

# ***Project Objectives and Work Breakdown Structure***

## **Introduction**

The Medisail e-procurement platform is a product that addresses the needs of many small, often rural, medical practices. This document describes Medisail's plan for allocating resources toward the completion of the final product. Part one reviews the project's goals and requirements from a high level, foregoing the details of exactly how the desired outcomes will be achieved in favor of a much broader perspective. A chart outlining the impact of Medisail's e-procurement platform is presented along with an explanation of the basic software components needed. Also included in this section is an establishment of project boundaries and a brief list of features that fall outside of this project's scope.

Part two begins establishing an order to follow when producing the basic software components. Qualities that may affect the production timeline include dependencies, client priorities, technical difficulty, and understanding of risk. Especially complex or high-risk components are broken down further across a three-phase development plan. This high-level work-breakdown structure (WBS) is then filled in with the carefully timed development of the remaining components. The section concludes with a chart that gives a clear visual of this roadmap.

Part three includes several charts which provide insight into the function and layout of the Medisail e-procurement system. The logical/structural diagram lays out each of the high-level functions supported by the software system. The use case diagram illustrates the experience of customers, suppliers, and Medisail employees using the software system. The project deployment view shows how the software and logical components will interact with each other in the final product.

The chart at the beginning of part four puts the deployment of the logical and software components in an approximate chronological order. This report concludes with a mid-level WBS that expands on the high-level WBS offered in section 2. Components across the three phases of development are further broken down into sub-components and the order of their deployment is further refined as additional dependencies and priorities are uncovered.

## **1 High-Level Requirements Analysis**

### **1.1 Business Processes and Operations Impacted/Supported by the System**

#### **1.1.1 Project Goals and Outcomes**

Medisail Solutions intends to develop an e-procurement software platform focused on providing quick and low-cost procurement of medical supplies for small medical practices. This will be achieved by developing a medical supply marketplace that enables us to connect these small medical practices with medical suppliers.

Our business outcomes of this project are targeting the following goals within the first year of the product:

1. 10,000 new users to our platform by the end of year 1
2. 75% customer retention (monthly purchases or sales)

3. \$500,000 in purchases by the end of year 2

### **1.1.2 Project Outcomes**

The following objectives were defined based on our problem analysis to define the business scope of impact.

#### **1.1.2.1 Develop e-purchasing marketplace to allow sellers to list items and healthcare providers to purchase**

Diversify product portfolios by introducing a marketplace, enabling users of the software to directly connect with sellers. This initiative aims to generate revenue for Medisail through seller and per-order fees associated with transactions conducted within the marketplace.

Areas of Organizational Impact: *customer, financial, and strategic*

#### **1.1.2.2 Implement product and seller reviews**

Incorporating product and seller reviews will significantly elevate the customer experience, ensuring smoother transactions thanks to enhanced product quality and seller services. This valuable feature will not only promote transparency but also drive a surge in traffic to the Medisail platform, ultimately benefiting all users.

Areas of Organizational Impact: *operational and social*

#### **1.1.2.3 Implement subscription tiers**

Medisail plans to implement three subscription tiers to the service: a basic tier, a standard tier, and a premium tier. Tiers will be priced according to their range.

Areas of Organizational Impact: *financial*

#### **1.1.2.4 Implement e-logistics software**

Generate additional revenue by offering sellers access to Medisail's product storage and shipping service. Simultaneously, provide customers with faster shipping options through Medisail's distributed logistics network.

Areas of Organizational Impact: *operational, strategic, and financial*

#### **1.1.2.5 Implement quality validation software**

Develop a software product designed to facilitate randomized quality control inspections of seller products. This innovation aims to enhance Medisail's customer experience by ensuring the quality and reliability of the products offered on its platform.

Areas of Organizational Impact: *operational and strategic*

#### **1.1.2.6 Purchase recommender system**

Harness the power of machine learning to deliver tailored purchase recommendations, leveraging customer data and real-time inventory insights. This dynamic feature will elevate customer satisfaction by empowering them to make informed buying decisions, all on a scalable platform.

Areas of Organizational Impact: *customer*

### **1.1.3 Business-Scope of Impact**

Figure 1 shows the recommended scope of impact for Medisail's new e-procurement platform.



