Omega Nutraceuticals Pvt. Ltd.

Design Phase Report

- Navroze Mishra

1. Executive Summary.

In this report, we are proposing changes to the business process for our client, Omega Nutraceuticals Pvt. Ltd., that would assist and optimize the inventory management system. Below we summarize each of the developmental phases of the SDLC for the proposed system.

Summary of Planning Phase

By talking to the owner of the company's and interviewing some of the department managers our team quickly identified the improvements needed in the business process of our client's company. With the current process, we could clearly see inefficiency in the way inventory was managed, all transactions were done through phone calls and there was no proper system to record all the data like available raw materials, customer's demand and supplies.

Summary of Analysis Phase

After consulting the client, we gathered all the information about their staff, warehouses, internal clients and suppliers, locations they supplied to and fertilizers that were in most demand. We then used these factors to understand their business needs and requirements. Through fact finding, we discovered basic business functions. This phase includes the Data flow diagrams, or Entity Relationship Diagram, that describes the relationship between entities and data.

Summary of Design Phase

In this phase we are providing proposed solution, we developed candidate solutions and a feasibility analysis matrix. Our three candidate systems include two commercial off-theshelf packages and one inhouse custom solution. The first solution is building the system with the Salesforce CRM which is easy to use with very little technical knowledge. The second solution is the Microsoft NetSuite Cloud platform which is a custom Inventory management system for small size businesses which is the easiest to use but expensive for a company based in India. The final solution is building a software inhouse and tailoring it exactly according to our clients need. This will provide complete efficiency of the processes and system and will provide long term benefits to our client.

Conclusion and Recommendations

Although NetSuite and Salesforce are leaps above the custom solution in terms of ease of and quickness of implementation, making the software in-house proves to be the clear leader in all the other candidate matrix categories, therefore, it is the recommended solution for Omega Nutraceuticals Pvt. Ltd. This solution best resolves the inefficiency in management, described in previous sections and can streamline the scheduling process to improve operational efficiency.

2. Statement of Work

We, a team of five MSIS graduate students from University of Maryland, are proposing changes to the business process for our client, Omega Nutraceuticals Pvt. Ltd., that would assist and optimize the inventory and accounting functionalities. Stated below are a few details about the client company and the industry followed by certain problems, opportunities and directives related to the scope, followed by the detailed project scope, project objectives, and project constraints. o **Client and Industry Background**

Omega Nutraceuticals Pvt. Ltd. is an organic fertilizer manufacturing company based in Madhya Pradesh, India. Established in the year 2000, Omega Nutraceuticals Pvt. Ltd. helps farmers across country and around the world in keeping up with the demands of a growing population. Started as a small trading company, they have currently developed into a manufacturing company with three departments:

- Formulation
- Technical Manufacturing
- Research and Development

The raw material comes from both local and international sources, and the finished goods are also exported as well as sold locally. Presently, there is little to no IT infrastructure in the company. Some of their short-term goals include further expanding the business as well as gaining a stronger online presence. Their long-term goal is to create and maintain a significant presence in the organic fertilizer market.

Let's look at some of the strengths, weaknesses, opportunities and threats to the client company.

Strengths. The company has a strong supplier and buyer network. The company has a consistent revenue stream. The company has vertically integrated backwards up to a certain extent that is they sell certain intermediate raw materials for fertilizers as well as the final fertilizer product.

Weaknesses. Small scale enterprise with limited expansion options. The company is completely out of touch with modern industry operation standards. The company has an obsolete inventory management and accounting system.

Opportunities. Inventory optimization. Productivity improvement. Workforce expansion. Clientele expansion. MSME ministry finance schemes. Increased online presence. Google Ads campaign for residential customers.

Threats. Substitution by chemical fertilizer. Competitor with better operations management and higher advertisement budget. Competition's economies of scale.

Now, looking at the organic fertilizer industry as a whole,
Suppliers to the organic fertilizer companies are chemical manufacturing companies based in India, China and a few other countries. They provide the raw materials required

to manufacture the fertilizer. The supplier bargaining power is low due to presence of multiple suppliers and low switching costs. The possibility of a supplier forward vertically integrating and entering the fertilizer market is also low.

Customers of the organic fertilizer companies are wholesale companies, farmer unions, farmers and residential customers. Due to availability of quite a few organic fertilizer companies in India and South Asia, the bargaining power of the customers is relatively high. This is also due to the fact that switching costs are low and access to companies is increasing via online platforms.

The organic fertilizer industry in India has been quite unevolved majorly due to lack of access to infrastructure and financial services. Hence, the threat of a new entrant in the form of a local firm is low. This is due to the fact that it is difficult to scale, require heavy capital, there is very little scope of differentiation, existing contracts between companies and wholesalers as well as brand loyalty, and low profitability. A multinational new entrant, however, would be able to easily break through all of the aforementioned constraints and become a possible threat.

Chemical fertilizers are a major **substitute** for organic fertilizers. Low switching costs, availability of multiple substitutes, high ease of substitution and a huge difference between the price performance of the two, show a high threat of substitutes. However, due to high product differentiation between the two and government regulations, the threat of total substitution is impossible.

Competitive rivalry is quite prevalent in the industry. With a heavy push towards online ecommerce and banking by the Government of India, the competition landscape in the industry has become more difficult. Companies with higher online presence and a higher advertising budget have higher chances of dominating the market. A firm with a powerful competitive strategy can easily take up the lion's share in the market.

o **Problems, Opportunities, and Directives**

I. **Problem.** Seasonal fluctuations in demand and supply.

The fertilizer sector has a history of moving higher from August to December. Seasonality is influenced by purchases of fertilizer near year-end when farmers are planning next year's crop. This makes it difficult to forecast demand and leads to overstocking and wastage of crucial resources.

