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Message from the Editor in Chief

Journal of Big Data & Smart City
Volume: 03 Issue: 02 Spring 2023

On behalf of my co-editors (Prof. Ahmed Nawaz Hakro, Prof. Anupam Srivastav, Prof. Mounir Dhibi) and other members of Editorial Board, I am delighted to bring this 3rd Issue of the Journal of Big Data and Smart City (JBDSC).

This Issue, like its predecessor issues, is an open access journal, with an Arabic translation of the Abstract of every paper published.

The Journal of Big Data and Smart City (JBDSC) is providing an exciting platform to scholars, researchers, other related professionals, policy makers, and especially to the students, to showcase their scholarly ideas and research in Smart City applications, building on Big Data technologies. The journal has been accessible, engaging and motivating to the young researchers, as all the 8 papers in this Issue are joint work with students.

The journal has been successful to fulfil its objective to publish original interdisciplinary research. All the published papers, which cover the areas of Expert Systems, IoT, Mobile Applications, etc, have been subjected to a double-blind review process. The multidisciplinary collaborative work combining multiple fields in wider possible contexts, published in this issue integrates theoretical, experimental, and computational approaches, providing solutions towards smart city/ information and communication technologies themes.

I am thankful to those who submitted papers, both individually or collaboratively from academia and industry. I take this opportunity to also thank all those who contributed in bringing out this issue of the Journal. My special thanks to Dr. Kiran G.R, Dean, Middle East College, for his guidance and complete support to the Editorial Board. I am extremely thankful for the continuous support of MoHERI and MoI for allowing this scholarly publication.

Special thanks to all the members of the Editorial Board for dedicating their valuable time and energy which made it possible for this issue to be published well in time.

Wishing the readers of the articles of this journal making a fruitful contribution in their future research pursuits.

Dr. Saleh Al Shaaibi
Editor in Chief
Journal of Big Data and Smart City

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CONTENT

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IoT-based Smart Assistive Technology Application for Dementia Care

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Abstract
Dementia patients face progressive neuronal loss in the brain and hence experience limited or no recall that may pose dangers to them while indoors or outdoors. Dementia-related illnesses have no cure. Perhaps, the symptoms can be alleviated to improve the quality of life to some extent. Researchers confirmed the use of Assistive Technology in improving the quality of life of Dementia patients and caretakers. This research article proposes the development of a sustainable Internet of Things (IoT) based power-harnessing wearable smart shoe that can be remotely controlled by a smartphone application to track the location of such patients outdoors and remotely control the various electrical and electronic devices indoors, thereby helping patients as well as caretakers to be safe, secure, and stress-free. The outcome of the research is a life-saving all-in-one location tracking and controlling device that utilizes the mechanism of self-charging the battery along with a mobile application that can be used by caregivers to remotely track and control patients indoors and outdoors.

Keywords: *Assistive technology, Dementia, Internet of Things, Mobile app, Smart shoe*

خالصة
يواجه مرضى الخرف فقدانًا عصبيًا تدريجيًا في الدماغ ، وبالتالي يعانون من محدودية الذاكرة أو حتى فقدانها مما قد يشكل مخاطر عليهم أثناء وجودهم في الداخل أو في الهواء الطلق. الأمراض المرتبطة بالخرف ليس لها علاج. ربما ، يمكن تخفيف الأعراض لتحسين نوعية الحياة إلى حد ما. أكد الباحثون قد يساهم في تحسين نوعية حياة مرضى الخرف ومقدمي الرعاية.يقترح البحث تطوير إنترنت مستدام للأشياء) على شكل حذاء ذكي قابل للارتداء و يعمل على نظام (IoT) يمكن التحكم فيه عن بُعد بواسطة تطبيق هاتف ذكي لتتبع الموقع . مثل هذا النظام يساهم في تحكم المرضى وعن بعد في الأجهزة الكهربائية والإلكترونية المختلفة في الأماكن المغلقة ، مما يساعد المرضى وكذلك مقدمي الرعاية على أن يكونوا آمنين وخاليين من الإجهاد. نتيجة البحث هي جهاز تتبع ومراقبة موقع المرضى يستخدم آلية الشحن الذاتي للبطارية مع تطبيق محمول يمكن استخدامه من قبل مقدمي الرعاية لتتبع المرضى عن بعد في الأماكن المغلقة والخارجية والتحكم في الأجهزة.

الكلمات الرئيسية: التكنولوجيا المساعدة ، الخرف ، إنترنت الأشياء ، تطبيق الجوال ، الحذاء الذكي

I. Introduction
The statistics of Alzheimer's Disease (AD) patients are expected to increase thrice the existing count of 44 million by 2050 (Klimova, 2018). Continuous care required to be provided for dementia patients causes a huge threat to the nation's economy. Since no cure for AD has been established until now, it is important to maintain a good quality of life for the sufferers and those taking care of them. It is estimated that approximately 1 to 4 members of the family act as caretakers for each individual with AD (Alzheimer's News Today, 2019). AD is one of the most popular among dementia-related illnesses. It is worth noting that there are roughly 11,900 individuals in the Sultanate of Oman diagnosed with Alzheimer's disease (Muscat Daily, 2023).

There exist limited drugs that are clinically approved for the cure; however, found to be expensive and have negative side effects too. In this scenario, smart Assistive Technology (AT) applications which have the potential to improve the lifestyle of patients and caretakers play a significant role. Alzheimer's Society (Alzheimer's Society, 2019) classifies AT into various categories such as technology devices for daily life that support the daily routines of the sufferers; safety devices that track the patients if get lost; telecare devices that enable an automatic and quick communication to the dear ones over the internet/telephone; and mobile technology devices that improve social participation. Literature evidences a variety of ways in which this is achieved. Smart devices integrated with patients' surroundings either track the movements of patients or provide an automated home system that can save the lives of patients such as continuously tracking the patients when they are likely to be outside the home so that they don't get lost and controlling the electrical and electronic devices if in case the patients are susceptible to operate any devices leading to serious situations respectively (Zucchella et al. 2018). However, these are available as independent devices.

Despite various tracking and controlling devices available across the globe, the use of such devices has been reported to be apparently limited in the Sultanate of Oman as reported by the consultants at the Memory Clinic in Sultan Qaboos University Hospital. This could be due to the high cost of the devices which become unaffordable for many families and that the devices require frequent charging at regular intervals or do not suit the patients to wear them.

The current research aims to develop a reliable, easy, cost-effective device that does tracking and controlling within a single device that requires no external charging for long days controlled by a smartphone application. The research outcome of this study will not only help in tracking locations and controlling devices remotely but also mitigate the burden of caretakers physically and mentally to some extent.

The idea of the proposed research project is a smart shoe with an electronic circuit connected to the GSM network and GPS. The device works to track Alzheimer's patients inside and outside the home thereby helping caregivers to find them. The device can also control facilities inside the home like in the room, bathroom, or kitchen. The device has sensors that switch off any electrical devices in the room, switch off the gas in the kitchen, and switch off the water in the bathroom to provide a secure environment for the patients. This facility makes the patient safe and also limits the consumption of water and electricity. The advantage of this device is the mechanism of self-charging the battery and the availability of the device at an affordable price. A feature of sustainability is added by linking the device to the main device operator at home, for instance; in the living room by controlling the operation of some necessary devices that may be used by the patient. Once the patient is out of the house, all the devices will be switched off. Moreover, forgetting the water faucet through this device can be controlled by opening and closing these luxuries, thereby maintaining a sustainable environment.

The remainder of the paper is organized as follows: Section 2 focuses on related works. The design aspects and implementation are detailed in Section 3 followed by the results in Section 4. Section 5 concludes the research work undertaken.

II. Related work

AD is an aging disease where there is a progressive degeneration of neurons in the brain that eventually leads to memory loss. There have been studies that confirmed the discovery of AT as a means to help Alzheimer's patients to slow down neurodegeneration though at a smaller scale. In fact, there are ways to mitigate and maintain the quality of life of people with the disease. The use of technology is found to help reduce the burden on caregivers. It also helps to understand the behaviors and symptoms of patients (Zanwar et al. 2018).

Researchers confirmed the benefit of cognitive devices and different sensors in the care of patients with Dementia. The research carried out by Bharucha et al., (2009) addressed Advanced Integrated Sensor Systems, including CareWatch, COACH, and CareMedia in addition to the sensors such as Fall Detectors and Environmental Sensors. There was a study conducted with 5 patients' caregivers where various monitors and sensors were placed in patient rooms to identify the patient's behavior while in the room. Sensors include pressure sensors, acceleration sensors, vibration sensors, and motion sensors in addition to some devices such as speakers and tablets for the residents and smartphones (Aloulou et al. 2013). The study revealed that the proposed solution failed at the 1st clinical trial testing since several issues neither anticipated during the design phase nor lab test were noted. However, feedback collected from the caregivers and the consultants helped them realize the drawbacks of the system and later re-design the system.

Björg et al (2019) conducted a study on cognitive disabilities and the consequences of AD and Dementia with innovative assistive technologies. Information and Communication Technologies (ICT) based on electronic circuits and surveillance systems were used in this study. The study was applied to 1655 participants from the USA, Canada, Australia, Europe, and Asia. The aim of the study was to support cognitive disabilities in safety and security using home sensors and dressing equipment. It was found that 80% of caregivers were not familiar with the use of assistive technologies. It is realized that the use and knowledge about innovative assistive technologies is essential for service providers and helps to succeed in innovative programs aimed at the independence of older people and people with Dementia.

The development of a chip that can be incorporated into a patient's clothing to detect potentially hazardous situations when they are alone is a fascinating area of research (Zucchella et al., 2018). However, to achieve an optimal outcome, it is important to customize assistive technology devices to meet the specific needs of both patients and caregivers, rather than relying on a one-size-fits-all approach.

Mobile-based health apps have been developed to monitor the behavior of patients that have been tested successfully however in the indoor environment (Vuong et al. 2013). iWander is an Android operating system-based mobile application that makes AD patients functionally independent in daily life activities thereby lessening the burden of caretakers (Sposaro et al. 2010). The app also allows the caretaker to remotely watch the patient's behavior within the indoor environment and gets alert if tries to move outdoors.

A study conducted in the US found that elderly people are more susceptible to AD and Dementia and two-thirds is women (Alzheimer's Association, 2019). The number of patients in 2050 is expected to reach more than 13 million Americans. Alzheimer's is the sixth leading cause of death, resulting from mental, physical, and social disorders. Hence Dementia care is a priority research area not only in the US but across the world. Assisting robots, biometric sensors, motion sensor technology, intelligent assistive technology for intelligent home connections, multimedia intercommunication systems, and Internet access are technologies that help to improve the daily performance and quality of life of people with Dementia-related illnesses (Bharucha et al. 2009).

An extensive review carried out by Sheikhtaheri and Sabermahani (2022) confirms that the utilization of IoT in

the context of AD/dementia has numerous opportunities to examine different facets of this condition. In the proposed study, the development of an intelligent AT is proposed as one of the solutions to minimize the suffering of patients and their caregivers, especially in the context of the Sultanate of Oman.

III. Design and Implementation

The complete system contains two main parts: 1. Smartphone with an application where a caregiver is the user 2. An electronic chip in a shoe where a patient is the user.

The first part involves an Android-based app development that tracks the patient in the outdoor environment via communication being done using SMS. This can be used by caregivers. The second part is a complex electronic chip that contains several components. This includes a charger, a mechanical piece that converts motion energy into electrical energy, a voltage regulation chip where the wafer regulates the voltage flow process and is connected to the battery, and the battery itself that works to store power from the charger and supply the GSM module. There will be a specialized unit of GPS module that locates any person or object using the signal reception of a group of orbital satellites on the Earth's surface. The specialized unit of the GPRS module will be used for local telecommunication and uses the SIM card which is the basic element for communication with the internal communication towers in the Sultanate of Oman; however, relies on wireless network distributors such as Omantel. One of the core modules is the microcontroller for data processing where an Arduino unit which is a specialized programmable unit is used to control all the modules in the system. Through the Arduino IDE, the coding is done. The libraries available in the program assist in microcontroller programming. This unit is connected to the GPS unit and the GPRS module, and the Arduino module is fed from the battery.

Through the application of the smartphone and smart module in the shoe, communication between them is established using SMS messages. While sending a message to a shoe, the shoe receives the message and automatically sends the SMS back to your location, or the user of the shoe (the patient's location).

In the control side of the project, the two parts of the electronic chip used are the chip placed in the shoe and the Control system located in the patient's place of residence or home. This chip placed in the shoe has a small size, it receives SMS from the smartphone, and automatically re-sends the location of the shoe to the smartphone. Radio oscillations are sent at a small distance not exceeding 20 cm. The control system is located at home with the Arduino board and the receiver sensor chip, relay and water valve, and gas. The receiver chip will sense the presence of shoes in the area. If it exists, each of the relay switches and the water and gas valve works, and if there is no shoe in the area, the relay and water valve and gas are closed. Here, the relay works as a mechanical switch. The receiver and sender parts names are Receiver RFID Reader and RFID Transmitter respectively.

IV. Results

Figure 1 shows the conceptual map that illustrates the AT system developed. The research project resulted in the development of a smart shoe with an electronic circuit connected to the GSM network and GPS. The mobile app is designed in English and Arabic.

The following functionalities are added to the application. •Authorizes the user to download the program from the store. •Allows the user to enter the application with a username and password using the phone number. •Allows caregivers to track the Alzheimer's patient and take coordinates from the location he is in. •Authorize doctors to obtain a database on patient movements. •Allocates the users to choose the functions they need from the application. •Provides the option for the user to store the time, day, and location of the patient. •Permits caregivers and the user to share the coordinates of the site. •Authorizes caregivers and system users to control the closing of gas, electricity, and water outlets. •Allows the system to send a text message to the caregivers in case the patient is late from home.

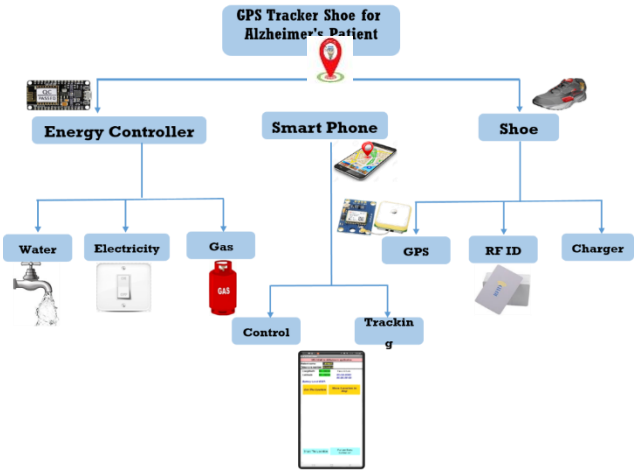

Figure 1. Conceptual map of smart AT system

V. Conclusion

It is scientifically proven that any dementia-related illnesses including Alzheimer's disease are not treatable. Hence, finding alternatives that help AD patients as well as caregivers is important so that the patients can live securely and safely away from the risks that are expected.

As scientific and technological advances progress in the field of healthcare, this research aimed to find innovative ways to develop a tracking and controlling device that can be remotely controlled by a smartphone application that is reliable, user-friendly, and affordable to a common man. The research outcome resulted in the design of an IoT-based power-harnessing smart shoe with embedded features of tracking and controlling within a single device, that requires no external charging for long days, remotely

operated by a smartphone application. The smart shoe features with self-charging mechanism while the patient walks resulting in sustainable energy generation. The mobile app available in the Arabic language makes it even more advantageous for caregivers in the Middle East region.

The idea of a smart shoe that integrates an electronic circuit connected to the GSM network and GPS works to track Dementia patients inside and outside the home and can control facilities inside the home like in the room, bathroom, or kitchen. The device has sensors that switch off any electrical devices in the room and switch off the gas in the kitchen and water in the bathroom to provide a secure environment for the patients.

The advantage of this device is the mechanism of self-charging the battery and the availability of the device at an affordable price. A feature of sustainability is added by linking the device to the main device operator at home, for instance; in the living room by controlling the operation of some necessary devices that may be used by the patient. Once the patient is out of the house, all the devices will be switched off. Moreover, forgetting the water faucet through this device can be controlled by opening and closing these luxuries, thereby maintaining a sustainable environment.

Acknowledgment

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IoT Based Safety and Security System for a Building: System Development and Testing

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Abstract

The possibility of cutting-edge embedded systems using the Internet of Things (IoT) to change safety and security measures is explored in this research work. For monitoring building safety and security, a system has been created. The device has the ability to identify gas leaks, unusual temperature or humidity levels, and fire or flame occurrences. The IoT infrastructure enables the quick dispatch of alarms to a dedicated website and mobile application in the event that any of these indicators are found. Additionally, for increased awareness, a sound alarm is set off to notify the appropriate audience in the event of a fire or gas leak emergency. The article explores the design and analytical phases of creating a comprehensive safety and security system, including hardware implementation using discrete components and circuit simulation. An ESP32-CAM module is connected into the system to increase security by enabling the capturing of photos that may be sent via email to alert building owners as soon as possible of prospective incursions. The system also includes an embedded PIR sensor that allows it to detect any unlawful motion. The gathered data are later compared and evaluated to provide useful insights after a complete review of established test points under various conditions.

Keywords: *Internet of Things, Passive Infra Red Sensor, ESP32-CAM, ThingSpeak, Thingview.*

خالصة

في هذا العمل البحثي . يتم استكشاف إمكانية وجود أنظمة مدمجة متطورة باستخدام إنترنت الأشياء (IoT) لتغيير تدابير السلامة والأمن و لرصد سلامة وأمن المباني. يتمتع الجهاز بالقدرة على تحديد تسرب الغاز ، ومستويات درجة الحرارة أو الرطوبة غير العادية ، وحوادث الحريق أو اللهب. تتيح البنية التحتية لإنترنت الأشياء إرسال الإنذارات بسرعة إلى موقع ويب مخصص وتطبيق جوال في حالة العثور على أي من هذه المؤشرات. بالإضافة إلى ذلك و لزيادة الوعي ، يتم تشغيل إنذار صوتي لإخطار الجمهور المناسب في حالة الطوارئ او بسبب الحريق أو تسرب الغاز. يستكشف البحث مراحل التصميم والتحليل لإنشاء نظام شامل للسلامة والأمن، بما في ذلك تنفيذ الأجهزة باستخدام مكونات منفصلة ومحاكاة الدوائر. يتم توصيل وحدة ESP32-CAM بالنظام لزيادة الأمان من خلال تمكين التقاط الصور التي يمكن إرسالها عبر البريد الإلكتروني لتنبيه مالكي المباني عن أي تسرب في أقرب وقت. يتضمن النظام أيضًا مستشعر PIR مضمن يسمح له باستشعار أي حركة.

الكلمات الرئيسية: إنترنت الأشياء ، مستشعر الأشعة تحت الحمراء السلبي ، الأشياء تتحدث ، عرض الأشياء. ESP32-CAM،

I. Introduction

Safety is commonly defined as the state of being protected from internal dangers and potential harm (Morgan, 2022). When individuals feel safe, it positively affects their well-being, promoting happiness and tranquility. This sense of security fosters motivation and provides a calm environment in which individuals can naturally carry out their personal and professional lives without fear. In turn, this allows for innovation and contributes to the overall development of a country. It is widely acknowledged that technology, when effectively utilized, can bring benefits to both individuals and society at large. In the twenty-first century, security systems face significant challenges related to cost-effectiveness, reliability, and efficiency.

One such technology with immense potential is the Internet of Things (IoT), which involves connecting various devices, objects, or items to the internet for remote control and monitoring, ultimately enhancing human life (Alkiyumi & Bashir, 2021). IoT is characterized by the interconnectivity of devices and objects equipped with sensors, seamlessly integrated into an IoT platform (Al-Amri, Bashir, & Iqbal, 2021). This platform aggregates data from multiple devices and utilizes analytics to provide the most relevant information to tailored applications designed to meet specific requirements (Clark, 2017). To meet the demands of modern communication and technology, the IoT has emerged as a promising technological standard.

By integrating IoT technology into security systems, affordable, reliable, and efficient solutions can be provided to address the problems of the current era. This integration enables remote monitoring, quick identification of potential safety risks, and efficient dissemination of critical information to building owners or security personnel. The IoT offers a range of enticing features while streamlining data transportation and reducing human errors. By leveraging IoT, multiple factors can be monitored, allowing for informed decision-making, such as data transmission and alarm activation. By implementing IoT technology in the security domain, it becomes feasible to effectively address concerns related to personal safety and the protection of private property, among other aspects as demonstrated in Figure 1.

Figure 1: IoT based Safety and Security System for a Building

The fundamental concept behind this project involves the development of an IoT-based device that integrates various sensors and establishes connections with a website and a remote monitoring program. This device incorporates a motion sensor, specifically a PIR Sensor, which enhances location security by detecting any movement. Additionally, it includes sensors for monitoring temperature and humidity (DHT11), fire and flame incidents (Flame Sensor), and gas levels (MQ2 Sensor). These sensors enable the device to detect relevant changes and transmit real-time information to the user. To visually display the sensed information, the device utilizes the ESP32-CAM, a power-efficient camera module based on the ESP32 platform. For remote monitoring purposes, the device is connected to IoT infrastructure, facilitating connections with email services, the Thingspeak website, and the Thingview application (a freely available application source). The visual representation and illustration of the project idea are depicted in Figure 1.

II. Problem Statement

The Sultanate of Oman has recently seen an increase in trespassers, including thieves, breaking into homes and committing thefts. These instances have caused worry and dread in many areas, which has prompted the community to look for effective remedies. This project intends to solve theft issues and improve security and safety in the community as a reaction to these difficulties. It additionally aims to catch trespassers before they commit thefts or other crimes against property. The project's main goal is to implement a cutting-edge Internet of Things-based security solution to address these security concerns and increase overall safety. Using cutting-edge techniques and proactive problem solving, this effort seeks to proactively prevent and limit unwanted access to both private and public assets (E., M. Elsherbini, & M. Abdel-Kader, 2019). By doing this, it gives property owners a sense of security, making sure they are safe even when they are away from their homes or places of business. The project also enables efficient monitoring, surveillance, and ongoing awareness of actions occurring at particular areas. As a result, any new problems can be addressed quickly and effectively before they get worse (Cote, 2023).

