TEPIAN Vol. 7 Number 2 (June 2026) 101-109 p-ISSN 2721-5350 e-ISSN 2721-5369
https://doi.org/10.51967/tepian.v7i2.3754 © 2026 Tepian Politeknik Pertanian Negeri Samarinda

IoT-Based Smart Temple Prototype for Remote Lamp and Loudspeaker Control at Pengulon Traditional Village Temple

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Submitted: 2026-04-26; Accepted: 2026-05-14; Published: 2026-06-01

Abstract**—**Daily temple operations in Balinese Hindu temples often require caretakers to manually activate and deactivate lamps and loudspeakers, especially for routine prayer activities such as Tri Sandya at 06:00, 12:00, and 18:00. This manual process can be inefficient when operators are unavailable and may cause unnecessary electricity consumption when devices remain active longer than needed. This study develops an Internet of Things (IoT)-based Smart Temple prototype for remote lamp and loudspeaker control at Pengulon Traditional Village Temple. The system was designed using an ESP32 microcontroller, a four-channel relay module, and a web-based interface that enables users to control temple devices through an internet connection. The research applied a prototype development model consisting of communication, quick planning, quick design modelling, prototype construction, deployment, and feedback. Functional testing showed that all connected devices could be activated and deactivated successfully through the web interface. The speaker was activated in 1.51 seconds and deactivated in 2.10 seconds, while the three lamp channels showed activation times between 3.61 and 4.40 seconds and deactivation times between 1.30 and 2.50 seconds. These results indicate that the proposed prototype can support more practical, flexible, and efficient temple device management. The contribution of this study lies in adapting low-cost IoT-based relay control to the operational context of a traditional worship facility, where remote accessibility, ritual scheduling needs, and energy-use efficiency are important practical considerations.

Keywords**—** ESP32, Iot-Based Control, Relay Control, Remote Monitoring, Smart Temple, Temple Automation, Web-Based Interface.

I. Introduction

Term Internet of Things (IoT) describes a network of physical devices, vehicles, home appliances, and other items embedded with sensors, software, and connectivity, enabling them to exchange data and operate autonomously over the Internet (Mohiuddin et al., 2024). Core components of IoT systems include sensors and actuators (to perceive and actuate), communication modules (e.g., Wi-Fi, Bluetooth, LPWAN), and cloud or local platforms facilitating data storage, processing, and analytics (Yuwono et al., 2024).

One significant benefit of IoT is enhanced operational efficiency. Real-time data allows systems to automate tasks that previously required manual intervention for example, smart thermostats regulating indoor climate, street lighting that adjusts based on ambient conditions, or automated irrigation systems in agriculture (Wahyu Nurmala et al., 2025), (Kumar et al., 2025). Moreover, IoT-generated data provides actionable intelligence: businesses can make data-driven decisions, detect anomalies, forecast demand, and optimize existing processes (Banluesapy et al., 2025).

Another major advantage is resource and energy optimization. IoT environments often incorporate mechanisms such as predictive maintenance, automated energy shutdowns, and precise control of electrical devices. These features reduce waste and lower operational costs (Shahab et al., 2025), (Gupta et al., 2025).

Security remains a concern. Secure authentication protocols, data encryption, and adherence to interoperability standards are essential to prevent unauthorized access and data breaches an especially critical consideration for cloud-based IoT systems

(Kingslin et al., 2025).

One enabler of scalable IoT designs is edge computing, which processes data locally close to the source reducing latency, bandwidth use, and dependency on centralized servers (Bagus Rahadi Putra et al., 2025). This trend is crucial for applications requiring real-time response and privacy, such as industrial automation, smart cities, and healthcare (Rinkeviciene et al., 2024).

Rapid development of information technology has entered various fields, such as health, education, transportation, marketing, even in our daily lives we often find sophisticated technology that can make life easier for users. Information technology has the potential to process data sets and convert them into information. Information technology is able to store data with a larger capacity. Currently, information technology can also be used to control electronic products that we often hear called IOT (Internet Of Things). The term Internet of Things is a technology that makes home electronic equipment to be controlled automatically.

