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SEPTEMBER 17

**Townley Grammar School**  
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## Section 1: Analysis

Maintaining attendance is compulsory and important in all the institutions for knowing the performance of students. This attendance constitutes a major role for students because based on these students get their final grade by the end of their semester for these the students attend their classes without any fail. This is the main factor in improving the education standard. So, for these reasons the teacher has to mark the attendance carefully without making any wrong attendance and before completing taking attendance should make sure whether marked attendance correctly. This is also a time waste process for teachers because of taking attendance manually. But it is very difficult when there are more students.

The main purpose of my idea is to provide my stakeholders with a new school registration system, which is not only easy to use but also filled with features that will allow optimum convenience to both students and teachers.

The current system of having to be in a certain place at a certain time can be defined as an inconvenience to both students and teachers. Not to mention time-consuming. Based on my experience during registration time ,I calculated that approximately 3360 minutes per week are taken out of students' lesson time to take the register. My solution aims to bring a new system of school registration. The aim with my solution, whenever a student walks into the school premises they are to tap their card on a reader, which will automatically sign the student in without having to be in a certain place, at a certain time. Although there are a lot of 'well known' card readers in the market that do integrate features such as time tracking on any device and Real-time reporting but these are not made for school. The similar products are only suitable in a business environment and not for a school setting.

My project allows schools to have their own attendance system that is suitable for a school environment. My solution would not only be easy to use but will also decrease time spent on having teachers to do sign students in.

## Section 2: Identifying Stakeholder

### ***Stakeholder : Pelumi Rabi , 11 Year old student, male***

My first stakeholder is a student who actively dislikes registration time . Pelumi believes they have a negative impact on learning time , and are above all time consuming and outdated. In my opinion, he holds the view of many full time students, and hence it would be interesting to have her insight as to how to make this System easily accessible to a wider audience. Specifically, I believe he would be interested in creating a more accessible and easy to use attendance system , thus I will be using Pelumi as a reference for level design and accessibility , in order to maximize the potential audience

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of this product.

Therefore, my final product will be useful to Pelumi as it may act as an entrance to the new world of attendance system, a product which can make her life easier . Pelumi plans to use this system to sign in immediately when he gets to school. This system caters to Pelumi's needs as being a student that dislikes registration time, the attendance system will allow him to get rid of the outdated system and he would not be required to be at registration as he would have been signed in immediately when he gets into the sign allowing him to spend extra time on his education .

### **Stakeholder 1: Lucy Brown - 38 Year old Teacher - female**

Lucy Brown is a 38 year old student currently teaching at a primary school . Though she enjoys interacting with the student during registration however she does not enjoy taking the student attendance , due to the fact that many are too challenging names and there are so many activities she would like to do with the children. She believes that registration time would be more enjoyable if they use the time to socialize with the students, and steered away from the traditional attendance system being in a certain place at a certain time, perhaps implementing automatic registration form.

Therefore, this product would be an amazing system for Mrs. Brown, allowing her to deliver a much more interactive time with her student. Mrs. Brown plans to use this system as an alternative to registration time. The system will be used by the student and not Mrs. Brown, however this system Mrs. Brown is appropriate for her needs as she will have extra time to socialize and intricate with students.

### **Stakeholder 2: Steve Johnson - 13 Year old student - male**

This stakeholder is a student who is often late and would have to then register with the head of year. Though he enjoys spending time with his friends during registration time, he does not enjoy the walk to the head of the year's office to register for school. Steve believes that having a more automatic attendance system would help him from having to constantly visit the head of year's office to sign in. Hence, Steve will be useful for suggesting what will be more convenient to include in the attendance system and which part of the system will help students who are late.

Therefore, Steve may be able to use this product as he is often late and would need an alternative to registration time, which he usually misses. Steve is planning to use the attendance system as a way to avoid the stress of having to go to the head of year's office to sign in as a result of being late. Having this system, Steve will be able to avoid the negative feeling he gets when he has to sign in with the head teacher. This system is appropriate for Steven as he gets to avoid the painful encounter with the head of the year.

### **Stakeholder 3: Tani Akinmoladun - 17 Year old student - Female**

This Stakeholder is a student who loves learning, reading and doing anything productive. Though she enjoys being in school, she doesn't believe registration time is very productive. She wishes there is a

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system that just easily and conveniently registers pupils' attendance. She believes this would help school become more productive as time is not wasted taking students attendance.

Therefore, This product would be extremely helpful for Tani as she could use this time to achieve something productive. Tani is planning to use the system as a way for her to avoid time waste that is caused by having to get registered in class, which she deemed as a time waste and unproductive. The system would allow her to skip registration altogether and do what she loves like reading. This is very appropriate for a student like Tani as the fact that she does have to be in a certain place at a certain time would allow her to spend her time more effectively and do some productive work as she has always wanted to do.

#### **Stakeholder4: Louise Kimuli - 40 Year old teacher - Female**

Louise Kimuli is a night school teacher. She mainly teaches adults. After interviewing Louise I found out that she dislikes the idea of having to take attendance of adults, she believes taking a register at a night school is quite childish for her students who are adults. Louise said that she already owns a registration system that takes the attendance of her students. She wishes there could be a system that unlock the door as soon as the student's attendance is recorded and verified this would make sure only her students have access to the classroom ,this is for security reasons. In addition to this she would like an immediate access to the database that updates as soon as attendance is recorded. She would also like an email sent to individual students confirming they have been registered.

#### ***What I believe my stakeholders would want from the system:***

- A system that is easy to use and set-up.
- A versatile system that can be used even in changing circumstances. Allowing the user to change the how Fonts ,Setup and layout of the attendance is more suitable to the user
- Reliability-a service they can trust.
- A system that's effective and has a purpose.

#### ***Initial Questionnaire:***

- The purpose of this questionnaire was first to attain stakeholders, but more importantly, learn about what existing attendance systems the stakeholders have come across, and whether they believe they provide a comprehensive and affordable solution which is compatible with their existing devices.
- Moreover, the questionnaire includes questions related to potential ideas for my project, in order to determine whether my ideas so far are valid, or whether my stakeholder believe they are of no benefit

Q1

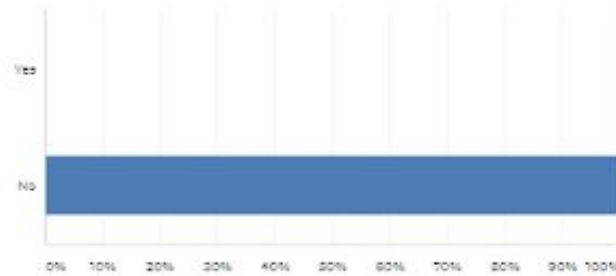


Customize

Save as ▼

Do you enjoy registration time at school ?

Answered: 5 Skipped: 0



ANSWER CHOICES ▼

RESPONSES ▼

▼ Yes

0.00%

0

▼ No

100.00%

5

TOTAL

5

Q2

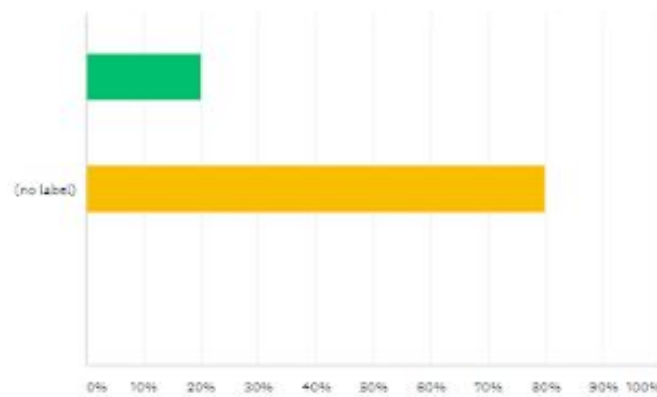


Customize

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How easy is the schools registration process?