3. Medisail user interface
  - a. Analytics and data tracking interface including supplier, customer, and distributor information

### 1.2.2 Back End Components

1. Database
  - a. Customer data and associated usage and purchase data
  - b. Supplier data and associated sales data
  - c. Collection of total marketplace offerings
  - d. Distributor data
2. Server to connect database with client application
  - a. API interfaces to route appropriate data to Medisail employees and to customers and suppliers

### 1.2.3 Software System Components

The following software system components were defined based on the analysis performed in 1.2

1. Website welcome page/initial posting prototype
2. Customer user interface
3. Supplier user interface
4. e-Purchase marketplace
5. Shopping cart and checkout
6. Data storage capabilities for customer data, supplier data, and marketplace offerings, and distributor data

## 1.3 So What?

Medisail plans to develop an e-procurement marketplace that will provide medical supplies to its target audience of small medical clinics. In implementing this project, we intend to attract 10,000 customers to our service, while retaining at least 75% of them as active users by the end of year 1. By the end of year two we are targeting \$500,000+ in sales through our marketplace services. To meet these goals, we plan to implement the system requirements defined in this section.

## 2 Analysis of Component Dependencies to Define Deliverables

### 2.1 Breakdown of Logical Components

*Table 1 Logical Components*

Component	Dependency	Priority	Difficulty	Risk
1. Customer User Interface	5	Critical	Low	Low
2. Supplier User Interface	5	Critical	Low	Low
3. Marketplace User Interface	5, 6	Critical	Medium	Low
4. Medisail User Interface	5, 6	Critical	Medium	Low
5. User API Interface	7, 8	Critical	Low	Medium

Component	Dependency	Priority	Difficulty	Risk
6. Medisail API Interface	7, 8, 9, 10	Critical	Medium	High
7. Customer & Purchases Database		Important	High	Medium
8. Inventory Database		Critical	High	High
9. Supplier Database		Important	High	Medium
10. Distributor Database		Important	High	Low
11. Supplier Analytics User Interface	5	Nice to have	Medium	Medium
12. Customer Analytics User Interface	5	Nice to have	Medium	Medium
13. Shopping Cart & Checkout Interface	1, 5	Critical	Medium	Medium

## 2.2 Three-Phase Development of High Risk and High Complexity Components

The following components have been designated as either high risk or high complexity and will be developed across a three-phase incremental rollout to reduce risk.

### 2.2.1 Medisail User Interface

*Phase 1 – Critical: Interface for Database Access*

The Medisail user interface will be used exclusively by Medisail employees. In the first phase of development for this component, both the customer user interface and the supplier user interface will be available, and Medisail employees will be able to toggle between the two. In addition, data from the three databases will be rendered on the interface. This will allow employees to conduct rudimentary data analysis.

*Phase 2 – Important: Analytics Algorithms*

Data analytics algorithms will be introduced to the user interface so employees can conduct more advanced data analysis. Simple graph and chart generation functionality will be available in this phase.

*Phase 3 – Nice to Have: Advanced Analytics Aids*

Tableau integration will become available in this phase for advanced data dashboard creation.

### 2.2.2 Inventory Database

*Phase 1 – Critical: Database Creation and Initial Data*

The inventory database will contain all the data of the Medisail marketplace. Phase 1 will include database, table, and static data creation. Static data will be derived from current ongoing contracts that Medisail has with medical supply companies, and will include product name, price, packaging quantity, and supplier name and contact information. The database will have capabilities to allow the Medisail API Interface and Customer API Interface to query data, and the Medisail API interface will have capabilities to modify data.

*Phase 2 – Important: Dynamic Data Integration*

The User API Interface will be modified to allow suppliers to post new marketplace items in the database via the user interface. Additional data will be added, including product sales and order statistics, inventory reporting, and Medisail customer statistics associated with products.

*Phase 3 – Nice to Have: Advanced Analytics Integration.* Database functionality will be modified to allow integration with advanced analytics aids, like Tableau software.