The Internet of Things (IoT) encompasses a broad spectrum of interconnected devices equipped with sensors, processors, and communication modules. These “things” are capable of exchanging data and triggering actions autonomously across networks, typically over Wi-Fi, Bluetooth, or other wireless protocols (Diptya Widayaka et al., n.d.), (Suda et al., 2022). By enabling objects to interact seamlessly, IoT extends the benefit of persistent internet connectivity to everyday environments, allowing for smarter, automated systems in homes, cities, industries, and even places of worship (K R S Suda et al., 2021).

One of the most compelling aspects of IoT is its promise of sustainable connectivity and energy efficiency. Through real-time monitoring and control, IoT applications can dynamically adapt to environmental conditions and user behaviors for example, adjusting lighting based on occupancy or inflammation of electricity use in buildings (Maghfiroh et al., 2023). As a result, pervasive IoT systems can significantly reduce energy consumption and enhance operational efficiency.

Among modern microcontrollers, the ESP32 stands out for IoT integration. Featuring dual-core processing, 520 KB SRAM, and 4 MB flash memory, along with built-in Wi-Fi (802.11 b/g/n) and dual-mode Bluetooth, ESP32 offers a compact and powerful platform for connected device applications with low power modes and multiple I/O interfaces. Developers appreciate its affordability, active support community, rich peripheral support (ADC, DAC, PWM), secure boot features, and scalability for both hobbyist and industrial end uses (Sri Muntiah Andriami et al., 2025).

Smart Temple technology is an emerging innovation within the IoT domain. It repurposes conventional religious shrines such as Balinese Hindu temples into cyber-physical systems capable of automating ritualistic functions including lighting, gong resonation, and prayer recitations. Traditionally, temple operators must be present at set daily ritual times (e.g., 06:00, 12:00, and 18:00) to manually switch amplifiers and lights. This manual process is increasingly inefficient, prone to human oversight, and results in unnecessary electrical consumption (S M Andriami et al., 2023).

By integrating IoT, temple environments can benefit such as automated scheduling and control of devices in line with ritual timings, remote accessibility, enabling administrators to manage systems via web or mobile dashboards without physical presence, Energy conservation, minimizing waste by avoiding unintentional activation or continued operation, Reliability and fault tolerance, supporting fallback to automatic triggers during operator absence.

A typical Smart Temple architecture includes ESP32-based control modules connected to relays and sensors, interfacing with temple networks such as the *Bali Smart Island* Wi-Fi infrastructure to host a lightweight server or web interface. The system maintains secure scheduling, user authentication, and device logs.

In general, the Internet of Things can be interpreted as objects around it that can communicate with each other via the Internet. The concept of the Internet of Things is to expand the benefits of sustainable Internet connectivity. The Internet of Things (IoT) is a growing topic in the world of technology(Santiyadnya et al., 2023).

Smart temple technology has never been developed so far and is still the latest topic to develop an automation system in temples, especially in Bali. Smart temple is a term developed to define a temple (a place of worship for Hindus) that uses a controller or remote to automatically integrate various existing devices. The purpose of developing this Smart Temple is to control electrical equipment in the temple such as lights and loudspeakers. Where usually in the temple every 06:00, 12:00 and 18:00 the sound of the gong and also the Puja Trisandya mantra will be heard, currently to sound the loudspeaker in the temple an operator is still needed who must actually come to the temple to turn on the amplifier (loudspeaker). This is considered inefficient to do in the long term because if the operator who usually turns on the loudspeaker has an obstacle, the loudspeaker, lights and others cannot be turned on/off, resulting in a waste of electricity when the operator cannot turn off the lights.