Answered: 5 Skipped: 0



Very Easy



Easy



Not Bad



Difficult



Very difficult



VERY EASY



EASY



NOT BAD



DIFFICULT



VERY DIFFICULT



TOTAL



WEIGHTED AVERAGE

Q3



Save as ▾

## What are the disadvantage of registration time?

Answered: 5 Skipped: 0

RESPONSES (5)

WORD CLOUD

TAGS (0)



Sentiments: OFF



Apply to selected ▾

Filter by tag ▾

Search responses



Showing 5 responses



I dont like answering the register. Can be time consuming Paper register has to be done when teacher is not in which is even more consuming Students have different arrival times

10/9/2020 9:32 AM

[View respondent's answers](#)

[Add tags ▾](#)



It is time consuming in the morning and It is too strict regarding arrival times and students being late.

10/9/2020 9:31 AM

[View respondent's answers](#)

[Add tags ▾](#)



Wasted time, and I feel like I could be spending the time doing something productive and constructive rather than sitting in a room for 15 minutes every day just to get signed in.

10/9/2020 9:28 AM

[View respondent's answers](#)

[Add tags ▾](#)



Its tedious and long in addition the teacher could have problems with their hearing

10/9/2020 9:28 AM

[View respondent's answers](#)

[Add tags ▾](#)

?

ts: OFF



[Add tags ▾](#)

[Add tags ▾](#)

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## In your own word how would you like registration time to improve?

Answered: 5 Skipped: 0

RESPONSES (5) WORD CLOUD TAGS (0)

Sentiments: OFF

☐ Apply to selected Filter by tag

Search responses

Showing 5 responses

☐ Make it quicker.  
10/9/2020 9:32 AM [View respondent's answers](#) [Add tags](#)

☐ To be less strict about students being a few minutes late and to shorten the length of registration.  
10/9/2020 9:31 AM [View respondent's answers](#) [Add tags](#)

☐ I would like the registration to be easy, accessible and time efficient  
10/9/2020 9:28 AM [View respondent's answers](#) [Add tags](#)

☐ We could register ourselves in via our devices ; there could be an online register available to students  
10/9/2020 9:28 AM [View respondent's answers](#) [Add tags](#)

Q6

Save as

According to the product description at the top, do you think this idea would improve time spent during registration ?

Answered: 5 Skipped: 0

ANSWER CHOICES		RESPONSES	
Yes	Responses	100.00%	5
Maybe	Responses	0.00%	0
No	Responses	0.00%	0

what new changes can be made to the product(attendance system)?

Answered: 5   Skipped: 0

**RESPONSES (5)**   WORD CLOUD   TAGS (0)

☐ Apply to selected   Filter by tag   Search responses

Showing 5 responses

<input type="checkbox"/>	Add a location tracker, so when you enter the school it reminds you to sign in to your lessons. Or they could have a separate tablet where students mark their attendance once they walk into the class	10/9/2020 9:32 AM	<a href="#">View respondent's answers</a>	<a href="#">Add tags</a>
<input type="checkbox"/>	You could be notified to sign in when you enter the school so you don't forget.	10/9/2020 9:31 AM	<a href="#">View respondent's answers</a>	<a href="#">Add tags</a>
<input type="checkbox"/>	I'm not sure. Just be more time efficient	10/9/2020 9:28 AM	<a href="#">View respondent's answers</a>	<a href="#">Add tags</a>
<input type="checkbox"/>	What if a student forgets to tap in hiw would you accommodate for this or what if they lose their card	10/9/2020 9:28 AM	<a href="#">View respondent's answers</a>	<a href="#">Add tags</a>

### Section 3: How computational methods can solve the problem

In terms of implementing this computationally, all of iteration, selection and sequence will of course have their uses. For example, iteration will be used to continuously check the input from the card reader.

If no student is scanning their card, then the program will continue to loop, but if this status changes, this loop could be exited and an alert flag could be raised that would allow the following to be performed sequentially: match card to student profile; sign student in ; update screen: if pass code known, allow the alarm to be deactivated from screen (selection); send alert and image (via the internet) to the user with the app installed on their phone; depending on the users input from the app (which use selection statement such as the if statement), deactivate the alarm if necessary or



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call the police. This is of course a basic overview, for which more details will be expressed for in the design section.

## **Abstraction**

The method of abstraction allows you to remove unnecessary complications and information from the problem in order to tackle the main problem at its base level. In the case of my system, I will be able to largely ignore factors such as interface design and aesthetics for a large portion of the development time. This allows me to solve the problem much more efficiently as these issues are of lesser concern.

## **Algorithms**

The final stage in computational thinking is developing instructions to solve a problem or steps for a task. This would be the actual programming of my project. It is important to remember that this should be the final stage, and therefore before I begin programming the database , I will ensure that I have used computational thinking effectively so that the system will be created in the best and most efficient manner possible.

## **Decomposition**

Using decomposition allows you to break down a greater problem into smaller subtasks, which are then easier to manage. Each smaller subtask can be developed, tested and improved individually, before combining each part to reconstruct the larger problem. In the case of this system, I will need to create two different experiences, i.e. the student should not be presented with the same functionality as Mrs brown or the admin. Therefore, immediately the problem can be broken down into User functionality and Admin functionality. Each of these can also be subdivided further. The user accounts will need to be able to access student attendance . In contrast, the admin accounts need to be able to manage the data stored in the system as well as being able to see it.

## **Pattern Recognition**

Pattern recognition- By finding the patterns among small, decomposed problems, complex problems can be solved more easily and efficiently. The patterns are similarities or characteristics which some of the smaller problems share. For example, there may be a similarity in the information that will be saved about the student characteristics that would be registered. Alternatively, patterns could be found in data, rather than between decomposed problems. For example, I could find that depending on the interface I decide to use, the system might be inconvenient on an older interface system , and thus I may decide to simplify the appearance in order to create a more convenient experience for my user .

## Section 4: Existing system

### Current System

The current system that exists for student registration form can be deemed as old fashion. As it requires students to be in a certain place at a certain time, where the teacher either registers you on paper or on a computer. In a world where technology and innovation drives our society and education. The current system is not moving in the same direction as the world.



#### Weekly School Attendance Sheet

<School Name>		Room 138	
SCHOOL NAME		TEACHER	
Geometry 401		mm/dd/yyyy to mm/dd/yyyy	
COURSE / WORK		WEEK OF	

Student Name	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
	P	A	E	P	A	E	P	A	E	P	A	E	P	A	E	P	A	E
John Smith	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Another advantage of paper attendance records is that the form is customizable to the requirements of each School/teacher without the need for any technical overhaul. Need a new template? Just design one on a standard text editor and you're good to go.

### **Disadvantage of Paper attendance system**

**Lack of storage space** - Paper documents can take up a significant amount of space, and the quantity of paper will increase day by day. Furthermore, documents will typically need to be stored close to hand so that they can be accessed as quickly as possible.

**Editing problems** - If you want to make changes to a paper-based document, you will need to write all the content again. This will need to be repeated every time you want to make more corrections. You should make a copy of the original document to distinguish all the amendments that have been done.

**Limit communication and collaboration** - When working with paper documents, collaboration is extremely difficult. If several department heads need to create a common document, they must have multiple copies printed, make all the necessary amendments separately and then share their version with each other before starting working on the ultimate version. Digital document management systems allow users to collaborate in a way that is easily and fast. They can also track all the changes made.

**Environmental damage** - Using more paper is bad for the environment and won't help much to boost your company's green credentials. Many of today's employees want to work for businesses that prioritize sustainability and many consumers also prefer environmentally friendly alternatives so you do your best to attract and retain them.

**Document transportation** - Transporting documents in a paper-based system is quite complicated, slow and inefficient. With a digital document management system in place, you can simply add attachments to an email and send information instantly.

### **Features that could be implemented into my project from this:**

**-Cost:** When creating the product use less expensive equipment with high effectiveness for example instead of using a LCD display board this could be replaced with LED light as the LED light would be doing the same job as the LCD display board , in addition to that it is cheaper.

