

## **Submission Two: Software Requirements Specification (SRS) Document**

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### **Work BreakDown**

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### **Strategy Employed**

The strategy employed was decided after a group meeting. The idea was to have one person work on a single section of the document. However, that did not align with the number of persons in the group so the section deemed most difficult: Section 3 of the SRS was delegated two individuals instead of one.

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# **1. Introduction**

## **1.1 Purpose**

To replace the unreliable paper based system, which is currently in operation with a more reliable and modern system.

The scope of the project is as follows:

- To produce a database system which can enter track the working hours of employees as well as location / use time of various equipment and machinery.
- Employees will be able to access this information to aid in providing accountability for personnel.

## **1.2 Intended Audience and Reading Suggestions**

The document is intended for The Manager of the Human Resources Department and additional staff of John Fernandes Ltd, project managers, developers, as well as testers.

This SRS is organized as follows:

- Introduction - geared toward a general audience as it outlines what the system entails and strives to solve concisely.
- Overall Description - outlines the product functions, perspectives, user classes, etc. Intended for the client and project team.
- System Features - details what the system is expected to offer, intended for the project team and the client.
- Other Non-functional Requirements - discusses the parameters the system is expected to conform to as well as some expectations of how the system will perform, intended for the project team as well as the client.

## **2. Overall Description**

### **2.1 Product Perspective**

The relational database management system that is being specified in this document is intended to replace an existing paper-based method of record keeping and add additional layers of functionality through the utilization of new technology.

### **2.2 Product Functions**

The major functions of the relational database management system are as follows:

- To keep a record of all company equipment and their condition.
- To calculate and record active work hours of all company employees.
- To identify employees by their unique ID's.

### **2.3 User Classes and Characteristics**

Since the system is fully automated functions such as tracking equipment and employee logs, the recording of active work hours for both the equipment and the employees have no need for user intervention, as such the system will only have two type of user with privileges such as:

- **User**
  - View personal information recorded by the system.
- **Administrator**
  - Add and delete database logs.
  - View and edit database logs.
  - Print logs associated with users or equipment.
  - Perform queries on the database.

### **2.4 Design and Implementation Constraints**

- The system Will be dependent on optical recognition to create logs of employees and equipment.
- MS SQL server will be used as the sql engine to conduct queries.

- Employees would not be able to view or manipulate logs only administrators
- Camera system must be linked to the database and tested to ensure the accuracy of logs.
- RFID tags must be placed on each piece of equipment and all employees.

## **2.5 Assumptions and Dependencies**

- The database will integrate with cameras that are already installed into the infrastructure of the environment.
- Storage infrastructure is placed in clear view of the cameras.
- The database system will be localized and independent of any other system in place.

## 3. System Features

### 3.1 Log and record equipment condition (Record equipment usage and condition.)

#### 3.1.1 Description and Priority

The system utilizes security cameras and RFID tags to record equipment condition before and after use. This is a high priority feature as it directly addresses a key problem the system has been created to alleviate/automate.

#### 3.1.2 Stimulus/Response Sequences

- 1) Equipment: Has RFID tag attached.
- 2) System: Uses cameras and location positioning to validate whether the equipment is in use/ has been moved.
- 3) System: Records equipment state via security cameras.
- 4) Equipment: Is put into use by an employee.
- 5) System: Records the amount of time the equipment has been in use via security cameras.
- 6) Equipment: Returned to designated storage area.
- 7) System: Records equipment state (via security cameras) and compares it with its initial state; stores images in the database.
- 8) System: Algorithm that scans and records damages/defects incurred then populates the database with the associated deliberation.

#### 3.1.3 Functional Requirements

The functional requirements that must be in place for this feature to be operational are as follows:

- Signal transmission functionality must be online and the RFID tags' serial numbers must be appropriately named.
- The security cameras must be recording with the correct time format.
- The algorithm that scans the images must consult the correct source images in order to correctly evaluate the equipment state.

## **3.2 Calculate active work hours (Tabulate employees' active work hours)**

### **3.2.1 Description and Priority**

The system utilizes security cameras, rfid tags and proprietary algorithms to calculate and record employees' active work hours. This is a high priority feature as it directly addresses a key problem the system is intended to alleviate.