Based on the description above, this study wants to implement an IoT-based smart temple. So that the process of activating and deactivating electrical devices in the temple can be done remotely. The case study in this study is in one of the temples in the Pengulon Traditional Village, namely the Village Temple. This is a consideration for researchers because the village temple, Pengulon Village has the potential to implement this smart temple, besides the location of the temple is in the middle of the village, the Pengulon village temple also has a free Wifi connection from the local government, namely wifi Bali Smart lsland. The main contribution of this study is the contextual adaptation of an IoT-based relay control system for a traditional temple environment. Unlike general smart-home automation, the proposed prototype is designed around the operational needs of a worship facility, including remote activation of lamps, loudspeaker control for scheduled prayer activities, and practical access through a web-based interface. The study also provides functional testing data on activation and deactivation response times for each controlled device, which can be used as an initial reference for similar IoT implementations in religious or community-managed facilities.

II. METHODS

In exploring information, this study applies a qualitative method where to explore in-depth information, researchers must directly become instruments. In order for the data and information obtained to be in accordance with the facts in the field, researchers must have a broad theoretical background and insight, so that researchers are able to ask, analyze, photograph, and construct the social situation of the object being studied (Komang et al., 2024). The data analysis carried out is inductive based on the facts in the field and then constructed into a hypothesis or temporary assumption. In determining the research subject, researchers took samples of data sources from stakeholders who manage the area of this research object such as the Village Temple Stakeholders, Customary Kelian, Perbekel and also the local community located around the temple area. The purpose of selecting samples is so that the information obtained is relevant to the research topic (Kadek Reda Setiawan Suda et al., 2025).

In developing the product that is the output or output in this study, the researcher uses a prototype model. The reason is because this model is good for clarifying the needs of users or stakeholders through prototyping design, in addition the prototype model can also provide flexibility in accommodating changes in needs and improvements during design development, before continuing to the production stage (Kadek Reda Setiawan Suda et al., 2024).

The research procedure consisted of three main activities: requirement identification, prototype development, and functional testing. Requirement identification was conducted through field observation and communication with temple stakeholders to determine the electrical devices that needed remote control. The identified devices consisted of one loudspeaker or amplifier channel and three lamp channels located in different temple areas. Prototype development was carried out by integrating an ESP32 microcontroller, a four-channel relay module, jumper cables, a breadboard, and a web-based control interface. The ESP32 received commands from the web interface through an internet connection and forwarded the command signal to the relay module. Each relay channel functioned as an electronic switch for one connected device.

Functional testing was conducted to evaluate whether each device could be activated and deactivated through the web interface. The measured variables were activation duration, deactivation duration, and device response status. Activation duration refers to the time required for the device to turn on after the user pressed the control button, while deactivation duration refers to the time required for the device to turn off after the command was sent. The test results were then summarized to determine whether the prototype met the intended function as a remote temple device-control system.

The stages of product development that are the output of this research are as follows:

A. *Communication*

At this stage, the researcher explores information needs from various problems that users have, where the information explored is relevant to the topic of this research. The techniques used to obtain information from users are. First is Interview. Conducting direct interviews with stakeholders who manage the Pura Desa, Pengulon Traditional Village such as the Pura Stakeholder, Kelian Adat, Perbekel and one of the communities located around the Pura location. Interviews are conducted by asking various problems at the temple, the questions of which have previously been prepared by the researcher to support this research, after knowing the various problems that exist, the researcher then designs a hypothesis or temporary assumption (Agus Kurniasari et al., 2025). Second are Field Study (Observation). Further data collection is carried out by conducting direct observations at the Pura Desa to find out what the conditions are like in the temple. After conducting observations, the researcher then provides solutions that can be done to overcome existing problems (Toruan et al., 2023). Third are Literature Study. This technique uses books, files, reports related to the title raised as references. The information is taken from various sources.

B. *Quick Plan*

Quick Plan is an initial plan based on research needs analysis. This analysis stage explains the analysis of system needs which includes technology and user analysis. The first step is to identify or analyze the needs in system design. This step defines the input specifications required by the system, the output produced by the system, and the processes required to process the input to produce the desired output. The analysis of the needs required in this study are Hardware components (ESP32 and Relay Module), Software components for coding (Arduino IDE, Visual Studio Code, Xampp and Google Chrome) and finally supporting components such as (Cables, tools, etc.).