**Transfer of data:** When designing the web page, I hope to input a feature that allows teacher an authorized personnel to download student attendance as email to be transferred to other authorized personnel

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### **Features that will not be implemented and why:**

-Whereas the paper system is designed for teachers to record student attendance, my intention is create an attendance system that would allow student to be registered as soon as they walk through the door without teachers input. This would be helpful for teachers as they would not have to stop the lesson to record the students attendance as it's done automatically .Therefore, there is no need to use paper.

### ***iBeacons with Mobile App***

The combination of iBeacons and a student mobile app allows students to record their own attendance, producing accurate proof of presence. By tapping-in on the SEAtS mobile app, the app confirms attendance by linking to the iBeacon in the room. Unlike other attendance solutions.

- ✓ Easy to install. Each iBeacon has a battery life of 3 years, so the iBeacons can be positioned anywhere in a lecture hall without any wiring.
- ✓ Data Accuracy. Each iBeacon is optimized to locate only students who are in the room which avoids fraudulent recordings. Unlike alternative options, the iBeacon can guarantee student attendance by using Bluetooth technology to connect the iBeacon with a student's mobile app.
- ✓ Affordability. iBeacons are around €50 each which makes them an extremely affordable option.
- ✓ Easy to use. Once a student confirms attendance, the data is sent to the cloud which is easily accessible via a dashboard where faculty can generate reports and use workflows to receive alerts for any student who does not meet a predetermined attendance requirement like 75% attendance.
- ✓ Productivity – The efficiency of student app attendance recording increases teaching time immediately, whilst also removing administration time.

### ***Disadvantage***

- Lack of full automation. Students need to record their own attendance by opening the SEAtS app and tapping-in.

### ***Features that could be implemented into my project from this:***

- A proper graphical user interface will be developed with a feature to download data and ability to change how user would want the data presented, which will allow easy transfer of data and also user-friendly than changing these settings by going into the code.
- Make it possible to record attendance without a need to manually open the app

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### ***Features that I will not be implementing into my project from this :***

- Having a student mobile app will not be useful for my system as it could be show as time consuming. As student will have to logging in to the app to register their attendance and this could take time. My user/Stakeholder would like my system to be as automated as possible.

### ***Student Card Readers***

Student attendance recording has been dominated by smart card readers over the last 20 years. While expensive to install, card readers allow for students to swipe as they enter a lecture hall, while also doubling as a student ID card. It should be noted that many software companies plug into existing card readers, allowing institutions to take advantage of much-improved software without having to reinvest in new hardware.

- ✓ Productivity – With zero input from lecturers, class teaching time increases significantly. Negative effects on teaching time are also reduced with Late arrivals who can scan, with no interaction with the lecturer.
- ✓ Ease of use – The responsive nature of a beep after a student scans makes the card reader solution a very simple option.
- ✓ 3rd party uses – Student ID cards can also be used to access other resources on campus like printers, and library access.

### ***Disadvantage***

- Data Accuracy – Left unmonitored, ghost attendance can occur whereby a student scans multiple cards at a time.
- Affordability – Costs range from €200 up to €1500 depending on features including NFC, and Fingerprint scanning.
- Installation – Card Readers need to be physically wired to the network, which in turn can be unstable if and when there is a network issue.
- Queuing – While card readers have the capability to accept 60 scans a minute, in practice more than one card reader would be needed to avoid queuing which ties into affordability.

### ***Features that could be implemented into my project from this:***

- Develop a Easy use setting, for Teachers and authorized user to monitor the attendance that will use a different sensitivity setting to normal.
- 3rd party uses , This will allow student to access places such as the library ,printer e.t.c.

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### ***Features that will not be implemented and why:***

- Cost - The Raspberry pi used in this project is relatively expensive, whereas I want to keep the cost to a minimum for my stakeholders and by adding a touch screen and other features that this project includes, the costs soon add up.

### **Mobile Only – GPS**

GPS is a novel way of recording proof of presence by using GPS to confirm location but suffers from accuracy issues. GPS is accurate to between 5m and 20m outdoors, going up to 40m indoors. When taking into account classrooms on multiple floors, accuracy is further reduced. However, if you are only looking for a solution which confirms attendance on campus, rather than a specific room then this is a viable option.

- ✓ Automation – Once a student's phone is connected via GPS, attendance is recorded with no direct interaction needed by the student.
- ✓ Productivity – With zero input from lecturers, class teaching time increases significantly.
- ✓ Affordability – GPS relies on satellites in space to send signals to smart phones, 99% of which have GPS capability. Therefore there is zero hardware required.

### ***Disadvantage:***

- Data Accuracy – GPS does not work well indoors, so the resulting location is typically not accurate enough to be useful. This allows for a student to only be in a building where the classroom is to record attendance, making this a non-runner for accurate proof of presence.
- GPS Switched On – If a student forgets to toggle on their phone's GPS, their attendance will not be recorded. This means that the advantage of automated attendance recording can also be a disadvantage with inattentive students.

### ***Features that could be implemented into my project from this:***

- Productivity - The Mobile Only GPS allows zero input from Teachers while is exactly something I would like to implement in my system as most of my user wanted more teaching time.

### ***Features that will not be implemented and why:***

- GPS - this system is based on using GPS to track attendance, However it would not accurately register the student attendance which defeats the purpose of my system.
- I will not be adding a GPS as it will mean that I will have to add Bluetooth to my system making the cost increase.

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## Mobile Only – QR Code

QR Code stands for “Quick Response” code and is mobile phone readable. A QR code is generated before each class, and students use an app to scan the code to confirm proof of presence as they enter the room. In theory, this is an excellent idea.

- ✓ Affordability – No hardware is required.
- ✓ Easy to use – Students open their app and scan the QR code which records attendance

Disadvantage:

- Data Accuracy – The QR code can be easily copied and shared making it a poor option for accurate proof of presence.
- Manual Input – The lecturer must generate the code and either present the code on a screen or email the student the code. This can take anywhere between 5 and 10mins. Students who are late will need to request the code which will also affect teaching time

### *Features that could be implemented into my project from this:*

- Easy to use - One of the advantage of this system is that it is easy to use ,I would like to implement that idea of a user friendly system, My system will only require user to tap their student card on the card reader system.

### *Features that will not be implemented and why:*

- Using a QR code - Not only will this be time consuming for the teachers will have to generate this code also in practice, it is the most rigged solution simply because the QR code can be photographed, and shared to students who are not in the classroom. There is potential to use this solution in tandem with a second system which would increase accuracy but also cost.

### **What my stakeholders actually want from the system:**

- Analyze attendance data
- Identify absent & tardy students-Multi-layered access point e.g an Access point to open the door and another access point to actually register and another access point to leave. If a student leaves at a time they are supposed to be on site (label as a tardy student).
- Share attendance records with parents
- Generate daily/weekly/monthly attendance reports for students or staff to set attendance goals
- Send automatic notifications and alerts to parents
- Try out disciplinary interventions to improve attendance
- Assess what makes for good attendance
- Webpage design

- 
- A feature to unlock doors if the card is verified.

#### **List of potential features for my project:**

- Uses a card reader to verify student.
- Red light and sounds if student is not verified.
- When Student is taps their card on the card reader it automatically registers the name and class of that student and sent to a website on the authorized user's Device.
- Complete graphical user interface using a WebPages.

#### ***From the GUI, the user can:***

- Connect to a wireless network using Wi-Fi Protected Setup (WPS).
- Set/change fonts setting and other setting.
- See Student timetable and lesson.