## 2.3 High Level Work Breakdown Structure

*Table 2 Work Breakdown Structure*

1. Develop Basic (Core System)	2. Develop Integrated System	3. Develop Advanced (Complete) System
<p><b>Implement core user interface components</b></p> <p>Implement critical components of marketplace</p> <ul style="list-style-type: none"> <li>- Implement display of products</li> <li>- Implement searching and sorting capabilities</li> <li>- Implement add to cart functionality</li> </ul> <p>Implement customer user interface</p> <ul style="list-style-type: none"> <li>- Implement user login capabilities</li> <li>- Implement ability to view marketplace user interface</li> <li>- Implement cart and checkout capabilities</li> </ul> <p>Implement supplier user interface</p> <ul style="list-style-type: none"> <li>- Implement supplier login capabilities</li> <li>- Implement ability to view products sold</li> </ul> <p>Implement critical components of Medisail user interface</p>	<p><b>Modify API interfaces for Suppliers</b></p> <p>Develop a component that allows suppliers to post new marketplace items.</p> <ul style="list-style-type: none"> <li>- Implement new API functionality that allows the addition of medical supplies</li> <li>- Implement feature that allows the inventory database to be edited directly by suppliers.</li> </ul> <p><b>Modify Medisail API Interface</b></p> <p>Implement data processing and analytics algorithms</p> <ul style="list-style-type: none"> <li>- Develop charting functionality for sales data, supplier data, and customer data</li> </ul> <p><b>Modify User Interfaces</b></p> <p>Update supplier user interface</p> <ul style="list-style-type: none"> <li>- Create rendering capabilities in supplier user interface so suppliers can post and update products</li> <li>- Create data analysis rendering capabilities</li> </ul>	<p><b>Modify API Interface for suppliers &amp; Customer Data Analytics</b></p> <p>Modify API to allow for analytics gathering by suppliers</p> <ul style="list-style-type: none"> <li>- Update API interface to allow suppliers to collect data analytics on customer orders</li> <li>- User interface will be equipped with tools, to allow suppliers to conduct custom searches without SQL knowledge</li> </ul> <p>Modify API to allow for analytics gathering by customers</p> <ul style="list-style-type: none"> <li>- Update API interface to allow customers to collect data analytics on their own orders.</li> <li>- Allow customers to review price history of each order/item</li> <li>- User interface will be equipped with tools, to allow customers to conduct custom searches without SQL knowledge</li> </ul>

<ul style="list-style-type: none"> <li>- Implement toggle function for views of user and supplier user interfaces</li> <li>- Implement data rendering and modification capabilities</li> </ul>	<ul style="list-style-type: none"> <li>- Test user API endpoints and user interface to ensure that changes appear in the marketplace interface and inventory database</li> <li>- Test that data analytics graphics work properly</li> </ul>	
<p><b>Implement core back-end functionality</b></p> <p>Implement Medisail API interface</p> <ul style="list-style-type: none"> <li>- Create GET, POST, PUT, and DELETE HTTP endpoints for the inventory database</li> <li>- Integrate server with Medisail user interface</li> </ul> <p>Implement user API interface</p> <ul style="list-style-type: none"> <li>- Create GET HTTP endpoints for the inventory management database</li> </ul> <p>Implement critical components of inventory database</p> <ul style="list-style-type: none"> <li>- Create the database and tables</li> <li>- Fill tables with static data</li> </ul>	<p>Update Medisail user interface</p> <ul style="list-style-type: none"> <li>- Create data analytics rendering capabilities in Medisail user interface</li> <li>- Test API endpoints</li> <li>- Test that data analytics and graphics work properly</li> </ul> <p><b>Add functionality to inventory database</b></p> <p>Add sales, order, inventory reporting, and customer statistics tables to database</p> <ul style="list-style-type: none"> <li>- Create tables</li> <li>- Fill with initial data</li> <li>- Update endpoints to insert new data into database as it becomes available</li> </ul>	<p>Integrate Tableau functionality in all API interfaces and marketplace database</p> <ul style="list-style-type: none"> <li>- Redefine tables as needed per Tableau documentation</li> <li>- Create new Tableau specific endpoints in APIs</li> <li>- Incorporate Tableau graphics into user interfaces</li> </ul>

## 2.4 So What?

Most of the critical components in Medisail's new e-procurement system are designated as low to medium risk and complexity, making development of the core functionality of the product straightforward apart from the inventory database and the Medisail API interface. Specific attention will be given to these two components in phases to ensure that the risk of their development and deployment is minimized. The proposed high-level work breakdown structure

incorporates the phased development of the inventory database and Medisail API interface along with the developments of the other components of the system.

