

International School

**Requirements Engineering Project**

CMU-SE 100

**Project Proposal**

**Version 1.0**

**Date: September 24, 2024**

**Smart Hotel Management System Using IoT and Data Analytics**

**Created by <Group 6>**

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**Approval of Mentor:**

Name Signature Date

#### **PROJECT INFORMATION**

|  |  |  |  |
| --- | --- | --- | --- |
| **Project acronym** | **HMS** | | |
| **Project Title** | Smart Hotel Management System Using IoT and Data Analytics | | |
| **Start Date** | 24 Feb 2024 | **End Date** | 25 May 2024 |
| **Lead Institution** | International School, Duy Tan University | | |
| **Project Mentor** | Man, Nguyen Duc, Ph.D | | |
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**REVISION HISTORY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Comments** | **Author** | **Approval** |
| 1.0 | 20/11/2024 | Initial Release | All members |  |
| 1.1 | 22/11/2024 | Update 4,5 | All members |  |
| 2.0 | 24/11/2024 | Official Document | All members |  |

**1. Project Title**

* **Example**: "Smart Hotel Management System Using IoT and Data Analytics"

**2. Project Overview**

* **Example**: " This project aims to develop a smart hotel management system that leverages IoT devices and data analytics to automate hotel operations, enhance guest experiences, and optimize resource management.."

**3. Project Background and Motivation**

* **Example**: " Managing a hotel involves complex operations such as room allocation, resource tracking, and customer service, which are often labor-intensive and prone to errors. By integrating IoT and data analytics, this project will streamline hotel operations, improve customer satisfaction, and reduce operational costs.."

**4. Proposed Solution**

* **Example**: " The proposed system will use IoT-enabled devices for real-time monitoring of room availability, energy consumption, and guest preferences. A centralized platform will provide hotel staff with data-driven insights, automate resource allocation, and enable guests to customize their stay using a mobile application.."
* +----------------------------+
* | Customers |
* +----------------------------+
* |
* | (Bookings, service requests, feedback)
* v
* +--------------------------+
* | Smart Hotel Management |
* | System |
* +--------------------------+
* ^
* | (Manage bookings, update status)
* |
* +-------------------+ +----------------+
* | Hotel Staff | | IoT Devices |
* +-------------------+ +----------------+
* ^ ^
* | (Payment information, confirmation) | (Environmental data, device usage)
* +-------------------------+
* |
* +--------------------+ +---------------------+
* | Hotel Database | | Third-Party Services|
* +--------------------+ +---------------------+
* ^
* | (Customer information, booking history)
* |
* +-------------------+
* | Payment Systems |
* +-------------------+

**5. Related Works or Projects on the Market**

* **Example**: " Existing hotel management systems such as Oracle Hospitality and RoomRaccoon focus on traditional booking and check-in processes. However, they lack real-time IoT integration and predictive analytics for personalized guest experiences. This project will differentiate itself by integrating smart devices and predictive data analysis for a more intelligent management approach.."
* **Create a table for a comparison of these products. (see example)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Characteristics | mytour.vn | Vietravel | KLOOK | viBOTour  (Old) | ViVu  (New) |
| Consulting  support |  | + | + | + |  |
| Promotions | + | + | + | + | update |
| Diverse and  quality tours | + | + | + | + | update |
| Online payment | + | + | + | + |  |
| Real reviews  from customers | + |  | + | + |  |
| Support chatbot |  |  |  | + |  |
| Support creating tours |  |  |  | + | update |
| Multi languages support |  | + | + | + |  |
| Check tour tickets for checkin | + | + |  |  | + |
| Upload short video in social network with checking harmful content |  |  |  |  | + |
| Earn points for redeeming rewards |  |  |  |  | + |
| Display advertisement |  |  |  |  | + |
| Map checking places |  |  |  |  | + |

