# Report

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## Revised Proposal

**IT Project Proposal: Inventory management system**



Submission date: December 3, 2024

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**Project Introduction**

The **Digital Inventory Management System** aims to streamline and enhance the real-time management of inventory for small to medium-sized businesses (SMBs). Designed with user-friendly interfaces and powerful backend systems, this platform addresses inefficiencies in inventory tracking, enabling businesses to avoid stockouts or overstocking, reduce operational costs, and improve decision-making.

The system will allow users to monitor stock levels, manage orders, and generate insightful reports, making it a comprehensive solution for inventory management challenges in retail, e-commerce, manufacturing, and logistics industries.

**Project objectives/Goal(s):**

**Objectives:**

* Develop an **automated inventory management system** to ensure accurate, real-time stock tracking.
* **Minimize manual errors** and save time in inventory checks by providing a digital alternative.
* Enhance operational efficiency with tools for stock alerts, order management, and supplier coordination.

**Problem Solved:**

The platform replaces outdated manual or semi-automated inventory systems, reducing human errors and inefficiencies. This ensures:

* Reduced losses from stock shortages or surplus inventory.
* Optimized storage and improved space utilization.
* Streamlined order fulfillment and delivery processes.

**Beneficiaries:**

* SMBs in retail, manufacturing, logistics, and e-commerce.
* Employees and managers responsible for inventory, orders, and supplier relationships.

**Project Target Customers**

* Retail businesses: Brick-and-mortar stores, online shops.
* E-commerce companies: Managing stock for virtual marketplaces.
* Warehousing and logistics firms: Ensuring accurate stock distribution.
* Manufacturing units: Tracking raw materials and production cycles.
* Suppliers and distributors: Managing inventory for multiple locations or partners.

**Project Features**

**Must-Have Features:**

1. User Authentication:
   * Secure login/register system to access inventory features.
2. Inventory Management:
   * Add, update, delete, and view product details (name, description, price, quantity).

**Nice-to-Have Features:**

1. Supplier Management:
   * Maintain supplier information and their associated products.
2. Low Stock Alerts:
   * Real-time notifications for low inventory levels.
3. Admin Access:
   * Provide administrative privileges for enhanced control.
4. Reports and Analytics:
   * Generate inventory performance reports.
5. Search and Filter:
   * Quickly locate products using advanced filters.

**Project Success Metrics**

1. Clean and intuitive **database schema** without redundant tables.
2. **Real-time database synchronization** with no significant delays.
3. Elimination of **manual errors** and stock discrepancies.
4. **User-centric design** to improve workflow productivity.
5. Seamless implementation of **CRUD operations** with robust data validation.
6. Deployment on **AWS services**, ensuring scalability and reliability

**Project Architecture**

**Frontend:**

* **Framework**: React.js with Tailwind CSS.
* **Components**:
  + Home/Login/Register
  + Dashboard with inventory overview.
  + Forms for managing users, products, categories, and orders.
  + Search and filter functionality for easy navigation.

**Backend:**

* **Framework**: ASP.NET Core Web API.
* **Features**:
  + RESTful APIs for inventory, user, and order management.
  + Integration with AWS DynamoDB for real-time, serverless data storage.
  + Secure endpoints with JWT authentication.

**Database:**

* **Primary**: AWS DynamoDB for a NoSQL schema.
* **Structure**:
  + Tables for **Users**, **Products**, **Categories**, and **Orders**.
  + Relationships managed with partition keys (e.g., UserId, ProductId).

**Middleware and Integration:**

* **API Gateway**: Google Apigee for centralized API management.
* **CORS**: Enabled for cross-origin requests.
* **Logging**: CloudWatch and built-in ASP.NET Core logging.

**Containerization and Deployment:**

* **Docker**:
  + Containerize the app for platform independence.
  + Multi-stage builds for efficient images.
* **AWS ECS Fargate**:
  + Deploy backend services with scalability.
  + Ensure high availability and fault tolerance.

**Projected Tools & Resources**

| Requirement | Details |
| --- | --- |
| Hardware | Cloud-based infrastructure (AWS) |
| Frontend | React.js, Tailwind CSS |
| Backend | ASP.NET Core Web API |
| Database | AWS DynamoDB |
| API Management | Google Apigee |
| Containerization | Docker |
| Cloud Hosting | AWS ECS (Fargate), ECR, and Route 53 |
| Version Control | GitHub |
| Dev Tools | Visual Studio, Postman (for API testing) |

**Project Challenges**

1. Data Consistency:  
   Ensuring data consistency across distributed systems using AWS DynamoDB.
2. Security:  
   Securing API endpoints, authentication, and database access to protect user data.
3. Deployment Configurations:  
   Managing containerization and configuring AWS deployments for seamless scaling.

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## Data Modeling

### ER Diagram

A screenshot of a computer

Description automatically generated

### Sample Data

**Categories**:

[

{

"CategoryID": "b149d10d-8d3a-4433-bb85-59a8e8622843",

"CategoryName": "Home Appliances",

"Description": "Appliances for household use, including kitchen and home essentials."

