system, the person's face must first be registered in this system [33]. A security guard is frequently stationed at the front of the building, reminding everyone who enters to wear a mask. This gadget, which is AI-enabled and coupled with TSC, can scan the face covered by the mask to match the personnel database [34,35]. FOSCAM can simultaneously measure the temperatures of up to 20 people. Even though they retain their distance, it is not suggested in this new-normal era. If someone's temperature rises beyond average, this tool will sound an alert and send an email warning.

Employees are expected to take attendance before entering the office building. Employees stand a certain distance in front of the TSC to monitor the temperature. This tool then recognizes each employee one at a time and compares them to the database. The employee's temperature will be recorded in the attendance list if it is normal. The tool then sends a signal to the PIR sensor to activate it. The active PIR sensor will tell the door to open automatically. In contrast, if an employee's temperature exceeds 37°C, the TSC will instruct that the PIR be turned off. This technology will also notify us for the umpteenth
time that employees with a body condition above normal. When the TSC encounters this scenario, the PIR fails to open the door automatically. As a result, if the employee is forced to enter the building while suffering from a heated body condition, the door will not open automatically.

Because external environmental factors can influence body heat, the employee is invited to rest on the supplied bench under certain circumstances. After a few moments, the employee resumed his absence. If the employee's condition is average, the TSC will automatically activate the PIR sensor and open the door. If the conditions stay the same, the employee may be suspected of being a COVID-19 suspect and must be examined further. TSC is at the forefront of screening visitors to the premises. This tool is the crucial factor in determining whether or not a person is eligible to enter the building. This device detects temperature by recognizing and collecting various degrees of infrared radiation. This light is undetectable to the naked eye, but it can be felt as heat if the intensity is high enough.

4.5. Automatically Open and Close Doors with PIR Sensor

The door is the primary point of entry into a building. In this new normal, some buildings use sensors to open and close doors without touching the doorknob. Several previously utilized technologies employ Radio Frequency Identification (RFID) [27,36]. Another method is to employ an infrared-based Passive Infrared Receiver (PIR) sensor. If it detects movement, this technology can regulate the door to open [24,25].

Generally, the door handle is permanently attached to the door. Holding doorknobs can be eliminated with technology to help contain the spread of COVID-19. A sensor that detects the presence of a human is required. As a result, this instrument sends a command to the door, instructing it to move automatically. PIR mounts on the front and back sides. The PIR sensor is attached to the TSC on the front side. If the TSC enables an individual to pass through its programme, the PIR sensor instructs the door's machine to open. The door will remain open if the PIR is activated and there is someone in the doorway. Thus, this tool's purpose contributes to preventing someone from getting squashed by the door. The PIR sensor on the backside is constantly functioning. It is not associated with the TSC on the building terrace. The purpose of this placement is to read the movement of someone who will go out through the door.

4.6. Touchless door sensor

A touchless door sensor is a piece of technology that makes operating the door area easier. Users no longer need to hold the door handle but directly use the sensor on the door. To activate the door handle sensor, gently raise the hand closer to the handle; the door will automatically open. This technology is advantageous because it has the potential to slow the spread of the COVID-19 virus significantly. This device is helpful in terms of security because it permits remote locking of the door via the remote. This technology is used as a backup in the event of a PIR system failure. It is seen in figure 4 and figure 5.

Figure 4. Touchless door sensors implementation in the reception area (direction of the entrance)
4.7. Screening Technology System

It is using AI technology that connects the Thermal Scanner Camera with the touchless door sensor. This technology works through the infrared sensor in the thermal scanner to detect the body temperature of a person passing in front of this camera. This tool is set to be able to scan body temperatures above 38 degrees Celsius. A person with a body temperature higher than this number can ensure that the person is infected with either bacteria or viruses. If this tool detects a temperature above 38o, this tool will send a signal to the PIR (Passive Infrared) sensor on the lobby door so that the door cannot be opened. Thus, the officer will ask whether the person is infected with the virus or is only affected by the heat from outside. The person can be asked to rest in a shaded area for 15 minutes and re-examined through the same sensor.

Based on its specifications, this Smart Thermal Scanner Camera can detect ten people per second simultaneously, undoubtedly reducing the accumulation of people when checking the temperature. Blackbody's built-in Thermal Network Camera can catch this device's body temperature measurement system automatically, quickly and accurately. This thermal camera system can detect faces accurately even when wearing a mask, hat, or glasses and only display the human body temperature. This Smart Thermal Scanner Camera has a system that can provide real-time notifications when it detects body temperature above average in the form of alarms and emails.

However, because this tool is integrated with other devices, namely PIR door sensors, this tool acts as a trigger in its application in the office lobby. So that to achieve the practical value of this tool as an initial COVID screening, checks are carried out per individual.

5. Conclusion

The technological application in the office lobby is committed to the type of technology that serves to help minimise the spread of COVID-19, in the form of a Thermal Scanner Camera backed by a touchless door sensor. The Thermal Scanner Camera was chosen since the current situation primarily focuses on the COVID-19 virus, requiring the office to adhere to health rules and give the best service and protection possible. The touchless door sensor is the most recent technology utilised in the office. Employees and guests do not make direct contact with the door. Hence this technology was chosen to be more effective. It is intended that implementing this technology will assist in reducing the spread of COVID-19 in the office environment, allowing for the creation of a safe, comfortable, and healthy working environment. Given that this is a large-scale workplace and that most employees spend time in the office area, this condition has the potential to increase the quality of employee performance in the office area.

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