**6. Objectives and Deliverables**

* **Example**:
  + **Objective 1**: Develop a cloud-based hotel management platform integrated with IoT devices.
  + **Objective 2**: Implement a guest-facing mobile app for personalized services and feedback collection.
  + **Deliverable**: A functional IoT-enabled hotel management system.
  + A mobile application for guest interaction.
  + Real-time dashboards for hotel staff to monitor and manage resources

**7. Methodology and Tools**

* **Example**: The project will follow Agile methodology with bi-weekly sprints. Key tools and technologies include:
* IoT: Arduino and Raspberry Pi for smart device integration.
* Data Analytics: Python and Tableau for predictive analysis and reporting.
* Development: React Native for the mobile app and Firebase for backend services
* **Provide a brief description of Agile scrum process/ or what process you used.**

**Agile Scrum** is a flexible software development process focused on delivering value quickly and efficiently to customers through short development phases called "sprints." The key characteristics of the Scrum process include:

* **Sprints:** Short development phases (usually 2-4 weeks) during which the development team focuses on completing a set of defined functions.
* **Scrum Team:** The development team includes members with different roles such as Scrum Master (the process guide), Product Owner (the product requirements manager), and Development Team (the development group).
* **Product Backlog:** A list of requirements and features to be developed, prioritized by the Product Owner.
* **Sprint Backlog:** A list of specific tasks selected from the Product Backlog to be completed in a sprint.
* **Daily Stand-up:** The team's daily meeting to discuss progress, obstacles, and plans for the next day.
* **Sprint Review:** The meeting at the end of each sprint to present the completed product and receive feedback from customers.
* **Sprint Retrospective:** The meeting to evaluate the working process during the sprint and make improvements for the future.

**8. Timeline**

**Example**:

Week 1-2: Requirement gathering and initial design of IoT setup.

Week 3-4: Integration of IoT devices for room monitoring and energy management.

Week 5-6: Development of the hotel management dashboard and guest mobile app.

Week 7: Testing and bug fixing.

Week 8: Final deployment and presentation.

**9. Project Team**

* **Example**: // create a table
  + **Nguyen Nhat Hoang**: Project Manager – Oversees project progress, timeline, and communication.
  + **Duong Pham Minh Khoa**: Lead Developer – Responsible for backend development and chatbot integration.
  + **Ngo Minh Quyen** : Frontend Developer – Develops the user interface using React.
  + **Tran Duc Dai Loc**:Data Engineer- Analyzes data from IoT devices and optimizes the system.

**10. Risk Management**

* **Example**:
* **Risk**: Hardware malfunctions during IoT device testing.
* **Mitigation**: Conduct thorough testing before deployment and maintain backup devices.
* **Risk**: Insufficient guest adoption of the mobile app.
* **Mitigation**: Include a user-friendly interface and conduct regular feedback sessions for improvement.

**11. Budget and Resources**

* **Example**:
  + **Budget:** $800 for IoT hardware, cloud hosting, and development tools**.**
  + **Resources**: IoT devices, cloud server, development software, and testing environment.

**12. Project constraints**

***//giữ nguyên bảng này, chỉ nhập nội dung vào cột giữa!!***

|  |  |  |
| --- | --- | --- |
| **Constraint** | **Constraints Description**  **Chỉ ghi vào cột này!!!** | **Guidelines for Acceptance** |
| **Economic** | The total cost of the project cannot exceed $4000. | Elements for consideration are design costs, production costs, maintenance costs, operating costs, and sales price |
| **Environmental** | Final product should be used in proper light setup, and stable camera. | The impact of the design on the environment as well as the impact of the environment (e.g. temperature range, humidity, vibration, electromagnetic interference immunity, and shock) on the design should be considered. Design for recycling and design to use recycled materials should also be considered |
| **Ethical** | N/A | Ethical considerations can be broad. Areas that are typically addressed include intellectual property, reverse-engineering, privacy, security, and the conflict between cost and safety |
| **Public health, safety, and welfare** | N/A | Includes safety standards as well as the impact of the design on users (for example, electrical or physical hazards) |
| **Social and Global** | The product will reduce the time and efforts of tasks related to hotel management, reception, and service evaluation. | Addresses aspects such as benefits, risks, the man-machine interface, the acceptance of products by the intended user or by society at large, and global and socially responsible engineering. |
| **Cultural** | N/A | Which cultural characteristics could influence the approach?  How do the design from different cultures differ? |
| **Sustainability** | The product will need to be maintained and upgraded in the future. This includes providing software updates, bug fixes, and feature improvements. | Refers to the sustainability of resources, including material, energy, supplies, manufacturing techniques, personnel, operation, and the need for additional infrastructure, as well as the sustainability of the design including reliability, lifetime, durability, reusability, maintainability. |