#### ***Desirable features that may not be included due to time constraints:***

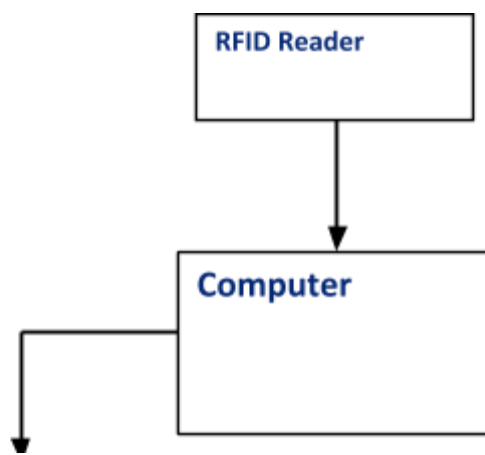
- Allowing Student to have access to other 3rd party such as Libraries and printers.
- Allow the user unlock doors/gates using the same card.

#### ***Limitations on proposed solution:***

- The Webpage will only work on Windows and IOS others such as Linux might not will not be able to run the WebPages.
- The hardware requires a constant power source to be run.

#### **Hardware and software requirements:**

- The user themselves will require any additional hardware such as a RFID tag to record students attendance (other than the hardware that I will use to make the system as will be seen in the design section).
- However, there are minimum hardware requirements to run the software which I will be using to write the programs for my project:





## Embedded System

Embedded system can be define as 'hardware embedded with software'. All the hardware components are controlled by a microcontroller with a special software. Traditionally, there are three phases on designing an embedded systems. First, decomposing and allocating the system into two part which are hardware and software. Second, separate hardware and software design team according to their specialization and lastly, integrating both hardware and software simultaneously. This separation of design task can prevent any mistakes in designing until integration phase happen

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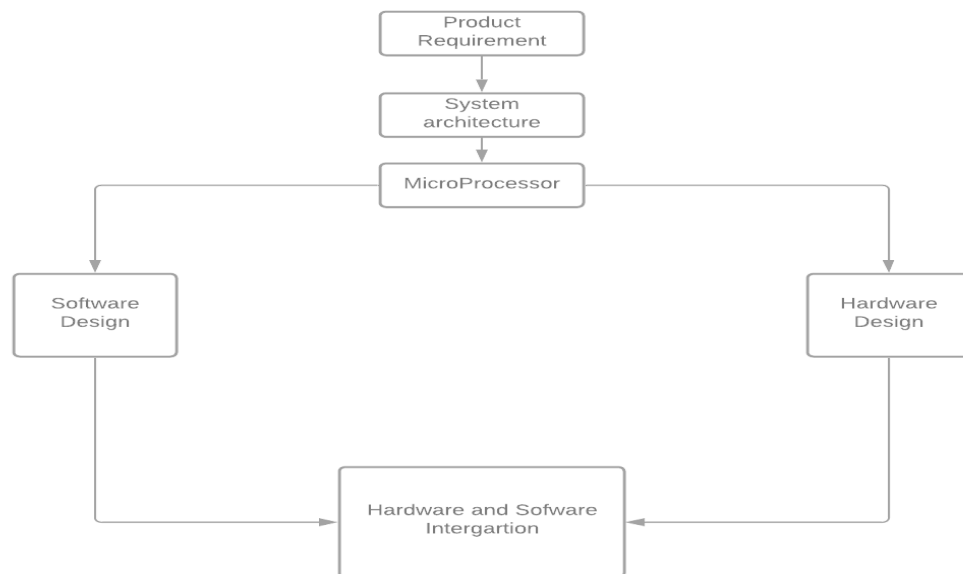
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## RFID Reader

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well. In simple RFID systems, the reader's pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even passwords.

RFID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation. However, for some applications, this is unnecessary and could be undesirable in battery-powered devices that need to conserve energy. Thus, it is possible to configure an RFID reader so that it sends the radio pulse only in response to an external event. For example, most electronic toll collection systems have the reader constantly powered up so that every passing car will be recorded. On the other hand, RFID scanners used in veterinarian's offices are frequently equipped with triggers and power up only when the trigger is pulled. Like the tag themselves, RFID readers come in many sizes.

## RFID Tag

The tag, also known as the transponder (derived from the terms transmitter and responder), holds the data that is transmitted to the reader when the tag is interrogated by the reader. The most common tags today consist of an Integrated Circuit with memory, essentially a microprocessor chip.

In my attendance system **Raspberry Pi 3** is controlling the whole the process of this project **RFID Reader** reads the **RFID card ID**, this data is received by Raspberry Pi through UART(Universal asynchronous receiver-transmitter, then Raspberry Pi validates the card and shows the results on LCD screen.

When a person put their RFID tag near over the RFID reader to scan, RFID reads tag's data and sends it to Raspberry Pi. Then Raspberry Pi reads the **Unique Identification Number** of that RFID tag and

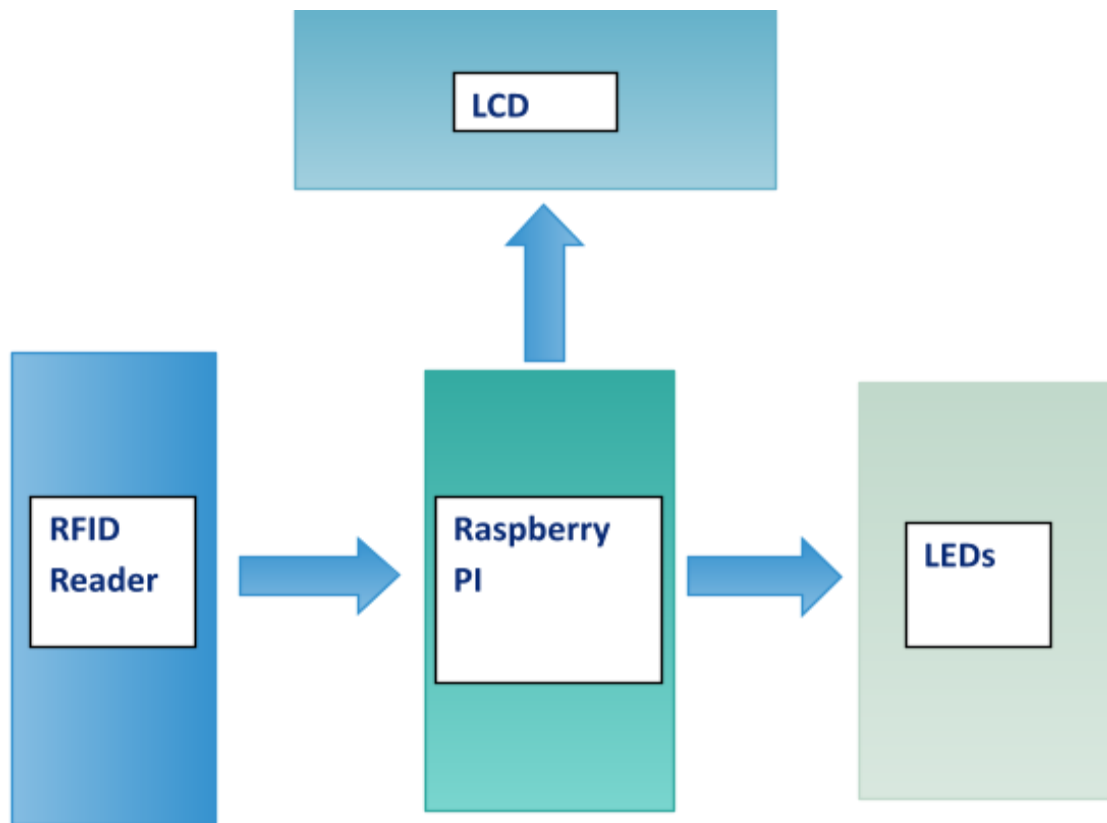
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then compares this data with predefined data or information. If data is matched with predefined data, then Raspberry Pi increments the attendance of the tag's person by one and if matched is not matched then microcontroller shows 'Invalid Card' message on LCD and buzzer is beeping continuously for some time.