### **3.2.2 Stimulus/Response Sequences**

The stimulus/response sequences for this feature are as follow:

- 1) Employee : Possesses RFID-enabled ID card.
- 2) System: Identifies position using camera and coordinates via RFID positioning.
- 3) System: Algorithm calculates movement by comparing current and previous positions which are then cross referenced with stipulated work hours (to validate whether it is during a break or work hours).
- 4) System: Updates employee time sheet accordingly in the database.

### **3.2.3 Functional Requirements**

The functional requirements that must be in place for this feature to be operational are as follows:

- 1) Signal transmission and receival functionality must be online and the RFID tags' serial numbers must be appropriately named.
- 1) The security cameras must be recording using the correct time format.
- 2) The algorithm that performs the calculation must be programmed to distinguish between work and break hours during the work day.

## **3.3 User Login (Enables database access)**

### **3.3.1 Description and Priority**

The system provides a means of accessing the database to view both personal and general information depending on the user class, i.e. user and administrator , this is also a high priority feature as it serves as a record of employees' active work hours and equipment misuse/accountability. Furthermore it provides the interface for data analytics and statistics.

### **3.3.2 Stimulus/Response Sequences**

The stimulus/response sequences for this feature are as follow:



- 1) System: The web app displays a user interface for inputting employee's credentials
- 2) User: Accesses website/webapp and inputs their credentials.
- 3) System: Validates what is entered and if correct, grants access to the database with the associated user privilege by displaying the default user interface (dependent on user privilege) of the web app e.g. user or administrator.
- 4) System: Else if an incorrect password is entered the system denies access and re-prompts the user to enter their password.

### 3.3.3 Functional Requirements

The functional requirements that must be in place for this feature to be operational are as follows:

- 1) The webpage/web app sign in page must be configured to grant/deny access given the right conditions.
- 2) The code that handles authorization should be configured to only provide the requisite information based on the user class, e.g. a user is only able to access his/her personal information within the database.

## 3.4 Database Query Operations (Provides the ability to perform database queries)

### 3.4.1 Description and Priority

The administrator will be able to perform a wide variety of system queries on the automated data that is taken from the camera and RFID tag. This is a high priority feature as it allows for any data that is stored to be manipulated for any intended purpose such as accountability or investigations.

### 3.4.2 Stimulus/Response Sequences

The stimulus/response sequences for this feature are as follow:

- 1) User: Accesses website/webapp and inputs their credentials.
- 2) User: Is verified to be an administrator.
- 3) Query operations such as selecting, updating or viewing are enabled and performed.

### 3.4.3 Functional Requirements

The functional requirements that must be in place for this feature to be operational are as follows:

- 1) The webpage/web app sign in page must be configured to grant/deny access given the right conditions.
- 2) The database to handle queries and manipulation.
- 3) Code that verifies admin login and gives access to the database for manipulation.

## 3.5 Unique Identifier Assignment (assigns a UID to all employees and users)

### 3.5.1 Description and Priority

The system automatically creates and assigns a randomly generated unique identifier to all registered users of the system, this includes both employees of the company and administrators of the system. This is a high priority feature as it serves as the basis for other features and also aids the system in compartmentalizing and individualizing users.

### 3.5.2 Stimulus/Response Sequences

The stimulus/response sequences for this feature are as follows:

- 1) User: Receives an identification card from the company that contains an rfid chip.
- 2) System: Transceiver recognizes a new serial number and checks with the HR department to evaluate if a new employee has been hired/a new ID card has been supplied.
- 3) System: Upon the result of the evaluation, the system generates and assigns a unique string of characters to that serial number in the database.
- 4) System: Reconsults the HR department and populates all the requisite fields pertinent to that employee in the database (name, contact number, etc.).

### 3.5.3 Functional Requirements

The functional requirements that must be in place for this feature to be operational are as follows:

- 1) Signal transmission and receival functionality must be online.
- 2) The algorithm must check for duplicate entries when creating random strings for the UID.

- 3) In the event that an employee misplaces their ID and requests a new one, the algorithm must delete the old records and create new ones.

**Figure 1.2** *Use Case Specification (Login)*

Use case:	Log In	
Actors:	Employees, Admin	
Cross Reference:	Fig 1.1	
Description	The user accesses the login screen on their device and enters their credentials. The system then verifies the credentials and identifies the user.	
Steps Specification		
General	Actor/System communication	System Response
1. Begins when the user accesses the login screen.		
	2. The user enters their credentials into the specified fields.	
		3. The system verifies the credentials and identifies the user as an Admin or Employee.