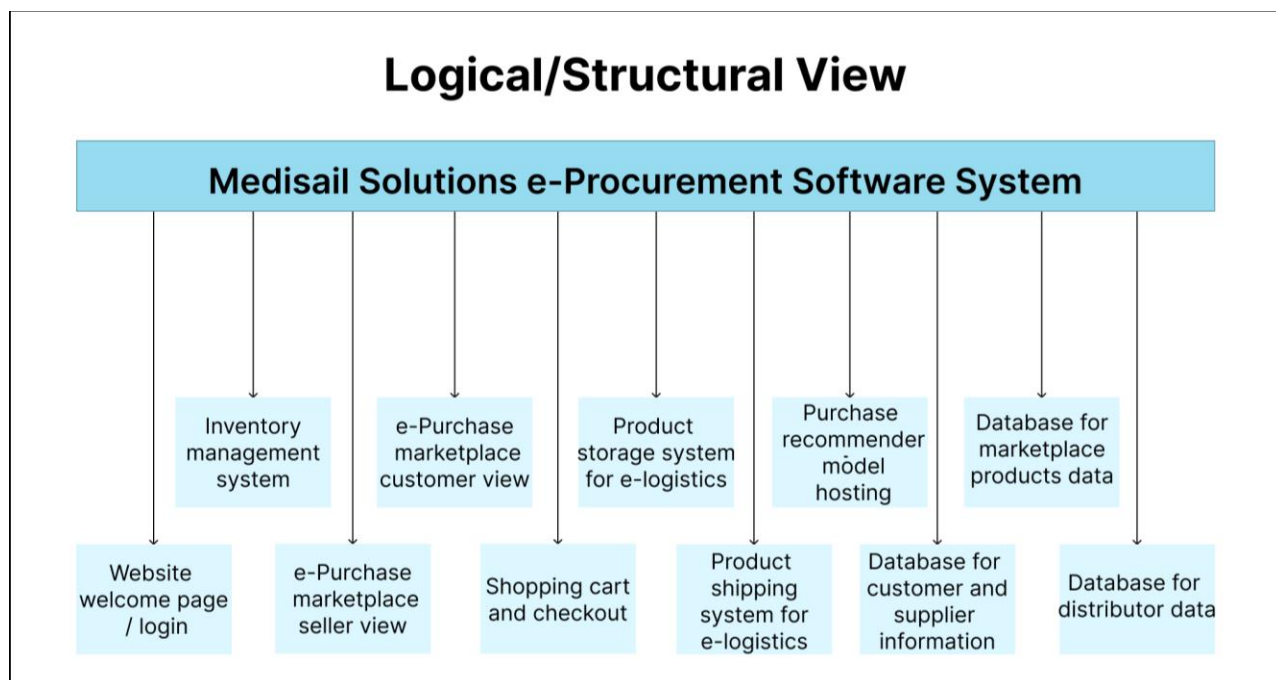
### 3 System Architecture

#### 3.1 Architecture Models

The following diagrams are models of the proposed architecture of Medisail's new e-procurement system.

##### 3.1.1 Logical/Structural View Diagram

The Logical/Structural View diagram describes the set of high-level functions supported by the system.