III. Literature Review

During the process of designing the embedded system, several relevant literature sources were examined (Dinakar, Singh, & Abbas, 2018). One study conducted by (Taryudi, Adriano, & Budi, 2018) developed an integrated home protection and surveillance system using the IoT. The authors utilized Arduino-nano and NodeMCU ESP8266 controllers to create a system that incorporated sensors and security features. The system included a PIR sensor for intruder detection, a DHT-22 sensor for temperature and humidity monitoring, and the ability to send alerts to a mobile device when the stove was switched on. Remote monitoring and control of the house, including temperature, humidity, and burner flame, were also possible. The system also integrated an RFID card and a digital PIN code for door access, along with home security features such as email notifications and password-protected door unlocking. A smartphone application called Blynk facilitated remote tracking of room temperature, humidity, stove flame, rain conditions, and intruder presence, as well as status of lights and solenoid valves. Electronic equipment within the home, such as lamps and solenoid valves, however could be operated remotely.

Another study by (Dinakar, Singh, & Abbas, 2018) focused on a project called "HSEPM: Home Security and Efficient Power Management." This project aimed to address the increase in crimes, thefts, and high electricity bills caused by inefficient energy usage. By integrating the Internet of Things and Raspberry Pi, the project proposed an alarm system to detect intruders and notify the owner via email. It also included an automatic lighting control system that activated lights based on user movement. The Passive Infrared (PIR) sensor was employed as a motion sensor for intruder detection and automatic monitoring of lighting. The project aimed to overcome limitations of the existing system, such as the need for mobile phone connectivity, limited bandwidth, and computing power. The use of Raspberry Pi's built-in 1.2 GHz processor allowed for future upgrades and improved data processing. This project can be uplifted by adding more features.

Authors in (Karaca, Sisman, & Savruk, 2016) conducted a study on a wireless sensor network based on NodeMCUs (IoT/WiFi Modules). The system aimed to provide an inexpensive wireless security solution with IoT capabilities to protect against burglary, gas leaks, and fire accidents. Key features included intruder, gas leakage, and fire detection, with the Blynk cloud and application used to notify the user globally through notifications and email. An IP camera was also integrated to inspect the property before taking action in the case of false alerts. This project combined sensor alarms with the Blynk server and a GSM module. NodeMCU, a lightweight and affordable device that combines the ESP8266 WiFi module with a microcontroller, was utilized for its long-range and high bandwidth capabilities. The wireless sensor nodes were easily installed throughout the home. The main objective of the research was to design an economical, reliable, energy-efficient, and widely accessible protection device using NodeMCUs. The system was capable of sending

SMS alerts to a predefined cell phone number using GSM modems and Blynk servers to notify intrusion, burglary, gas leakage, and fire incidents. Application users could control and monitor the system through the Blynk app or by sending SMS.

Authors in (Katangle, Kharade, Deosarkar, Kale, & Nalbalwar, 2020) designed a system to monitor and improve air quality in industrial environments, with a focus on fire safety measures and environmental monitoring. The device utilized an ESP8266 NodeMCU controller along with sensors such as MQ135 for air quality monitoring, DHT11 for temperature and humidity, and a flame sensor for fire protection. An I2C OLED display was used for visual output. The device connected to Thingspeak's cloud storage via the Blynk application. When the temperature exceeded a certain threshold, the Blynk software activated the air coolers using a portable switch. Temperature, humidity, and ppm values were sent to the Thingspeak server and shared with the microcontroller through the built-in WiFi module. In the event of a fire, the fire alarm connected to a relay was activated, allowing staff to take appropriate measures. The system utilized Thingspeak as a storage network to display and analyze data in graphical form. The microcontroller was programmed using the Arduino IDE software framework. This device aimed to provide fire safety measures and environmental monitoring in industrial settings, creating a secure and trouble-free workspace.

The projects mentioned could be improved by considering additional features such as enhanced remote control capabilities, advanced data analysis, and integration with other IoT devices for a comprehensive safety and security solution.

IV. Produced Solution

As shown in Figure 2, this suggested system consists of numerous functional blocks connected to a power source. A PIR sensor, buzzer, DHT11 sensor, MQ2 sensor, and flame sensor are all included in the set of blocks designed using v-model (Regulwar, Deshmukh, Tugnayat, Jawandhiya, & Gulhane, 2010). Additionally, it makes use of email communication, the Thingspeak website, and the Thingview program. The ESP32-CAM microcontroller, in particular, connects the inputs and outputs and regulates and controls the overall operation of the system (Kharade, Katangle, Kale, Deosarkar, & Nalbalwar, 2020). The PIR sensor detects motion, the DHT11 sensor measures temperature and humidity, the MQ2 sensor detects gas leaks (such as carbon dioxide, liquefied petroleum gas, propane, and hydrogen), and the flame sensor detects the presence of fire. All of these sensors are connected to the microcontroller. The microcontroller gathers information from these sensors and analyzes it, allowing it to take precise actions based on the findings (Asif, Bashir, & Iqbal, 2021).

The ESP32-CAM microcontroller receives a signal from the motion sensor when it detects motion, which causes it to take a picture of the intruder. However, because the ESP32-CAM lacks a serial interface, an integrated programmer, and a USB connection for computer communication and programming, an external interface adapter known as "FTDI" from Future Technology Devices International Limited is used for programming. The ESP32-CAM then establishes a connection to the system's or device's local Wi-Fi network and sends the captured image to the cloud. An email notification is sent to the user with the intruder's image attached thanks to a server that is established and connected to both the cloud and the application. Temperature, humidity, gas, and flame information from the additional sensors are sent to the ESP32-CAM microcontroller device. This unit analyzes and collects the data, which is then sent to the cloud.

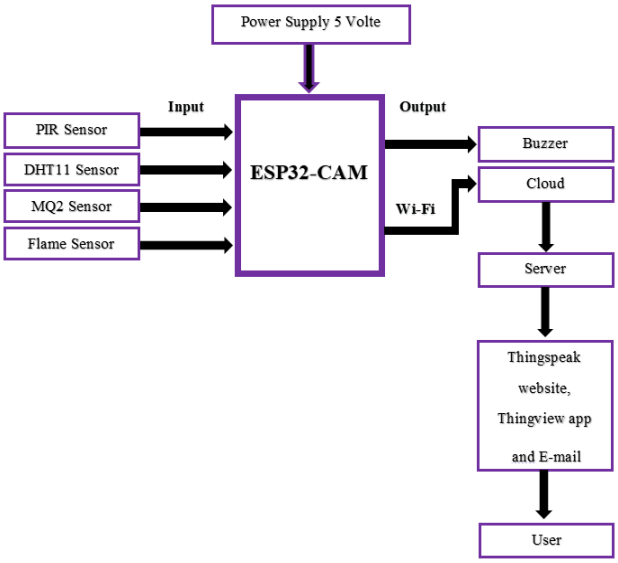

Figure 2: Block diagram of the system

The Thingspeak website and the Thingview app display the data as digital indicators for temperature, humidity, gas, and flames. In the case of a gas leak or flame detection, the buzzer is activated as demonstrated by flowchart of Figure 3.

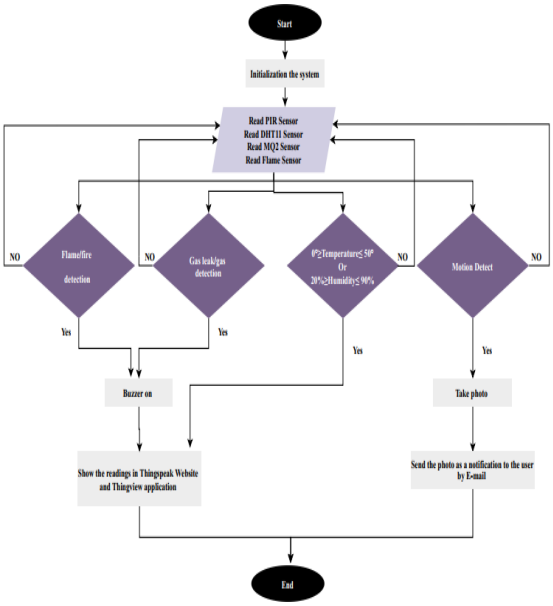

Figure 3: Flow chart of the system

Figure 3 elaborates the operational flowchart for the system. To guarantee that it is ready for tasks, the system is initially configured for security and safety reasons. The sensors for sensing and detecting changes or events in the environment include the Motion Sensor (PIR), Temperature and Humidity Sensor (DHT11), Gas Sensor (MQ2), and Flame Sensor (Hashmi & Bashir, 2022). The system starts by initializing and waiting a little while to make sure all of its parts are working properly. The microcontroller is then able to collect input data and transmit information to the user (building owner) after the Wi-Fi module is set up to establish a connection. Once all sensors are prepared to accept commands and detect, they are all read simultaneously. If the PIR Sensor detects an intruder through motion, a signal is sent, and a picture of the intruder is captured. Subsequently, the photo is sent to the user as an email notification. If no motion is detected, the process repeats, continuously reading the PIR Sensor until motion is detected.

When the temperature is between 0 and 50 degrees or the humidity is between 20% and 90%, the temperature and humidity sensors take readings. This process is repeated continually, with the readings shown on the Thingspeak website and the Thingview app. The buzzer is activated and the readings are shown on the Thingspeak website and the Thingview application in the case of the Gas and Flame sensors in the event that a gas leak, flame, or fire is discovered. In a manner identical to the last instance, this cycle continues. The process closes and then continues by reading the inputs again after the email notification is received and the data is presented on the website and application. This ongoing cycle ensures that the system is continuously monitored and working properly.

V. Results Discussion

Figure 4 depicts the functional block diagram, offering a clearer comprehension of the system's process and concept. If there is movement, such as an intruder entering the premises, the PIR sensor detects the motion and transmits a signal to the microcontroller (ESP32-CAM).

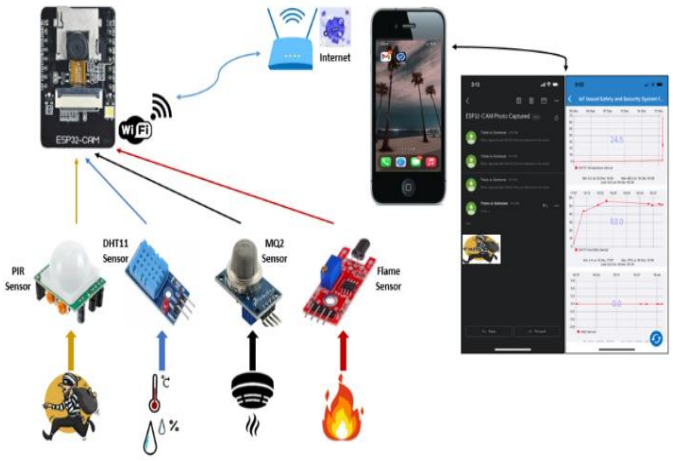

Figure 4: The Functional Block Diagram for the System of Project

The microcontroller captures an image of the intruder and establishes a Wi-Fi connection using the on-site Wi-Fi router. Subsequently, the microcontroller sends the image to the user via email. The process remains consistent for the other sensors as well. The sensor data for temperature, humidity, gas, and flame is recorded and stored on the ThingSpeak website. Through the website and the Thingview app, the user can monitor changes in these variables. Tinkercad and the Arduino IDE software were used as simulation tools to test the system's functionality. Although it lacked all of the project's components, Tinkercad was used to explain the system's concept. It's vital to remember that simulation findings could not exactly reflect outcomes in the actual world. The circuit schematic for the project in Tinkercad is shown in Figure 5. All of the sensors were tested for functionality, and the results were seen in the Serial Monitor. Additionally, a breadboard was used for hardware testing. Figure 6 shows the circuit schematic of the hardware components attached to the breadboard for hardware testing.

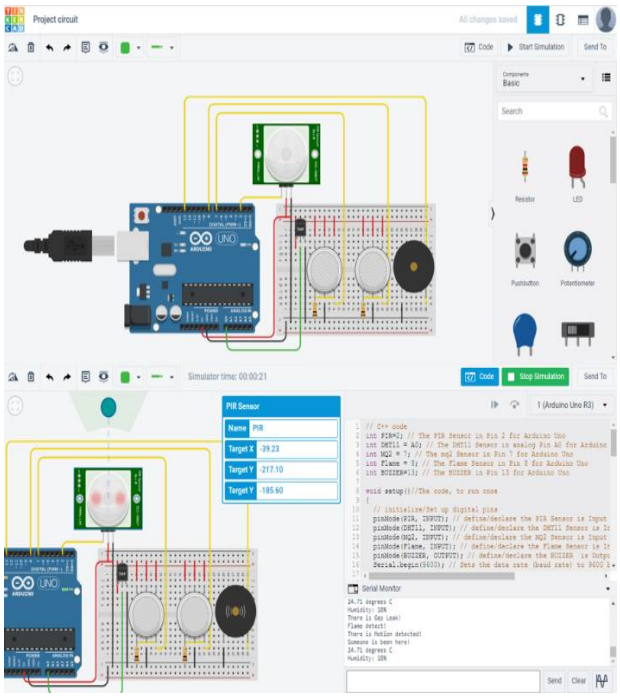

Figure 5: The Circuit Diagram of the Project in Tinkercad

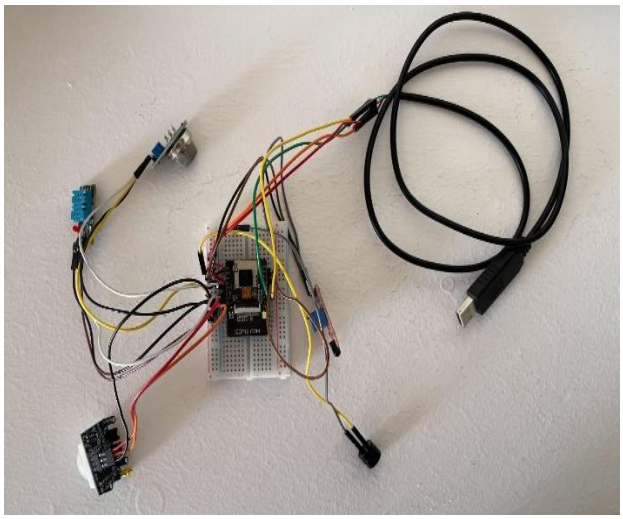

Figure 6: The System Design

As part of the project's objective, when an intruder is detected by the PIR sensor, it will transmit a signal to the

ESP32-CAM. The ESP32-CAM will receive the signal, gather the necessary data, and prepare to capture an image. Once the image is taken, the system proceeds to send an email, delivering a notification to the user (the owner of the premises) along with the intruder's image. Figure 7 illustrates this process.

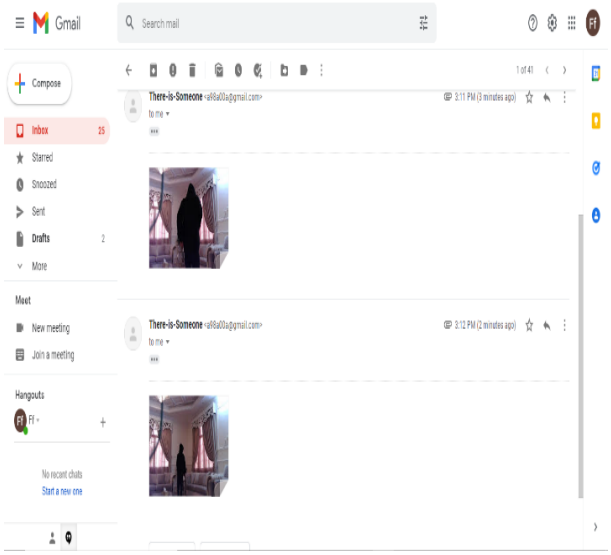

Figure 7: Received Photo of an Intruder to the User/Owner by E-mail

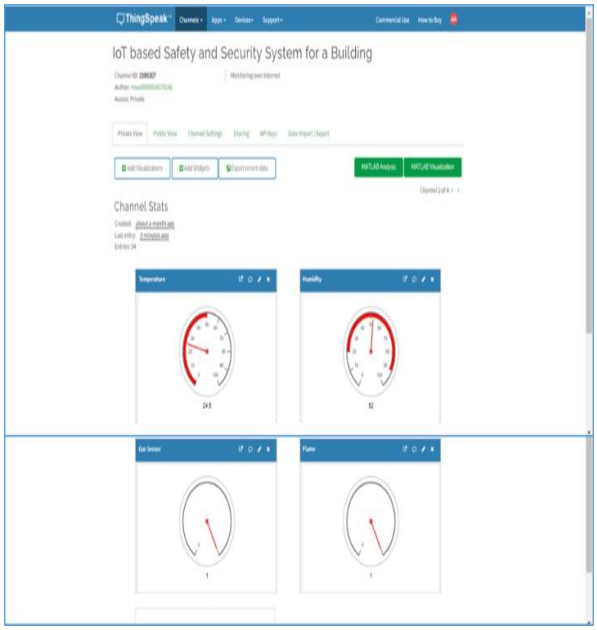

Figure 8: The Result of DHT11, MQ2, and Flame Sensors in the ThingSpeak Website

Another objective of this project is to display the readings and results from the DHT11, MQ2, and Flame sensors on the ThingSpeak website and Thingview app. This allows the user or owner to conveniently monitor the temperature, humidity, gas levels, and flame presence through both the website and app interfaces. Figures 8 and 9 illustrate the display of these readings and results. Another objective of this project is to display the readings and results from the DHT11, MQ2, and Flame sensors on the ThingSpeak website and Thingview app. This allows the user or owner to conveniently monitor the temperature, humidity, gas levels, and flame presence through both the website and app interfaces. Figures 8 and 9 illustrate the display of these readings and results.

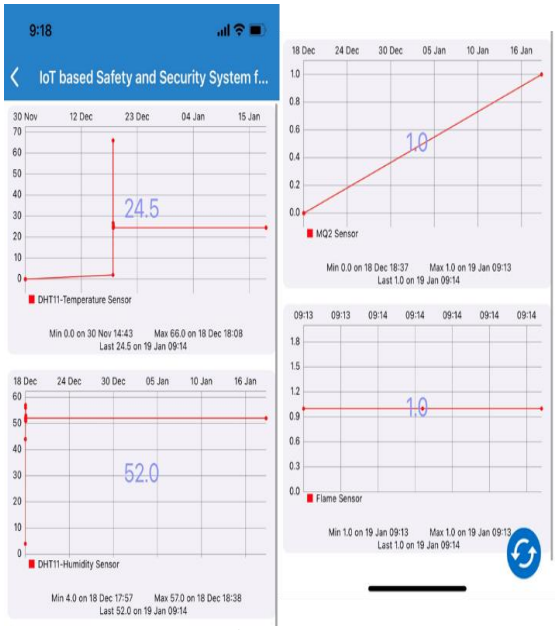

Figure 9: The Result of DHT11, MQ2 and Flame Sensors in the Thingview Program

VI. Conclusion

Utilizing technology's capacity to address a variety of issues is essential, especially in the area of security and safety. Both individuals and society as a whole will profit directly from this. It is feasible to keep current and in line with technology improvements by adopting the IoT and connecting devices, improving people's lives. The goal of this project was to create a building security and safety system based on the Internet of Things that would allow for remote monitoring via email, the Thingview app, and the ThingSpeak website. These security and safety factors are periodically recorded. This system offers a number of security elements that successfully deter theft and robberies. It enables remote monitoring of temperature, humidity, gas levels, and the existence of flames or fires for safety reasons. Both the ThingSpeak website and the Thingview app allow users to keep track of these parameters. The idea achieves its objectives by automatically taking a picture of an intruder and emailing it to the user along with a notification. Furthermore, it takes readings of temperature, humidity, gas concentrations, and flames or fires and stores them for further monitoring on the internet and mobile app. The device uses a buzzer to sound an audible alert in the case of a fire or gas leak, warning anyone close to take prompt action.

VII. Acknowledgements

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كلية الشرق الأوسط Middle East College

IoT Based First Aid Drone System to be Used Before Ambulance Arrival

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Abstract

Drones are being used in various applications, including delivery services. In cases of car accidents, a significant number of fatalities occur due to delays in providing prompt first aid, exacerbated by factors such as insufficient infrastructure that leads to delayed ambulance arrivals. To tackle this problem, the First Aid Drone, an Internet of Things-based system, aims to decrease the response time for delivering immediate medical assistance to the injured individuals before the ambulance arrives. The system's design includes a microcontroller-based drone equipped with a global positioning system and essential first aid components, as well as sensors for monitoring vital signs like heart rate, temperature, and gas levels of the patient. The collected patient data is transmitted to the emergency healthcare facility through the mobile Blynk application, using cloud technology. This allows the healthcare facility to communicate with the ambulance end route, ensuring that necessary procedures are prepared based on the patient's requirements.

Keywords: *medical emergency response, microcontroller, global positioning system, sensor, mobile application, cloud technology.*

خالصة

يتم استخدام الطائرات بدون طيار في تطبيقات مختلفة ، بما في ذلك خدمات التوصيل. في حالات حوادث السيارات ، يحدث عدد كبير من الوفيات بسبب التأخير في تقديم الإسعافات الأولية الفورية ، والتي تفاقمت بسبب عوامل مثل عدم كفاية البنية التحتية التي تؤدي إلى تأخر وصول سيارات الإسعاف. لمعالجة هذه المشكلة ، تهدف ، وهي نظام قائم على إنترنت الأشياء ، إلى تقليل وقت الاستجابة لتقديم المساعدة الطبية الفورية للمصابين قبل وصول سيارة الإسعاف. يتضمن تصميم النظام طائرة بدون طيار قائمة على وحدة تحكم دقيقة ومجهزة بنظام تحديد المواقع العالمي ومكونات الإسعافات الأولية الأساسية ، بالإضافة إلى أجهزة استشعار لرصد العلامات الحيوية مثل معدل ضربات القلب ودرجة الحرارة ومستويات الغاز للمريض. يتم إرسال بيانات المريض التي تم جمعها إلى تطبيق المحمول Blynk ، باستخدام تقنية السحابة. وهذا يسمح لمرافق الرعاية الصحية بالتواصل مع سيارة الإسعاف في الطريق ، مما يضمن إعداد الإجراءات اللازمة بناءً على متطلبات المريض

الكلمات الرئيسية: الاستجابة للطوارئ الطبية ، وحدة التحكم الدقيقة ، نظام تحديد المواقع العالمي ، المستشعر ، تطبيق الهاتف المحمول ، تقنية السحابة

I. Introduction

It is crucial to provide prompt and proper care during a medical emergency to avoid serious repercussions. In the European Union, more than 700,000 people have heart attacks each year, with a survival rate of just 9% due to response times that are too slow and the brain dying 4 to 6 minutes after the attack begins, frequently resulting in fatalities. Only 5% of heart attack victims make it through their recovery and are allowed to leave the hospital. However, there have been instances were receiving quick medical care improved survival rates. To reduce potential fatalities and speed up patient care, healthcare workers must launch a quick emergency response. For instance, if an ambulance arrives at the site of a heart attack after 10 minutes, the patient's chances of survival drop to 9%. However, the development of first-aid drones can change this scenario by arriving on the scene faster, permitting a thorough evaluation of the patient, and delivering rapid medical supplies before the arrival of the ambulance (Al-Amri, Bashir, & Iqbal, 2021).

