Module 5- Computer Systems
(2021-22)
Project

UNIVERSITY OF TWENTE.

Requirement Analysis Document Template

Project Name: **Raspberry Home**	**Team Members:** **Damon Kaewborisut** **Niek Zieverink** **Masis Zovikoglu** **Shuhang Tian** **Yifan Sun** **Jelke Schröder**
Team ID: 31	**Mentor(s):Filip Ivanov, Ricco Pratama Halim**

1. Introduction

There are several existing applications that you can select as a base for your project. In this section, you need to give a small background of already existing applications. In case an existing application is chosen you need to give **at least 2 new features** and include these in the requirements.

The following points are introduced to get to know the purpose of your application, limitations of the existing system on which your project is based, etc.

1.1. **Purpose**:

You should know the purpose of creating your application. Write the reason for selecting this project by mentioning the usefulness, quality, etc. of the system.

This project will be based on a Smart Home System, whereas you could change your lights or your devices remotely from anywhere with only one touch on your phone. With this, it is possible to monitor your energy usage and save electricity when you find out that you have forgotten to turn off one of the lights.

1.2. **Limitations of the current system(If any)**:

List down the limitations of the currently existing similar systems.

The current limitations of already existing smart home automation system are:

- *The Internet is required to make use of the smart home System.*
- *It is possible to gain access to the smart home automation system by hacking.*
- *synchronization problems between devices, where 2 devices simultaneously try to either turn on or off the same light.*
- *Technical problems with the software or hardware of the smart home automation system, such as a power Burst, where the System could be damaged.*
- *Older homes must be renovated with rewiring to make a smart home system applicable.*
- *Installing the system comes with a big investment.*

1.3. **Intended Audience**

Write about the targeted audience who can have access to your product or the documents.

The target audience of our product are all people living in a home. Our product is especially designed for an environment-friendly audience, although other people are able to benefit as well. Raspberry Home is also designed for people who tend to forget things fast. Other stakeholders include home interior businesses, our mentor, the project coordinator, the module coordinator and TA's.

1.4. **Define SMART Goals**:

This section is used to list down the target/expected results from the project. All the goals should be written in a SMART (Specific + Measurable + Attainable + Relevant + Time-bound) way.

Specific (What)	***Measurable (Up to)***	***Attainable (How)***	***Relevant (Why)***	***Time-bound (when)***
*1. To improve the **efficiency** of the system by having a webpage/app on which different devices can be controlled by the user*	*To evaluate whether the webpage/app is intuitive and easy to use. This will be done using a user test where our goal is to achieve a score above 68 percent to be considered successful.*	*To do a user test for testing how intuitive and easy to use the webpage/app is. This lies within our scope using html, javascript, php and css.*	*To create a user-friendly environment such that the system can be managed with ease by the user.*	*To finish the task in or before week 8 (October 27th - November 7th)*

*2. To improve the **productivity** of the system we can add a temperature sensor to regulate heat and infrared sensors to check whether a person is in a room*	*To evaluate the range of rooms and or different elements of the outside world that the system can regulate.* *If the implementations work 90% of the time, then the goal is reached.*	*To test the system with the new elements for temperature and/or persons in a room*	*To create a wider range of functionalities such that the user can incorporate the system in their environment easier.*	*To finish the task before or in week 8 (October 27 - November 7)*
*3. To improve the **quality** of the system by reviewing existing applications which we can use to improve our own product.*	*To evaluate implications of positive features from existing in our own application.* *If the existing applications were in detail reviewed and some of the implementations were used as ideas to improve and implement working features on our own product, then it is counted as successful.*	*To study the existing application and testing features in our own application*	*To create a wider range of possibilities based on the users needs*	*To finish the task before or in week 8 (October 27 - November 7)*

*4. To improve the **security** of the system by encrypting any data that will be send or stored through the internet*	*To evaluate success rate of encryption and decryption and quality of the encryption.* *If it is almost impossible to crack the encryption and decryption, then the goal is reached.*	*To test the system with encryption/ decryption and test if the encrypted data can be encrypted without a key.*	*To protect the online safety of users and other stakeholders of the system in case of a data breach.*	*To finish this task before or in week 8 (October 27 - November 7)*

1.5. **Scope:** This section is required to write about the important resources to achieve the goals of your system. The technology used to develop your project (methods/algorithms, software requirements, hardware requirements), the duration of the project, and the project constraints should be included here. The project constraints can be any technical hiccups, lack of resources, internal and external conditions(boundary conditions), etc. that can help further to avoid the related problems in the future during execution. In short, you can utilize this section to write about the limitations and boundaries of your project.