C. *Modelling Quick Design*

Modeling is the design of the workflow of the system to be created (Sahroni et al., 2023). At this stage, the researcher created a design of the Smart Temple system using a use case diagram to make it easier later in the prototype creation stage. In creating this Use Case Diagram, the researcher used the diagrams.net website. Figure 1 is the Use Case Diagram.

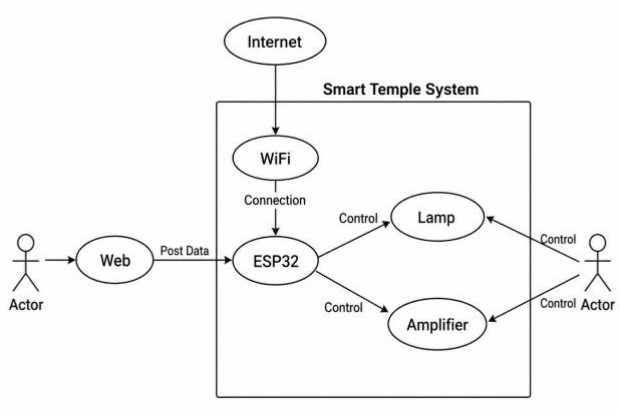

Figure 1. Use Case Diagram

D. *Prototype Formation (Prototyping)*

After analysis and design, Prototype Formation is carried out in the form of implementing the Smart Temple design on a breadboard using jumper cables, then the program code is created on the local server or localhost which begins with the creation of a website interface, backend, database, and Arduino code idea, after the website interface is felt to be running normally, then the website is hosted with a free hosting provider or hostinger such as 000webhost so that the system can run instructions given online by users remotely.

E. *Deployment Delivery & Feedback*

The final stage of the prototype stage is testing. This test is carried out to ensure whether the smart temple system that has been created can run well according to the needs and goals expected by all parties. After testing, the researcher will record the input given by users in this area, namely the stakeholders that have been explained at the beginning. These inputs will be used as material for developing similar systems in the future.

In this research, the author created a flowchart to ensure that the research process adheres to the design plan. The author can work according to the predetermined flowchart. The research flowchart can be seen in Figure 2.

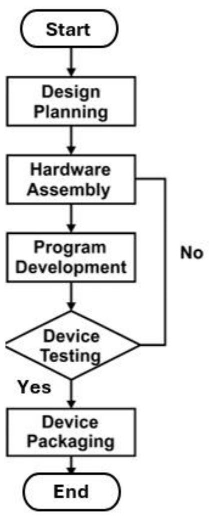

Figure 2. Research Flowchart

The process begins with the Start node, indicating the initiation of the project. The first step is Design Planning, where the overall design and concept of the device or system are developed (Bayar et al., 2025). Next, the process proceeds to Hardware Assembly, which involves the physical construction or setup of the device components. After assembling the hardware, the next step is Program Development, where the necessary software or control program is written and implemented. Following this, the process moves to Device Testing to verify the functionality and performance of the device. A decision is made based on the test results such as If the device does not function properly ("No"), the process loops back to Hardware Assembly to make corrections or adjustments and If the device functions correctly ("Yes"), the process continues to Device Packaging, where the completed device is prepared for delivery or final presentation.

Finally, the process ends at the Finish node, indicating the completion of the entire workflow.

III. Result and Discussion

A. *Product Discussion*

The product to be made is a smart temple prototype product. The tool is made through several stages. The stages in making this tool are divided into several stages, including:

1) System Design

Figure 3 shows the smart temple system design. This system design uses the Wokwi Simulator platform to facilitate system requirements analysis before the prototype development stage. The final design uses ESP32 components, jumper cables, and a 4-channel relay module. The pins on the device can be seen in Table 1.