According to (Bashir & Yusof, 2019), unmanned aerial vehicles (UAVs), also known as drones, have drawn a lot of interest, and are transforming the mobile computing sector. These drones could be widely used and provide a variety of services in civilian environments (Bashir, Iqbal, & Yuso, Design Principles for Cooperative Relaying on UAVs-based FANET, 2022). An overview of drone services and applications is given in this study of the literature, with a focus on data management, data services, cloud computing trends, and studies on human-drone interaction. According to (Alkiyumi & Bashir, 2021), it emphasizes the difficulties in data handling and the application of aerial Internet-of-Things (IoT) computer systems. One promising application of IoT is the utilization of first-aid drones, which utilize the NodeMCU esp8266 and various sensors such as GY-MAX30100, DS18B20, and MQ-135 to track a patient's health, as described by (Kumar & Jeeva, 2017). The healthcare sector is experiencing rapid transformation through the adoption of IoT, as explored by (Al-Amri, Bashir, & Iqbal, 2021).

The design of a control and monitoring interface for devices is made easier by the widely used IoT platform Blynk, which also allows for the display of sensor data and the monitoring and control of pins. The Blynk app makes it simple for people at the disaster scene to get in touch with emergency professionals. Once the injured person has been discovered, the first-aid drone can be launched quickly and arrive at the scene quickly. A medical

emergency team receives the patient's information from the Blynk app, which is used to evaluate the patient's status and display sensor data on a liquid crystal display (LCD) screen. The medical staff has a thorough awareness of the patient's condition when the ambulance arrives to pick up the patient.

II. Problem Statement

Emergency response systems struggle with sluggish and ineffective patient-emergency service communication, which causes delays in emergency response because of weaknesses in the current system (Bashir & Yusof, 2021). Second, a lack of first aid supplies could worsen the conditions of patients who are in life-threatening situations by preventing them from receiving prompt medical attention. Thirdly, the issue of inadequate methods for sharing health information results from the current system's inability to provide people with a trustworthy way to communicate their health concerns to the emergency room, which makes it difficult for medical professionals to accurately assess the situation. Finally, remedies are needed for the lack of real-time health monitoring, which prevents medical professionals from making better decisions.

There is currently no quick and effective way for persons experiencing severe medical crises to receive assistance from the emergency response system, except for ambulances (Bashir & Yusof, 2021). For patients to communicate their medical conditions to the emergency department, a drone outfitted with first aid supplies and medical equipment can be sent to their location, that displays pertinent health readings on an LCD screen, and provides urgent solutions. The creation of such a solution can address numerous difficulties. This project is an effort to fill this gap by designing a prototype to meet the requirements of emergency response to patients.

III. Literature Review

A drone is essentially a flying robot that can be operated by a human. Drones, sometimes referred to as UAVs, are constantly evolving due to technological advancements (Bashir & Yusof, 2019). A particular kind of drone used to carry medical supplies is the subject of this research review (Kristensen, Ahsan, Mehmood, & Saqib, 2017). A locking system is used in the connected compartment to protect the supplies and keep them intact until they are delivered to the appropriate recipient. Additionally, taking advantage of the rising popularity of such services, the drone can be used to transport prescription medications bought through online pharmacies (Kristensen, Ahsan, Mehmood, & Saqib, 2017). The architecture of the drone incorporates IoT technology, enabling connectivity and communication with other gadgets in the internet ecosystem (Al-Amri, Bashir, & Iqbal, 2021).

In numerous research, ideas like "drones as a service" and the "fly-in, fly-out" computing framework are presented that solve the data management and network configuration difficulties unique to drone contexts (Bashir, Yusof, & Iqbal, UAV Deployment Model in Aerial Monitoring Applications Using Camera Field of View, 2022). They also go over subjects like managing large amounts of data in drone applications, enhancing user experience and quality of service in airborne and ground networks, situational awareness, scalability, reliability, caching for efficiency, and user-robot interaction using various techniques (Bashir & Yusof, 2019). When traditional ground methods cannot be used to bring medical aid quickly, quadcopter air transportation is thought to be the most viable option. Studies recommend the employment of quadcopter-based flight manuals and quick response units to reduce delays in the delivery of medical treatment. An abundance screening system, a quadcopter base station, and a summoning system for field workers working in open areas are all part of the project (Hussain, et al., 2021). Through pre-established GSM and GPS-based connectivity, a quadcopter is sent out to provide immediate help to the field worker in unanticipated situations. A user using a virtual reality (VR) headset at the base station, which is outfitted with VR technology and a wireless network, can move in time with the motions of the drone camera to get a thorough view of the surroundings from a distance. An infrared (IR) model is employed to enhance obstacle avoidance. The reduced response times enabled by this obstacle avoidance system facilitate swift arrival at optimal locations.

In their article, (Fakhrulddin, Gharghan, S. K., & Chahl, 2019) established a sophisticated system for emergency medical care. The framework focuses in particular on monitoring elderly individuals who have chronic illnesses like heart disease because these disorders raise their risk of falling. A robot is used to deliver medical assistance in the suggested solution. Two devices make up the system: one that transmits data and one that receives it. The person is wearing a frequency division duplex (FDD) smartwatch that tracks heart rate and blood pressure. A drone carrying emergency medical supplies is immediately dispatched when the readings depart from the normal range, and an alert is delivered directly to the hospital's emergency room. The injured senior is located using a method based on the global positioning system (GPS). The article also describes a fall detection method that uses variations in heart rate and gait to identify falls. The algorithm was tested, and five employees evaluated the effectiveness of the heart rate sensor. Statistical analysis validated the accuracy of the collected data and the fall detection system, including the precise location of the fall. The results demonstrated that the robots outperformed humans in all tasks, arriving at the patient's location before the ambulance in approximately 31.81% of cases, saving around 105 seconds. For the safe delivery of medical supplies and real-time monitoring of vital signs in emergency circumstances, an integrated drone system with IoT connectivity must be developed in order to handle these problems.

IV. Proposed System

The suggested approach is creating a patient-triggered emergency call system that uses drones to deliver medical supplies and equipment for health checks as demonstrated

in Figure 1. It incorporates a keypad and LCD screen to enable real-time monitoring of the health readings of patients and smooth communication of their health difficulties. The final goal is to offer a holistic solution that adequately handles the problems that have been found, assuring better patient care and emergency response. The method of establishing a Wi-Fi connection is shown in Figure 1 along with the system block diagram, which integrates numerous components including temperature, heart rate, and gas sensors, a patient status input panel, a DHT11 sensor, a GPS module, and an LCD screen. The GPS unit is then examined to determine if the drone needs to reach the patient's location based on significant GPS data. Subsequently, the sensors commence detecting the patient's temperature, heart rate, ambient gas levels, as well as temperature and humidity.

Assuming that the DHT11 sensor provides data within the range of 0°C to 50°C for temperature and 20% to 90% for humidity, and the MLX90614 temperature sensor indicates a value below 35°C or above 38°C, high gas levels, and a heart rate less than 60 BPM or exceeding 100 beats per minute (BPM), the readings will be displayed on the LCD screen. The Red light emitting diode (LED) will illuminate to indicate an abnormal condition, and all the information will be transmitted from the Blynk app to the healthcare department. If none of the above conditions are met, the readings are considered normal, and they will be displayed on the LCD screen. The Red LED will be off, and the readings will be transmitted from the healthcare department via the Blynk app. Finally, when the patient has finished using the system, pressing the pushbutton will turn off the LED in the Blynk app, indicating that the patient has completed the use of the equipment and is in good condition.

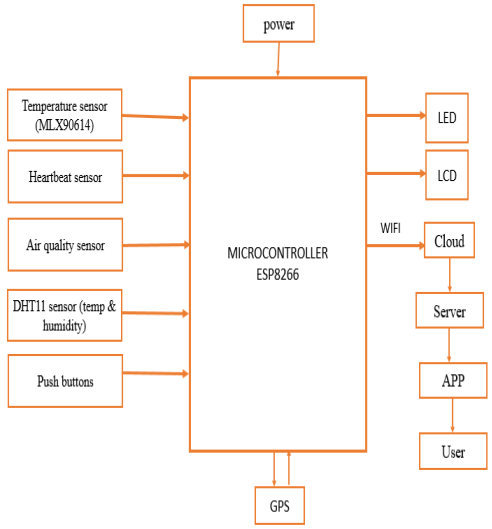

Figure 1: System Block Diagram

Figure 2 illustrates the system flow diagram. The initial step involves setting up the system's Wi-Fi connection and initializing the temperature sensor, heart rate sensor, gas sensor, DHT11 sensor, GPS module, and LCD screen. If the GPS data is accurate, indicating the drone's ability to reach the patient, the next action is to read the GPS module. The sensors then begin measuring the patient's temperature, heart rate, as well as the ambient air temperature and gases. The collected readings are displayed on the LCD screen. If the DHT11 sensor detects data within the range of 0°C to 50°C for temperature and 20% to 90% for humidity, and the MLX90614 temperature sensor indicates a value below 35°C or above 38°C, high gas levels, and a heart rate below 60 BPM or above 100 BPM, the readings are considered abnormal. In this case, the LCD screen will display the abnormal readings, and a red LED will be turned on to indicate an abnormal condition. Furthermore, all the data will be transmitted to the health department through the Blynk application.

If none of the aforementioned conditions are met, the readings are deemed normal, and they will be displayed as such on the LCD screen. The red LED will be turned off, indicating a normal condition, and the readings will be sent to the health department via the Blynk application. Finally, when the push button is pressed, an LED on the Blynk application will be turned off, signaling that the patient has completed using the system. Every component within the system is interconnected, establishing a relationship between inputs and outputs. The system's outputs, namely the LCD screen and the Blynk application accessed through the cloud, present the readings from the sensors and GPS.

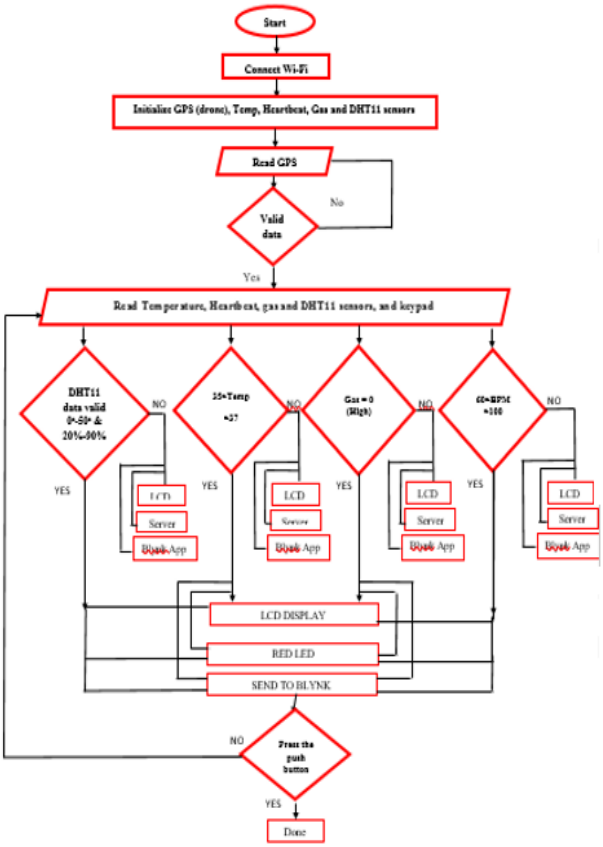

Figure 2: System Flow Chart

To establish this connection, the digital pins and analog pins of the microcontroller are linked to the system's four inputs. Each sensor transmits signals to the microcontroller, which then processes and converts the analog signals to digital signals using the Analog-to-Digital Converter (ADC). Consequently, the signals from the sensors function as inputs for the microcontroller. The

microcontroller generates output signals that are directed to the system's outputs, specifically the LCD screen. The user through the cloud via the Blynk application subsequently receives these signals. Thus, the inputs and outputs are interlinked, forming a cohesive system.

To perform temperature computation and estimation, an internal state machine governs the operation of the MLX90614. It manages the processing of temperature data, which can be outputted through pulse width modulation (PWM) or the SMBus interface. The MLX90614 consists of two IR sensors, enhanced by a low noise low offset chopper amplifier, followed by a Sigma Delta modulator that converts the analog signal to a digital stream. Additional data processing is conducted using a powerful Digital Signal Processor (DSP), including programmable Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) low-pass filters to reduce the bandwidth of the information signal. The resulting temperature estimation is stored in the internal random access memory (RAM) of the IIR filter. The computation of the item's temperature can be expressed by the following Equation 1:

$$T_o[K] = T\_Oreg \times 0.02 \quad (1)$$

Here, [K] represents the temperature of the object in Kelvin, and T_Oreg is the output stored in RAM with a resolution of 3AF7h 0.02 C°. To illustrate with an example, decimalizing the value 3AF7h results in 15095d. By multiplying 15095d by the resolution of 0.02, we obtain 301.9K. To convert this value to Celsius, we subtract the absolute zero point (-273.15K) from 301.9K, yielding a temperature of 28.75C°.

V. Results and Discussion

The circuit shown in Figure 3 establishes connections between each sensor and a Nodemcu pin that shares common power and ground. The gas sensor's output pin is linked to the microcontroller's digital pin D6, with the remaining two pins connected to ground and 5 volts. Similarly, the heartbeat sensor has three pins, with the output pin connected to the microcontroller's analog pin, and the other two pins are connected to ground and 5 volts. As for the DHT11 sensor, it also possesses three pins: Vin (5 Volts), ground, and the data pin, which is connected to the microcontroller's digital pin D7. The MLX90614 sensor, responsible for measuring human temperature, is comprised of four pins. The SCL and SDA pins are connected to the microcontroller's SCL (D1) and SDA (D2) pins, while the other two pins are connected to the power and ground pins. For the GPS module, the Tx and Rx pins are wired to D2 (Tx) and D3 (Rx) respectively. The microcontroller's SCL (D1) and SDA (D2) pins are utilized to connect the LCD, while the remaining two pins are used for power and ground connections to the microcontroller. The digital pins of the ESP8266 are attached to three LEDs that indicate the status of the gas, heartbeat, and temperature sensors respectively. Figure 4 to 8 show simulating testing of the system components while Figure 9 is the overall software testing of the system for the fault conditions. The virtual terminal is showing the values from all sensors (MQ-6, Heartbeat, DHT11, and LM35), as well as the GPS module.