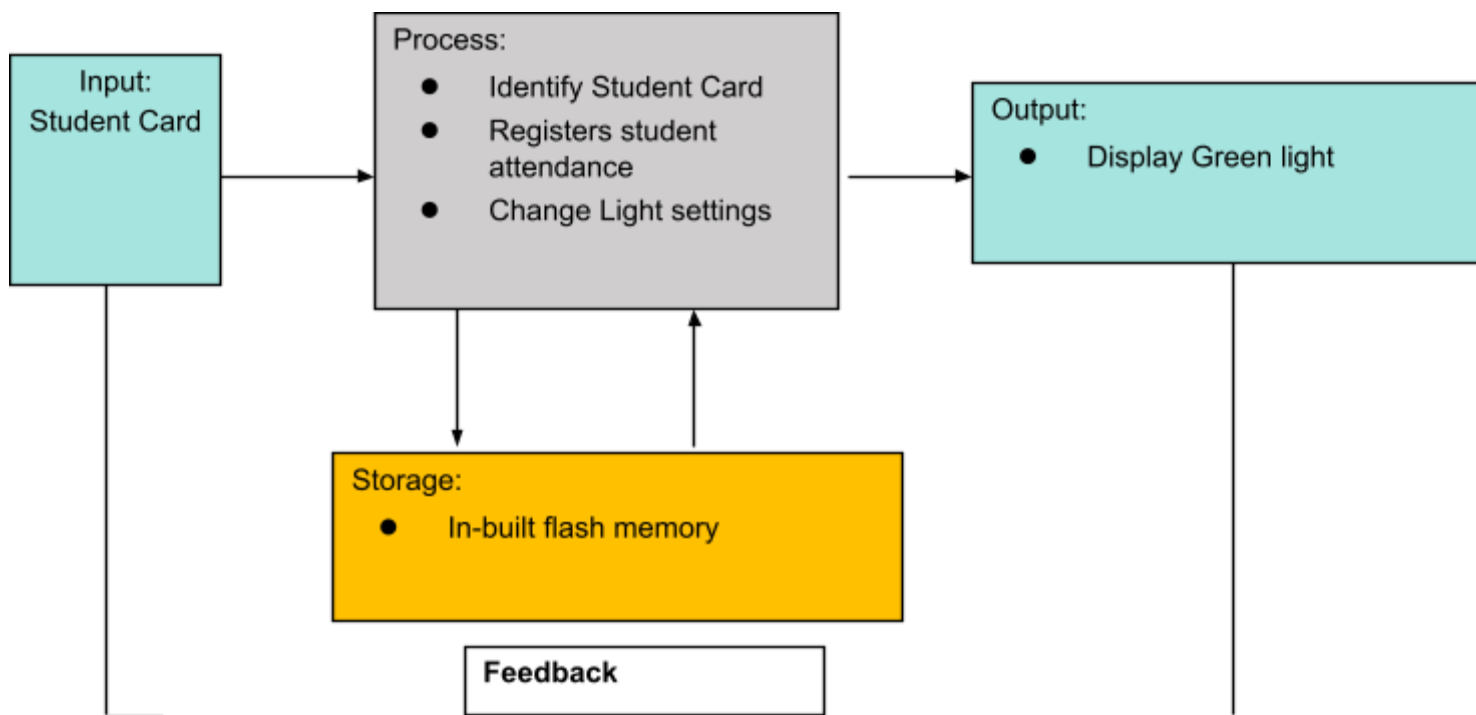
To compile code and upload this to the Raspberry Pi microcontrollers involved, I will be using the Raspberry Pi OS, which is free and open-source, and allows integration with the various libraries that I will need to write my code. The program is uploaded via a micro-USB cable connected to your PC and associated Raspberry Pi board. The minimum system requirements for the Raspberry Pi OS are not stated on the Raspberry Pi website, but it will only run on Microsoft Windows, Mac OS or Linux-based systems. However, it can run on ARM-based Linux systems, and it is indeed possible to run the IDE on as limited hardware requirements as the Raspberry Pi.

In terms of the programming language I will be using, I will be using a version of Python which has been designed to be compatible with Raspberry Pi. The associated libraries that I will be using will be listed in my design section.

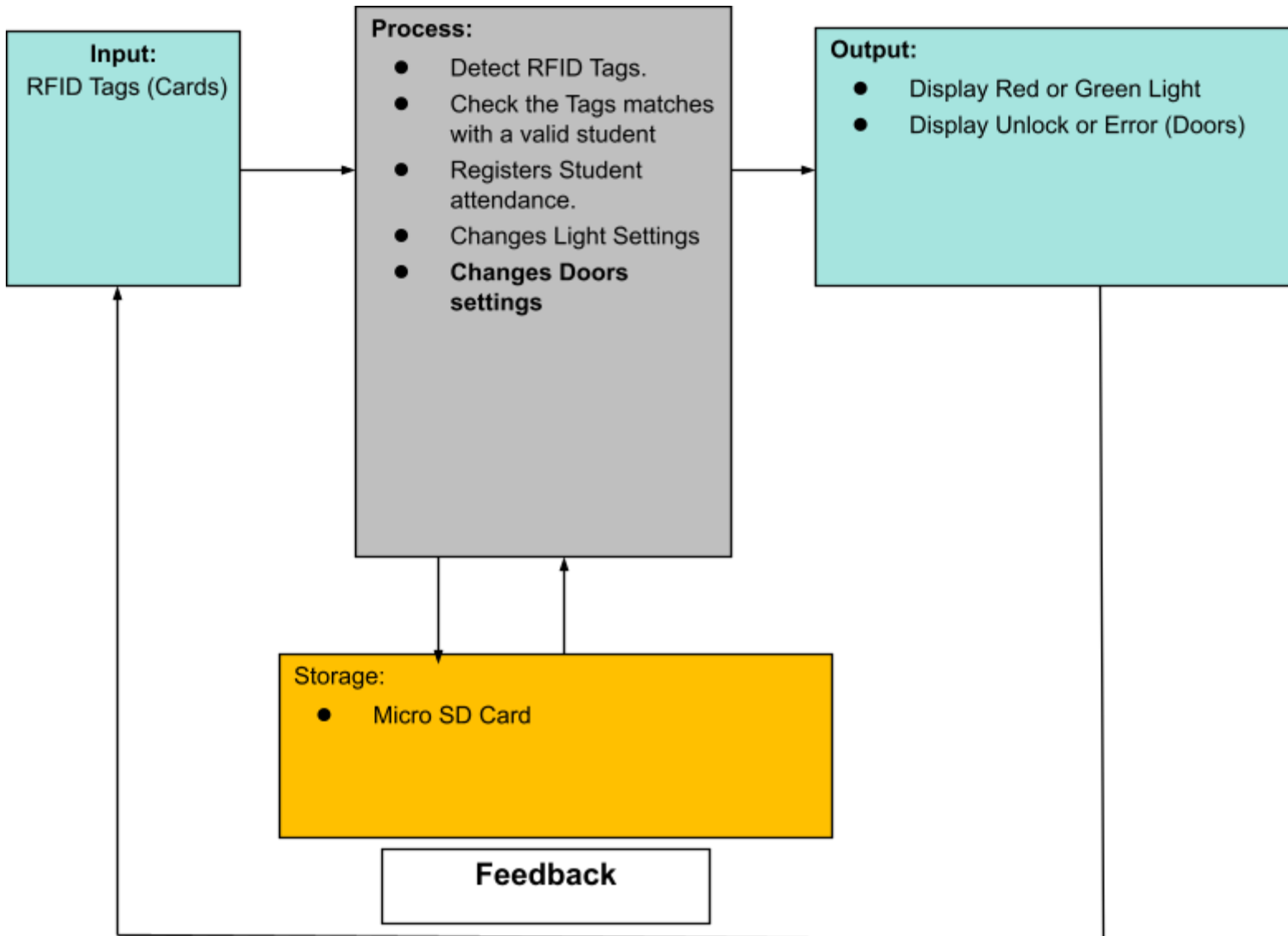
Additionally, my method of connecting an Android app to my solution is via a webpage, with my 'server' board acting as a web server. This means that I will require to write some HTML (potentially