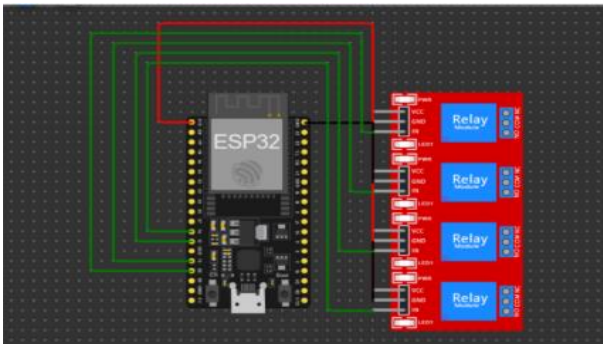

Figure 3. Smart Temple Circuit Design

Table 1. Pin Circuit

Pin Relay	Pin ESP32
VCC	3V3
GND	GND
IN1	D2
IN2	D13
IN3	D12
IN4	D14

2) System Prototype

This Smart Temple system prototype uses several components: an ESP32 as the control center (brain) that sends commands to the relay module; a relay that functions as an electronic switch to turn electronic devices on and off; a breadboard that serves as a worksheet to simplify the prototype assembly process, eliminating the need for soldering; and male-female and female-female jumper cables to connect each component. Finally, this system also uses a USB to micro cable to supply power and upload programs to the ESP32. The Prototype System Circuit can be seen in Figure 4.

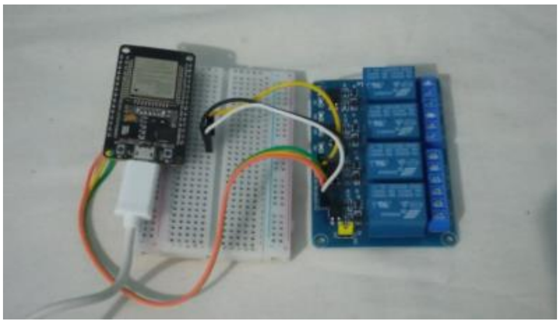

Figure 4. Prototype System Circuit

3) Website Interface

a) Login Page

Figure 5 shows the login page on the Smart Temple control website. To improve system security from unwanted things such as fake users or outsiders, here researcher provide security in the form of login authentication, where when entering the system interface the user must first log in with the username and password that have been previously registered in the database, if the user successfully enters the username and password correctly, they will be directed to the home page, while if the user fails to enter the username and password correctly, the user cannot log in to the home page

Figure 5. Login page display

b) Home Page

Figure 6 is the home display on the smart temple tool website. After successfully logging in with the username and password, the user will be directed to the home page. On this page, the user will find 4 switches that can be controlled "ON and OFF" where each switch has its own path. The "Speaker" switch functions to control the amplifier to turn on or off the speaker sound. The Lamp1 switch functions to control the lights outside the temple area. The Lamp2 switch functions to control the lights in the madya mandala area (central temple). And finally, the Lamp 3 switch functions to control the lights in the main mandala or jeroan area. In addition to the switch, the user will also find a logout button to exit the system.

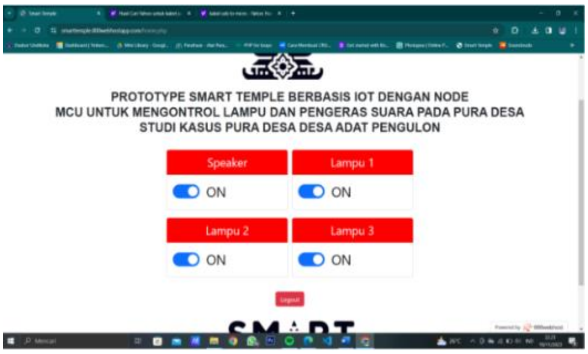

Figure 6. Home page display

4) Source Code Arduino IDE

Description of the Code Displayed. Platforms: The code is written and compiled using Arduino IDE, with "ESP32 Dev Module" selected as the board. Libraries Used: The code begins by importing essential libraries: WiFi.h – to enable WiFi communication. HTTPClient.h – for sending HTTP requests. "DHT.h" – for handling data from a DHT temperature and humidity sensor (even though it seems unused in the visible code). WiFi Configuration: The SSID and password are defined to connect the ESP32 to a local WiFi network. A host URL is defined: smarttemple.000webhostapp.com, indicating integration with a web server. Relay Pin Definitions: The relays are connected to digital pins 12, 13, and 14 on the ESP32. Each relay likely controls different electronic devices. Setup Function: Initializes serial communication using Serial.begin(9600). Connects to WiFi using WiFi.begin(ssid, pass).