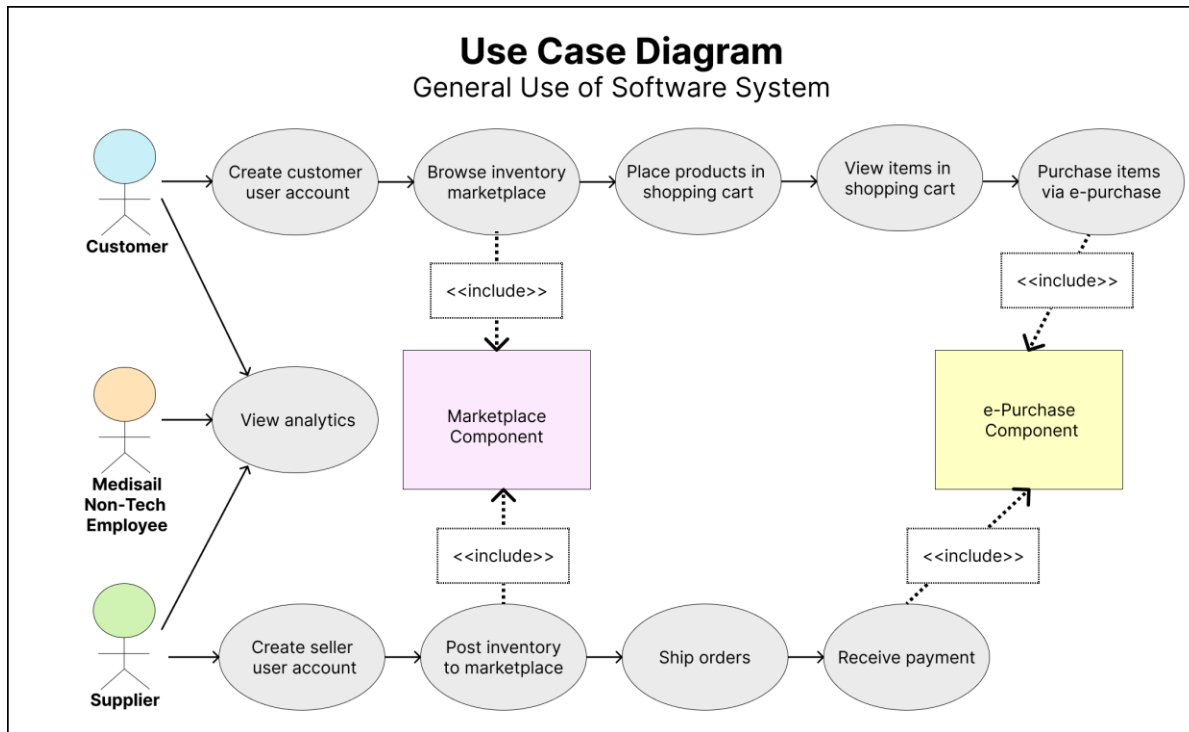


*Figure 2 Logical/Structural View*

##### 3.1.2 Use Case Diagram

The Use Case diagram describes concurrent use of the client user interface by customers of Medisail and medical supply partners. The user interface includes functionality of the marketplace and e-purchase components and is supported by the server which acts as an intermediary between the user interface and the databases.





**Figure 3 Use case diagram**

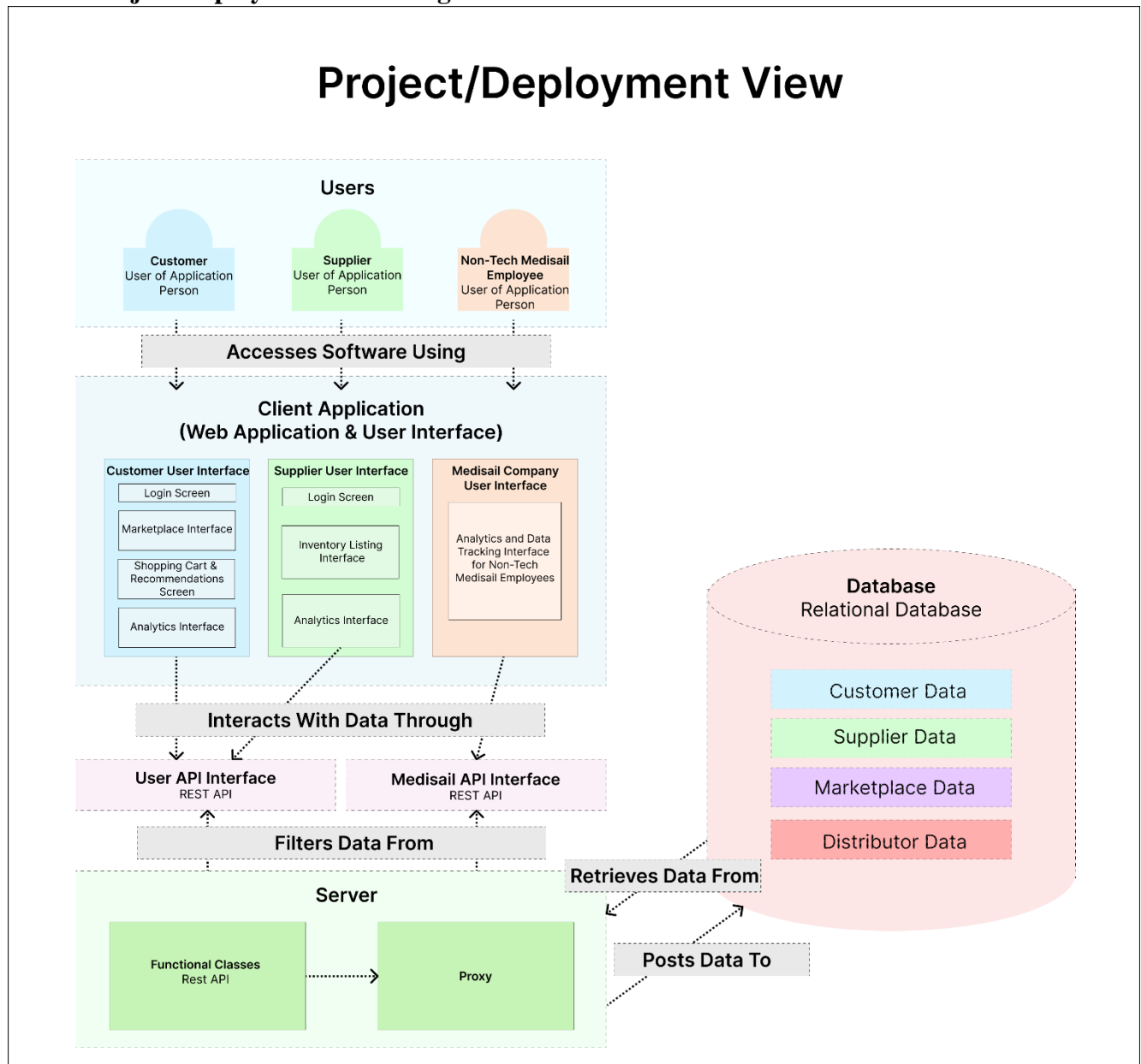
### 3.2 Mapping of Logical Components to Physical Software Components