II. **Problem.** Non-existent ERP solution.

ERP solutions are highly effective for financial administration, which is very helpful for any manufacturing company. After speaking to the owner of the business we were able to identify a huge scope of optimization in areas of procurement, inventory management, production and warehouse management. This leads to better tracking of all customers and vendors and keep a historical record of all the transactions taking place.

III. **Opportunity.** Workforce expansion.

With technical solutions managing inventory and accounting, the management of Omega Nutraceuticals is looking to expand its worker base to increase productivity by 50%. With automated tracking of billable hours, inventory and distribution of tasks, the management feels this is the perfect opportunity to increase the workforce.

IV. Opportunity. Clientele expansion.

With the considerate improvement in inventory management, a new accounting system, and a goal to expand the workforce, the management plans to seize this opportunity to increase supply of both their products to their current clients while expanding their client base. Their aim to look towards selling the products at competitive rates on ecommerce websites, partner with wholesale suppliers, increase traffic to their website and sell online, and supply directly to residential customers.

V. Directive. Implementing accounting system to manage human resources.

Even though the revenue of the business runs to the order of USD 750,000 to USD 1 million, it seems to lack a robust accounting system. To manage the operating budget and track its expenditures and receivables, or income, so far, the business has been using traditional techniques which require a lot of human hours and lack consistency. Failure to properly manage an accounting system can result in financial disaster for a small business. Functions of accounting have been handled in house at our client's till now. The owner wants a robust accounting system designed for their company that takes into account the specific types of workers employed in their business.

o **Project Scope**

Since the fertilizer industry is a traditional industry, in this project, we will focus on implementing systems to improve business processes using best project management methodologies and IT as it is not well established in the company.

The scope of this project would strictly include:

Currently, the business is done through phone calls and paper work for orders and inventory. We will try to insert an IT module with serial number tracking into the process that will smoothen operations and keep track of the demand and supply. The proposed inventory system would also include functionality that learns and optimises the amount of raw material ordered and stored to avoid stock outs and excess stock.

The scope of this project would not include:

I.   Online presence. Increasing client's business to identify potential clients, increase traffic to client's website and increasing online presence of the brand.

II.   Expense planning functionality. The proposed inventory management system would not include functionality to plan the expenses and regulate orders based on multiple suppliers.

III.   Inventory quality management and feedback system. The proposed inventory management system will not support the aforementioned functionalities.

- **Project Objectives**

I.   Schedule. We will set our milestones within the entire proposed system with two major milestones being the successful implementations of the inventory and accounting systems within the timeframe set by our and the client's agreement. Using Gantt charts, we would be able to easily define and measure the schedule.

II.   Quality. Following an enhanced waterfall model of development, we will assess quality of the deliverable after each phase, based on the industry standards and the standards set by the client. At the completion of the design phase of the development model, we will have a feedback loop from client-side to measure client satisfaction with the quality.

III.   Cost. We will divide the project into unit modules for both the systems based on the time and resources required. The cost per unit would be set according to that. Accordingly, the cost of each iteration after every feedback loop will also be calculated.

IV.   Performance to business case (inventory system). Improving quality of the inventory management process would be the strategic objective. To measure this, the key performance indicator would be the reduction in stock-outs and/or excess stocks. The target set would be to reduce the inventory order error (mean absolute) to less than 15%.

- **Constraints Client**

constraints:

Ø **Concept conflicts and resistance to change.** Concept conflicts between the team and client poses a possible constraint. The resistance to change of client's employees with the introduction of new business processes and alteration to the already existing ones.

Ø **Limited access to financial services.** Although, MSME financing schemes are provided by the Government of India, factors such as corruption and a high rate of defaulters makes it hard for businesses to get financing. These loans are considered high risk and commercially unviable.

Ø **Limited access to information.** The key challenges in this regard is acquisition, interpretation and effective utilization of information and its dissemination. The client, having a physical information system setup, has poor means of information acquisition and hence ineffective information support to drive profits.

Ø **Limited linkages with large enterprises.** Absence or poor condition of a relationship with large enterprises within the client's industry leads to poor information flow, weak subcontracting arrangements and inadequate marketing opportunities to promote vertical growth.

Ø Inadequate access to skills and technology. With the presence of a huge population in India, the workforce has an inadequate access to proper institutional systems that can support absorption of modern skills, technological or otherwise.

Ø Limited access to markets and infrastructure. This is a severe constraint to our client's business. Availability of vast amounts of information and lack of statistical knowledge to interpret them signifies our client's poor access to market. The client relies heavily on private and physical contacts for market related information. Infrastructural problems common to most developing countries like accessibility to land, water, feeder roads, electricity and other utilities, fueled by the overpopulation problem specific to India, poses heavy limitations on MSMEs like our client. This further leads to reliability issues with customers.

o **Team constraints:**

Ø Time and team management. Since there is a huge scope of change, it is important to stick to the scope of the project and not get distracted based on client's demands. Hence, time management and maintaining efficient use of team's resources can be a possible constraint.

Ø Time-zone variation. The team and the client being in separate time zones (+10.30 hours) poses a difficulty in communication, especially during the feedback phases after the design phase.