This screenshot is labeled as "1. Source Code Arduino IDE", representing the core microcontroller program used to manage the Smart Temple system's behavior, particularly its connection to the internet and relay-based control of external devices. The program code displayed in the Arduino application can be seen in Figure 7.

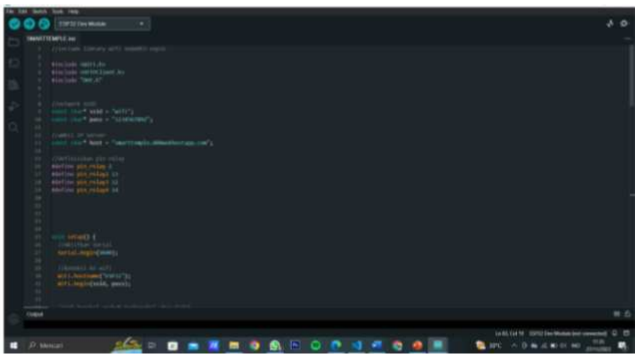

Figure 7. Program code Arduino IDE display

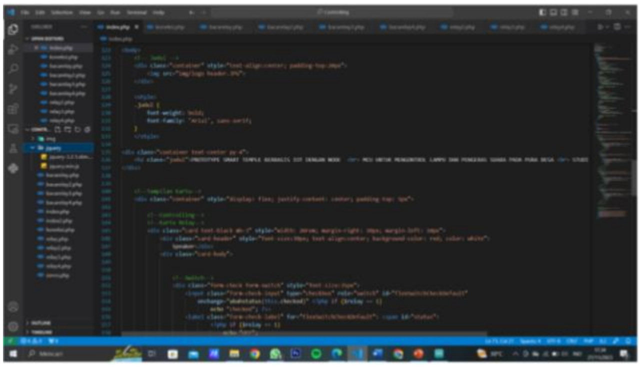

Figure 8. Home page display

Home page display can be seen in Figure 8. Key Observations: Editor & File Structure: The left sidebar shows a directory structure with various .php files like lampu1.php, relayOff.php, relayOn.php, and more, indicating a modular setup for device control. The active file is index.php, which appears to serve as the main webpage interface. HTML Content: The body includes a centered image placeholder (logo header.png) and a title section using `<h2>` that describes the purpose of the system: `"IOT-BASED SMART TEMPLE CONTROL SYSTEM USING ESP32 FOR LAMP AND LOUDSPEAKER CONTROL AT PENGULON TRADITIONAL VILLAGE TEMPLE."` (Monitoring Smart Temple based on IoT using NodeMCU to control lights and loudspeakers at Pura Sri Giri Studio) PHP and Control Elements: The page includes PHP code blocks like `<?php if ($relay == 1) {?>`, which dynamically change button status or visual output based on the relay condition. Buttons are created using input checkboxes to control relays (presumably to toggle the status of lights or other devices). Styling and Design: Basic inline CSS styling is used (`style="background-color: red; color: white;"`), mostly for visibility and user interaction feedback. The layout uses Bootstrap-like containers and row classes, suggesting responsiveness. Purpose: This interface allows authorized users to control and monitor the status of lamps and loudspeakers connected to the Smart Temple prototype. The interface is integrated with the ESP32 microcontroller through a web server, while each control button sends a command to the relay module to activate or deactivate the connected device.

B. *Device Testing*

The Smart Temple device testing process can be seen in Figure 9. Testing was conducted to determine the accuracy and reliability of the system. After testing the device, the following test results were obtained, as shown in Table 2.