Users of Medisail’s e-procurement software include customers (small healthcare clinics), suppliers (medical supply companies), and non-technical Medisail employees, including sales and service teams. Each of these groups has a dedicated user interface that provides respective services. Through their user interfaces, customers access the inventory marketplace to choose products to purchase and view recommended items, sellers post products, and both groups can log in and view analytics based on purchases and sales. Medisail’s non-technical employees can view both the seller and customer user interfaces and have access to advanced analytics that they can use to help drive sales, troubleshoot order issues, and view usage data.

A server exists to process requests from and responses to the user interface and retrieves and posts data to the databases. The databases contain data pertaining to customers, suppliers, products, sales and orders, and distribution.

The Project/Deployment View diagram (Figure 4) illustrates the complete software architecture map of logical components to physical software components.

### 3.2.1 Project/Deployment View Diagram



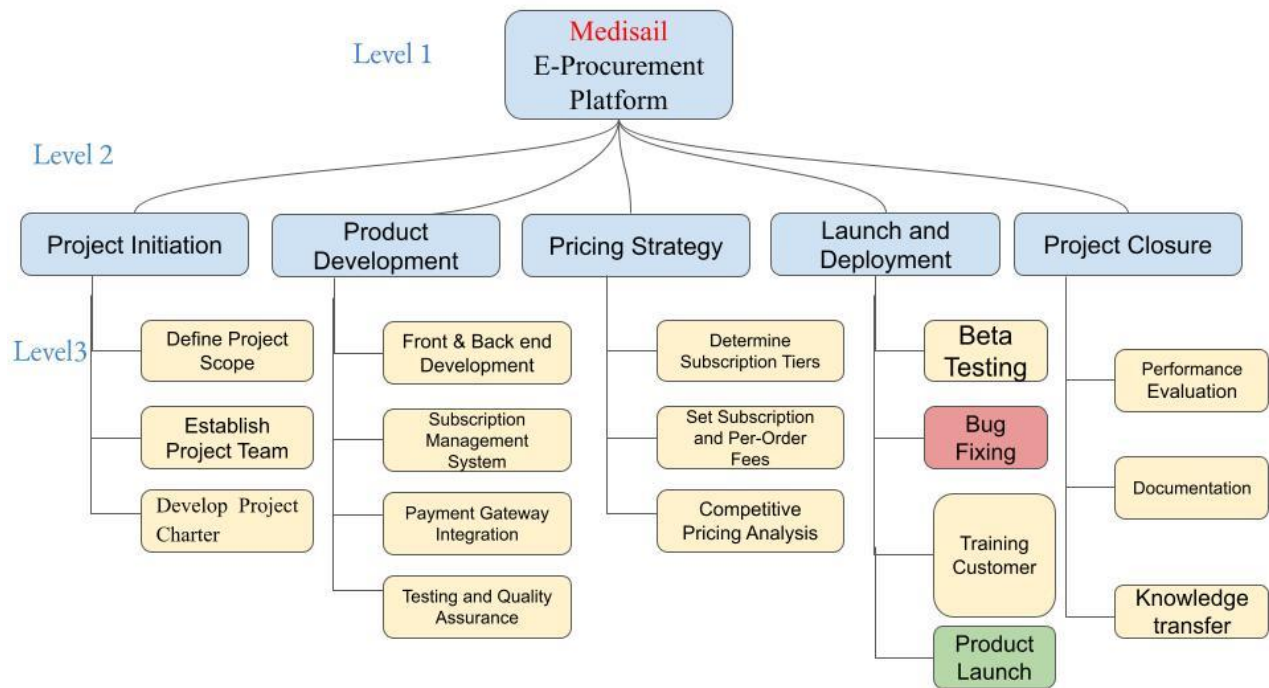
*Figure 4 Project deployment view*

### 3.3 So What?

The proposed architecture of Medisail's e-procurement system supports the system's functional requirements and a need for security and usability. APIs for outside users operate independently from APIs for Medisail employees, and while interrelated, functional databases are separated. By using a microservice architecture including RESTful APIs, the software system can function as intended while remaining secure and accessible to users, and functionality can be expanded relatively easily if needed.