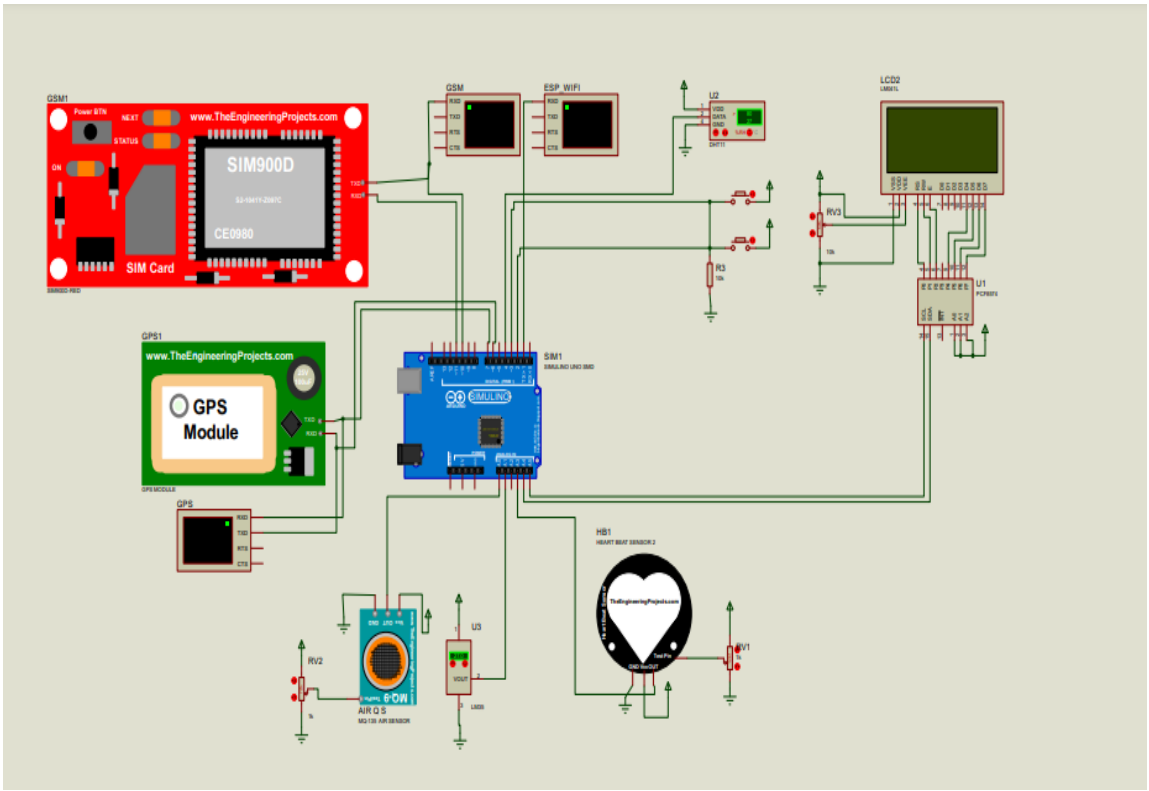

Figure 3: System Design

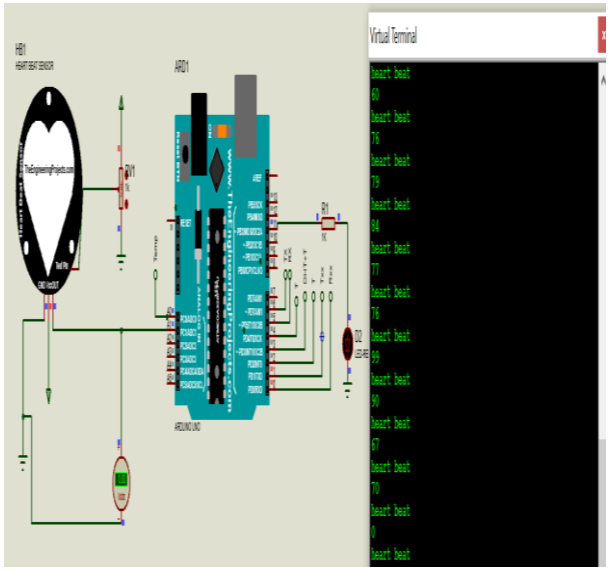

Figure 4: Testing Heartbeat sensor in Software

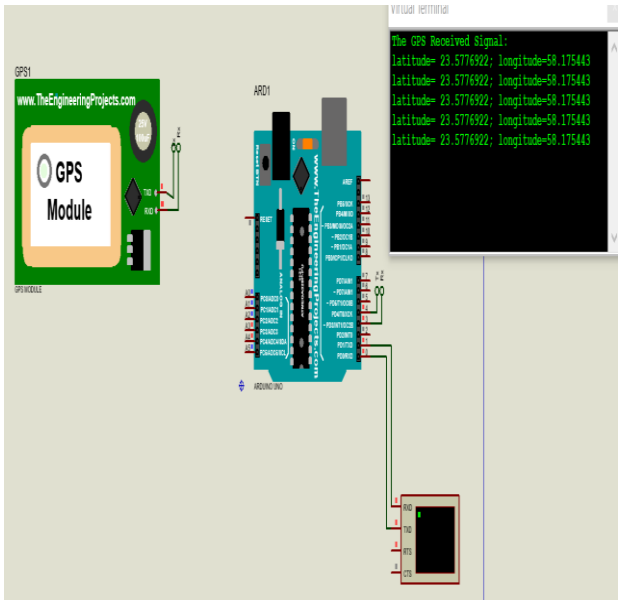

Figure 5: Testing GPS sensor in Software

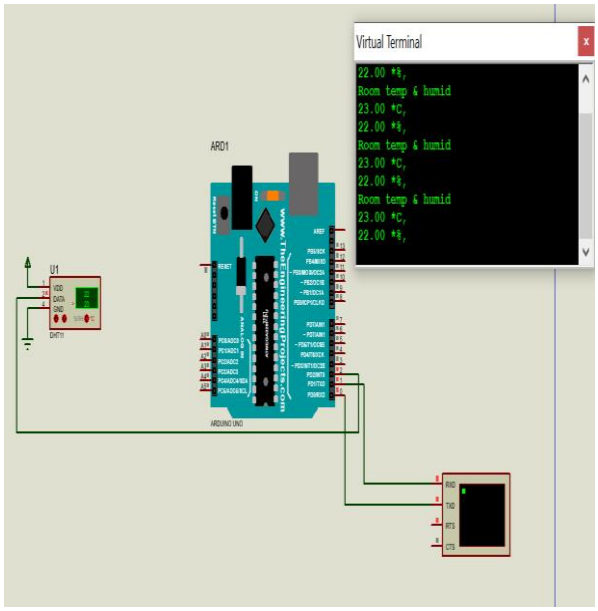

Figure 6: Testing of DHT11 in Software

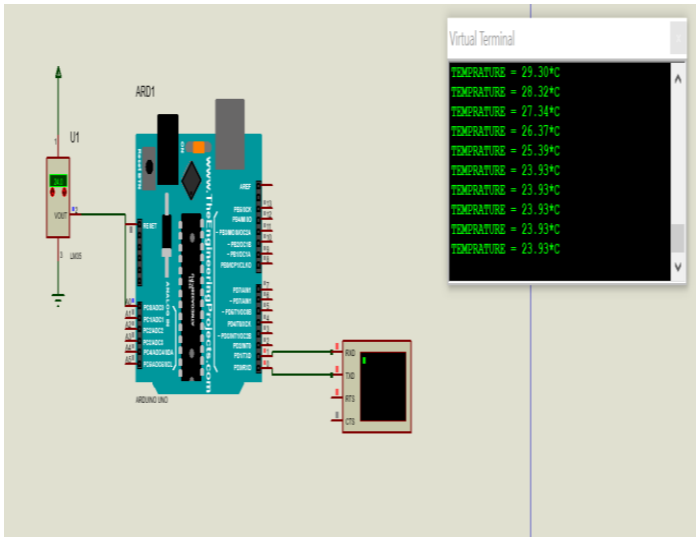

Figure 7: Testing of LM35 Sensor in Software

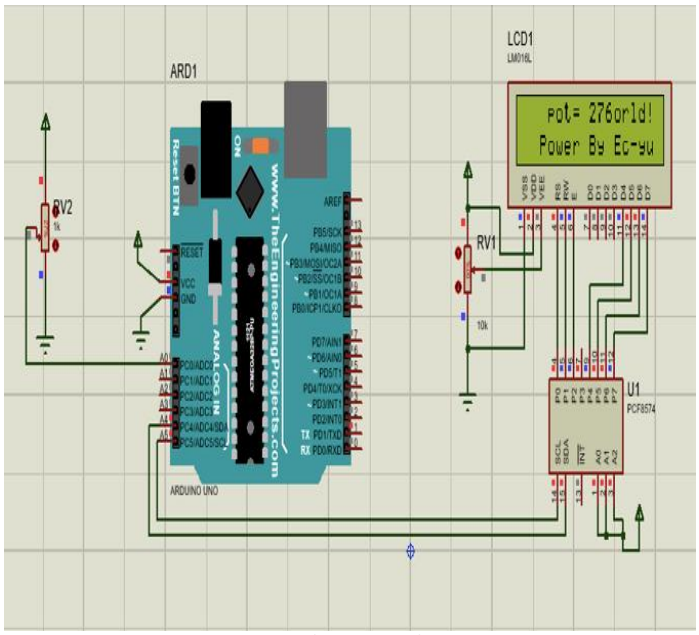

Figure 8: Testing of LCD in Software

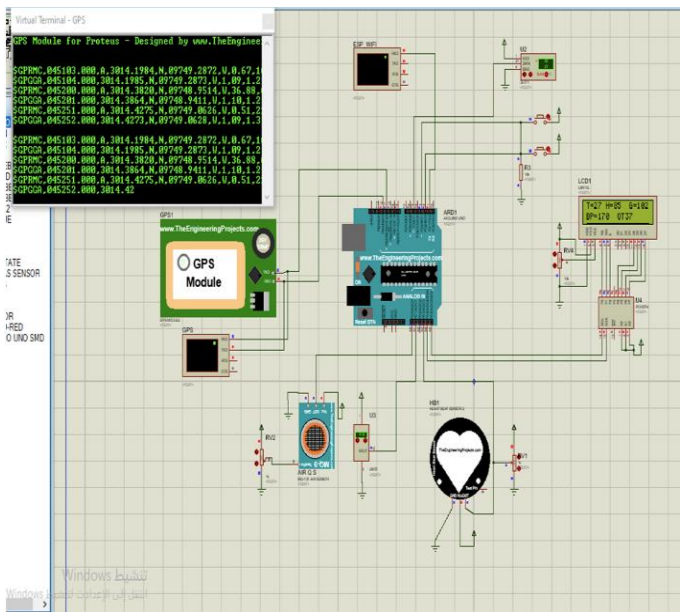

Figure 9: Complete software testing for circuits

Based on Figure 9, the gas sensor is connected to the ESP8266 in real hardware. The digital pin of the gas sensor is linked to the microcontroller's D6 digital pin, Vcc is connected to the 5V pin, and the ground pin is connected to ground (GND). Hardware testing of the gas sensor is depicted in Figure 10. In the test, a lighter is used to generate gas near the sensor. Upon detecting the presence of gas, the sensor returns a value of 272, indicating the presence of gas in the surrounding air. This result is displayed on the LCD, which is connected to the microcontroller's D1 (SCL) and D2 (SDA) pins while Figure 11 shows the case of clean air with no dangerous gas.

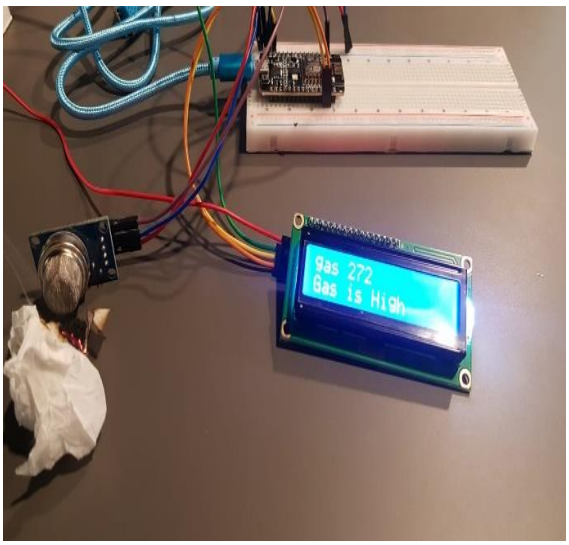

Figure 10: Testing Gas sensor in Hardware 1

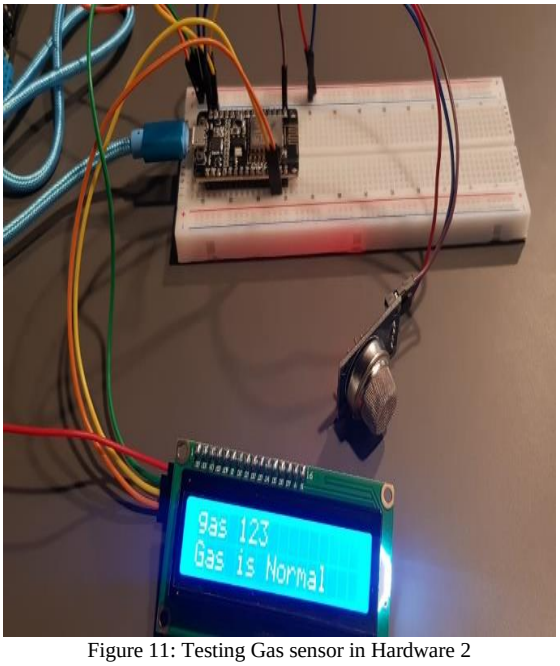

Figure 11: Testing Gas sensor in Hardware 2

Figure 12 depicts the pulse rate sensor is connected to the microcontroller. The sensor's output pin is connected to the microcontroller's analog pin A0, and its power pin is connected to the 5V pin. The microcontroller's D1 (SCL) and D2 (SDA) pins are connected to the LCD. Once the code is uploaded to the microcontroller, the pulse rate sensor is positioned on a vein in the human body to start detecting blood flow and heart rate. The measurement result of the heart rate is displayed on the LCD. Figure 14 shows the related software steps. Figure 13 shows the related software steps of the sensors. The complete circuit of the system is shown in Figure 15, illustrating the connection of all sensors, the GPS module, and the LCD. To ensure proper functionality and satellite tracking of the GPS module, it is recommended to test the circuit in an open area. The microcontroller is equipped with two push buttons: the first button is pressed by the patient to initiate the measurement process and inform the health department, while the second button is pressed by the patient to indicate the completion of system usage to the health department.

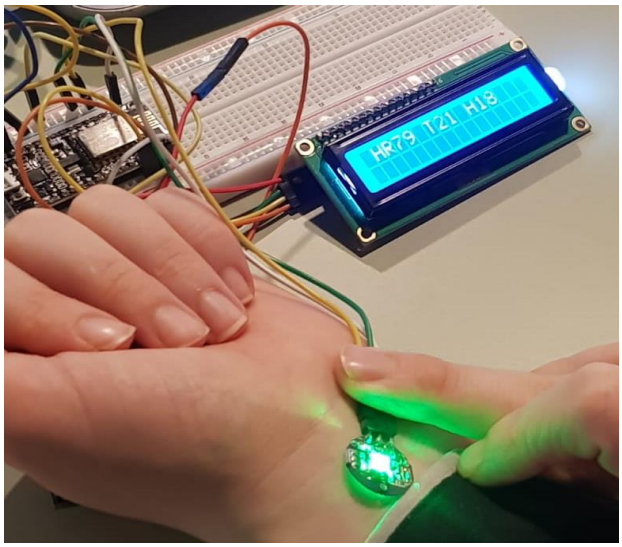

Figure 12: Testing Heart rate sensor in Hardware

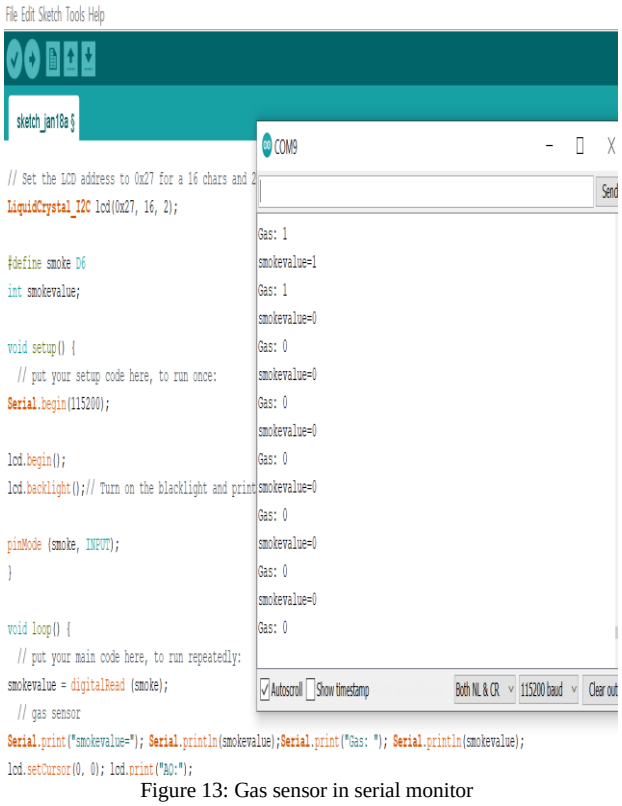

Figure 13: Gas sensor in serial monitor

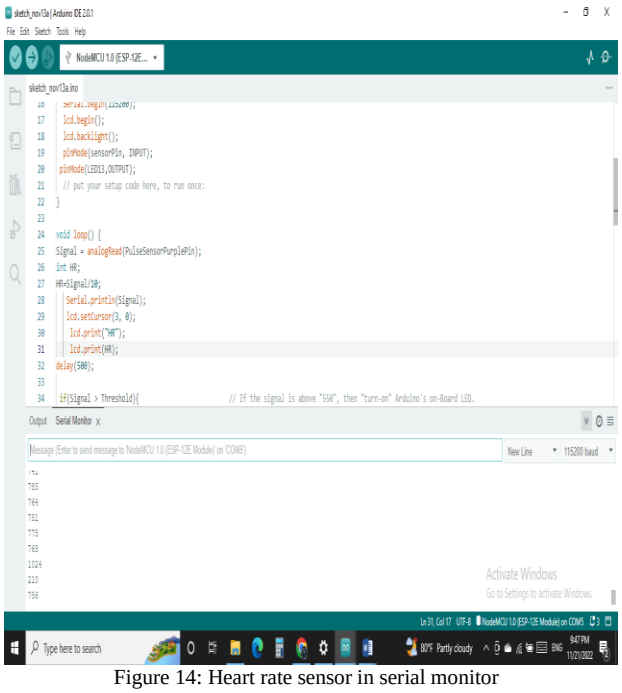

Figure 14: Heart rate sensor in serial monitor

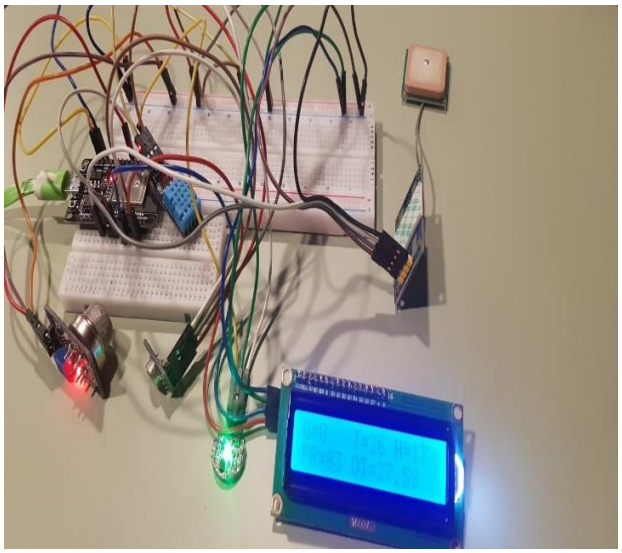
Figure 15: Hardware testing of complete circuit

The values shown in Blynk Application is depicted in Figure 16. The web dash of the project should be taken into consideration when creating a project inside the Blynk platform by visiting the Blynk website. With an Esp32 device board and a Wi-Fi connection, a Blynk template is produced. DataStream is built after the template is created in order to add virtual pins for displaying the sensor output. A virtual pin is selected for each widget, including gauges, LEDs, labels, and maps, so that it may be inserted into the code and used to show the output.

A comparison of the results obtained in various scenarios is shown in Table 1. The results had only minor to moderate differences and were generally similar. The results of the Hardware test and the simulation test differ, but this is expected given that the simulation test was not conducted under actual conditions and that the Hardware test used different components than those used in the simulation test. Previous system testing has revealed that the system has accomplished the project's goals. The sensor data and readings were displayed on an LCD and forwarded to the Blynk program. The drone's location was found, and its coordinates were recorded and displayed on the Blynk application map. As a result of the earlier conversation, the system has successfully undergone validation. The following formula could be used to determine the accuracy and error rate. Assuming that the heart rate is meant to be 70 and is actually measured to be 60, the error rate is calculated using Equation 2:

% Error = (|Implemented Value-Designed value|)/(Designed value)
= (|60-70|)/70100 =14.28% (2)

The project's components have undergone the following modifications: ESP 8266: Initially, the proposal included the use of ESP 8266, but it was later replaced with ESP 32 due to its increased analog capabilities compared to ESP 8266. The heart rate sensor's fragility posed a challenge, which was resolved by soldering the sensor to enhance its durability.

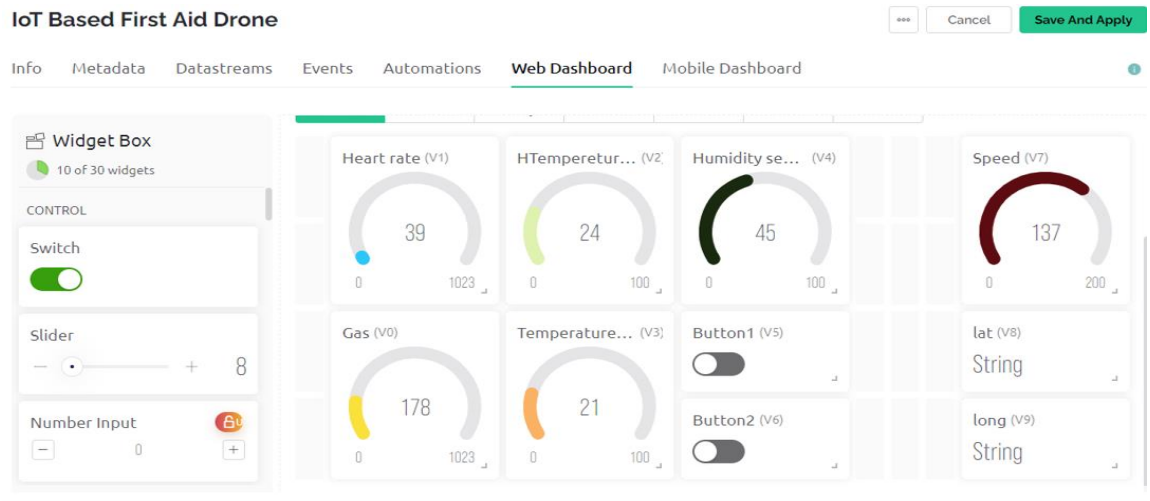

Figure 16: Platform of Blynk Application

Gas sensors can sometimes be excessively sensitive to certain gases, resulting in the detection of harmful substances even at low concentrations. To address this limitation, the sensitivity of the gas sensor was adjusted by modifying the potential meter, allowing for a more appropriate response. Further, there are couple of concerns about reliability of the real time parameters that affect the overall performance of such system. These include, onboard memory size and its management, maintenance issues of the hardware and software of the prototype and how to deal with the emergency in case equipment fails, price considerations of the equipment for the designers, developers and users. A further study is required on the impact of all these parameters on the performance of the system

Table 1: Comparison between different cases values

Test cases at test pionts	Design Value	Simulation value	Implemented value
T1: MQ-6	272	272	1
T1:MQ-6	123	123	0
T2: Heartbeat	60 < BPM < 100	60	79
T2: Heartbeat	60 < BPM < 100	90	75
T3: DHT11	0°-50°& 20-90%	24C°&18%	24C°&18%
T4: Temperature	35< temp < 38	27.81C°	27C°
T4: Temperature	35< temp < 38	25.23C°	25C°
T5: GPS	Testing GPS	working	working
T6: LCD	-	Showing result	Showing result

VI. Conclusions

The created project makes use of sensor-based UAV aircraft and IoT technology. Sensors are used in IoT components to track information such as patient temperature, heart rate, gas levels, and weather. A cloud platform is used to send data to the health department. The Blynk cloud platform successfully established internet connectivity thanks to thorough testing of the sensors and other parts. The project's specific objectives were met, including real-time mapping and GPS-based drone monitoring. Integrating sound and GSM technologies for drone-based remote communication with the health department could be explored further as part of the aircraft concept. Artificial intelligence (AI) can be included to improve autonomous drone flight. Another potential enhancement is the combination of various tasks, such as patient inspection and emergency response. For instance, adding sensor-controlled water pumps to the drone can make it capable of combating fires.

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Integrating Blockchain in Real Estate Transaction System

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Abstract

Blockchain technology is a modern technology that increases data protection. Blockchain is a collection of blocks, each block contains a piece of encrypted data, and all blocks are linked in a chain using encryption algorithms called Blockchain. We also notice in commercial transactions in the field of real estate an old and complex method, rather than the lack of security and risks exposed to the data, so the importance of the blockchain in the field of real estate lies in increasing security through encryption and publishing data on all devices, and matching them with each other (decentralization), as well as the certification of any process A unanimous authentication between all the devices in the network after confirming the validity of the transaction. This project comes with a proposal to establish a system that serves the real estate trade to increase safety and facilitate operations.

Keywords: *Blockchain technology, encryption, decentralization.*

خالصة

تقنية البلوك جبن (Blockchain)هي تقنية حديثة تزيد من حماية البيانات ,وهي عبارة عن مجموعة من الكتل ، تحتوي كل كتلة على قطعة من البيانات المشفرة ، ويتم ربط جميع الكتل في سلسلة باستخدام خوارزميات التشفير تسمى .Blockchain . ولفدا لوحظ أيضا للعقارات استخدام طريقة قديمة ومعقدة ، بدلاً من انعدام الأمن والمخاطر المعرضة للبيانات, لذا فإن أهمية blockchain في مجال العقارات تكمن في زيادة الأمان من خلال التشفير ونشر البيانات على جميع الأجهزة ، ومطابقتها مع بعضها البعض (اللامركزية), وكذلك التصديق على أي عملية مصادقة بالإجماع بين جميع الأجهزة في الشبكة بعد تأكيد صحة المعاملة. يأتي هذا المشروع مع اقتراح لإنشاء نظام يخدم تجارة العقارات من أجل زيادة السلامة وتسهيل العمليات

الكلمات الرئيسية:
Blockchainالتجارية ، الأمنية والمخاطر ، اللامركزية ، المصادقة.

I. Introduction

The blockchain is a database distributed among a computer network's nodes. Being a database. A blockchain saves information electronically in a digital format, as opposed to traditional databases that keep transaction data in files called blocks. Blockchains are known for their crucial role in cryptocurrency systems and technical security systems due to their ability to encrypt and immutable data. In addition, the blockchain does not depend on a central server, but its data is distributed to all devices connected to each other in the form of a chain of blocks called Blockchain. (HAYES, 2022).

"The blockchain is "the trust machine" in a sense that no one person or entity is required for the records to be recorded and verified. Instead, consensus rules enforce the validity of a block and its transactions." Thus, the contracts will be documented through consensus among the nodes on the validity of the contract without the need for a third party. Each contract will have its own number, contract data (transaction) and the hash of the previous block. All this data results in a special hash associated with this block.

II. Literature Review

Blockchain started in 2008 as bitcoin technology. Because the banks in the United States have faced bankruptcy of Lehman Brothers in 2008. Through clearinghouse-based centralized payment and monetary system that assumes default risk and serves as a middleman between buyers and sellers. the word faces these problems in United States. For that reasons found and create bitcoin technology which is follow blockchain system. Where this technology is made banks transactions works without center party or may allow banks to settle accounts between others, in other words these transactions will done between customers only. The Bitcoin system is a global financial system that uses digital money. It is characterized using peer-to-peer networks, digital signatures, and cryptographic proof-of-work to create a distributed ledger (referred to as the blockchain) that records transactions. The simplest application of blockchain technology is digital currency. In order to create more expressive “smart contracts,” which are effectively secured crypto funds that can be opened if certain conditions are met, Bitcoin has a scripting language. In addition, transactions can use the OP RETURN mechanism to store any type of data. (Ateniese, 2017).

Governments around the world are planning to launch blockchain technologies in various industrial and commercial sectors with the aim of preventing fraud and improving data management, also, to secure data by disrupting data around word. As an addition the encryption which included in blockchain help to secure data and prevent any changes on data. Blockchain technologies will change the field of security in industries, and all fields will become dependent on blockchain technologies. Some of the applications of Blockchain are listed below:

Land Registry: With the help of SBAB, Telia Company, Landshypotek Bank, Kairos Future and ChromaWay, land registry blockchain technologies have been successfully

tested by Swedish company Lantmäteriet and blockchain-based land registry technology (Haridas, 2018).