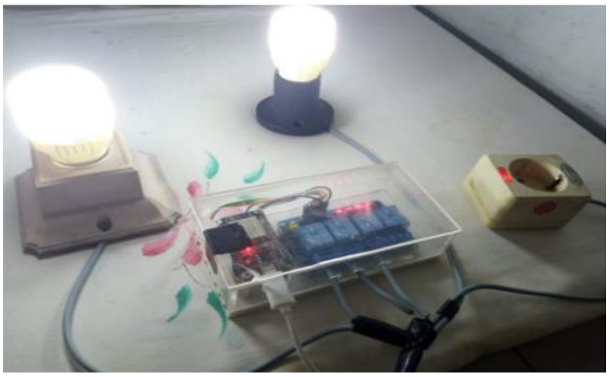

Figure 9. Testing Process

Table 2. Testing Results

Device	**Activation Duration (second)**	**Deactivation Duration (second)**	**Description**
Speaker	1.51	2.10	Speaker can be activated and deactivated
Lamp 1	3.61	1.81	Lamp 1 can be activated and deactivated
Lamp 2	4.4	2.50	Lamp 2 can be activated and deactivated
Lamp 3	3.66	1.30	Lamp 3 can be activated and deactivated

The testing results show that all connected devices responded successfully to commands sent from the web-based interface. The speaker showed the fastest activation response, with an activation duration of 1.51 seconds and a deactivation duration of 2.1 seconds. Lamp 1, Lamp 2, and Lamp 3 were also successfully activated and deactivated, with activation durations ranging from 3.61 to 4.40 seconds and deactivation durations ranging from 1.30 to 2.50 seconds. These results indicate that the ESP32 and relay-based architecture can perform the intended remote switching function for temple electrical devices.

The test was conducted using the same hotspot connection and at a relatively close distance. The measured response times should be interpreted as initial functional performance rather than final network performance under all conditions. Response time may be affected by internet stability, server response, Wi-Fi signal strength, and the distance between the user and the temple control system. Further testing using different networks and longer-distance access is needed to evaluate system reliability in broader deployment conditions.

C. Discussion of System Relevance and Contribution

The proposed Smart Temple prototype demonstrates how a simple IoT-based control architecture can be adapted to a worship-facility environment. Although relay-based IoT control has been widely used in smart-home systems, the temple context provides a different use case because device operation is related to recurring prayer schedules, community-based management, and the availability of temple caretakers. In this study, the controlled devices are not only ordinary electrical loads, but also facilities that support ritual activities, such as temple lighting and loudspeaker use for gong sounds and Tri Sandya prayer.

The broader relevance of this system lies in its potential application to other community-managed worship places that require scheduled or remote activation of electrical devices. By using low-cost components such as ESP32 and relay modules, the prototype offers an affordable approach for small religious facilities that may not have access to advanced building automation systems. The web-based interface also makes the system accessible from common devices such as smartphones and laptops, making it more practical for temple administrators or caretakers.

Compared with general IoT automation studies, this research contributes a contextual implementation model for religious-facility automation. The system design shows how remote access, relay-based switching, and web control can be arranged to support traditional temple operations without replacing the cultural and religious functions of the temple itself. Therefore, the value of this study is not only in the technical construction of the prototype, but also in demonstrating how IoT can be localized for culturally specific operational needs.

D. Product Packaging (Final Product)

Product packaging is carried out to ensure the system's appearance is attractive and the wiring is neat. This stage is carried out after the testing process has achieved the desired results. The basic material used in this product's packaging is acrylic, which is used to ensure a transparent appearance, allowing the system's circuitry to be visible from the outside. The case manufacturing process can be seen in Figure 10.

Figure 10. Case Manufacturing Process

Korean glue or G is used to join each acrylic side part because Korean glue is known to have very strong adhesive strength and is also affordable. After the case is complete, the next stage is the creation of the temple miniature that is shown in figure 11.

Figure 11. Making the Temple Miniature

The materials used to create this miniature include printed paper resembling temple carvings, used cardboard, and popsicle sticks to support the paper to prevent it from falling. The final stage is arranging the miniature, created using the developed system, to achieve the following final appearance that is shown in figure 12.