## 4 Mid-Level Work Breakdown Structure

### 4.1 Components and Relationships Between Components



*Figure 5 Component and Relationship Mapping*

### 4.2 Mid-Level Work Breakdown Structure

#### 4.2.1 Pre-Development: Install & configure development environment

1. Install a dependable relational database
2. Install primary system hardware and operating system

#### **Develop basic system components**

1. Develop Inventory management
2. Develop Procurement management for medical supplies
3. Develop customer sales management plan for medical supplies
4. GUI for client side and basic navigation

#### 4.2.2 Release 1: Basic Inventory, Procurement, Supplier, Distributor and Customer Management

*Install and configure first iteration of development environment*

- Install and configure PostgreSQL and SQL interface
- Install basic system hardware and Microsoft Windows 11 operating system
- Install and configure Junit 5 and Maven testing software
- Install Visual Studio Code, with Java, JavaScript, HTML, PostgreSQL, and CSS dependencies

#### *System management module*

- Develop basic client-side application and user interface module for client, supplier, and administrator users.
- Develop a client, supplier, and administrator log-in portal with stubbed privileges for each user
- Add placeholder interface components to allow planned remote services to be tested using prototyped API calls

#### *Implement & test API Gateway Service*

- Install API gateway dependencies
- Connect API to current client-side application and test with known API services such as a weather and or time service.
- Test API calls with test suites to confirm functionality

#### *Develop Medical supplies inventory database*

- Implement basic static table schema for medical supplies with fields:

Inventor y SKU Number (Integer)	Item Name (String )	Manufacter (String)	Listin g Price (float)	Supplie r Name (String)	Expiratio n Date (date)	Generic Medicin e (Boolean )	Brand Name Medicin e (Boolean )
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- Initiate “Item SKU Number” as the primary key for Medisail’s relational database for

#### *Develop Medical Supplier database*

- Implement basic static table schema for medical suppliers with fields:

Supplier ID (Integer)	Supplier Name (String)	Supplier Primary Address (String)	Phone Number (Integer)	Supplier Email (String)	Supplier “Better Business Bureau” Rating (String)	General Internal Notes on Supplier (String)
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- Initiate “Supplier ID” as primary key for Medisail’s relational database for suppliers

#### *Develop Medical Distributor database*

- Implement basic static table schema for medical suppliers with fields:

Distributor ID (Integer)	Distributor Name (String)	Distributor primary Address (String)	Phone Number (Integer )	Distributor Email (String)	Distributor “Better Business Bureau” Rating (String)	General Internal Notes on Distributor (String)
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- Initiate “Distributor ID” as primary key for Medisail’s relational database for distributors

#### *Develop Customer & Purchase database*

- Implement basic static table schema for customers and purchases with fields:

Customer ID (Integer)	Customer Name (String)	Subscription Tier (Integer)	Item Purchased (String)	Customer primary Address (String)	Phone Number (Integer)	Customer Email (String)
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- Initiate “Customer ID” as primary key for Medisail’s relational database for customers and purchase.

#### *Develop Medical supplies procurement management system*

- Build marketplace interface, where users and suppliers can interact with each other
- Integrate marketplace interface with “medical supplies” database

### **4.2.3 Release 2: Develop integrated system components**

#### *Develop account creation for clients*

- Develop welcome screen with information about Medisail, mission statement, purpose, etc.
- Develop interface for potential clients with explanation of tiered subscription system.
- Develop secure account creation system through email or text verification.
- Develop secure login for existing clients

#### *Further develop integrated system module for clients.*

- Develop data analytics system
  - Client-based system to aid in strategic purchasing from Medisail
  - Admin-based system to aid in forecasting for inventory needs
  - Develop GUI with charts and graphs reflecting past purchasing and future needs
- Develop shopping cart interface that applies discounts appropriate to the client’s subscription tier.
- Develop payment gateway for secure transactions or integrate a system like Authorize.net and/or PayPal.