International Trade: The feasibility of applying blockchain technologies in the field of global trade has been studied by the World Trade Organization. The study included the digitization of supply chains and the improvement of international trade in collaboration with Maersk and IBM. "In August 2018, Maersk and IBM unveiled a powerful blockchain platform dubbed TradeLens with shipping solutions" (IBM, 2018).

Security in Blockchain Technology:

Ledger: Since the old storage techniques depended on database, which consume a large part of the storage. Blockchain technologies come with the use of only an extension of the ledger, which can provide the complete transaction history.

Security: Blockchain technology encrypts all packages in it, which are in the form of blocks linked in a secure encrypted chain, ensuring that data is not tampered with and changed. In addition, all existing data is subject to automatic certification.

Shared and Distributed: In order to increase the flexibility of security in blockchain technologies, the chains of blocks are distributed, thus reducing the ability of malicious attacks to change data. Also, by sharing the ledger, transparency increases among participants in blockchain technologies.

There are four types of blockchain. This is classified based on access data or nature of data accessibility in addition based on a authorization to participate in Blockchain.

Public Blockchain: this type of blockchain is open ledger and distributed for all nods where allowed all nods to read and submit transactions. Through the consensus mechanism, its validity is approved, stored and preserved. Public blockchain examples: Bitcoin, Ethereum, Litecoin (Shrivas, researchgate, 2018).

Private Blockchain: Private blockchains have limitations because only one organization or all sub-organizations within the same cluster are allowed to read and send transactions in this form of blockchain so not everyone can quickly join the network. It is a centralized blockchain managed by a central authority to ensure accessibility is guaranteed. Sometimes nodes are given permission to examine data on a private blockchain. The most suitable projects for private. blockchain networks are small businesses or private markets. Counting, digital identification, asset ownership, and supply chain management are examples of specific blockchain use cases. Examples of this are projects like Multichain, Hyperledger, and Corda (Shrivas, researchgate, 2018).

Community/Consortium Blockchain: Blockchain is managed in this type by uniting a group of institutions instead of a single company or institution, so a group of different institutions can send transactions and read transaction data in this type of blockchain. This is the basic distinction (Shrivas, researchgate, 2018).

Hybrid Blockchain: Hybrid Blockchain: This is a completely new category in which any of the three types of blockchain — public, private, or community/federate — can be combined to speed up transactions. A node may participate in both authorized and unauthorized blockchains simultaneously to enable communication between the two blockchains. Hybrid Blockchain allows multi-mode configuration of the blockchain platform. Some examples: hybrid blockchain is Dragonchain (Shrivas, researchgate, 2018).

III. Methodology

All projects must have a methodology to move forward step by step accurately. Where the methodology works to clarify project plan and shows plan progress. In this part of project discussed type of methodology with simple explanation clearly in addition to advantages and disadvantages. Finally, in this part choice one methodology following it in this project depends on the project.

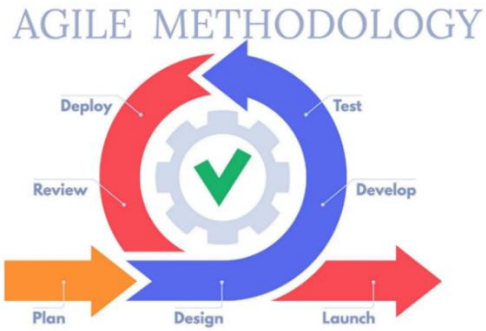

Fig 1. Methodology

Based on the pros and cons presented previously for all methodologies, the appropriate methodology for my project is the Agile method for several reasons, the first of which is that it is an easy-to-understand and very simple model, which leads to following this methodology for easy access to customers, and it is also useful for novice developers. In addition, the Agile rapid development methodology helps save a significant amount of time in all phases of the project that allows it to be processed, completed and modified in a given time.

IV. Logical design

Application Layer:

The application layer is responsible for creating and managing decentralized applications (dApps) and user interfaces. This layer consists of numerous web3.js frameworks, smart contracts, front-end and back-end apps, and other elements that communicate with the blockchain. Back-end apps handle and store data connected to the blockchain, whereas front-end applications are in charge of developing user interfaces for dApps. where Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code, which are stored on the blockchain.so, This layer is critical to the development and operation of blockchain-based applications, and it enables developers to create decentralized applications that can run on top of the blockchain.

Trust Layer:

The integrity and security of the blockchain network is ensured by the layer of trust. It is included in retail

operations. Consensus algorithms ensure that all nodes of the network agree on the state of the blockchain, while hash functions maintain hashes stored on the blockchain that cannot be tampered with. Transactions are the basic unit that is recorded on the blockchain, and they are verified and processed by a consensus algorithm. You can store cryptocurrencies.

Platforms Layer:
Public blockchain and mining are two examples of the infrastructure that the platform layer is responsible for providing for the blockchain network. Public blockchains are open to anyone and allow anyone to participate in the network by validating transactions and creating new blocks. Mining is the verification process. Transactions and adding them to the blockchain, this is done by specialized computers that solve complex mathematical problems. The platform layer is critical to the operation of the blockchain network and enables anyone to participate in the network and contribute to its operation.

Network Layer:
The network layer is responsible for managing communication between nodes on the blockchain network. This layer includes components such as peer-to-peer networks, Ethereum nodes, and storage. Peer-to-peer networks enable nodes on the network to communicate with each other without the need for a central authority, which allows this system to create and clear transactions between only two parties and distribute smart contracts around all nodes in the network while Ethereum nodes are responsible for processing transactions and maintaining blockchain status. Storage is used to store data related to the blockchain, including the management and organization of transactions, blocks and smart contracts related to smart transactions of buying and selling real estate in this system.

Hardware Layer:
The actual infrastructure, including virtual computers, that is utilized to power the blockchain network is included in the hardware layer. Virtual machines are essential to the smooth running of the blockchain network since they are utilized to perform smart contracts on the blockchain. Mining equipment, servers, and storage devices are a few other elements that might be part of the hardware layer.
In summary, the blockchain is made up of a number of layers that cooperate to create a secure, open, and decentralized network. The integrity and security of the blockchain network are ensured by the cooperation of each layer, every one of which has a distinct set of tasks and duties. While the trust layer is in charge of assuring the integrity and security of the blockchain network, the application layer is in charge of developing and administering decentralized apps and user interfaces. While the network layer controls communication between network nodes, the platforms layer provides the network's infrastructure. The physical infrastructure that is utilized to power the blockchain network is included in the hardware layer as well.

V. Physical design

This design shows physical steps of transactions:
Step 1: The user requests the creation of a new transaction.
Step 2: The transaction is created as a new block.
Step 3: The new block is distributed to all the nodes in the network.
Step 4: The validity of the block and the content transaction is validated.
Step 5: Add the correct block after verification to the chain.
Step 6: Transaction completed successfully.

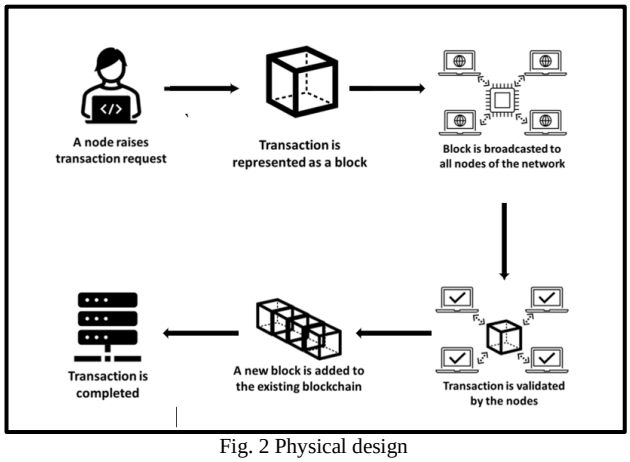

Fig. 2 Physical design

VI. Structure Design

Step 1: The structural design of this blockchain system provides a comprehensive depiction of the transaction process, where the beginning of the request is the registration of a new account on the site, or the login of people who have an account.
Step 2: Then the user submits the request starting from the transaction request. Once the request is received, the system communicates with the transaction system to generate new smart contracts.

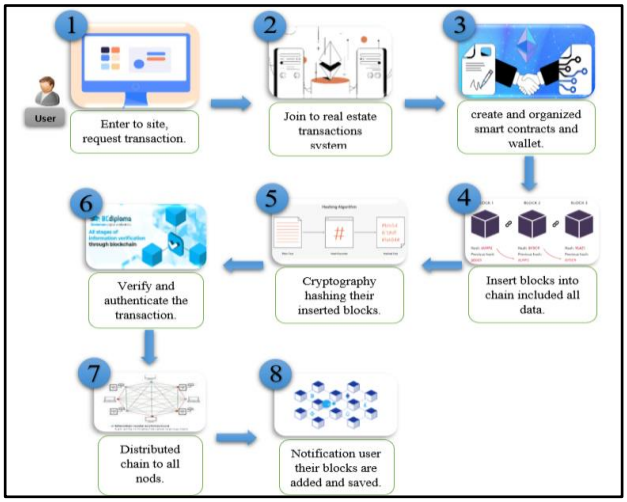

Fig. 3 Structure design

Step 3: Since the site is for buying and selling real estate, such as lands, buildings, and others, the site displays all real estate offered for sale on the system interface, and some user data, such as the wallet and username.
Step 4: These smart contracts, which are the sale or purchase of real estate, are then inserted as a new block in the chain, with secure data storage guaranteed by cryptographic hashing.
Step 5: Where the storage saves the smart contracts and encrypts them to be in a secure environment.

Step 6: After the user's transaction is included in the chain, the system continues to authenticate and validate the transaction after the block is added to the block chain.
Step 7: To achieve decentralization in blockchain technologies, the system guarantees the distribution of the new chain after verifying and validating it on all nodes in the network, thus achieving the level of security of real estate transactions and subscriber data required by blockchain technology.
Step 8: The user is then informed that their transaction as a new block has been added to the chain and verified to be valid and saved. The user is assured that the data attached to the smart transaction is protected. This approach provides a comprehensive and reliable basis for performing blockchain transactions.

VII. Conclusion

In conclusion, the adoption of blockchain technology in real estate transactions is a game-changing development for the sector's efficiency, transparency, and security. This investigation has shown that blockchain offers a variety of benefits that could completely alter how real estate transactions are carried out.

First off, blockchain's built-in immutability and cryptographic security measures offer a strong barrier against fraud and data manipulation. As a result, the ecosystem is more trustworthy, from buyers and sellers to agents and regulatory organizations.

Second, the blockchain's smart contract features expedite and automate different elements of real estate transactions, obviating the need for middlemen and lowering the possibility of mistakes. Significant cost reductions and quicker transaction times may result from this. Additionally, the transparent ledger of the blockchain ensures that any parties with permission may see transaction history, allowing for real-time tracking and accountability. This degree of openness lessens disagreements and streamlines the auditing procedure.

But it's important to recognize that integrating blockchain into real estate transactions successfully necessitates overcoming regulatory obstacles, promoting uniformity, and building a solid infrastructure.

In summary, using blockchain technology in real estate transactions has enormous potential. It might increase trust, restructure procedures, and cut expenses. We can envision a time where real estate transactions are more safe, effective, and available than ever before as the sector continues to embrace new technology and respond to its issues.Alshamrani, A. (2015, January 1). A Comparison

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كلية الشرق الأوسط Middle East College

Performance Evaluation of Enhanced Convolutional Neural Network in Terms of Accuracy and Loss for the Prediction of Monkey Pox Disease

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Abstract

The new monkey pox outbreak appears to be more harmful for the world because it is affecting nearly 45 countries at the same time. Chickenpox is difficult to diagnose manually or clinically since it is so like monkeypox and measles. Polymerase Chain Reactions (PCR) are commonly used to identify monkey pox, although it is difficult to pinpoint places where it is not available. So, in this case, monkey pox skin lesions will be used to identify monkey pox using various approaches. Machine and deep learning algorithms are utilized to identify various diseases using these skin lesions. Multiple trained models are also created using various sorts of datasets. To prepare the convolutional neural network models, a monkey pox skin lesion dataset (MSLD) will be used. MSLD is characterized by skin lesion pictures of monkey pox, chicken pox, and measles. For Kaggle, a dataset is collected, and data augmentation will be used to enhance sample size, while three cross-fold validation will be used for training and testing. A user must upload an image of a skin lesion to a deep server that CNN has trained, so that classification can be produced using these techniques, and the results may then be examined to predict the monkey pox disease.

Keywords: *Polymerase Chain Reactions (PCR), monkey pox skin lesion dataset (MSLD), Convolutional Neural Network.*

خالصة

يبدو أن تفشي الوباء الحديد جدري القرود أكثر ضررًا للعالم لأنه يؤثر على ما يقرب من 45 دولة في نفس الوقت. من الصعب تشخيص جدري الماء يدويًا أو سريريًا لأنه يشبه جدًا جدري القرود والحصبة. تُستخدم تفاعلات سلسلة البوليميراز (PCR) بشكل شائع لتحديد جدري القرد ، على الرغم من صعوبة تحديد الأماكن التي لا تتوفر فيها. لذلك ، في هذه الحالة ، سيتم استخدام نمادح جلد الجدري القرد لتحديد جدري القرد باستخدام طرق مختلفة. يتم استخدام خوارزميات التعلم الآلي والعميق لتحديد الأمراض المختلفة باستخدام هذه النماذج الجلدية. و يتم أيضًا إنشاء نماذج متعددة التدريب باستخدام أنواع مختلفة من مجموعات البيانات.

لتحضير نماذج الشبكة العصبية ، سيتم استخدام مجموعة بيانات نموذج جلد بصور الآفات الجلدية لجدري MSLD يتميز .(MSLD) الجدري القرد ، يتم جمع مجموعة Kaggle القرد وجدري الماء والحصبة. بالنسبة لـ بيانات ، وسيتم استخدام زيادة البيانات لتحسين حجم العينة ، في حين سيتم استخدام ثلاثة عمليات تحقق متقاطعة للتدريب والاختبار. يجب على المستخدم ، بحيث يمكن إنتاج CNN تحميل صورة آفة جلدية إلى خادم عميق تدربته التصنيف باستخدام هذه التقنيات, ويمكن بعد ذلك فحص النتائج للتنبؤ بمرض جدري القرد

الكلمات الرئيسية:
مجموعة بيانات آفة جلد الجدري القرد (PCR) تفاعلات سلسلة البلمرة ،. الشبكة العصبية الالتهابية (MSLD)

I. Introduction

Monkey pox, like smallpox, is an uncommon illness caused by the monkey pox virus. It is most seenin Africa, but it has also been seen in other parts of the world. It can take many weeks for the flu-like symptoms, such as rashes, fever, and chills, to subside. Monkey pox does not have a recognized cure; however, it typically goesaway completely on its own. Medical staff, families, and other close friends of current patients are at risk since prolonged face-to-face contact is frequently required while droplet-inhaling particles are present. Even though there may not be any evidence to corroborate this, researchers are still looking into the possibility that the virus can spread by airborne contact. Fever, chills, swollen lymph nodes, headaches, muscle aches, backaches, andexhaustion are some of the early signs of monkey pox. A rash may begin on the face and extend to other parts of the body, such as the genitalia. The rash may begin as a fluid-filled blistering rash like chickenpox or syphilis andproceed to varied degrees before forming a scab that eventually falls off. Without therapy, monkey pox usuallyclears up in a few weeks. The prognosis is frequently scientific, which means that the symptoms and signs are enough for professionals to make the diagnosis without the need for tests. If monkey pox is suspected, physiciansmust collect a sample of fluid from one of the lesions andsend it to a laboratory for a polymerase chain reaction (PCR) test to confirm the diagnosis. Blood tests are not intended to be as accurate and should not be utilized automatically. Monkey pox virus, also known as an encapsulated double standard DNA virus, is a member of the smallpox family. They are caused by a variety of animal species, including squirrels and Gambian pitched rats; non-human primates have also been discovered as a natural host of the monkey pox virus. The first smallpox outbreak of the 1960s was discovered on January 11, 1962. As a result of the vaccine's efficacy, the last smallpox outbreak in the United States occurred in 1949. Since the International Health Organization (WHO) declared smallpox extinct in 1980, there have been no reports of the illness resurfacingon its own. However, in the 1970s, a new disease known as

"Monkey Pox" emerges. It belongs to the smallpox virus family (variola virus). Fever, redness, and enlarged lymph nodes are common signs of zoonotic monkey pox. Monkey pox cases have been documented in practically every part of the world since the beginning of 2022. There are currently 5035 verified cases from nearly 60 countriesthroughout the world. It is usually a self-limiting sicknesswith a duration of 2 to 4 weeks. It affects people of all ages,with children being the most vulnerable. The extent of virus exposure, the number of symptoms, and the problems that occurred in the patient are used to determine the disease's status. The incubation period of the monkey pox virus is approximately 5 to 21 days. It is distinguished by symptoms such as fever, myalgia (muscle pain), asthenia (physical weakness), severe headache, and weariness. It also produces rashes, which can be visible on the patients' eyes, mouths, and faces. Furthermore, papules (raised hard painful lesions) appear on day 6 of the sickness, followed by pustules (filled with pus). Encrustation occurs after these pustules. Polymerase chain reaction (PCR) is one method for predicting, finding, or identifying monkey pox. PCR is a tool for detecting DNA at various levels in order to diagnose monkey pox and its symptoms in different person. The PCR method employs numerous AI techniques to analyse monkey pox in humans and employs DNA in varying amounts to discover monkey pox within an individual. When these diagnostic tools are unavailable, a clinical determination is performed utilizing skin lesions to identify the illness early on. With cell phones in everyone's pockets these days, AI-based skin lesions can be very useful in detecting other flaws in the healthcaresystem. The remainder of the paper is organized as follows: Section 2 will be focusing on the literature review, section 3 will be focusing on methodology, section 4 will be focusing on results and discussions followed by conclusions and references.

II. Literature Review

The whole world is already dealt and still dealing with a covid 19 outbreak, and now monkey pox is threatening its spread; some experts are even calling it a global pandemic. Though the monkey pox virus is not as harmful as covid 19, if it is not controlled, it can spread similarly to covid 19. In recent years, machine learning has made significant progress in diagnosing diseases such as cancer and tumour cells using image-based diagnostics. As a result, the same applications can be used to detect monkey pox in humans. (rizk, 2022) proposed that this study present a computer vision method for the accurate diagnosis of four types of skin diseases. The system's efficiency was evaluated using photographs of skin disorders such as acne, keratosis, Eczema herpeticum, and urticaria from the DermNet database. One of the key parts of the proposed technique is the big features created by the network's convolutional layer, which are used for classification by the network's final layers.

This paper is presented (Moore, 2022), he claims that deep learning has been increasingly popular in recent years. Convolutional Neural Networks, Recurrent Neural Connections, Generative Adversarial Networks, and Vibrational Auto Encoders are some well-known Transfer Learning designs. For image classification applications, Convolutional Neural Networkarchitectures have demonstrated high accuracy and performance. Skin cancer, on the other hand, is virtually always curable if detected and treated early. Convolutional neural networks are used in the research model to predict and classify seven different types of skin lesions. Users can access the program, which can rapidly detect the three most likely types of skin lesions from an image, via a website. (Sherwat, 2022) proposed that in the deep learning algorithm, a transfer learning and Meta heuristic technique for the optimization and extraction of an artificial neural network's parameters be used. A Google net deep networkwill be used for feature extraction, and the Al- Biruni earth radium algorithm and the sine cosine technique will be employed for heuristic optimization. Based on the preceding techniques, a new hybrid approach is now presented to optimize the parameters of neural networks (Mathieu, 2022). A Kaggle public dataset will be used, and the categorization will be made using ten evaluation criteria. Multiple statistical tests are performed to assess the correctness of suggested algorithms. The results demonstrated that the proposed strategy outperformed any other optimization tool. Furthermore, the average categorization accuracy might reach 98.8%.

According to (Pastula, 2022), skin illness is the most common health condition in all nations on the planet. The method proposed in this study use computer vision to detect four different skin conditions. The proposed method, which focuses especially on skin disorders, employs Convolutional Neural Networks. The Convent, Activation Surface, Pooling Surface, Fully ConnectedLayer, and Soft-Max Classifier are a few of the 11 layers that comprise the Convolutional Neural Network (CNN) employed in this study. To validate the design, images from the DermNet database are used. All recognized categories of skin disorders are represented by samples inthe database, but we have concentrated on four in particular, with between 30 and 60 samples in each class: keratosis, dermatitis herpeticum, urticaria, and acne. One of the issues in automating the process is its volatility. Because of the vast range of skin tones, the location of such a condition, the image-capturing equipment requirements, and so on, automating the method is tough. The deep Convolutional Neural Classifier has an accuracyrange of 98.6% to 99.04%.

III. System Design

System Block Diagram

A block diagram will be used to show a monkey pox identification system, providing a functional perspective on the system. Block diagrams let us create linkages insidea system and better understand how it works. As a result,the graphic below depicts the procedures and operation ofthe monkey pox detection system one by one.

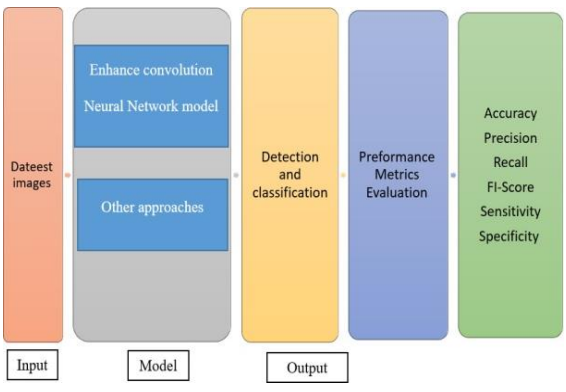

Figure 1 Block diagram of the proposed system

The monkey pox dataset from Kaggle was then uploaded to a notebook for three cross-validation tests. A model that has been pre-trained three times is then trained on the existing dataset, and it is also implacable on other datasets that may be used in the future. The custom layer is then poured into the classification module, where tensor flow will be constructed, connecting the training data with the testing data. At this point, the data will be divided into testing and training categories. The testing data will then be fed into existing models, which will classify based on their precision. Following that, a forecast for each model, such as recall, precision, and f1 score, will show in front of each model.