#### IPOS for current system

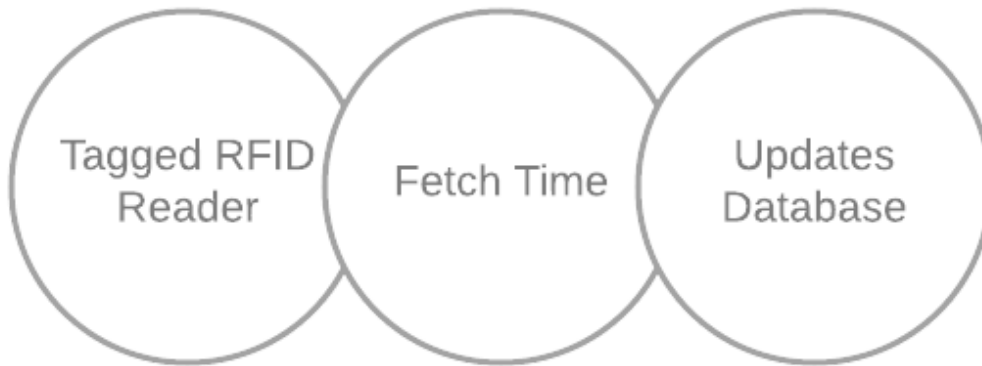


## IPOS for Proposed system

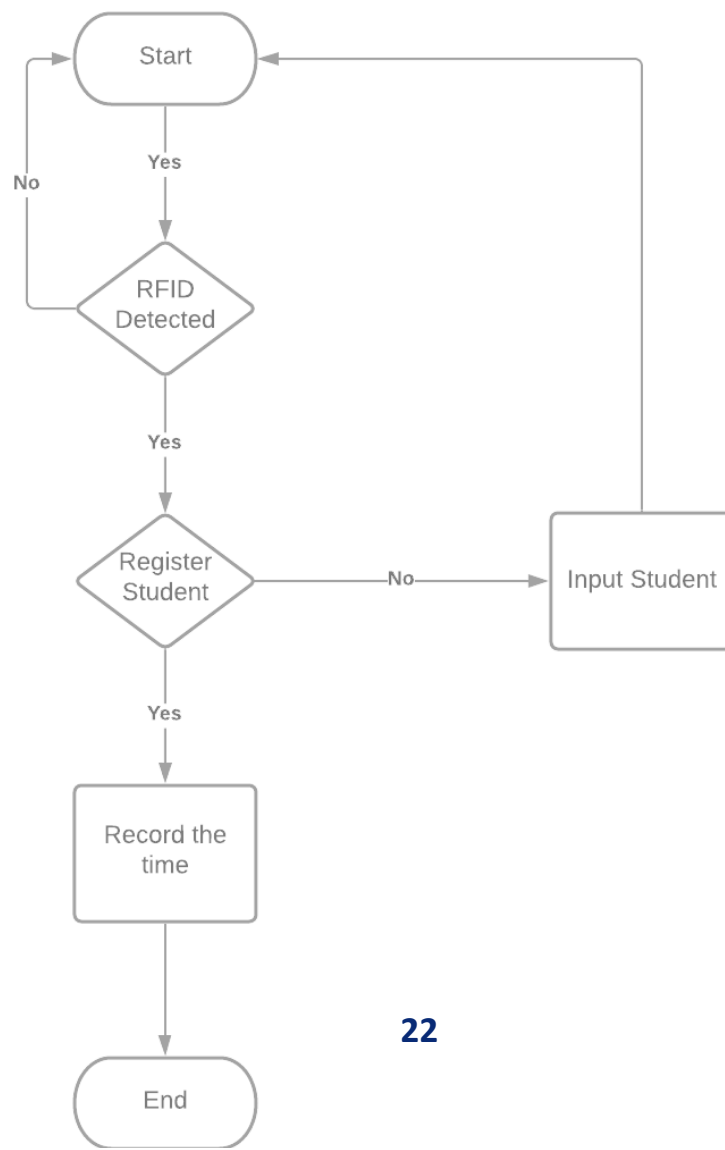


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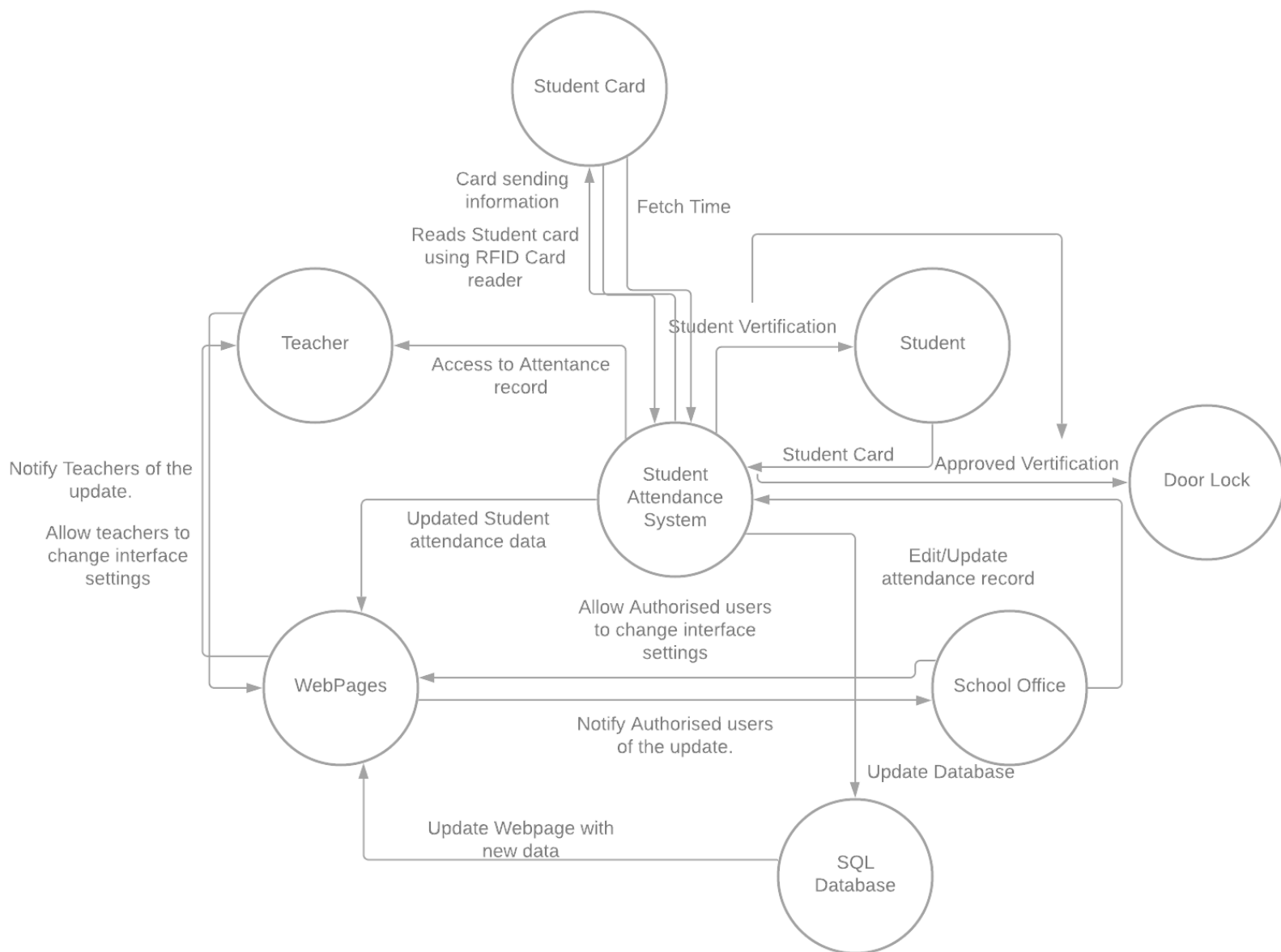
### Data Flow Diagram of Current System (Level 0)