**Figure 1.3** *Use Case Specification (View Database)*

Use case:	View Database	
Actors:	Employees, Admin	
Cross Reference:	Fig 1.1	
Description	After the system has identified the user, it displays personal information if the user is an employee or displays the entire database if the user is an admin.	
Steps Specification		
General	Actor/System communication	System Response
1. After identifying the user, the system displays information pertinent to their position.		
		2. The system provides the personal records of an individual if they are identified as an employee.
		3. The system provides all records if they are identified as an administrator.

**Figure 1.4** *Use Case Specification (Perform Queries)*

<b>Use case:</b>	Perform Queries
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Actors:	Admin	
Cross Reference:	Fig 1.1	
Description	Upon verifying that the user is an admin, the system then provides the user with various tools to aid in creating queries.	
Steps Specification		
General	Actor/System communication	System Response
1. After identifying the user, the system displays all records within the database.		
	2. The admin is presented with an interface that allows them to perform various queries depending on their needs.	
		3. The system iterates the database and executes the query to create an output.

## **4. Other Nonfunctional Requirements**

### **4.1 Performance Requirements**

- a. The response rate of the RFID tags shall, on average, transmit signals to the readers once per 3 to 5 seconds (CircuitsToday, 2020). A delay in system transmission should never exceed 10 seconds. Since the purpose of these tags is to keep track of movement of work equipment, allowing for a longer delay would effectively provide an open window for malicious actions. In a worse case scenario, theft of equipment could occur.
- b. The database's response time for queries with small returns (no more than 20 records) should take no more than 1s.
- c. The database's response time for larger query returns, such as generating reports, should not exceed 30s per 1000 records.
- d. The system's software application should not experience lags or delays exceeding 2s at a particular time.

### **4.2 Safety Requirements**

- a. Users shall be made aware of the slightly radioactive nature of RFID technology. RFID technology emits small amounts of radiation (RFIDCard, 2022). This is often not harmful but employees should be made aware since, regardless of severity, it does increase the average level of radiation that a person is exposed to in their daily life.

### **4.3 Security Requirements**

- a. The system shall only allow a user to create an account only if they provide valid employee credentials. Ensuring that the system correctly validates that a potential user is indeed a member of the organization is critical to prevent random users accessing the system.
- b. The system shall encrypt transmission data to prevent equipment information from leaking to bystanders who pick up or tamper into the radio waves emitted by the RFID tags (Stazzone, 2022).
- c. The system shall encrypt all data of critical importance that is stored in the database.
- d. The system shall require that users create strong and secure passwords for accessing their accounts.
- e. The system shall require users to provide an email address to facilitate password recovery in events of forgetfulness.

#### **4.4 Software Quality Attributes**

- a. The software should be designed to be scalable to adapt to the organization's growth and expansion.
- b. The system interface should be easily understandable and usable to allow employees to easily utilize desired functionality. This attribute is of importance due to the employee's reluctance for the creation of the system.
- c. The software should be easily maintainable and understandable to allow for long term use that caters for additional teams that are contracted to work on the system
- d. Software should have high levels of availability due to its nature of existing in a real time tracking system.
- e. Database should be readily available for the duration of work hours.

#### **4.5 Business Rules**

- a. All employees that seek to utilize equipment must utilize the system in order to book usage time for said equipment.
- b. Only administrative users, such as those in managerial positions, will be allowed to view usage logs for each employee.
- c. Employees that do not return equipment should be marked as offenders and shall not be allowed access to the system until previous equipment is retrieved or the matter is deemed to be resolved by another personnel with administrative rights.



## References

CircuitsToday. (2020). *RFID Reader and Tag – Ultimate Guide on RFID Module*.  
<https://www.circuitstoday.com/rfid-reader-tag>

RFIDCard. (2022). *What is RFID Technology and How Does It Work*.  
<https://www.rfidcard.com/what-is-rfid-technology/>

Stazzone, S. (2022, September 26). Using RFID for Inventory Management: Pros and Cons.  
*Camcode*. <https://www.camcode.com/blog/using-rfid-for-inventory-management-pros-and-cons/>