Ø Scope. Due to the fact that this is an academic project, the possibility of variation in scope is little to none. Hence, the team would not be able to accommodate any changes in scope demanded by the client.

3. Analysis Phase Report

1. Fact finding and information gathering techniques

The following were our primary fact finding techniques to gather information about the business –

1. Interviewing and questionnaires
2. Examining the documentation
3. Observing the organization in operation
4. Research

To gather more information about the current service system at Omega Nutraceuticals Pvt. Ltd. , our team conducted an interview with the business owner, a customer and the respective managers of the three departments who use the system daily. Since we're performing the analysis from a remote location, it was not possible for us the observe the organization in operation.

However, we were able to review their current website and develop solutions that could help them improve their online presence and reach out to customers and suppliers more effectively.

These interviews allowed our team to obtain first hand insight into how the system operates and how the various external entities interact with it. We also reviewed management structure and payroll system of the business to better understand the functioning of its units. This was done through the documentation provided based on the owner and the information available on their official website. Another area of research was examining the business practices of their competitors so that they can optimize their pricing and list of products to tap into new markets.

We also reviewed the policies and legal requirements for the fertilizer manufacturing industry in India to ensure that our framework can be implemented without any potential roadblocks. For example, hiring new employees for an IT department or outsourcing the IT related tasks would require government approvals and tax overheads. So, it was best to set up a basic ERP system and train the existing managers to operate it.

During the observation, our team was walked through the entire management of the three departments from start to finish. The process begins with the administrative staff of the company requesting the suppliers to provide raw materials and inventory required for manufacturing. This is usually performed over a phone call and the logistics are taken care of by the supplier. This is followed by the billing and receipt exchange between the two parties. The management updates the inventory and production schedule of the factory. The end products are then shipped to the customers with a similar exchange of bills and receipts. The owner is responsible for the approvals and overall financial reports of the business.

Since most of this is done manually, the team observed that the business lacks the synergy necessary to optimize its operations. The current system does not only have several inefficient and redundant processes, but it also leaves room for human error. Also the records were being studied to predict trends and optimize the supply chain.

Interviews with the customer were also conducted in order to obtain even more details and identify their pain points. A brief, open-ended structured interview was performed with a regular fertilizer seller who would source his products from the business. This interview allowed for clarification and explanation on specific questions that arose from our team during the website review and observation. Informal interviews were also conducted, in order to gain insight and background on the interaction between the operations and current system at Omega Nutraceuticals.

The focus of the interviews was to gain insight on current processes, obtain opinions on the current user experience, and determine if there is a willingness

or want for change. Through the fact finding techniques conducted, current inefficiencies, disadvantages of the current system, areas of improvement, and expectations of a potential new system were uncovered and can be used in the future to build a more efficient database and ERP system for the Omega Nutraceuticals Pvt. Ltd.

2. Systems Model of the current system

Context Level Diagram
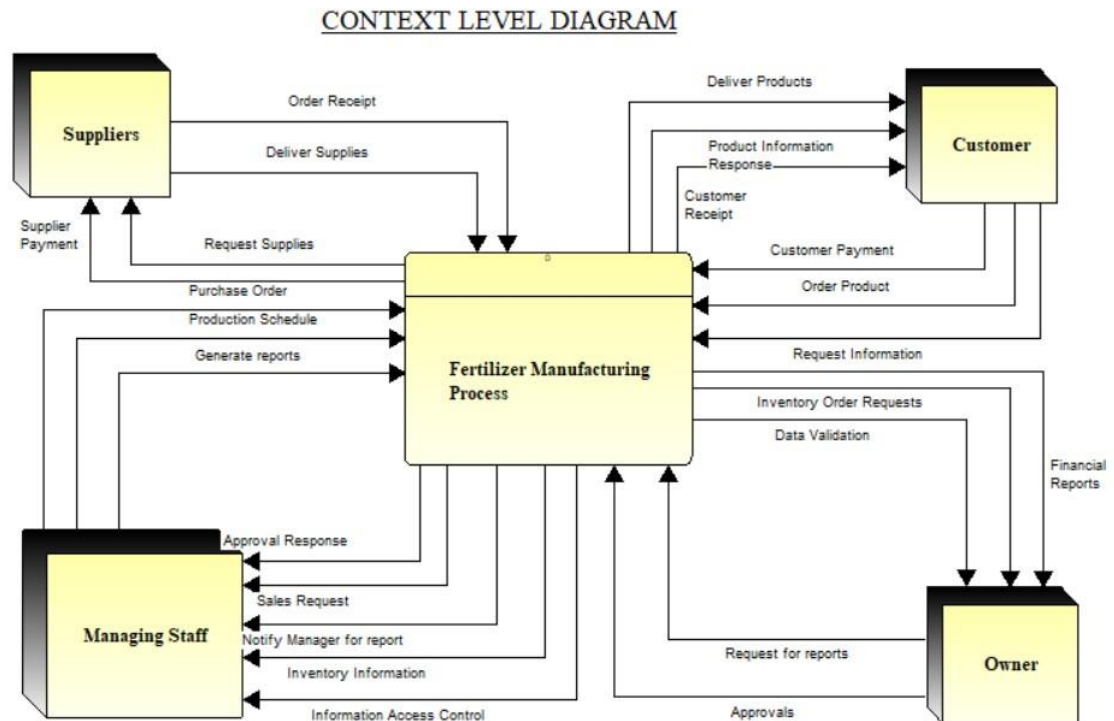
There are four external entities that interact with the Residency Services System.