Figure 12. Smart Temple Prototype Implementation

IV. CONCLUSION

The developed Smart Temple prototype has successfully implemented Internet of Things (IoT) technology as an innovative solution for modern temple management. The system enables users to monitor and control electrical devices installed in the temple remotely from different locations, including outside the city, provided that both the user’s device and the Smart Temple controller are connected to a stable internet network. This capability demonstrates that conventional temple operations, which previously relied heavily on the physical presence of operators or temple caretakers, can now be transformed into a more practical, flexible, and efficient digital system. Through this implementation, the Smart Temple concept offers a bridge between traditional religious activities and modern technological advancement without reducing the sacred value of temple worship activities.

The prototype system is specifically designed to control several electrical devices commonly used in temples, such as lighting systems, loudspeakers, amplifiers, and other supporting facilities. Through a web-based interface, users can access the system easily using smartphones, tablets, laptops, or desktop computers. The website dashboard contains four control switches, where each switch is connected to an individual relay module that functions as an electronic switch for separate devices. This arrangement allows users to independently activate or deactivate each connected device in real time. For example, temple lights can be turned on before ceremonies begin, while loudspeakers can be activated only during prayer schedules. Such functionality significantly improves convenience and provides better control over temple electrical operations.

One of the most important contributions of the Smart Temple prototype is its role in improving energy efficiency and optimizing electricity usage. In many conventional temple environments, electrical devices are often left running longer than necessary because operators forget to switch them off or are unable to come to the temple on time. This situation can lead to unnecessary electricity consumption and increased operational costs. By using the Smart Temple system, users can remotely turn off lights, amplifiers, or other devices immediately whenever they are no longer needed. As a result, the utilization of electricity becomes more effective, efficient, and environmentally friendly. Over the long term, this system has the potential to reduce energy waste and lower temple maintenance expenses.

Another significant advantage of the developed prototype is the improvement of accessibility and user experience through a redesigned website interface. The web platform has been developed using a responsive and dynamic design approach, meaning that the display automatically adjusts according to the screen size and type of device used by the user. Whether accessed from a smartphone, tablet, or computer, the interface remains clear, organized, and easy to navigate. This responsive design is particularly important because many users today rely on mobile devices for daily digital activities. The Smart Temple platform ensures that users can conveniently control temple devices anytime and anywhere without technical difficulty.

The Smart Temple system has also considered modern authentication methods to protect user access. Instead of relying solely on traditional username and password combinations, future versions of the system are designed to adopt password-less authentication technologies such as FIDO2. Through this mechanism, users can log in securely using biometric verification methods such as fingerprints or face recognition, depending on the device being used. This approach offers several advantages, including stronger protection against password theft, phishing attacks, and forgotten credentials. In addition, password-less login simplifies the user experience because administrators and temple officers can access the system faster and more conveniently.

The research findings indicate strong opportunities for future development, especially in the field of automation and intelligent scheduling. At present, the website is used to manually send commands to the system. However, future enhancements can integrate automatic scheduling features that allow devices to operate according to predetermined religious activity times. For instance, relay switch 1, which is connected to the loudspeaker system, can be programmed to automatically turn on at 06:00, 12:00, and 18:00 to play gong sounds and Tri Sandya prayers, then turn off again after the scheduled duration. With such automation, users no longer need to access the website every day to perform repetitive tasks manually. This feature would greatly improve reliability, especially when temple operators are busy, unavailable, or outside the area.

Additional future developments may also include sensor integration, real-time notifications, power monitoring systems, and activity logs. Sensors could detect environmental conditions such as light intensity, temperature, or occupancy, allowing devices to respond automatically based on actual conditions. Notifications through messaging applications could inform administrators when devices are turned on or off, while power monitoring systems could provide detailed data on electricity consumption. These improvements would make the Smart Temple system even more intelligent, transparent, and efficient.

The Smart Temple prototype demonstrates excellent potential as a practical implementation of IoT technology in places of worship. It successfully combines remote control, energy efficiency, responsive web access, secure authentication, and future automation capabilities into one integrated system. More importantly, the system supports temple management in carrying out daily operational tasks while maintaining the continuity of traditional worship practices. Therefore, the Smart Temple prototype can be considered a valuable innovation that not only modernizes temple facilities but also promotes sustainable, reliable, and user-friendly management for the future.

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