Simulation, Testing, and Implementation:

Following are the steps followed for predicting monkey pox disease:

i. Capturing of Image

The user uses the app to take pictures of a monkey pox lesion and uploads it to the system. To identify monkey pox, a user must take a photo of his symptoms on his mobile device and upload it to the program, after which the system will upload the photo to a server to determine whether or not the user has monkey pox. In addition, the user will enter details about his symptoms and personal information for further classification.

ii. Data Set

The dataset supplied into the 'data' variable serves as the input for this test case. For an algorithm to be taught to accurately forecast information, an open source monkey pox dataset is chosen and imported into the system.

iii. Neural Network Training

The augmented image data store 'augimds' and the layer'sarray 'layers' are used as input for this test case. To improve classification results, the data store is classed across many levels. The output displays the training progress for each epoch, as well as the loss and accuracy for the training and validation sets.

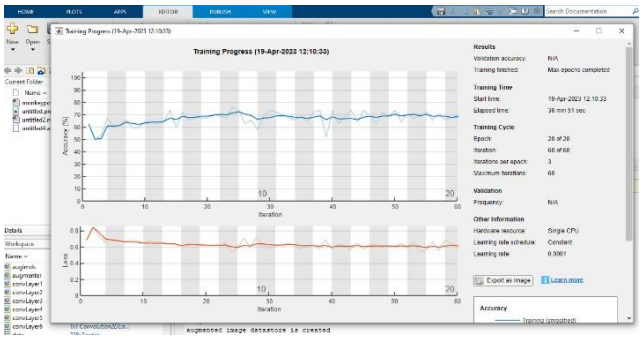

Figure 2 Training progress

iv. Image Classification

This test case's input is an image depicting a monkey poxinfection entered into the 'user Image' variable. A user image has been entered into the software using the imread function; this function will then perform additional classification on the image. The loaded image is then pre-processed to the correct image size and categorized using the trained neural network. If the image is determined to be infected with monkey pox, the output message informsthe user that he or she is infected. If the image is determined to be monkey pox-free, the output message informs the user that he or she is not affected.

v. User image classified correctly as infected with monkey pox/non infected with monkey pox. A monkey pox-infected user's test image. A user will upload a photograph of diseased monkey pox, and the system will properly predict that the user is infected. The loaded image is pre-processed to the correct image size and categorized using the trained neural network. The output message indicates that the user is not infected with monkey pox. As shown in the image below, the app informed the user that they were not infected with monkey pox.

vi. Accuracy Graph

The accuracy graph indicates a steady growth over the course of 20 epochs, with minor volatility due to the random nature of the training process. The final accuracy obtained is approximately 65%, which is commensurate with the accuracy obtained throughout training.

Figure 3 Accuracy graph

vii. Loss Graph

The loss graph indicates a progressive decrease across 5 epochs, with occasional oscillations due to the random nature of the training process. The final loss obtained is approximately 0.6, which is similar with the loss obtainedduring training.

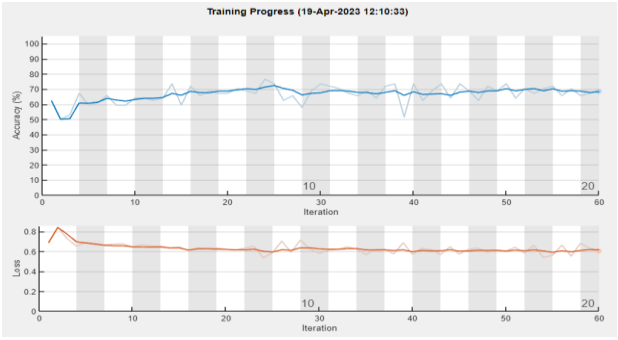

Figure 4 Loss graph

As a user is requested to start an application, the application will operate on the basis of a matlab program. There will be a monkey pox detecting app. An interface will open, prompting the user to upload an image of his own, after which the system will detect the image using a trained algorithm. The application will then provide a clear notification indicating whether it was recognized or not.

IV. Conclusion

Monkey pox, like all other diseases, was one of the principal diseases that caused anxiety in the world, which was already suffering from covid 19. There have already been multiple searches for the identification of monkey pox, which is progressively spreading over the world with its severe symptoms. Following these studies, we decided to employ a convolutional neural network to evaluate the performance and to classify monkey pox using MATLAB software.

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Integrated Systems for Atika School

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Abstract

This article describes and develops a new integrated system for the Atika school. It consists of installing and integrating electronic devices and education service systems. E-learning, attendance management, and digital gates are among the integrated systems. To develop the integrated techniques, the researcher combined different types of software and hardware. To evaluate the effectiveness of this project, it should be assessed according to its ability to improve the delivery of lessons. This should include the level of security in the school and the efficiency of the educational process. A three-month testing period was conducted with the integrated system, and training was conducted with the school's end users. As of now, the school is utilizing the integrated system.

Keywords: *Digital, Education, E-learning, Integrated, Security.*

خالصة

تتناول هذه المقالة وصف وتطوير نظام متكامل جديد لمدرسة عتيقة. ويتكون من تركيب ودمج الأجهزة الإلكترونية وأنظمة الخدمات التعليمية. ويعد التعلم الإلكتروني وإدارة الحضور والبوابات الرقمية من الأنظمة المتكاملة. ولتطوير التقنيات المتكاملة، قام الباحث بدمج أنواع مختلفة من البرامج والأجهزة. ولتقييم فعالية هذا المشروع، ينبغي تقييمه وفقًا لقدرته على تحسين تقديم الدروس. وينبغي أن يشمل ذلك مستوى الأمن في المدرسة وكفاءة العملية التعليمية. تم إجراء فترة اختبار لمدة ثلاثة أشهر مع النظام المتكامل، وتم إجراء التدريب مع المستخدمين النهائيين للمدرسة. اعتبارًا من الآن، تستخدم المدرسة النظام المتكامل.

الكلمات الرئيسية: الرقمية ، التعليم ، التعلم الإلكتروني ، المتكاملة ، الأمن

I. Introduction

System integration pertains to the method of developing complex information system that covers the designing or creating a customized application or network architecture and integrate it with custom software, packaged software, existing hardware or communications (Abeer, 2011). System integration is a vital solution in proving the organization connectivity to overcome the software and hardware challenges that may happen. System integration makes the sub-systems and other components as a whole functional system ensuring that all the parts or components are working in harmony in order to elevate productivity and improvement in the existing system. (Nick, 2022).

The idea of the project comes in light of the digital revolution as part of the digital transformation initiatives in all sectors, and what it provides in terms of knowledge and the needs of applying or using e-learning in schools. From this standpoint, a practical experiment was implemented for some of the devices used in e-learning in Atika School for Basic Education in North Al-Batinah Governorate with the support of some of the leading companies in Oman.

II. The Components of the Integrated Systems

The research composed of the installation of a number of electronic devices and service systems for education such as:

1. Central server with integrated control system.
2. Interactive electronic screens and interactive projectors in a number of classrooms.
3. Visual display transmission system.
4. A smart gate equipped with cameras that uses the technology of recording attendance and leaving electronically by means of a face print.
5. Facial Recognition device to record the attendance and departure of the school's teaching and administrative staff, along with capturing the temperature of the workers.
6. A number of cameras with Facial Recognition capacity and classroom data analysis.
7. Digital call system (Intercom).
8. Reports display screen (digital kiosk).
9. A number of wireless routers with modern technologies.

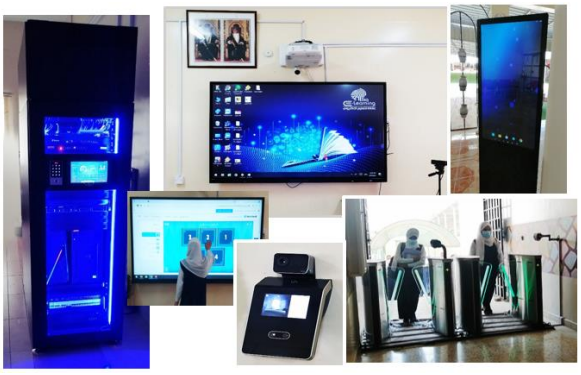

Figure 1. Integrated electronic devices and service systems.

III. Integrated Classrooms

Classrooms are equipped with interactive multi-touch screens (Interactive LED Display), equipped with Windows and Android systems, with the ability to designate external sources for display, with speakers, multi-use ports, and wired and wireless network adapters.

The interactive whiteboard can also be activated with many tools that help to facilitate the educational process, interactive presentations, and the ability to drag and drop images, swipe, rotate, and scale.

A camera connected to the interactive screen for a live broadcast of the teacher during the class, the performance of the explanation, the interaction of the students inside the classroom, and the sharing of the video recording of the students on the platform. Other camera installed at the top of the interactive screen to capture the entire classroom, identify those present, and record attendance which is also, used for other security purposes.

Integrated Classrooms Activation Plan

A plan has been developed to activate classrooms to employ them in an excellent manner, serve the educational process, and provide long-term facilities for the teacher as follows:

- Training a number of teachers and introducing them to the features and capabilities of the screens.
- Adjusting all the necessary settings to operate the educational platforms.
- Installing a number of interactive and service programs.
- Providing the halls with a number of tablets for students.
- Developing an organizational schedule and scheduling the activation of the halls.

Operating of Integrated Classrooms

Classes were run in the conditions of the Corona pandemic, distance education for various grade levels and various subjects, some seminars and workshops, and activating the links of blended education with direct education through various educational platforms. It happened by providing a simultaneous class with the students who are at home and the group of students in the school with homogeneous interaction and involvement between the students of the two groups Where the students who are online can see the classroom as a full simultaneous presence by capturing it with the camera in the class.

Figure 2. Some applications on the screens and activate interactive features.

Blended Learning in Light of Interactive Screens and Traditional Whiteboards

Table 1. Interactive screens vs. Traditional whiteboards

Specifications	Interactive screens	Traditional whiteboards
Distance Learning	Yes	No
Blended learning (week by week system)	All class students (two groups)	Only one group
The presence of a student in the class	Does not require	Requires
Pen writing	Yes	Yes
Touch interaction	Yes	No
Display source	Miscellaneous	One source
Use of various systems	Yes	No
Use of various programs	Yes	No
Diversity of styles	Yes	No
Time to implement classes	Less	More
Use of tools	Electronic tools	Concrete tools
Activities	Interactive activities	Sensory activities
Technical malfunctions	Yes	No
Possibility of recording classes	Yes	No
Repeat the explanation in one class	Yes (refer to recorded explanation)	No
Power outage	It affects the implementation of the session	It does not affect the implementation of the session
Surf the internet and search during class	Yes	No
Computer	Does not require	Requires (providing a view source)
The ability to store annotation	It can be in several formats	Not possible
Student notebook	It is not required, as all explanations are recorded electronically	It requires writing and recording annotations by hand
Absence or interruption of the student	Does not affect (classes are registered)	Affects (classes missed)

IV. Update and Upgrade the Data Room

This type of data room is one of the practical solutions in the absence of a server room in the school. It is an integrated locker equipped with a complete control system, backup battery devices, power supply, alarms, an internal air conditioner against humidity, wired and wireless network distributors, humidity and temperature sensors in the locker, and a voltage sensor They are all managed by a control system built into the cabinet, and the data room is the work centre of the e-learning system.

V. Face Recognition System

The project works to provide security through high technology that can be used for surveillance through the installation and use of surveillance cameras in the corridors and classrooms. The aim is to provide a high security in the school vicinity for the stakeholders especially the students. In addition to surveillance, it analyses data by linking it to a system that is capable of analysing the face and give results about the condition of the face, behaviour, age, and matching the images that are taken. Capturing them throughout the school days and in the event of any security breach or unauthorized entry being detected and the system may send notifications to the management or school authority.

Attendance and Departure System with a Face Print

The project was not only limited to the development of the education aspects, but also exceeded that to include the administrative aspect, where the facial print attendance system was introduced as an alternative to the fingerprint devices. It links the surveillance cameras with the attendance and departure system, and the entrances were reinforced with a smart gate, in addition it can connect tablets with the possibility taking a face print in order to take the class attendance of the students.

The idea of applying this technology came because of its contribution to raising the level of confidentiality in proving the attendance and departure of students and the administrative and teaching staff in the school through the use of Face recognition technology, which achieves a high level of accuracy in identifying or verifying a person's identity from a digital image or video frame from a video source. It works by comparing specific facial features from a given photo with faces within the database. It is an application of bio-artificial intelligence that can uniquely identify a person by analysing patterns based on facial texture and shape.

Smart Digital Gate

The digital gate is a type of motorized revolving door that is characterized by the principle of operating sliding panels to control the entry process. Where the process of opening and closing the glass panels is controlled by cameras installed in it, so the camera installed in the gate takes its capture of the face and compares it with the database in the server, and if it matches, it allows the student to pass or the teacher. If the person is not matched or identified, the visitor will not be able to pass through it, and with this feature also it is possible to record the attendance and departure of the students and the administrative and teaching staff and monitor the entry and departure times, and with regard to the exit process from the gate, the automatic operation process was activated to open the panels as soon as the student or teacher approached them, because there are sensors that sense the arrival of a person from a certain distance set in the system.

The Thermal Camera

The most prominent devices that have been installed to record attendance and leave are the thermal cameras that can detect faces and measure temperatures instead of the fingerprint device. Thermal cameras were very effective in COVID-19 or Corona times that helped to reduce infection cases. It does not require users to touch the device and suffices to stand near the device at a good distance. This device combines the feature of recording and recognizing the face with the feature of detecting temperature for users with fever or high temperature. The data of these readings can also be saved as event logs for tracking and the authority can refer to the record when needed.

The device is also equipped with an infrared camera for night capture, speaker, microphone, and LCD screen & card authentication module.

Figure 3. Various reports that can be extracted from the face recognition system.

VI. Digital Call System

This system includes devices designed to increase communications productivity and simplify technology management. One of the most prominent benefits offered by the internal network is the ability to reduce the size of the devices connected to it, as it depends on networking. This has transformed the traditional intercom system into a digital intercom system that provides a number of advantages, namely:

1. Easy to install, program and use.
2. Reducing the space used for devices, as it depends on the server.
3. The possibility of providing an encapsulated communication channel through desktop phones or a mobile application.
4. The ability to connect it to the mobile phone network and use it for external communication.

Audio Converter

This device is characterized by its small size and multi-functionality, which saves space and reduces the number of devices required. The device connects the public address to your telephone system and issues notifications through mobile phone. It converts the sound from the SIP phone system to the classic analog form so that the user can broadcast live or pre-recorded messages over an IP network to any distance.

Linking the Accessories of the Digital Calling System

There is a server in the data room is a device that contains an integrated system for controlling and connecting accessories to the calling system and telephones. Integrated and full-featured IP-PBX capable of supporting ISDN BRI, PSTN and GSM calling, providing VoIP communication for up to 50 users, provides a set of interfaces Flexible telephony while allowing for future expandability with a modular design.

VII. Report Display Device (Digital Kiosk)

The report display screen with Android system is Ultra HD, with a wide viewing angle and high brightness, to display updates and alerts related to the system, and it can play photo and video files. The screen can be operated 24 hours a day, seven days a week, and it is also distinguished by its high capacity to deliver messages with vivid clarity in a sleek and slim design.

VIII. Conclusion

The research proponents hope that this project will contribute to enhance educational process through the use of Information Technology in the academe. Through an organized and thoughtful framework that aims to improve, develop and digitize the education system by creating an interactive and integrated e-learning system. At the same time that aims to highlight the role of the teacher and the student within a scientific environment that stimulates innovation and creativity.

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Study of the Factors Influencing the Growth of Green Buildings in Oman's Construction Projects

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Abstract

Over the last few years, green construction has gained considerable attention. Due to the country's fast population and economic growth, housing and urban expansion are major development priorities in Oman. Moreover, many new infrastructure projects are thriving, and the construction industry is growing rapidly. Although the country has good environmental laws, their efficiency in execution is unclear. Increased greenhouse gas emissions from construction industries based on non-renewable energy sources have increased the effects of harmful carbon and scarce resources in the future. The main objectives of this research are to study the factors influencing the growth of green buildings in Oman's construction projects as well as to evaluate and determine the trend of green buildings in Oman's construction projects. The main objectives of this research are to evaluate the trend of growth of green buildings in Oman's construction projects. To identify the factors that affect the growth of green buildings in Oman's construction projects and to determine a strategy for implementing green buildings in Oman's construction projects. Qualitative and quantitative methods are adopted in this research. In addition, relevant literature is reviewed to provide an outline of the significant factors influencing the growth of green buildings in Oman's construction projects. The interviews were conducted with six professionals in the Omani construction industry. Furthermore, 199 questionnaires were distributed to the members of the Omani construction project in different sectors. As evident from the results of the survey, the top three factors affecting the growth of green buildings in Oman construction projects are the lack of knowledge and awareness of green buildings, lack of promotion of sustainable projects, and the lack of government incentives. Additionally, the most crucial strategy for implementing green buildings is that the government should provide incentives for green construction initiatives, the use of non-toxic, ethical, and sustainable materials in building projects, and contractors should get tax breaks if they use green building materials, systems, and technology. This research can be useful for ongoing projects and planning for the future.

Keywords: *Construction industry, sustainability, green buildings and environmental.*

خالصة

على مدى السنوات القليلة الماضية ، حصل البناء الأخضر على اهتمام كبير. بسبب النمو السكاني والاقتصادي السريع للبلاد ، يعد الإسكان والتوسع الحضري من أولويات التنمية الرئيسية في عمان. علاوة على ذلك ، تزدهر العديد من مشاريع البنية التحتية الجديدة ، وتنمو صناعة البناء بسرعة. أدت زيادة انبعاثات غازات الدفيئة من الصناعات الإنشائية القائمة على مصادر الطاقة غير المتجددة إلى زيادة آثار الكربون الضار والموارد النادرة في المستقبل. ان الأهداف الرئيسية لهذا البحث هي دراسة العوامل التي تؤثر على نمو المباني الخضراء و في مشاريع البناء العمانية وكذلك تقييم وتحديد اتجاه المباني الخضراء. يتم اعتماد الأساليب النوعية والكمية في هذا البحث. بالإضافة إلى ذلك ، تتم مراجعة الأدبيات ذات الصلة لتقديم مخطط للعوامل المهمة التي تؤثر على نمو المباني الخضراء في مشاريع البناء في عمان. أجريت المقابلات مع ستة اخصائيين في صناعة البناء العمانية. علاوة على ذلك ، تم توزيع 199 استبيانًا على أعضاء مشروع البناء العماني في قطاعات مختلفة. كما يتضح من نتائج المسح ، فإن العوامل الثلاثة الأولى التي تؤثر على نمو المباني الخضراء هي نقص المعرفة والوعي بالمباني الخضراء, الافتقار إلى تعزيز المشاريع المستدامة ، ونقص الحوافز . بالإضافة إلى ذلك ، فإن الاستراتيجية الأكثر أهمية لتنفيذ المباني الخضراء هي أنه يجب على الحكومة تقديم حوافز لمبادرات البناء الأخضر ، واستخدام المواد غير السامة والأخلاقية والمستدامة في مشاريع البناء, ويجب أن يحصل المقاولون على إعفاءات ضريبية إذا استخدموا مواد وأنظمة وتكنولوجيا المباني الخضراء. يمكن أن يكون هذا البحث مفيدًا للمشاريع الجارية والتخطيط للمستقبل .

الكلمات الرئيسية: صناعة البناء والاستدامة والمباني الخضراء والبيئية

I. Introduction

In the last decade, most Gulf Cooperation Council (GCC) nations have seen rapid growth in the building industry, resulting in increased domestic energy consumption per capita. However, due to a lack of concern for environmental challenges, these countries are among the top contributors to CO2 emissions per capita. Green buildings have lately become more popular in GCC nations. Building projects in Gulf Cooperation Council countries (GCC) face significant hurdles due to the necessity to include environmentally friendly components into the design [9]. The environment and its surroundings suffer when people keep buildings without taking environmental needs into account.

The global buildings construction industry utilizes almost 40 % of the world's total energy output. The response of the building construction industry to the problem of sustainable development has been recognized as green buildings. Green buildings often use green materials,

which reduces energy use, saves water, and keeps the quality of the air inside, among other things.

Oman, a Middle Eastern nation with a middle-income economy, produces less oil and gas than other Persian Gulf Cooperation Council countries with higher production costs. Rapid population growth, economic growth, development, and urbanization all have direct effects on the demand for energy, water, and building materials. Between 2012 and 2022, Omani construction projects increased by 9.4% yearly, and are predicted to grow by another 9.4% between 2017 and 2021. As a result, the Sultanate of Oman has resorted to promoting green buildings to reduce demand for energy and water, as well as to reduce the environmental repercussions of fast construction and growth [9]. Also, using green building materials isn't the only thing that influences the environment. The way these materials are built and used also has a big effect. When sustainable materials are used in construction instead of traditional materials, the overall environmental sustainability improves and the effects on the environment are lessened for the whole life of the structure. The use of ecologically friendly building materials conserves natural resources and decreases pollution [10].

The aim of this study is to highlight the current state of green buildings in Oman, as well as the implementation obstacles and the factors affecting the growth of green buildings in Oman's construction projects. This research provided light on the existing state of green application in Omani building practices and allow future suggestions to enhance and encourage broader use. The results show that a great deal more work is required to advance green buildings, and the government should play a significant role in this development.

The study highlighted the challenges in adopting green buildings in Oman's construction projects. Moreover, the construction sector in Oman faces several problems, such as poor design, poor layout, and the emission of carbon dioxide and heat. Furthermore, the study sheds light on the barriers preventing the growth of green buildings, such as lack of capacity, skill, knowledge, research, and innovation. Sustainable development is one of Oman's 2040 visions and implementing green buildings is a part of sustainability that enhances the quality of life and environment and assist in achieving Oman's 2040 vision [1].

II. Concept of Green Buildings

Green buildings are structures that are designed, constructed, operated, maintained, restored, and demolished in an environmentally responsible and resource-efficient way. Green buildings augment and expand standard building design concepts such as use, durability, comfort, and economy [11]. New technologies are constantly being developed to enhance existing strategies for the construction of green buildings. Green buildings are designed to minimize the total impact of the built environment on the natural environment and human health by efficiently utilizing energy, water, and other resources, preserving occupant health, increasing labor productivity, and reducing waste, pollution, and environmental damage. Green buildings prioritize energy savings. Designers use components that restrict air leakage through the building envelope to minimize operating energy consumption. Also, included in their suggestions are the installation of high-performance windows and insulation in the form of walls, ceilings, and floors [5].