External entities:

•**Suppliers**: This external entity represents all the vendors associated with the company that supply goods and services in the form of raw materials required for production of fertilizers. The company may have several vendors for several kinds of raw materials and they are contacted for purchases when there is requirement by the schedule of production.
•**Customers:** This external entity represents the recipients of the finished goods and products where the fertilizer manufacturing company acts as the seller. For every product sold, the seller is responsible for shipping it to the customer in exchange for a quoted price which is paid by the customer.
•**Managing Staff**: This external entity represents a set of employees associated with the company who are responsible for overseeing all the operations as well as taking decisions regarding the sales and purchases of goods. These decisions require approval by the owner of the company.

•**Owner:** This external entity represents the owner of the business who is responsible for managing the human resources of the company, market the products and take business decisions based on the financial reports provided by its employees. Owner is also responsible for approving the purchase requests and perform audit into the operations of the fertilizer plant.

Process:
Fertilizer Manufacturing Process is the central processing system for all data used and stored in the five processes: Raw Material Purchasing, Sell Finished Products, Information Portal, Submit Reports and Request for Approvals. System inputs and outputs are listed below:

System Inputs:

From Suppliers
- Deliver Supplies
- Order Receipts

From Customers
- Customer Payment
- Order Product
- Request Information

From Managing Staff
- Purchase Order
- Production Schedule
- Generate Reports

From Owner
- Approvals
- Request for reports

System Outputs:

To Suppliers
- Request Supplies
- Supplier Payment

To Customers
- Deliver Products
- Product Information Response
- Customer Receipt

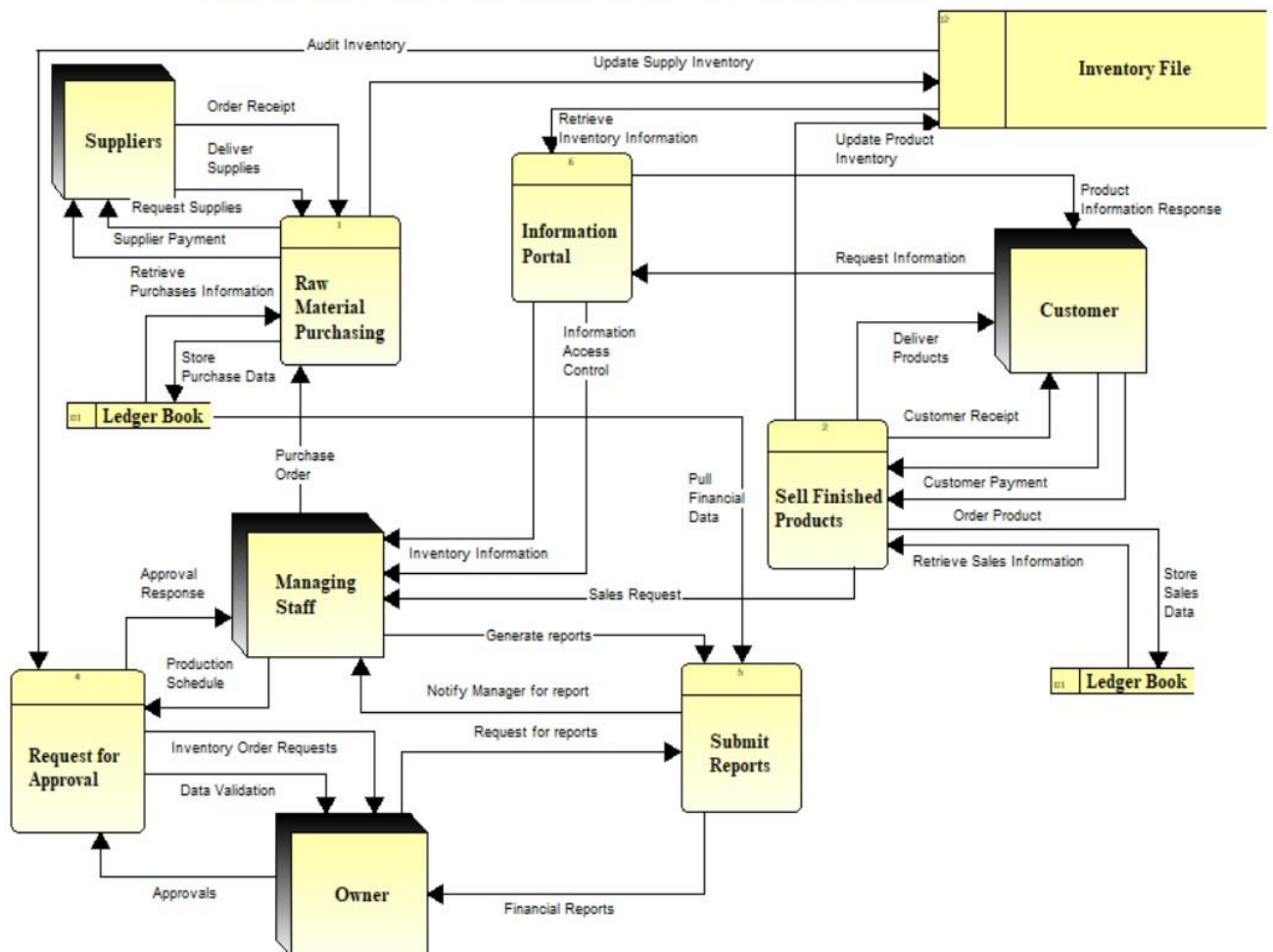*To Managing Staff*
- Approval Response

- Sales Request
- Notify Manager for report
- Inventory Information
- Information Access Control

To Owner
- Data Validation
- Inventory Order Requests
- Financial Reports

Level 0 Diagram

FERTILIZER MANUFACTURING PROCESS LEVEL 0 DIAGRAM

The four entities described in the Context Diagram Description are retained in the Level 0 Diagram. However, the system shown previously is now expanded and includes 5 processes and 2 data stores.