},

{

"CategoryID": "112b5c05-a3db-43ef-a1d2-e1dd6ceac32e",

"CategoryName": "Toys & Games",

"Description": "Toys and games for kids and adults of all ages."

},

{

"CategoryID": "de9445d5-ed99-4095-bf66-8816e807ff5a",

"CategoryName": "Groceries",

"Description": "Everyday food and kitchen essentials."

},

{

"CategoryID": "db97e0fb-4d2e-444f-a227-0cb2e8bdf0cc",

"CategoryName": "Health & Wellness",

"Description": "Products for a healthy and active lifestyle."

},

{

"CategoryID": "9b20faea-b65b-4223-8203-46caf869ada2",

"CategoryName": "Sports & Outdoors",

"Description": "Equipment and accessories for sports and outdoor activities."

},

{

"CategoryID": "564b23c5-9e4e-4477-88fa-095b00b42316",

"CategoryName": "Books",

"Description": "Books across various genres and topics."

},

{

"CategoryID": "d03884d3-0d4c-4bda-ade5-75321578b6a0",

"CategoryName": "Beauty & Personal Care",

"Description": "Products for skincare, makeup, and personal grooming."

}

]

**Products**:

[

{

"ProductId": "1a2b3c4d-5e6f-7g8h-9i0j-klmnop123456",

"Name": "Stainless Steel Blender",

"CategoryId": "b149d10d-8d3a-4433-bb85-59a8e8622843",

"QuantityInStock": 50,

"Price": 49.99

},

{

"ProductId": "2b3c4d5e-6f7g-8h9i-0jkl-mnopq1234567",

"Name": "Remote Control Car",

"CategoryId": "112b5c05-a3db-43ef-a1d2-e1dd6ceac32e",

"QuantityInStock": 100,

"Price": 29.99

},

{

"ProductId": "3c4d5e6f-7g8h-9i0j-klmn-opqrs12345678",

"Name": "Organic Almonds - 1 lb",

"CategoryId": "de9445d5-ed99-4095-bf66-8816e807ff5a",

"QuantityInStock": 200,

"Price": 15.99

},

{

"ProductId": "4d5e6f7g-8h9i-0jkl-mnop-qrst123456789",

"Name": "Yoga Mat - Non-Slip",

"CategoryId": "db97e0fb-4d2e-444f-a227-0cb2e8bdf0cc",

"QuantityInStock": 75,

"Price": 24.99

},

{

"ProductId": "5e6f7g8h-9i0j-klmn-opqr-stuv1234567890",

"Name": "Basketball - Official Size",

"CategoryId": "9b20faea-b65b-4223-8203-46caf869ada2",

"QuantityInStock": 60,

"Price": 19.99

},

{

"ProductId": "6f7g8h9i-0jkl-mnop-qrst-uvwx12345678901",

"Name": "Fiction Novel - Hardcover",

"CategoryId": "564b23c5-9e4e-4477-88fa-095b00b42316",

"QuantityInStock": 150,

"Price": 14.99

},

{

"ProductId": "7g8h9i0j-klmn-opqr-stuv-wxyz123456789012",

"Name": "Face Wash - Gentle Cleanser",

"CategoryId": "d03884d3-0d4c-4bda-ade5-75321578b6a0",

"QuantityInStock": 120,

"Price": 8.99

},

{

"ProductId": "8h9i0jkl-mnop-qrst-uvwx-yzab1234567890123",

"Name": "Microwave Oven - Compact",

"CategoryId": "b149d10d-8d3a-4433-bb85-59a8e8622843",

"QuantityInStock": 30,

"Price": 89.99

},

{

"ProductId": "9i0jklmn-opqr-stuv-wxyz-abcd12345678901234",

"Name": "Board Game - Family Fun",

"CategoryId": "112b5c05-a3db-43ef-a1d2-e1dd6ceac32e",

"QuantityInStock": 90,

"Price": 34.99

},

{

"ProductId": "0jklmnop-qrst-uvwx-yzab-cdef123456789012345",

"Name": "Herbal Tea - 20 Bags",

"CategoryId": "db97e0fb-4d2e-444f-a227-0cb2e8bdf0cc",

"QuantityInStock": 180,

"Price": 6.49

}

]

## Experiences Gained & Lessons Learned

This project provided invaluable insights into developing applications that align with industry standards, particularly in building robust backend APIs. Through this experience, I gained practical knowledge in several key areas:

* **API Development:** Mastering the implementation of RESTful APIs, including secure endpoints, CRUD operations, and data validation.
* **Cloud Computing:** Gaining hands-on experience with AWS services such as DynamoDB, ECS Fargate, and API Gateway to create scalable and efficient solutions.
* **Containerization and Deployment:** Learning to containerize applications using Docker and deploying them through cloud services, which streamlined the deployment process and ensured platform independence.
* **Best Practices in Development:** Understanding the importance of clean architecture, real-time data handling, and efficient resource management to deliver a high-performing application.

These experiences have deepened my understanding of modern software development practices and enhanced my ability to manage end-to-end project lifecycles.