### Flow Chart of Current System

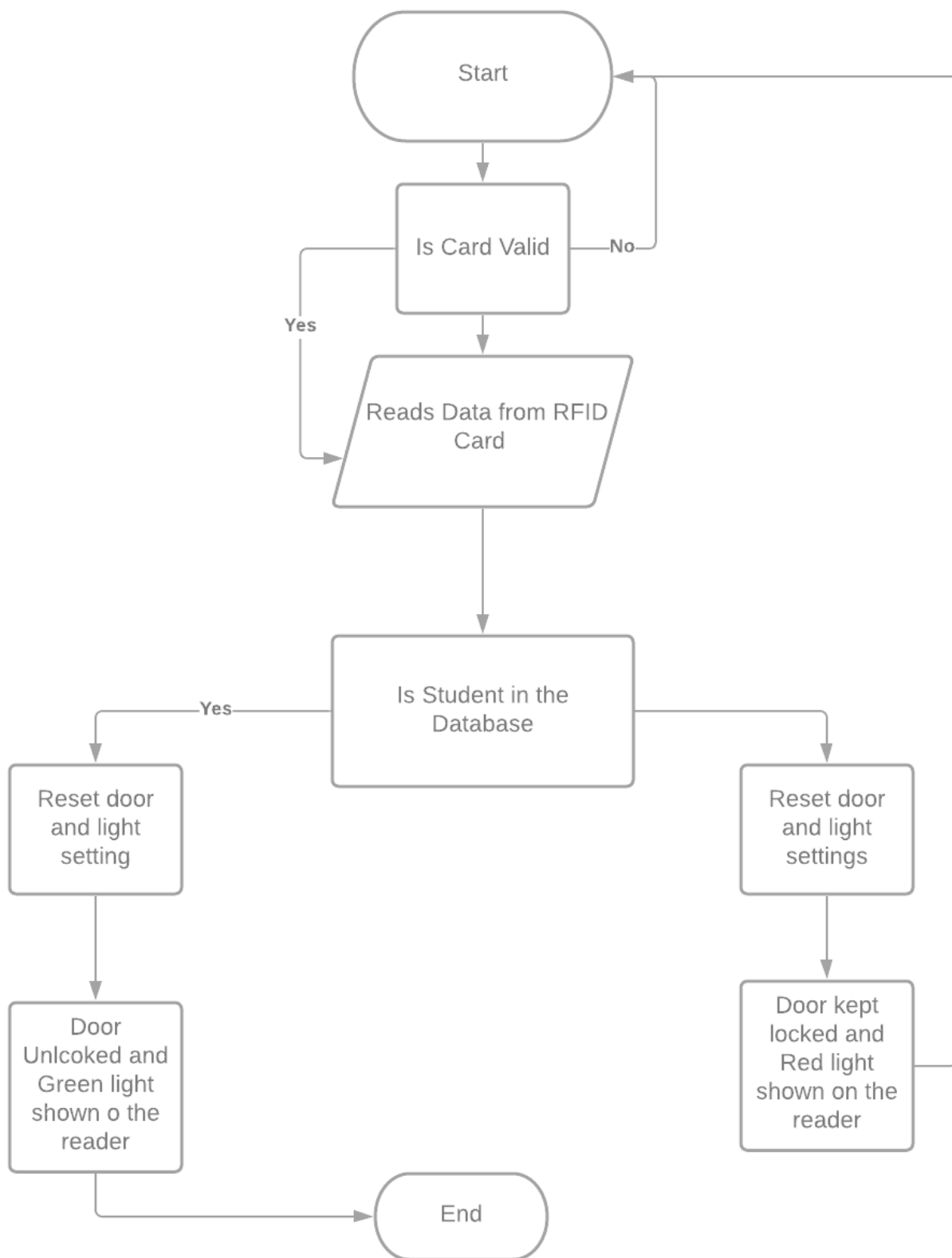


## Data Flow Diagram of Proposed Solution (Level 2)











Requirements	Success criteria
1.The system needs to be able to connect to a Wi-Fi network.	<ul style="list-style-type: none"> <li>• User interface should be created to allow the user to connect to a network easily.</li> <li>• Selecting the appropriate SSID and entering the correct password will connect the device to the network.</li> </ul>
2.The server needs to be able to deal with requests.	<ul style="list-style-type: none"> <li>• Server requests will be sent to the server.</li> <li>• Depending on the request the server will perform a particular function.</li> </ul>
3.The website needs to be able display WebPages.	<ul style="list-style-type: none"> <li>• A website will be created that allows HTML code to be executed.</li> </ul>
4.The webpage needs to be able to connect to the attendance system to display the latest student data taken.	<ul style="list-style-type: none"> <li>• The latest data will be sent to web server.</li> <li>• HTML will be generated by the web server.</li> <li>• The website will generate a web request to view the webpage, which is the HTML just generated.</li> <li>• Every time the website is restarted the device's current IP address will be sent to the web server to be stored.</li> </ul>
5.The attendance system needs to send an notification to the website when a student has been registered	<ul style="list-style-type: none"> <li>• The Reader detects the valid input (Valid Rfid Card).</li> <li>• When this happens, the reader fetches information that matches with the Card and send to the server.</li> <li>• The server then requests that the web server send the IP address of the user's device to it for communication.</li> </ul>
6.Provide a reader as means of allowing the user to input data into the attendance system.	<ul style="list-style-type: none"> <li>• Set-up RFID reader when the device is powered on.</li> <li>• Accept input when user taps the card. Depending on what is on the card, a different function is performed.</li> </ul>
7.Provide a reader as means of allowing the output of information from the attendance system to the student	<ul style="list-style-type: none"> <li>• A graphical user interface (GUI) will be created. It will allow data to be.</li> <li>• Allows users to see if card is accepted or declined</li> </ul>

8. Authorised Technician should be able to activate/deactivate the system with a password.	<ul style="list-style-type: none"> <li>When the system is not needed for certain reason, the website should display a 'pop-up' asking for a to deactivate the alarm.</li> <li>Upon first using the system, a form will be displayed that allows the Admin and Authorised Technician to set this password. (It can contain any characters from the 7-bit ASCII .</li> </ul>
9. There will be a 'home page' that allows the admin to access commonly desired functions e.g. change settings, and view certain children attendance	<ul style="list-style-type: none"> <li>A graphical home web page will be created based on boxes, including icons for settings, deactivating/activating alarm.</li> </ul>
10. The Technicians/admin should be able to change wireless network settings, change password and change the sensitivity of the alarm in 'settings' (found on the admin homepage).	<ul style="list-style-type: none"> <li>When the technician/user selects settings from the admin home web page, they will be taken to a scroll down menu where the user can select to either change the website setting, change the activation password or connect to a different wireless network.</li> </ul>
11. The time period of the attendance system can be changed.	<ul style="list-style-type: none"> <li>In this case, the time student should be in school to be registered as late. Admin should be able to set a certain time for students to be in school and after that time they should be labelled as late.</li> <li>A time period scale will be created ranging from 12am to 12pm . If the system is set to 6 am -7am, then student that get to school after this time will be registered as late.</li> </ul>
12. A list of available wireless networks will be displayed when the user chooses to change network settings in settings.	<ul style="list-style-type: none"> <li>The server will search for available wireless networks and display them to screen as a scroll-down list, ordered alphabetically. The first character of each SSID will be converted to its ASCII equivalent and then each network will be ordered from this (smallest to largest ASCII). They can be ordered using the quick-sort algorithm.</li> </ul>
13. The device should be able to store data to the micro SD card, allowing	<ul style="list-style-type: none"> <li>Using the Raspberry SD card library, files can be saved to a microSD card module.</li> </ul>