Data Stores:

Ledger Book (D1): This data store records all the information regarding economic transactions of the company i.e. payments and recipients of the raw materials bought from suppliers and the products sold to customers. This information is stored manually in the system which is then used to generate the receipts and financial reports.

Inventory File (D2): This data store records information about all the products and raw materials present in the company warehouses. This information is also stored manually into the system to keep a track of all the supplier and customer related inventory that the company keeps.

Processes:

1. Raw Material Purchasing: This process ensures a reliable supply of raw materials into the manufacturing of fertilizers. The procurement of raw materials is done by contacting the supplier and performing transactions depending on the requirement of the factory.

System Inputs

From Managing Staff
- Purchase Order

From Suppliers
- Deliver Supplies
- Order Receipts

From Ledger Book (data store)
- Retrieve Purchases Information

System Outputs

To Suppliers
- Request Supplies
- Supplier Payment

To Ledger Book (data store)
- Deliver Supplies
- Order Receipts

To Inventory File (data store)
- Update Supply Inventory

2. Sell Finished Products: This process performs sales of fertilizer products from the factory to the customers in return for money. This process also involves the customer contacting the company to enquire about the availability of products along with the financial transactions that happen during the sale. Based on the demand of the products and request of customers, the production is updated so that new products can be manufactured in time.

System Inputs

From Customer
- Customer Payment
- Order Product

From Ledger Book (data store)
- Retrieve Sales Information

System Outputs

To Customer
- Deliver Products
- Customer Receipt

To Managing Staff
- Sales Request

To Ledger Book (data store)
- Store Sales Data

To Inventory File (data store) ▪
Update Product Inventory

3. Request for Approval: This process is used to get approvals from the Owner regarding important purchases of inventory done by the managing staff within the company.

System Inputs

From Managing Staff
- Production Schedule

From Owner
- Approvals

From Inventory File (data store)
- Audit Inventory

System Outputs

To Managing Staff
- Approval Response

To Owner
- Data Validation
- Inventory order requests

To Inventory File (data store)
- Update Product Inventory

4. Information Portal: This process is allows customers and managing staff to catalog and access data about the product inventory that the company offers. Customers view this data and place orders based on their requirements while the managers get control to modify the data depending on what should be displayed to the customer.

System Inputs
From Customer
- Request Information

From Inventory File (data store)
- Retrieve Inventory Information

System Outputs

To Customer

- Product Information Response

To Managing Staff
- Information Access Control
- Inventory Information

5. Submit Reports: This process is used to prepare human readable reports about the operations of the company by collating information from the data stores. The managing

staff is required to generate these reports on a cyclic and on-demand basis and submit these to the owner of the company.