**13. Conclusion**

* **Example**: This smart hotel management system will enhance operational efficiency and provide a superior guest experience through automation and data-driven decision-making. It will demonstrate the potential of IoT and analytics in revolutionizing the hospitality industry.

**14. References**

|  |  |  |
| --- | --- | --- |
| **No.** | **References** | **Document Information** |
| 1 | Scrum Model | <https://en.wikipedia.org/wiki/Scrum_(software_development)> |
| <https://www.atlassian.com/agile/scrum> |
| <https://www.digite.com/agile/scrum-methodology/> |
| <https://www.scrum.org/resources/scrum-guide> |
| 2 | Technical | <https://www.tensorflow.org/tutorials/quickstart/beginner?hl=vi> |
| [https://www.flutterclutter.dev/flutter/tutorials/implementing-edge-detection-in-flutter/2020/1509/](https://www.flutterclutter.dev/flutter/tutorials/implementing-edge-detection-in-flutter/2020/1509/%20) |
| <https://stackoverflow.com/questions/14248571/finding-properties-of-sloppy-hand-drawn-rectangles> |
| <https://www.tutorialspoint.com/how-to-detect-a-rectangle-and-square-in-an-image-using-opencv-python> |
| 3 | Standard | [https://www.nws.noaa.gov/oh/hrl/developers\_docs/General\_So](https://www.nws.noaa.gov/oh/hrl/developers_docs/General_Software_Standards.pdf) [ftware\_Standards.pdf](https://www.nws.noaa.gov/oh/hrl/developers_docs/General_Software_Standards.pdf) |
| <https://standards.ieee.org/standard/12208-2017.html> |
| <https://en.wikipedia.org/wiki/Scrum_(software_development)> |

#### 15. Attached “DESCRIPTION OF PRODUCT REQUIREMENTS”

### Description of Product Requirements

**1. Overview:**

* **Project Name:** Smart Hotel Management System Using IoT and Data Analytics
* **Objective:** To create a smart hotel management system that optimizes management operations and enhances guest experience through the use of IoT devices and data analytics.

**2. Functional Requirements:**

* **Room Management:** The system should be able to manage room status (vacant, booked, occupied, needs cleaning) and update in real-time.
* **IoT Integration:** Connect with IoT devices in rooms (lights, air conditioning, TVs, smart locks) for remote control and data collection.
* **Data Analytics:** Utilize data analytics to analyze customer service usage habits and provide personalized recommendations.
* **Online Payment:** Support online payments through various payment gateways.
* **User Interface:** Provide a user-friendly interface for both guests and hotel staff.

**3. Non-functional Requirements:**

* **Security:** Ensure data security and customer privacy.
* **Performance:** The system must handle multiple simultaneous requests and respond promptly.
* **Availability:** The system must be available with minimal downtime.
* **Scalability:** The system must be scalable to support multiple hotels and various IoT devices.

**4. Interface Requirements:**

* **Customer User Interface:** Mobile or web application allowing customers to control in-room devices and request services.
* **Management Interface:** Online dashboard for hotel staff to manage rooms, guests, and IoT devices.

**5. Integration Requirements:**

* **Integration with Existing Hotel Management Systems:** The new system must integrate with existing hotel management systems for data synchronization.
* **Integration with Third-Party Services:** Integrate with services like online booking, transportation services, and food delivery services.