Green buildings use energy conservation methods to minimize operational energy consumption, architects utilize building envelope elements that limit air leakage. Additionally, green buildings need high-performance windows and extra wall, ceiling, and floor insulation. Solar water heating decreases energy expenses even more. It is estimated that buildings are responsible for around 70% of the total load of electricity, 40% of the total energy consumption, and 40% of CO2 emissions. As a result, making buildings more energy efficient may be one of the best and most cost-effective strategies to decrease greenhouse gas emissions, especially with increasing energy costs [5].

Ken et al., (2020) observed that sustainability in real estate development has recently been one of the industry's primary issues. Green buildings attributes have been found to have an influence on property value and affected market demand and supply. The current study investigated the available literature on factors impacting the property value of green buildings to corroborate this. Academic resources were searched for relevant literature on the variables. The features of green building and other elements determining their value were extracted using content analysis. A conceptual framework for elements impacting the value of green buildings has been established because of the content analysis method. This framework would give an overview of green buildings characteristics as well as other aspects that affect property value. This information may be used by industry participants, researchers, and policymakers for investment, property development, further research, and policymaking. The authors disputed that the concept of green buildings have become the focus of major attention in the industry. As well, the effect of green buildings is based on market demands [4].

2.1 Green Buildings in Oman

According to Safinia et al., (2017) Oman has rapid growth in construction projects. The researchers investigated the barriers to implementing sustainable materials in Oman construction projects. The aim of the research is to identify the obstacles that prevent the utilize of sustainable materials in construction projects in Oman. There are two types of methods utilized in this research: interviews and questionnaires [10]. The interviews were conducted with experts from the construction industry. Questionnaires were prepared based on the criteria found during interviews and a literature review. The questionnaires were distributed to different sectors of the construction industry. Hence, the survey results are based on the opinions and views of the construction industry members, based on their knowledge and experience in the field. The

following are key barriers to the successful use of construction materials: low demand for sustainable materials, the high cost of green materials, and a lack of knowledge regarding green construction [10]. In addition, Saleh and Alalouch (2020) noted that the construction industry in Oman has been criticized for a lack of environmentally friendly practices. Therefore, the government should take action to promote sustainable building practices. This research focused on industrialized building systems (IBS) that may play a major role in construction projects [12].

Abidin and Powmya (2014) argued that modernization and urbanization have promoted effective growth in the construction industry in Oman, especially in infrastructure development. The study shed light on the status of green buildings in Oman and made recommendations to be improved and promoted for plans and applications [18]. From this project, it has been identified that there are four categories affecting green construction in Oman: business strategy, finance, ethics, awareness, and knowledge. Therefore, from the survey, it was observed that the most affected factors related to ethical issues were the least related to awareness and knowledge. The coordination and efforts made by the government and commercial groups would move the building sector towards wider green application, according to those who considered development positively. The most important obstacles that prevent the implementation of sustainable buildings in Oman are a lack of demand and a lack of awareness among local building professionals.

III. Research Methodology

Research strategy is the process of gathering, analyzing, and interpreting data to solve a problem. In addition, it involves a thorough understanding of the study components and procedures required to achieve the research goals [8]. There are two main types of data-gathering techniques: qualitative and quantitative data collection. The qualitative data was distributed to experts in the Omani construction sector associated with green building development and the quantitative data was in the form of a survey questionnaire with engineers in different construction sectors. The study used the constant comparative approach to build ideas from the data by simultaneously coding and analyzing. To provide a theory that is integrated, close to the facts, and articulated in a way that is understandable for future testing to allow for continual comparisons to lead to the development of a strong hypothesis. An extensive amount of time must be spent on data collection and analysis to develop a grounded theory [16]. The Statistical Package for the Social Sciences (SPSS) version 25.0 was used to conduct descriptive analyses of the data. The leading statistical program for data analysis was employed for the analysis approach that was used for the quantitative data obtained through questionnaires. Furthermore, descriptive statistics are a key analytical function that may generate frequencies, descriptive statistics, and crosstabs by displaying them in tables and graphs [18].

IV. Result and Discussion

Qualitative Research Finding

Interviews were conducted to collect the necessary information on factors influencing the growth of green buildings in Oman's construction projects. Interviews were conducted face-to-face with influential people from various authorities. The interviewees were briefed by the researcher about the purpose of the interviews, their relevance, and the reason for the study before the interviews were conducted. Interview Respondents come from a wide range of industries and organizational structures as shown in Table 1.

Table 1: Details about interview participants

Code	Organization	Position	Experience	Age	Level of Education
P1	Muscat Municipality	Project Engineer	11 Years	38 Years	Master
P2	OMRAN	Director of planning	16 Years	35 Years	PhD
P3	SEZAD	Director of Project Development	12 Years	40 Years	B.Sc.
P4	Daleel Petroleum	Project Manager	10 Years	43 Years	Master
P5	National Bank of Oman	Project Manager	21 Years	38 Years	B.Sc.
P6	NU	Head of Section Civil Engineering	38 Years	63 Years	PhD

The following were the main themes of the qualitative approach:

- The growth trend of green buildings in Oman over the past ten years.
- The factors that affected the growth of green buildings in Oman.
- The actions and recommendations that your organization has taken to promote the use of green buildings in Oman.
- The strategies used to encourage the growth of green buildings in your organization.

Al Kathiri and Damdelen (2022) stated that green buildings are an important way to deal with climate change and global warming and to stop the use of natural resources from running out. This requires special consideration to enhance the uptake of green-certified buildings in the construction sector. In recent years, green buildings (GB) have emerged as the primary example of environmentally responsible construction, which has resulted in a variety of publications being written on the subject [6]. Over the last several years, the number of green buildings has been rapidly rising. During this time, many standards for evaluating green buildings have been made to keep up with the growth of green buildings.

The Sultanate of Oman's growth rate in green buildings over the last several years has been moderate, but it might be accelerated with a little more support and infrastructure (P1).

There was a good trend of growth a few years ago as people became more interested in buying and utilizing instruments and materials that were more environmentally friendly. The lower cost of green buildings encourages people to be more interested in green buildings and raises awareness of environmental aspects. Also, there has been an increase in the government's interest in green buildings (P2).

The number of green buildings has been rising significantly over the last several years, and a variety of green building evaluation standards have emerged to keep up with the trend (P3).

In the near future, the number of green buildings in Oman will double. Even though not many people are aware of it, Oman has built and encouraged the construction of green buildings over the last decade. This is both a step and proof that the country is adopting optimum solutions to minimize its influence on the environment and resources (P5).

Most of the participants believe that the growth of green buildings in Oman has been rising in recent years. The development of green buildings in Oman is influenced by a variety of factors. The factors affecting the growth of green buildings in Oman were discussed based on the opinions of experts. One of the primary factors is that Omani people are still quite unfamiliar with the green construction idea since it is still a relatively new trend in Oman [13]. The public is still unaware of the distinctions between traditional buildings and green buildings and how they impact the environment differently. Moreover, incentives for contractors who fulfil green building ratings and consultants who integrate concepts of green architecture into designs are still behind the times in Oman's construction sector [5]. The lack of green products and materials in the construction sector is another obstacle to the acceptance and application of green buildings. Green development is also held back by the fact that people don't know enough about its financial benefits and future potential [9].

Obtaining permission was and still a barrier for green buildings since they need optimized service corridors, trunk size, and available capacity, none of which are presently supported by service providers and authorities (P3).

Legislation and local construction restrictions posed difficulties for the team since permission required certain deviations. The local market lacks specialized construction materials and technology. It was also difficult to find non-specialized contractors in green construction (P5).

The factors are low availability of green building materials, the high cost of materials for green construction, lack of community awareness, there is a lack of public understanding about green construction practices, and government support for green construction (P6).

I think that people in Oman are aware of the importance of green buildings, and they are keen on them. However, the unaffordable prices of materials used in green buildings would be a challenge that would affect the growth of green buildings. Also, there aren't enough of these buildings' resources. In addition, there is a lack of knowledge and experience among people. When it comes to green buildings, there aren't enough professional engineers and recognized companies (P2)."

Participants say that it's hard to get permission, they don't know enough about it, green building materials are expensive, and there aren't any government incentives. These are the main things that affected the growth of green buildings and reduced sustainable practices. Different organizations in Oman have taken significant steps to encourage the use of green buildings in the country. For instance, renewable energy like solar energy and non-toxic materials were adopted, ethical and sustainable materials were utilized. Many Omani organizations consider environmental factors throughout the planning, managing, and running phases.

Promoting the adoption of green building materials by the contractor, teaching workers on the value of environmentally friendly building because sustainable design techniques result in satisfied workers, participating in international green building conferences, and strategic activation of the green buildings program inside the company (P3).

Making sensors that track how much electricity is used and help cut down on it, while also using less plastic and paper and as many green materials as possible. The solar cell was used at the field office of the firm; the firm encourages customers to use eco-friendly products (P5).

Students and supervisors are encouraged to work on technical initiatives related to green buildings. Also, funding is available for green construction initiatives, and the university has already begun using solar cells (P6).

Requiring LEED requirements for new construction, giving financial incentives for eco-friendly construction, engineering and design standards are being revised, encourage environmentally responsible construction by offering tax breaks, make financial support available for energy efficiency (P4).

The government demonstrates leadership by increasing energy efficiency and decreasing greenhouse gas emissions in its operations, providing property tax incentive, applying a reduced property tax rate for developers for one or more years to cover the additional cost of green development, making new and restored structures more pleasant and less costly to operate, minimizing energy usage throughout a building's life cycle, assisting building users in becoming more efficient and reducing waste and increasing reuse [7].

Using social media to encourage the public to embrace green construction methods, utilizing renewable energy sources such as solar cells and integrating them with the building's utility system, and providing staff with courses and training. In addition, the organization informs its clientele of the value of eco-friendly construction practices (P2)".

Changing the way building are constructed, designed, and operated in order to reach the maximum levels of sustainability possible in accordance with Oman's vision for the year 2040 and in accordance with standards for green buildings design, and educating customers on the

value of green construction, and increasing the use of green materials (P3).

Material selection based on low toxicity, ethics, and durability, achieves the desired level of quality, provides important building construction professionals with green building education, and improves the company's competitiveness (P5).

Most participants feel that the number of green buildings in Oman has increased in recent years. There are many green buildings recently, such as Ras al Hadd in Al Hamra. It is noteworthy that most respondents were worried about factors affecting the growth of green buildings in Oman's construction projects, as shown by the results. In addition, most of the participants believe that there are restrictions and difficulties in getting permission for green buildings. Furthermore, several participants shed light on the excessive cost of green construction materials, the lack of expertise, and the scarcity of green building resources.

This is a result of the high initial costs associated with green construction, and respondents are concerned about Oman's lack of knowledge and awareness of green buildings. According to interviews, most companies are unaware of green building, and their employees prefer to use traditional construction techniques. Therefore, a lack of green knowledge has a significant impact on the adoption of green concepts in buildings. From the interview, many participants said that many construction buildings in Oman have implemented LEED requirements. Furthermore, participants reported that their organization pushed for the use of green construction materials by contractors as well as educated employees about the need for environmentally friendly structures, since sustainable design practices result in contented workers.

Quantitative Research Finding

The dataset was evaluated using the SPSS version 25 software. A variety of statistical analyses were performed on the data, including descriptive, frequency, and correlation between variables.

Demographic Profile Analysis

Table 2 displays the frequency and ratio of each demographic profile questions. The respondent's data was in the first eight questions of the survey. This section talks about the respondents' gender, type of job, years of experience in construction, nationality, education level, and work field.

With 199 questionnaires distributed, 56.3% of the respondents were male, compared to 43.7% of females. According to the data, Omani people have a 65.8% answer rate to nationality queries, while non-Omanis have a 34.2% response rate. Most respondents were between the ages of 18 and 30, while 19.6% of respondents were beyond the age of 45, according to the results of the surveys. Approximately 25.1% of participants work for the government, compared to 17.1% for government firms and 25.6% for private companies. The proportion of people with the biggest amount of working experience was between 0 and 5 years, and it was 33.7%. 26.1% of employees have more than 12 years of experience, while the group of practitioners having between 6 to 12 years of experience had the least participation. most of the participants are employed in the construction industry making up 16.1% of the total, followed by oil and gas sector which account for 13.1% of the total, while 12.6% of respondents are employed in some aspect of the chemical, mechanical and process. Electricity and water have the lowest proportion. The highest proportion of participants holding a bachelor's degree is around 39.2%. According to the data, almost 24.1% of participants have a master's degree. 14.1% of participants have a PHD, compared to around 22.6% who have a diploma.

Table 2: Frequency and percent of Demographic Profile

Variables	Category	Result	
		F	%
Gender	Male	112	56.3
	Female	87	43.7
Nationality	Omani	131	65.8
	Non- Omani	68	34.2
Age Group	18-30 Young adults	101	50.8
	31-45 Middle- aged adults	59	29.6
	Above 45 Old- aged adults	39	19.6
Education Qualifications	Diploma	45	22.6
	Bachelor's	78	39.2
	Masters	48	24.1
	PhD	28	14.1
Having a job	Yes	169	84.9
	No	30	15.1
Occupation	Government employees	50	25.1
	Entrepreneurs	34	17.1
	Private sector	51	25.6
	Government company	34	17.1
Work experience	0-5 years	67	33.7
	6 -12 years	50	25.1
	More than 12 years	52	26.1
Work field	Construction	32	16.1
	Design and Architecture	12	6.0
	Quality	10	5.0
	Planning	8	4.0
	Health and Safe	13	6.5
	Quantity Surveying	20	10.1
	Electricity and water	7	3.5
	Chemical, mechanical and process	25	12.6
	Oil and Gas sector	26	13.1
	Environmental sector	16	8.0

The Concept of Green Buildings

The second part of the questionnaire evaluated respondents' knowledge of green buildings. By assessing the participants' replies to the questions that follow, this part aims to figure out the level of knowledge that the participants have about green buildings. An analysis of the responses to question 1 shows that approximately 42.2% of the respondents were aware of green buildings in the world; this shows that the majority of individuals who were chosen had some knowledge about green buildings. 37.7% of respondents agreed that they had some experience with environmentally friendly development in Oman, which suggests that green construction is becoming more accessible to the general population. From an

environmental perspective, 38.7% of all respondents strongly agree with the statement "Is it possible to create a green building in Oman?" (Muscat). This statement is highly supported by 37.7% of respondents (I agree that green buildings are sustainable in the long term). In addition, 39.2% of respondents strongly agree that there are many eco-friendly features in their area. Finally, 43.7% think that it is crucial to begin adopting green building infrastructure on a large scale for the future. All respondents agreed that the most crucial question was (I have a background in green buildings in Oman) according to the rank. This question had the largest standard deviation among any of the others (there are many eco-friendly features in my area).

Table 3: Descriptive Statistics of general information questions

General Information	Strongly Agree	Mean	SD	Rank
I am fully aware about green buildings in the global	26.6	2.0704	.81963	5
I have a background in green buildings in Oman	21.6	2.2864	.93925	6
From the environment perspectives is it feasible to implement a green building in Oman (Muscat)	38.7	1.9045	.85039	3
I agree that green buildings are sustainable in long term	37.7	1.8945	.82506	2
There are many eco-friendly features in my area	39.2	2.0050	.99746	4
It is important to begin majorly implementing green buildings infrastructure for the future	43.7	1.7839	.80938	1

Key Factors Affecting Growth of Green Buildings in Oman Construction Projects

The responses in Table 4 reflect respondents' perspectives on the factors affecting the rise of green buildings in Oman construction projects. According to table 4, the most crucial factor that affects the growth of green buildings is a lack of knowledge and awareness of green buildings in Oman, which has the highest ratio. 45.2 % strongly agree that there is a shortage of green building expertise in Oman. One of the major reasons influencing the rise of green buildings in Oman is public awareness. This is based on the idea that the lack of technical knowledge and awareness among professionals in the built environment, which has spread to clients, is the main thing stopping sustainable construction from being used. Other assumptions are that people didn't know about the benefits of sustainability, didn't understand it, didn't get enough education, and had the wrong idea of what green design is.

The promotion of sustainable buildings leads to the introduction of low-carbon technologies that decrease the environmental impact during the construction process. The lack of promotion for sustainable projects is the second critical aspect. 43.7% of the respondents strongly agree that it has an impact on the expansion of green construction in Oman. The lack of government incentives is the third aspect that has an impact on green construction. 42.7% of those who responded are completely in agreement that there are not enough government incentives. One of the most important obstacles to the growth of green buildings is the absence of government incentives.

The fourth significant issue impeding the expansion of green construction was the lack of plants suitable for recycling as well as the lack of recycling facilities and plants, particularly for those that produce hazardous compounds during recycling. 41.7 % of those who took the survey are certain in their belief that there are not enough recycling facilities.

The respondents say that not being part of the organization's plan is the least significant issue affecting the development of green buildings in Oman's construction projects. 34.7% of respondents are neutral about this factor. Furthermore, the difficulty of obtaining green services and resources is the second-least impacting on the development of green construction.

Table 4: Descriptive Statistics of Factors affecting growth of green buildings.

Factors	Strongly Agree	Mean	SD	Rank
Lack of data regarding cost benefit analysis of green buildings	36.7	1.9698	.88140	7
Cultural and social resistance	36.7	2.0553	.99593	14
Delays in obtaining certification and permits for green buildings	41.7	1.9347	.93784	5
Lack of demand for green construction	30.7	2.1005	.92110	17
Lack of promotion for sustainable projects	43.7	1.8090	.86674	2
Green buildings technologies are more expensive	35.2	2.0302	.92611	11
Lack of market demand	38.2	1.9548	.88931	6
Lack of knowledge and awareness of green buildings in Oman	45.2	1.7990	.85268	1
Resistance to change	33.2	2.0352	.90105	12

Lack of skilled and experienced staff	35.7	2.0000	.92660	8
Difficulty and complexity of working with sustainable construction materials	30.7	2.0553	.88304	14
Plants for recycling are scarce	41.7	1.8945	.88416	4
Lack of green buildings information and cost data	36.2	1.9347	.87661	5
Difficulty in getting green services and resources, e.g., materials, technologies, etc.	28.1	2.1156	.88289	18
The high cost of green technologies and materials	33.2	2.0050	.87327	9
Lack of government incentives	42.7	1.8693	.87791	3
Higher research and development costs for green buildings products, systems, technologies, etc.	34.7	2.0151	.90720	10
Not part of the organization's strategy	31.2	2.1457	.96078	19
Lack of competitive advantages	33.7	2.0603	.96210	15
Lack of cooperation within the company	32.2	2.0905	.90557	16
Lack of demand and interest in green buildings from client or market	36.7	1.9347	.85325	5
Lack of collaboration between different stakeholders	32.2	2.0503	.88048	13
Complex code of practices and requirements	35.2	2.0905	.98055	16

The strategy of implementing green buildings in the Oman construction projects.

According to respondent answers, the most important strategy for adopting green buildings in Oman's construction projects is the use of materials that are non-toxic, ethical, and sustainable. 53.3% strongly believe that non-toxic, ethical, and sustainable products should be used in Oman's construction projects. The Sultanate of Oman produces a wide range of waste and by-product materials, such as recycled asphalt pavement aggregate, demolition concrete, cement by-pass dust, copper slag, soils polluted with petroleum, used tires, incinerator ash, and others.

According to the rank, the second key method is that contractors may get tax benefits for using green construction items, systems, and technology. 48.7% of respondents strongly agree that contractors may get tax benefits for employing green construction materials, systems, and technology. According to the respondents, the government should provide incentives for green construction projects as the third important option. Additionally, 50.8% of respondents strongly believe that the government needs to provide incentives for green construction initiatives. The least significant method that green buildings may be used to Oman's development projects is to increase profits. The most minor strategy of incorporating green buildings into Oman's development projects is an improvement in profitability as shown in table 5.

Table 5: Descriptive Statistics of the strategy of implementing green buildings

Factors	Strongly Agree	Mean	SD	Rank
The government should provide incentives for green buildings projects	50.8	1.72	.83	3
Contractors can get tax breaks for using green buildings products, systems, and technologies.	48.7	1.71	.80	2
Availability of a skilled and experienced project team and contractors	48.2	1.74	.84	7
Offering green buildings education courses for key buildings construction personnel	44.2	1.78	.84	10
Minimize pollution and strain on resources	49.2	1.73	.83	4
Adding market value	44.2	1.77	.81	9
Investing for the future	47.2	1.73	.83	5
Meet the quality requirements	41.2	1.76	.75	8
Increase in profitability	37.7	1.93	.89	15
Increase the return on investment	39.2	1.87	.83	13
Improve your competitiveness	33.7	1.93	.82	15
Creation of new markets, technologies, and products	46.7	1.73	.80	6
Employing green buildings practices	38.7	1.89	.85	14
Engaging with the community and exemplifying corporate responsibility	39.7	1.87	.84	13
Promoting business excellence and maintaining the highest ethical standards	48.2	1.76	.86	8

Expanded market for environmentally preferable products	41.7	1.78	.78	10
Improved environmental product market	42.7	1.80	.82	11
Use of materials that are non-toxic, ethical and sustainable	53.3	1.67	.82	1
Increased local economic development opportunities	40.7	1.82	.80	12

Correlation Between Variables

The relationship between demographic profile, the concept of green buildings, factors influencing green building growth, and green building implementation strategy is depicted in Table 6. There is a strong relationship between gender and nationality, with these factors affecting the growth of green buildings at around 70%. Moreover, there is a strong relationship between the respondents' qualifications and their views about the factors affecting the growth of green buildings, at around 80%. Additionally, the respondents' occupation highly affected their view of the strategy to implement green buildings. In an equivalent manner, the respondents' work experience highly affected their views on the strategy to implement green buildings. Likewise, the respondents' work fields affected their knowledge regarding green buildings in Oman.