System Inputs

From Owner
- Request for reports

From Managing Staff
- *Generate Reports*

From Ledger Book (data store)
- Pull Financial Data

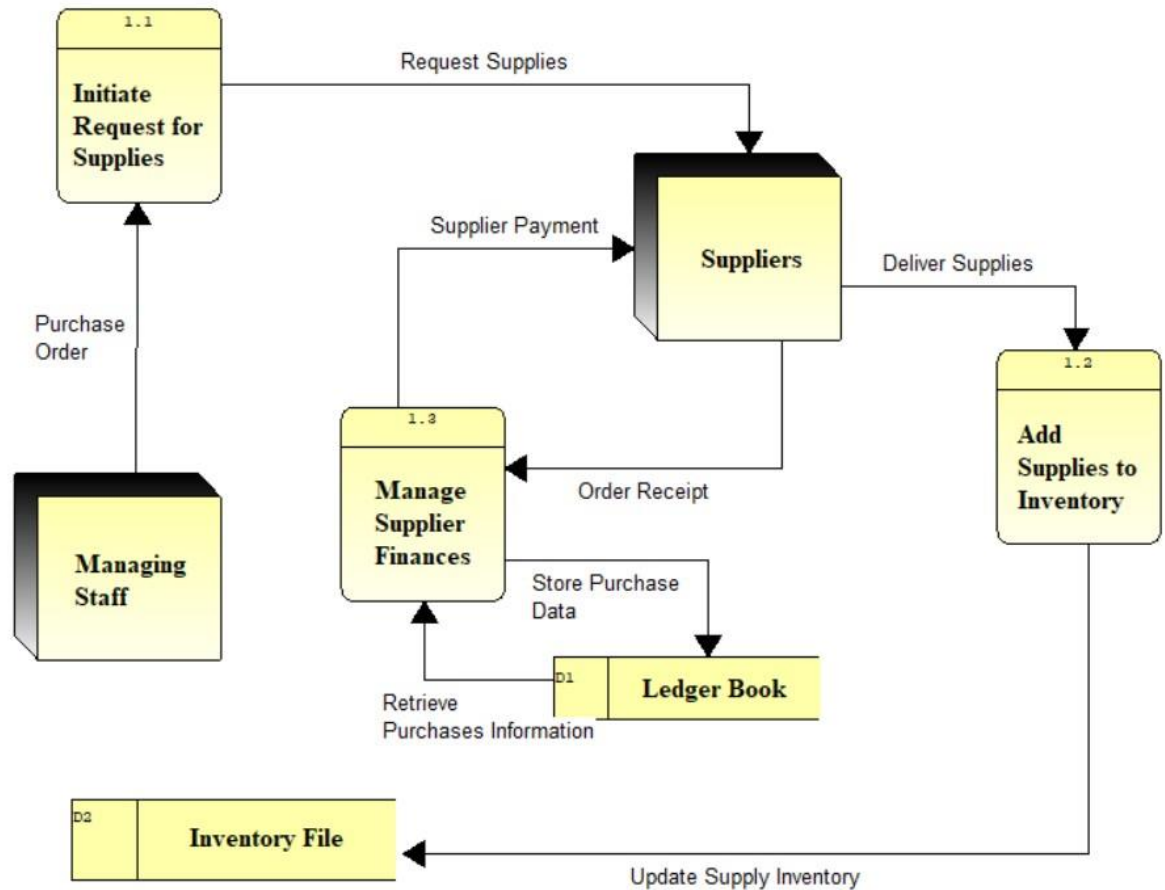**System Outputs**

To Owner
- Financial Reports

To Managing Staff
- Notify manager for reports

Level 1 Diagrams

Level 1 Diagram for Raw Material Purchasing

RAW MATERIAL PURCHASING LEVEL 1 DIAGRAM

Processes:

1.1 Initiate Request for supplies: This process is responsible to transferring purchase request from the managing staff of the company to the supplier. It is used during the purchases of raw material and inventory when there is a demand for customer products.

System Inputs

• *From Managing Staff*
▪ Purchase Order

System Outputs

• *To Suppliers*

- Request Supplies

1.2 Manage supplier finances: This process is required to handle all the financial work i.e. billing and payment related to the purchase of raw materials in the factory.

System Inputs

- *From Suppliers*
- Order Receipt

- *From Ledger Book (data store)*
- Retrieve Purchases Information

System Outputs

- *To Suppliers*
- Supplier Payment

- *To Ledger Book (data store)*
- Store purchases data

1.3 Add supplies to inventory: This process is used for updating the inventory database after new raw materials have been shipped by the suppliers to the company warehouses.
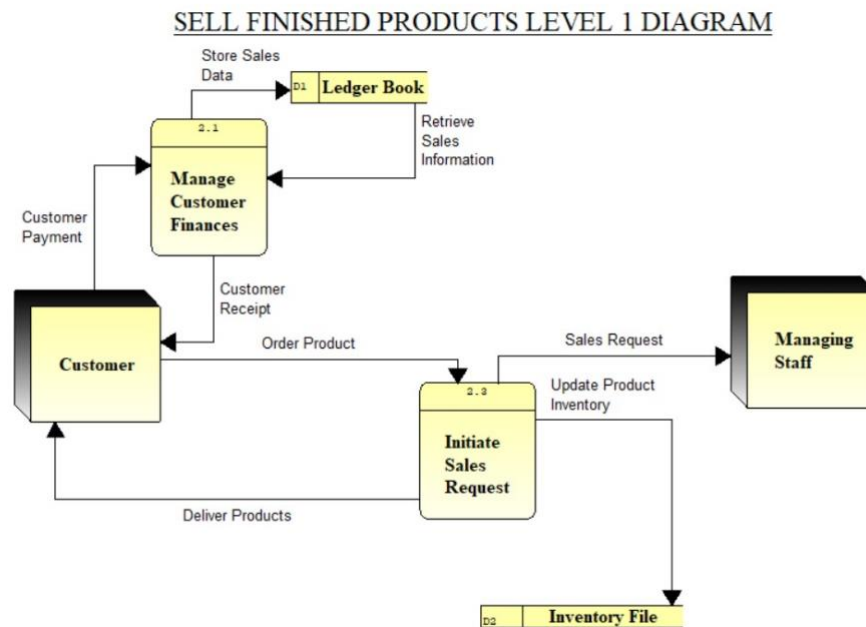
System Inputs

- *From Suppliers*
- Deliver supplies

System Outputs

- *To Inventory File (data store)*
- Supplier Payment

- *To Ledger Book (data store)* ▪
Update Supply Inventory

Level 1 Diagram for

Sell Finished Products

SELL FINISHED PRODUCTS LEVEL 1 DIAGRAM

Processes:

2.1 Manage Customer Finances: This process is required to handle all the customer related financial work i.e. billing and payment related to the sales of finished goods and fertilizers in the factory.

System Inputs

• *From Customer*
▪ Customer payment

• *From Ledger Book (data store)*
▪ Retrieve sales information

System Outputs

• *To Customer*
▪ Customer receipt

• *To Ledger Book (data store)*
▪ *Store Sales data*

2.2 **Initiate Sales Request**: This process is responsible to transferring sales request from the customers of the company to its managing staff. It is used when goods are ready to be sold to the customers after their manufacturing. On completion of a sale, the inventory data store needs to be updated accordingly.