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settings and user to revisit previous data	
14. When the system is turned off and restarted, it 'remembers' settings by loading them into RAM from the microSD card.	<ul style="list-style-type: none"> <li>Using the Raspberry SD card library, files can be loaded from a microSD card module.</li> </ul>
15. The admin/authorised user will be able to view previous and recent student attendance data.	<ul style="list-style-type: none"> <li>Student attendance searched and then displayed on the screen. A search button will be included to allow authorised user to search through data (by date) as well as providing arrow buttons, to simply allow the user to scroll from one data to the next.</li> </ul>
16. A green light will turn on if the student is in registered, providing maximum security in schools.	<ul style="list-style-type: none"> <li>Change in the RFID setting that will turn the light green or red in response to the input.</li> <li>By allowing only Registered student in to the school provides a sense of security in the school.</li> </ul>
17. Allow the server to have access to the data.	<ul style="list-style-type: none"> <li>The student data will be sent to the server from the sensor board's SD card module</li> </ul>
18. The door /gate will be unlocked if student verified	<ul style="list-style-type: none"> <li>When the data has been verified the settings for the door will change allowing it to open .</li> </ul>

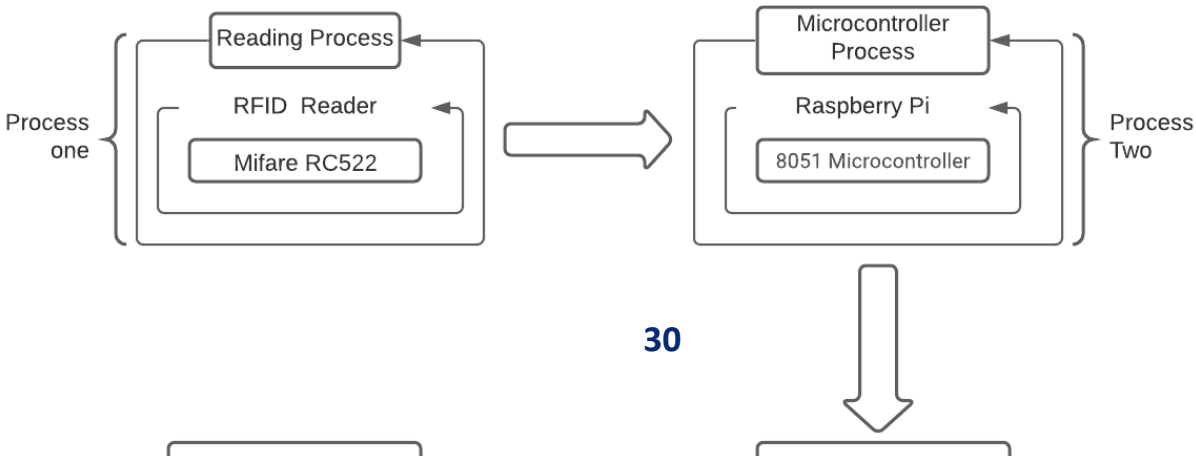
19. User that have requested the admin access need to wait for a response.	<ul style="list-style-type: none"> <li>Once a user has sent a request, it will keep looping until it gets a response, and once it gets a response, will perform what is necessary accordingly. An error will be raised however if the response is not dealt with within one day.</li> </ul>
20. A basic user interface will be provided for the teachers.	<ul style="list-style-type: none"> <li>The interface will include a refresh button to reload the webpage (though it will automatically refresh upon reopening of the app). The image and</li> </ul>

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	date will be the only other data displayed in the app.
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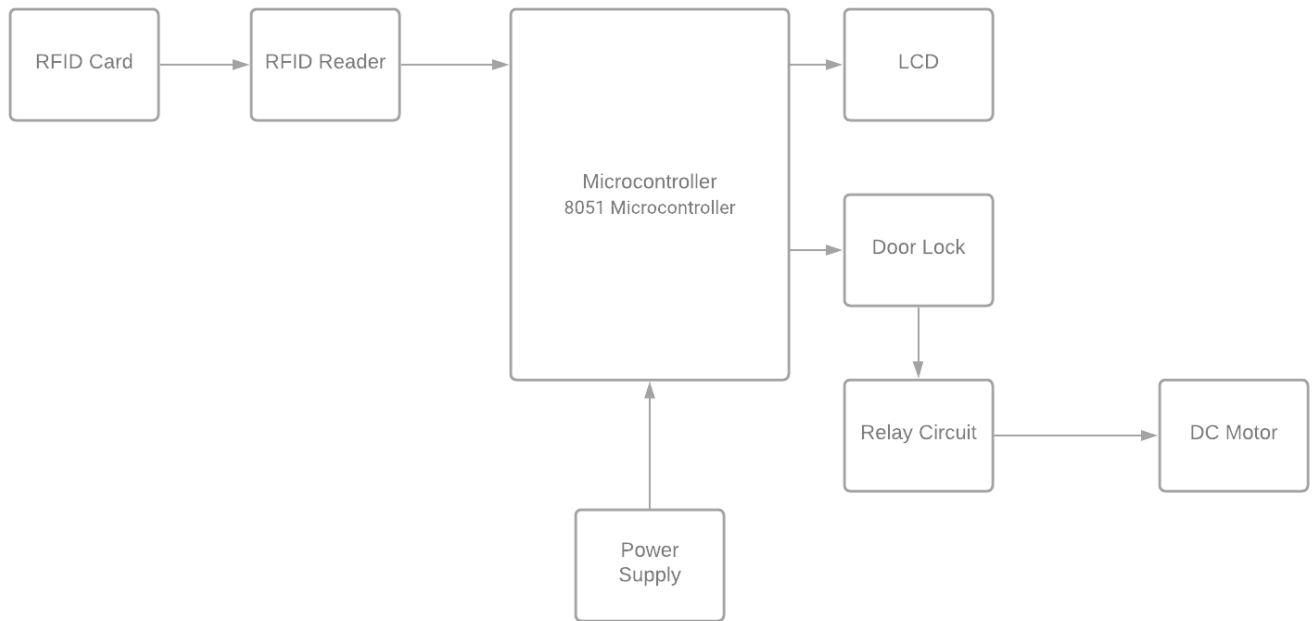
Design

A top-down overview of the project:

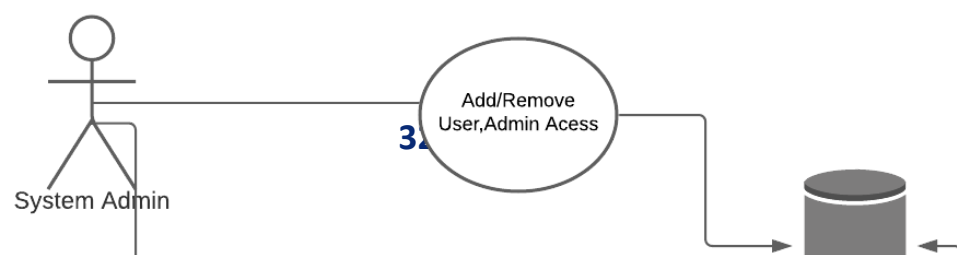


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**Hardware:**



## Software:





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## Project Scheduling:

The Gantt diagram below gives an estimated project timeline, showing when sections of the project, including, analysis, design, development and evaluation will take place, and if they overlap at all.

Gantt chart programming project

Bolarinwa Rabiu | January 30, 2021

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Analysis								
Analysis								

- 
- The design and development sections have such a large overlap because once something has been implemented in code, parts of the design may have to be changed as modifications are made.
  - The Analysis and Design section also have a huge overlap this is because most of the design is based on the analysis I have done on my stakeholders
  - Development and Testing stage also has an overlap this is because I will be testing my program as I develop my system.

#### Design of Hardware

I will be using Raspberry Pi as a base for my system. This is because, being open source with a large backed community, I believe Raspberry Pi allows me to be as creative and unique as possible as I can choose the hardware that I want to use with my solution and only use the hardware that I need. Also, by isolating the hardware as its own, separate entity (rather than running a software solution on an operating system such as Windows for example), this limits the number of security vulnerabilities to the system.