System boundaries (Software and hardware):

- *Software: html, php, css and javascript for website, Mobile applications if implemented, Python language.*
- *Hardware: Raspberry pi 4, Sensors, power supply, lights, power cables.*

Interfaces:

- *Access the internet via Wifi or 4G/5G hotspot,*
- *Control application for the smart home system*
- *GUI of the website to gain access to the smart home system*
- *keypads/buttons on the smart home system itself.*

Limitations:

- *This project can only monitor and control the lights of a home.*
- *This project can only have 10 devices connected to the raspberry pi.*
- *This project can only have 10 implementations due to a 'small hardware', Raspberry pi.*
- *This project can only use 6W electricity usage and should be energy efficient.*

Duration of the project: 9 weeks

2. **Product features:**

This section describes the functionality that you want to have in your product such as the components used for the application and its functionality, appearance, performance in terms of speed/time, etc. You can specify them in the form of functional and non-functional requirements. A minimum number of 7 requirements (9 in case of selecting an existing application) is to be expected for your application. That includes functional as well as non-functional requirements cumulatively. However, it is highly probable that you will need more than the minimum amount to fully cover all the requirements.

2.1 **Functional requirements:**

Write the requirements that are directly connected with the functionality of the application.

Functional requirements:

- *The System should store the privacy sensitive data in a built-in storage.*
- *An User is able to access the System via a website/application with the internet.*
- *An User is able to alternate the lights via a website.*
- *An User is able to see the conditions of the lights while using the system.*
- *The System will periodically send a message whether you are in the house, when no one replies that they are at home, the System will turn all the lights off.*
- *The System will give a statistic with a score how good your energy saving is depending on your energy consumption over a period of time.*

2.2 **Nonfunctional requirements:**

Write the requirements that are not the specific actions for your application but improve the quality of the system. This can be related to the storage capacity, performance requirements, Security requirements(Refer to the checklist given in SBD document-Phase 1), etc.

Non-functional requirements:

- *The system must implement user authentication, such that only housekeepers can access the system (security)*
- *The personal data of authenticated users should be encrypted in the database or in a built-in storage, such that a breach in the system will not expose data (security)*
- *The system must be able to handle multiple devices alternating the lights and devices at the same time. (multi-user friendly)*
- *The devices connected to the system should only grant access to authorized users (security)*
- *The system must be accessible by different sorts of devices: Smartphones, tablets, PC.*

3. **Conclusion:** You should write the concluding remarks here. You can do this by **highlighting noteworthy decisions and challenges** for the next phase that you recognized.

One of the things we have considered was SMART temperature control, when the measured temperature is below a certain number, then the System will change the room temperature. But that will be a difficult task: How do we measure the whole room temperature? And how can we change the temperature of the whole room/house. We also decided to create a method where the system will predict whether certain components are using electricity unnecessarily, and shut them off. This will create the challenge to not interfere with the needs of the user. The overall project is challenging since there are many aspects that need to be kept in mind.

4. **Reference**: List the existing literature (documents/articles/blogs/research papers) references you have considered for finalizing the project idea.

https://www.sciencedirect.com/science/article/pii/S2214785321000572 explaining temperature sensor and IR sensor

https://www.sciencedirect.com/science/article/pii/S266729522100026X explaining video surveillance and alarm on smart home

https://www.sciencedirect.com/science/article/pii/S2214785320392439 wireless smarthome

https://www.sciencedirect.com/science/article/pii/S0736585321001283 discussion of privacy and security concerns, the trust in Smart home automation

[1]**Note:** ***The security requirements should be mapped with the SBD requirement analysis (phase 1) checklist. You are free to write the security requirements in the form of a user story/abuse case***