System Inputs

• *From Customer*
▪ Order Product

System Outputs

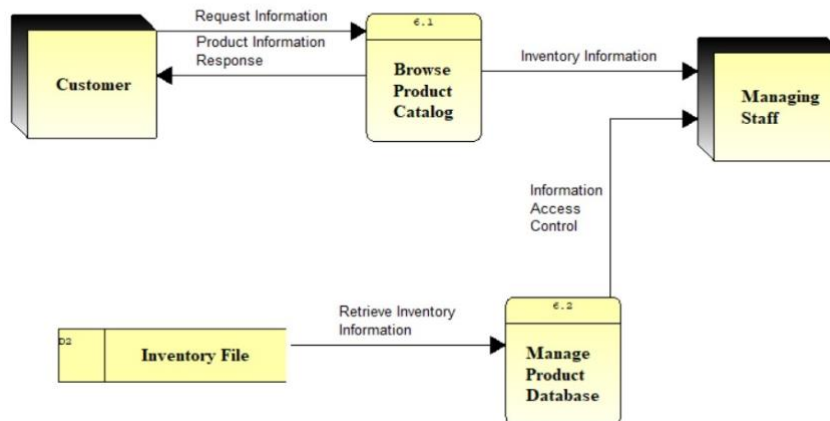• *To Customer*
▪ Deliver Products

• To Managing Staff
▪ Sales Request

• To Inventory File (data store) ▪
Update product inventory

Level 1 Diagram for

Information Portal

Information Portal Level 1 Diagram

Processes:

3.1 **Browse Product Catalog:** This process allows customers and managers within the company to browse the list of products that are available for sale. It helps them monitor the inventory from a front end page.

System Inputs

• *From Customer*
▪ *Request information*

System Outputs

• *To Customer*
▪ Product information response

• *To Managing Staff*
▪ *Inventory information*

3.2 **Manage Product Database:** This process allows the managers to control the level of information visible to customers as well as add changes to it. The data managed is retrieved from a data store.

System Inputs

- *From Inventory File (data store)*
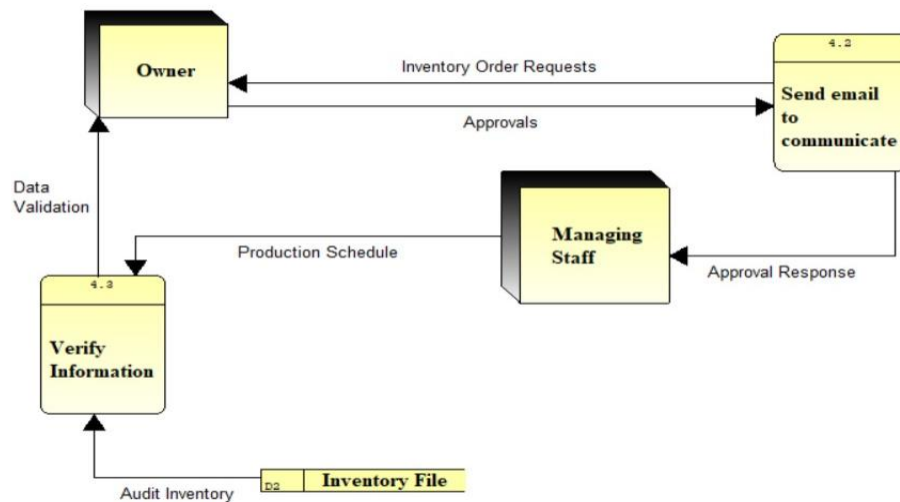 - *Retrieve inventory information*

System Outputs

- *To Managing Staff*
  - *Information Access Control*

Level 1 Diagram for

Request for Approval

REQUEST FOR APPROVAL LEVEL 1 DIAGRAM

Owner

Inventory Order Requests

4.2

Send email to communicate

Approvals

Data Validation

Production Schedule

Managing Staff

Approval Response

4.3

Verify Information

Audit Inventory

D2 Inventory File

Processes:

4.1 **Send email to communicate:** This process ensures that there's a reliable communication channel between the owner and managing staff through which approval reports and requests can be sent.

System Inputs

• *From Owner*
▪ Approvals

System Outputs

• *To Owner*
▪ Inventory Order Requests

• *To Managing Staff*
▪ Approval response

4.2 **Verify Information:** This process allows the owner to keep a tab and verify the authenticity of new purchase requests based on the inventory and production schedule of the factory.
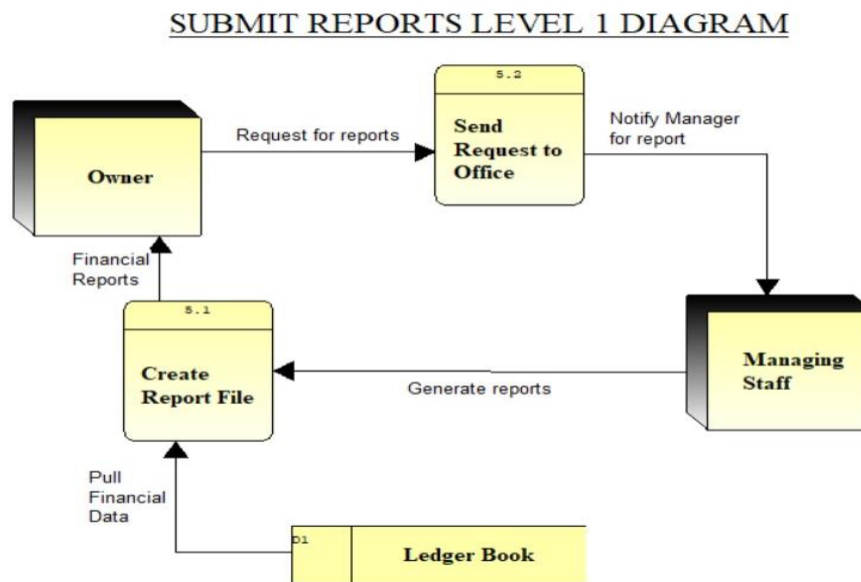
System Inputs