Table 6: Correlation between variables

		Concept	Factor	Strategy
Gender	Pearson Correlation	.049	.024	.051
	Sig. (2-tailed)	.489	.735	.476
Nationality	Pearson Correlation	.074	.021	.198**
	Sig. (2-tailed)	.301	.763	.005
Age Group	Pearson Correlation	.074	.088	.027
	Sig. (2-tailed)	.299	.218	.706
Education Qualifications	Pearson Correlation	.110	.005	.106
	Sig. (2-tailed)	.123	.942	.138
Having a job	Pearson Correlation	.035	.015	.336**
	Sig. (2-tailed)	.620	.838	.000
Occupation	Pearson Correlation	.010	.137	.008
	Sig. (2-tailed)	.896	.076	.920
Work experience	Pearson Correlation	.079	.085	.018
	Sig. (2-tailed)	.305	.270	.811
Work field	Pearson Correlation	.006	.099	.059
	Sig. (2-tailed)	.940	.199	.445

**. Correlation is significant at the 0.01 level (2-tailed).

V. Conclusion

This research project investigated some of the essential aspects influencing green building adoption in the local construction sector. The study identified 23 factors, including a lack of knowledge and awareness, a lack of incentives to promote green building, a lack of green building cost data, a lack of green building information and opportunities, and a lack of greening existing buildings cost data. The others include the restricted selection of environmentally friendly goods and materials, cultural and societal opposition, a lack of resources, and delays in securing certification and permission for green structures. Research shows that three main factors affecting the growth of green buildings in Oman are a lack of understanding and awareness of green buildings in Oman, a lack of incentives for promoting green construction, and a lack of government incentives.

It was discovered that Oman's challenges with sustainable building practices mirror those of other developed nations, particularly higher capital costs, a lack of comprehensive information about sustainable construction, and the availability and affordability of suitable materials and technology. A number of the issues raised could be addressed by more appropriate green building approaches, such as an integrated systems approach, which would have a positive impact on the design and construction process, as well as rethinking what sustainable building practices aspire to; refocusing sustainability away from energy efficiency and highly technical solutions, and toward a more holistic examination of the impact of building on the environment.

There are opportunities to learn from developed-country mistakes and to build capacity, particularly in education and the adoption of indigenous and sustainable materials and technology, which, when combined with integrated approaches to design and construction management, can lead to more efficient, affordable, and sustainable results. Cohesive decision-making and the use of ability and expertise to ensure the most suitable strategies are in place to provide sustainable building solutions present both a problem and an opportunity in both instances.

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NN's PSPD Framework: A Layered Approach to Mitigate Phishing, SQL Injection, Password Cracking, and DNS Spoofing Risks

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Abstract

Cybercriminals employ sophisticated new tactics and technologies to conduct harmful activities well to disrupt, distort, and obtain sensitive information for individual monetary advantage. Cybercriminals establish their connection and reap the benefits of this barrier to execute offenses online all around the world. Cybercriminals would attempt to use personnel to acquire data about the organization. These will appear as either fake emails or messages demanding access to documents or private details.

Nowadays, malevolent hackers are capable of perpetrating offenses via electronic gadgets such as laptops, tablets, and smartphones. Every technological device is linked to networks that permit data access and communication from just about anywhere, which raises its vulnerability to cyberattacks.

A more effective defence against these security assaults will be made possible by NN's PSPD FRAMEWORK. Studying and evaluating these attacks is the main goal of this project. Due to the monitoring and data breaches caused by these attacks, numerous businesses and individuals have suffered harm and had their security compromised. The goal of this research is to comprehend an attack's origins, points of entry, and points of vulnerability that an attacker might employ to attack a system, harming both people and businesses. The attacks will be put into practice to demonstrate how the attackers launch the attacks and to offer the appropriate defensive mechanism for each attack.

Keywords: *cyber-attacks, SQL Injection, Phishing, Password Cracking, DNS spoofing, Defensive mechanism*

خالصة

يستخدم مجرمو الإنترنت تكتيكات وتقنيات جديدة متطورة للقيام بأنشطة ضارة بشكل جيد لتعطيل وتشويه والحصول على معلومات حساسة للميزة النقدية الفردية. يقوم مجرمو الإنترنت بتأسيس اتصالهم وجني فوائد هذا الحاجز لتنفيذ الجرائم عبر الإنترنت في جميع أنحاء العالم. سيحاول مجرمو الإنترنت استخدام الموظفين للحصول على بيانات حول المؤسسة . ستظهر هذه إما رسائل بريد إلكتروني مزيفة أو رسائل تتطلب الوصول إلى المستندات أو التفاصيل الخاصة .

في الوقت الحاضر ، القراصنة الخبيثون قادرون على ارتكاب الجرائم عبر الأدوات الإلكترونية مثل أجهزة الكمبيوتر المحمولة والأجهزة اللوحية والهواتف الذكية. يرتبط كل جهاز تكنولوجي بالشبكات التي تسمح بالوصول إلى البيانات والاتصال من أي مكان تقريبًا ، مما يزيد من تعرضه للهجمات السيبرانية .

إن الدفاع الأكثر فعالية ضد هذه الاعتداءات الأمنية سيكون ممكناً بفضل إطار PSPD التابع لـ NN. إن دراسة وتقييم هذه الهجمات هو الهدف الرئيسي لهذا المشروع. بسبب المراقبة وخرق البيانات الناجمة عن هذه الهجمات ، عانت العديد من الشركات والأفراد من الأذى وتعرض أمنهم للخطر. الهدف من هذا البحث هو فهم أصول الهجوم ونقاط الدخول ونقاط الضعف التي قد يستخدمها المهاجم لمهاجمة نظام ، مما يضر بالناس والشركات. سيتم وضع هذه الهجمات لتوضيح كيفية شن المهاجمين للهجمات وتقديم الآلية الدفاعية المناسبة لكل هجوم

الكلمات الرئيسية:
الكلمات المفتاحية: الهجمات الإلكترونية، حقن SQL ، التصيد الاحتيالي، آلية الدفاعDNS اختراق كلمة المرور، انتحال ،

I. Introduction

The potential to guard against and recover from cyberattacks can indeed be called CYBERSECURITY. NIST (National Institute of Standards & Technology) describes it to be the competence to safeguard the utilization of cyberspace from cyberattacks. The internet, computer systems, telecom networks, embedded controllers, etc. are all elements of cyberspace. Any firm's privacy is wholly contingent on three critical factors: confidentiality, availability, and integrity. Cybersecurity is an important aspect of today's world. Today, the internet serves as the medium for nearly everything that we do, and it has blended effortlessly throughout our daily lives. On the internet, especially our breath gets recorded, thereby rendering it simple for cyber criminals to get everything regarding us.

One of the most prevalent cyber hazards is phishing. Don't we all believe that cybercriminals are getting more advanced? Nearly every day, hackers explore new methods for gathering data. There seem to be newer techniques that regular cybercriminals exploit in contrast to cyberattacks such as unauthorized access, password sniffing, system penetration, computer hacking, internet browser exploits, online messaging exploitation, and IP theft. Consequently, educating the general public against cybercrime is essential. Identifying and using cutting-edge tools successfully are essential for ensuring the confidentiality of your information. (Boleva, 2022)

enterprises cannot afford a data breach, which is one cause of the cybersecurity industry increasing. The estimated cost of a breach of information to firms is $3.62 million, which could be sufficient to knock many businesses out of the market. Additionally, the costs associated with cybercrime rose everywhere. Latest reports from Forbes state that "the cost of breaches has indeed been steadily

starting to rise over the past few years, new vulnerabilities which appeared from progressing to a distributed workforce decided to expand the cyber-attack area and decided to add many vulnerabilities for attackers to exploit from home offices, robotic attacks by hackers, and the capability to convert virtual currencies via ransomware have indeed decided to add to cybercrimes, and cybersecurity is also grabbing recognition." (Dinger et.al 2019)

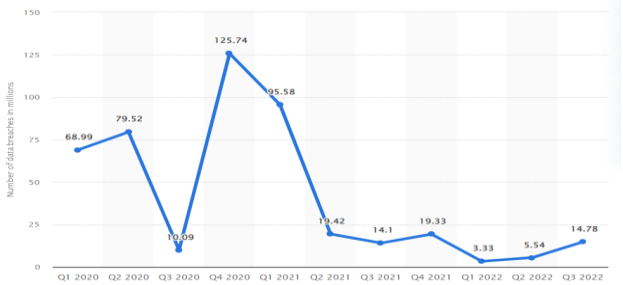

Figure 1: Data breaches in today's world**.** (Statista,2022)

The statistics above illustrate how many data breaches have affected the world in recent years. In the three months leading up to June 2022, there were 15 million data breaches, a 167 percent increase over the second quarter. Around 125 million data breaches were reported in the fourth quarter of 2020, which would have been the highest number ever recorded during the measurement period. (Statista,2022)

Organization	Estimated Direct Cost	Source
Anthem	>$100 million	(Osborne, 2015)
Community Health Systems	>$100 million	(McGee, 2014)
Equifax	$439 million	(McCrank & Finkle, 2018)
Home Depot	$62 million	(Vinton, 2014)
Sony	$15 million	(Hackett, 2015)
Target	$148 million	(Vinton, 2014)
Yahoo*	$350 million	(Paul, 2017)

Figure 2. The direct estimated cost of security data breaches**.** (Dinger et.al 2019)

Figure 2 illustrates the direct costs associated with data breaches and how they have impacted a firm. This demonstrates how serious damages can result from data breaches for businesses. Protecting data and assets for businesses and individuals is the responsibility of the security administrator. This project work aims to thoroughly research and analyze a number of attacks in that area. The attacks covered in this project are password cracking, DNS spoofing, SQL injection, and phishing.

II. Similar Works

Similar efforts in the world of cybersecurity have centered on creating thorough defense-in-depth plans to counter different kinds of cyber threats. With the use of these techniques, the risks brought on by phishing, SQL injection, password cracking, and DNS spoofing attacks should be reduced.

SIMILAR WORK RELATED TO DNS SPOOFING:

Redirecting Network Traffic into a Forged DNS Server on a LAN reveals a new DNS attack that spoofs phony DNS servers to hijack DNS requests, which are subsequently communicated with by network systems through fake destinations. By delivering repeated ping requests to the switch and confusing it with duplicate MAC addresses and IP addresses, the attacker enables the switch to transmit data toward both ports which are associated with the legitimate host and the attacker's system. Neither the IDS nor any anti-spoofing program can detect this kind of attack. (Janbeglou et al., 2010)

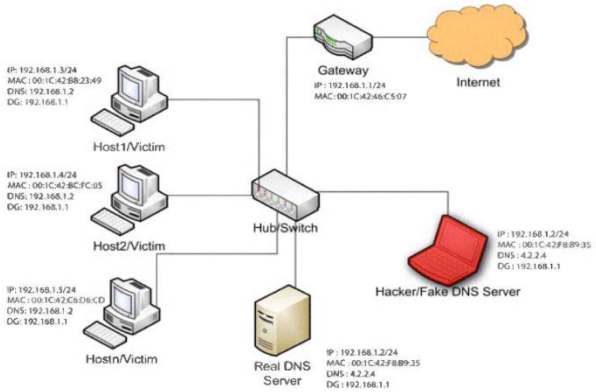

Figure 3. Redirecting Network Traffic into a Forged DNS Server on a LAN (Janbeglou et al., 2010)

Similar Work Related To Phishing:

The [3] suggested that since both hackers and system developers struggle to utilize user interfaces to guide the user, phishing is a core issue for exemplifying usable security and privacy concerns. They brought out a brand-new strategy called Dynamic Security Skins that forbade a remote web server from confirming its identity in a form that was simple for a trusted user to confirm and challenging for an attacker to forge.

III. Literature Review

In this section of the paper, it includes a few works of literature that is having a link to the proposed framework. The literature review helps to understand and analyze the topic in a better way.

ROOT CAUSE OF PHISHING ATTACKS (ABROSHAN ET.AL 2018)

This study examines the root causes of phishing assaults and the components that give criminals the capacity to defraud individuals as well as obtain their private data. To identify these essential reasons, the authors examined previous studies on phishing assaults, anti-phishing strategies, social engineering tactics, and online scams.

Scientists revealed that phishing attacks are heavily influenced by human characteristics. A key component in the achievement of phishing attacks is users' inadequate knowledge about phishing attempts. Many people are uninformed of the risks that are associated with opening files contained in emails or messages from unidentified individuals or clicking on dubious websites. In addition, they may not understand how to recognize bogus emails or websites that pretend to be to be legitimate ones. (Abroshan et.al 2018)

Successful attempts at phishing are additionally affected by technical aspects. Hackers could take advantage of

vulnerabilities and flaws in hardware or software to gain entry to sensitive information. For instance, to install malware on victims' devices, hackers might make use of vulnerabilities in online browsers, email apps, computer systems, or mobile devices. A further component that allows phishing scams to succeed is the culture of the organization. Organizations could become more open to attempts at phishing whenever they fail to make staff cybersecurity awareness training a top priority. Employees who have not been acquainted with phishing attack identification and reaction may unwittingly provide hackers access to confidential data.

The cause-and-effect diagram described in the article can be extended in future studies which could uncover deeper causes of phishing, corresponding to the authors. The discovered critical causes, perhaps aimed at the phishers' tools or the users who eventually make the choices, may already be utilized to create new anti-phishing techniques that can actively avoid future phishing frauds. The main justification for phishing is depicted in Figure (4.6). (Abroshan et.al 2018)

In conclusion, this research evaluation underlines how important it is to grasp the root causes that result in phishing attempts and to defend against them and keep us safe digitally more effectively. The proposed root causes include psychological and technological advancements elements, such as weaknesses in both hardware and software, as well as traits that humans possess such as a lack of knowledge, curiosity, and trust. Another factor that determines the effectiveness of phishing involves the culture of the organization.

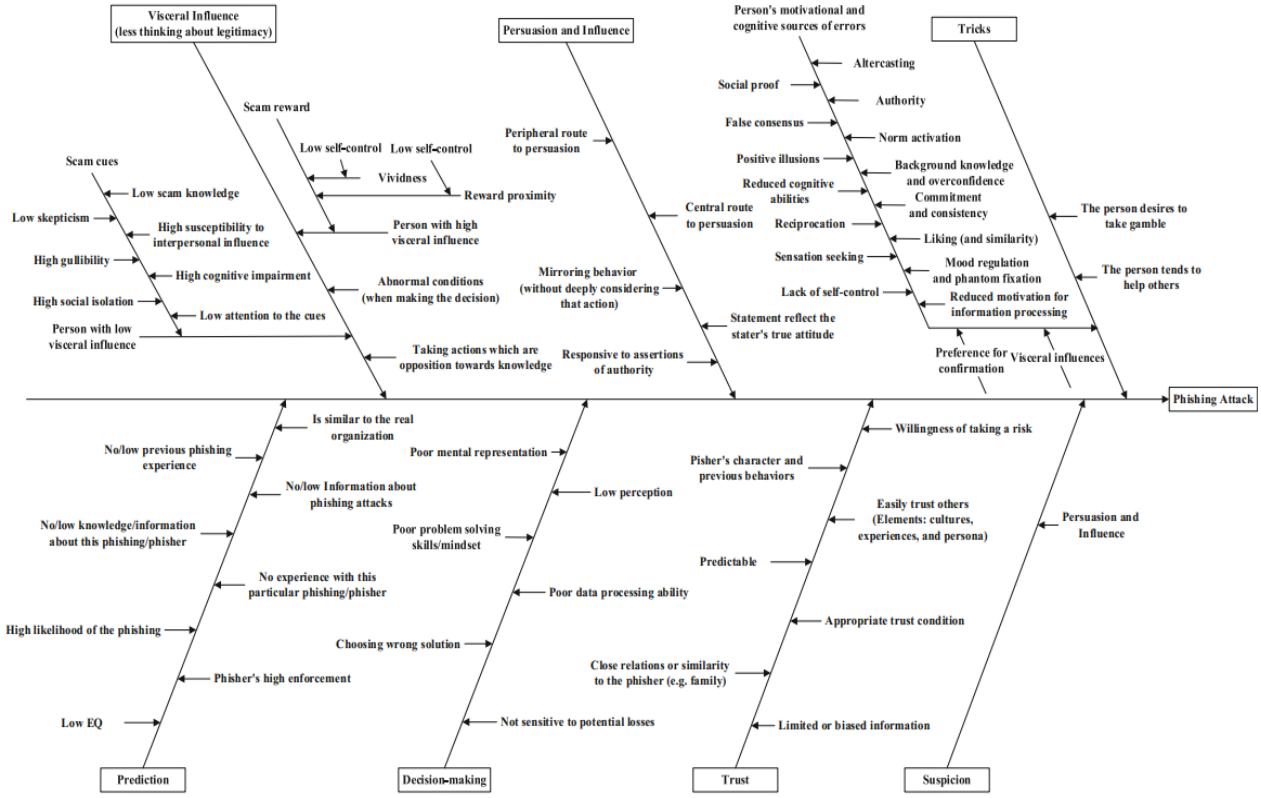

Figure 4. Fishbone Diagram Phishing Attack Cycle (Abroshan et.al 2018)

A Case Study on SQL Injection Attacks

The article "A Case Study on SQL Injection Attacks" (Sonakshi et.al 2016) presents an in-depth examination of SQL injection attacks including the impact they have on online applications. The research establishes an analogy amongst each type of SQL injection that currently exists, covering error-based, union-based, and blind SQL injection.

The authors explain how hackers may employ weaknesses in web-based applications to get sensitive data without permission or conduct unlawful activities. To assist developers in understanding the weaknesses which remain in online applications, the study additionally includes attacks on several active websites.

SQL injection attacks are a regular problem with websites that use databases. When a hacker can include fraudulent SQL code inside a web application's database query, attacks like these take place. Recommended procedures for secure code, validation of input, queries with parameters, as well as additional methods that may assist in thwarting SQL injection attacks are provided in these recommendations.

Countless additional investigations on SQL injection attacks and how they impact web applications have been carried out alongside the case study which forms the focus of this paper. For instance, Halfond et al.'s (2006) study indicated that some well-known web applications were susceptible to SQL injection attacks due to weak validation of input and sanitization strategies. A further investigation by Kals et al. (2010) demonstrated that

hackers might get in addition to standard safety precautions to obtain confidential information without permission by utilizing cutting-edge methods like time-based blind SQL injection. (Sonakshi et.al 2016)

Considering the reality that such assaults happen frequently, there are many methods for mitigating attacks in online applications. Developers can, for example, use parameterized queries as opposed to dynamic queries to make sure that user data is appropriately examined and cleansed before being utilized in a database query. The case study described in this article offers helpful knowledge into the various types of SQL injections which are currently in use as well as how attackers can take benefit of them. For developers who wish to keep these kinds of attacks from developing in their very own web apps, the study additionally provides useful advice. The most effective techniques for safeguarded coding, input confirmation, and queries with parameters may all be employed by developers to make certain their online applications are safe against SQL injection. (Sonakshi et.al 2016)

Proposed Framework

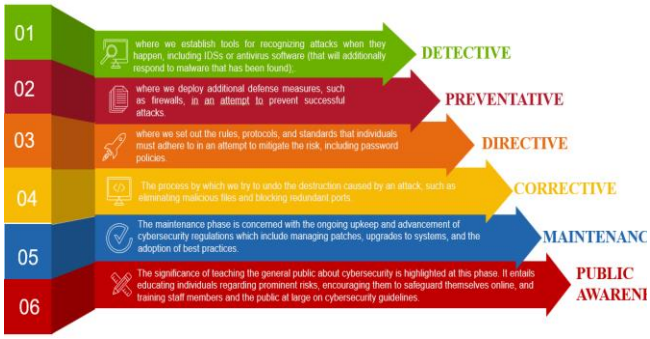

Figure 5. Proposed Framework

Detective: Any security framework must involve detection. Antivirus programs and intrusion detection systems (IDSs) are prominent tools employed now.

Preventative: Crimes are to be prevented prior to their start. This can often be achieved by security measures like firewalls, secure coding techniques, and other preventative security measures.

Directive: This may involve handles for handling incidents, handling data regulations, as well as password policies.

Corrective: Following a cybersecurity occurrence, remedial steps are carried out to mitigate the damage while restoring systems back to conventional functioning.

Maintenance: Periodic maintenance of systems includes repairing and upgrading software, thereby keeping track of and improving security protocols.

Public Awareness: A adequately informed population can serve as an efficient barrier versus risks associated with the internet. This phase consists of educating people of all ages on the risks presented by cyber threats, ways to identify them, and respond to them, including the value of complying with cybersecurity guidelines. All these measures add up to a solid and comprehensive cybersecurity framework that could be

helpful in protecting individuals, organizations, and communities at large against the modern world's constantly developing and complex cyber threats.

IV. Result

The suggested structure offers advice on how to defend against four specific attacks: SQL injection, phishing, DNS spoofing, and password cracking. The project recommends implementing input validation, prepared announcements, and stored processes to prevent SQL injection to avoid attackers from taking advantage of the vulnerabilities in web applications. To prevent employees from unintentionally disclosing sensitive information, employers might use phishing defenses, email filtering, and staff awareness and training efforts. In the event of DNS spoofing, the project advises utilizing DNSSEC to stop attacks by validating DNS replies. The concept proposes developing a robust password policy that demands difficult passwords and regular password updates after a predetermined amount of time to prevent password cracking. To strengthen the effectiveness of the countermeasures, the strategy advises installing firewall security, intrusion detection systems, and multiple-factor authentication. These actions could help with risk assessment, access restriction, and harm avoidance.

The proposed project provides a comprehensive framework for preventing cyberattacks and protecting computer systems and networks, to sum up. A few protections, broken down into monitoring, detection/detective, identification, preventive, and reactionary activities, are encouraged by the initiative. The project offers thorough instructions on how to defend against four different types of attacks: password cracking, phishing, DNS spoofing, and SQL injection. By putting the suggested remedies in place, you can reduce the likelihood of successful assaults and improve an organization's cybersecurity posture. The initiative also suggests that staff workers be given greater training and made more aware of the countermeasures to maximize their beneficial effects.

V. Conclusions

This study paper concludes by thoroughly reviewing the NN's PSPD framework, which provides a defense-in-depth strategy for combating numerous cyber threats like phishing, SQL injection, password cracking, and DNS spoofing assaults. To safeguard against cyberattacks, the framework incorporates a variety of defensive methods, such as firewall protection, multifactor authentication, intrusion detection systems, and security rules which includes email filtering. While the conceptual portion described the framework's architecture and implementation options, the literature review and similar research aided in improving the comprehension of the subject. The results showed that the framework proved effective at lowering online dangers, offering a practical and dependable way to improve cybersecurity.

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