IoT Enabled Smart Inventory Requirements Document

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Group 110

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Change Log

Date	Author	Summary of change	Section pointer
January 15, 2020	A.S.	Weight requirement scaled down to 780G	Specification
February 9, 2020	W.G.	Cleaned and rephrased Requirements Specification document.	
April 4, 2020.	W.G.	Added section numbering. Added names for all tables. Rephrased the paragraphs for section 4.0 and 5.0.	

April 6, 2020.	W.G.	Removed COVID-19 as a constraint – not within scope of document.	

1.0 Introduction

TechPOS is a startup company based in Vancouver focusing on bridging the gap between emerging technologies and retail businesses. By using Internet of Things (IoT) and cloud technologies, TechPOS aims to deliver an intuitive and comprehensive store management system that allows small to medium business owners to stay competitive with online stores and big box retailers.

The rapidly growing cannabis industry is TechPOS' largest clientele and the main issues in inventory management are the volume of products and the way transactions are made. Cannabis goods are sold and kept by weight or per-package, usually by small amounts such as a few grams or ounces. The project, IoT Enabled Smart Inventory, seeks to deliver a modern solution to inventory management by tracking product weight and sending inventory data to the cloud. By simplifying this process, store owners and their employees will be able to manage inventory quicker and easier, with live data accessible through the cloud.

2.0 Project Goal

The overall goal for this project is to design a proof-of-concept for a novel and inexpensive inventory management system using IoT technology. The attributes that make the IoT Enabled Smart Inventory unique would be its simplicity, accuracy, and low cost. For retailers that hold large volumes of goods, manual inventory counts are mandatory to ensure accurate reports of inventory, despite having a software system in place. By implementing an IoT Enabled Smart Inventory, the inventory counts are updated automatically and accessible in the cloud; decreasing the frequency and manpower required for manual inventory counts. The simplicity of the system would attract existing and potential clients for its easy to use interface, making the transition to a new system go smoothly. In addition, its low cost would provide even more of an incentive for the adoption of the system.

3.0 Domain

The IoT Enabled Smart Inventory uses IoT and cloud technologies at its core. It uses an IoT infrastructure to gather data and send it to the cloud, where the data can be viewed by authorized users. Although the main application of the product is for business purposes, it can

also be used by consumers so the product's domain can be generalized to the IoT hardware and services sector.

4.0 Specifications

Project specifications identify key considerations and features that must be met upon a successful completion of a project. The technical requirements, constraints, and goals (RCGs) for this project were obtained and clarified through client meetings and was presented for review during the project proposal to ensure it met the client's needs. Our team has defined the RCGs into technical specifications and grouped them into functional or non-functional specifications which are explained in detail in Table 2 and Table 3.

Functional Specifications	Functional specifications are any specifications that pertain to the functionality of the product, ranging from power consumption, weight limits, and communications. Some specifications have no quantifiable constraints as the client has not specified values so in our design, we opted to meet the requirements first and optimize at a later stage.
Non-functional Specifications	Non-functional specifications are specifications that do not contribute to the overall functionality of the system; i.e. the system will operate without meeting these specifications, however, they are equally as important as the functionality since it will make the system attractive for further development.

Table 1: Definition of Functional and Non-Functional Specifications.

Specification	Requirement	Goals
Power	End and edge devices must continuously operate.	End and edge devices will to be plugged into a wall socket so no charging is required.
Weight Sensor	The sensor must be able to handle a limit of at least 750 grams.	Client is projecting that the end devices will need to handle at least 750 grams of product weight.
	Must have at least +/- 1 gram of sensitivity.	Client is also projecting that the per-product weight will be in the scale of grams so a high sensitivity is required to calculate inventory data.
End Device	Send and receive data through a low-bandwidth communication protocol to the edge device.	End device should consume as little power as possible so low-bandwidth, low-power communication is required.
Edge Device	Send and receive data through a low-bandwidth communication protocol to the end device.	Edge device should be capable of sending and receiving data with the end device.
	Send data to the cloud via high-bandwidth communication protocol.	Edge device should be capable of uploading data to the cloud.
Cloud Computing	Aggregate data onto Microsoft Azure.	Client currently uses Microsoft Azure for their cloud services so our design will also use Microsoft Azure for scalability and integration purposes.
Data Transfer	Communications between end and edge device, as well as the cloud, must be wireless.	Wired communications will create messy working spaces and may become dangerous when the system is scaled for many devices. Wireless communications is also aesthetically cleaner.

Table 2: Functional Specifications, Requirements, Goals, and their descriptions.

Specification	Requirement	Goals
Cost	Final product cost must be as inexpensive as possible.	Final product cost of less than $100 CAD per edge device and $50 per end device.
Aesthetic	Simple and minimal design.	Clean outward appearance of devices to end user; one LED and one button on end device for configuration.
Ease of Use	End user must be able to configure inventory settings.	Implement configuration settings as minimal as possible for ease of use.
Scalability	System should be designed to be scalable for future development and production.	Clean coding practices and proper documentation to make project hand-off run smoothly.
Robust Data Handling	Able to handle interruptions in data handling and processing.	Ensure data is cached somewhere in the end or edge devices so that when it resumes operation, no data is lost.

Table 3: Non-functional Specifications, Requirements, Goals, and their descriptions.

5.0 Constraints

In general, project constraints are defined to be limitations or restrictions for the progression of a project that need to be considered for its successful completion. For this project, the constraints we have identified are listed below in Table 4.

Constraint	Description	Result
Power	End and edge devices must be in continuous operation.	Our devices will be designed to be plugged into the wall socket to ensure continuous operation.
Cost	Capstone budget of $650 CAD.	Limited in our prototyping costs; may require funds from client or out of pocket in case of cost overrun.
Time	Project timeline spans only 8 months with each member engaged in different courses and outside projects.	Time management limits the scope for the project with each team member involved in different courses, projects, and activities. The goal of the project is for a product prototype and further research and development will be considered outside of the scope.

Table 4: Description and result of project constraints.