#### *Further develop integrated system module for admin*

- Develop API linking admin accounts and supplier database allowing for updating of contracts, adding new suppliers, and removing of expired contracts.
- Create initial admin accounts with privileges based on employee function
  - Purchase management
  - Marketplace management
  - Shipping initiation and tracking
  - Information Technology Specialist
  - Database Analyst Specialist

#### *Develop inventory database access*

- Develop supplier/inventory database API to allow suppliers to submit new items to the inventory database pending Medisail's approval
- Develop system for movement of new marketplace items into *active* inventory.
- Develop ability for admin to add items to the active stock in the marketplace.
- Develop API linking marketplace purchases to active inventory database reducing stock as appropriate and preventing purchase of out-of-stock items.

#### *Establish and organize necessary contract relationships.*

- Create template for basic contracts between Medisail and product warehouses.
- Update supplier database with bulk purchase price point contracts.
- Establish contract relationship between Medisail and Amazon shipping e.g., Fulfillment by Amazon.

#### *Lay framework for tiered subscription system*

- Develop variations on an invoice template for each tier.
- Develop system to apply/unlock purchasing restrictions for each tier.

#### *Develop customer service support system*

- Train a group of employees in the use of Medisail software from the client side.
- Develop a live chat system or integrate an already existing one e.g., Intercom.
- Establish a telephone support system with automated menu and several available lines.

#### *Develop Customer Statistic Table*

- Implement basic table schema for customers Statistic with fields:

Customer ID (Integer)	Customer Name (String)	Subscription Tier (Integer)	Total Quarter Spending (String)	Most Purchased Item (String)	Number of Total Orders (Integer)
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- Initiate "Customer ID" as primary key for Medisail's relational database for customers statistics

#### **4.2.4 Release 3: Advanced API and Data Analytic system**

*Modify existing customer API Interface for data analytics*

- Upgrade a new API user interface for customers that allows for Data Analytics
- Allow customers to search for their previous orders, and collect data on overall spending
- Allow customers to collect data on their purchases made within a custom time frame, defined by the user
- Allow customers to compare previous purchase prices for past orders, and compare to competing supplier prices within the Medisail marketplace
- Allow customers to calculate total savings for using Medisail services, when compared to competing e-procurement systems.
- Develop subscribe and save feature appropriate to a customer's subscription tier.

*Modify existing Supplier API Interface for data analytics*

- Upgrade a new API user interface for suppliers that allows for Data Analytics
- Allow suppliers to collect data on the products they have sold, such as prices and quantity
- Allow suppliers to collect total purchases revenue over a custom period
- Allow suppliers to collect data analytics on customers who have purchased their medical supplies.

*Integrate Tableau functionality into each API Interface*

- Modify current tables to fit within lines of Tableau documentation.
- Add Tableau specific endpoints in all API interfaces
- Update user interfaces with Tableau graphics

### **4.3 So What?**

While considering many work breakdown structures, Medisail Solutions opted for a breakdown of work done in three manageable steps. Medisail found that by breaking down the work structure into a series of functionalities, it could better serve not only its key interests, but those of its consumers. Offering not only base functionality early in conception, but also leaving room for upgrades that will help benefit its clients. In the first planned release, Medisail plans on introducing some foundation features. Chiefly among them is preparing a development environment and integrating a basic relational PostgreSQL database. In the second release, Medisail plans on integrating an API that will allow suppliers, purchasers, and distributors to have their own logins and individual interface. Not only that, but Medisail plans on working with contracts and its clients directly to implement the three-tiered subscription service. Finally, in release three Medisail plans on implementing an upgraded API interface, that will give customers and suppliers the ability to perform data analytics from the available information in our database, with no SQL knowledge required.

## 5 Conclusions

The main goals and priorities of Medisail's e-procurement system are to support the company's mission in providing access to medical supplies to small and rural communities, while providing a source of profit and market expansion for Medisail. To achieve the project's business metrics set forth by Medisail, requirements of the software system and their associated components have been identified. The complexity of development and risk level of these components have been assessed, and a three-phase approach to development has been selected. A high-level work breakdown structure highlights the phased development of the components of the system.

The ideal system architecture has been identified as a client-server-database microservice architecture. The use of this architecture allows the system to remain secure and segmented in the case of failure of any component and prevents access to system resources by unauthorized parties. It also facilitates the phased development plan and allows for potential expansion of the system later. The mid-level work breakdown structure expands on the high-level work breakdown structure's findings, taking the proposed system architecture into account. Medisail chooses to remain consistent with the three-phase development approach and to develop the basic, essential components of the system in the earlier phases, then move on to more complex and involved components later.

Through the exploration of these project objectives and developing work breakdown structures, Medisail's confidence in the success of this project has grown, and the project development team looks forward to further development of the new e-procurement system.