- • *From Managing Staff* ▪ Production schedule
- • *From Inventory File (data store)*
- ▪ Audit inventory

System Outputs

- • *To Owner*
- ▪ Data validation

Level 1 Diagram for Submit Reports

SUBMIT REPORTS LEVEL 1 DIAGRAM

Processes:

5.1 Create Report File:

System Inputs

- • *From Managing Staff*
- ▪ Generate reports

- • *From Ledger Book (data store)*
- ▪ Pull financial data

System Outputs

- • *To Owner*

Level 1 Diagram for

- Financial Reports

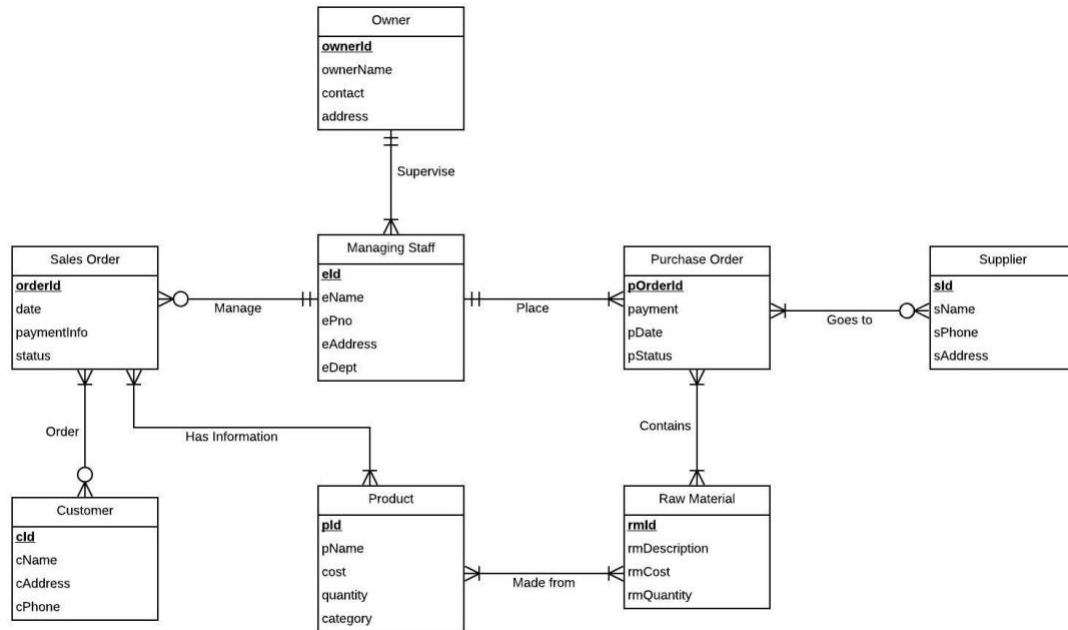5.2 **Send Request to office:**

System Inputs

- *From Owner*
  - Request for reports

System Outputs

- *To Managing Staff*
  - Notify manager for report

Entity Relationship Diagram

Entities:

Owner – Contains all the basic information about the owner of the business.

Managing Staff - Contains all the basic information about the employees of the business responsible for managing the operations.

Customer – Contains all the basic information about the customers who purchase fertilizers from the business.

Supplier – Contains all the basic information about the suppliers from who the business purchases its raw materials.

Raw Material – This is data about the raw materials that are required for the production of fertilizers in the factory.

Product – This is data like quantity, cost, name and id of all the fertilizer products that are manufactured by the company and sold to customers.

Sales Order – This entity contains all the information about individual sales of products and is stored as a part of the ledger.

Purchase Order – This entity contains information about individual purchases of raw materials like order quantity, payment, supplier id etc.

4. The system models of the Proposed system

4.1 Data Flow Diagrams (DFDs)

There are four external entities that interact with the Fertilizer Manufacturing Process. External entities:

•**Suppliers**: This external entity represents all the vendors associated with the company that supply goods and services in the form of raw materials required for production of fertilizers. The company may have several vendors for several kinds of raw materials and they are contacted for purchases when there is requirement by the schedule of production.

•**Customers**: This external entity represents the recipients of the finished goods and products where the fertilizer manufacturing company acts as the seller. For every product sold, the seller is responsible for shipping it to the customer in exchange for a quoted price which is paid by the customer.

•**Managing Staff**: This external entity represents a set of employees associated with the company who are responsible for overseeing all the operations as well as taking decisions regarding the sales and purchases of goods. These decisions require approval by the owner of the company.

•**Owner**: This external entity represents the owner of the business who is responsible for managing the human resources of the company, market the products and take business decisions based on the financial reports provided by its employees. Owner is also responsible for approving the purchase requests and perform audit into the operations of the fertilizer plant.

Process:

Fertilizer Manufacturing Process is the central processing system for all data used and stored in the five processes: Raw Material Purchasing, Sell Finished Products, Information Portal, Submit Reports and Request for Approvals. System inputs and outputs are listed below:

System Inputs:

From Suppliers
- Deliver Supplies
- Order Receipts
- Update Purchase Status

From Customers
- Customer Payment
- Order Product
- Request Information
- Sales Status

From Managing Staff
- Purchase Order
- Production Schedule
- Generate Reports

- Update Status

- Approvals
- Request for reports

System Outputs:

To Suppliers
- Request Supplies
- Supplier Payment
- Purchase Notification
- Supplier Access

To Customers
- Deliver Products
- Product Information Response
- Customer Receipt
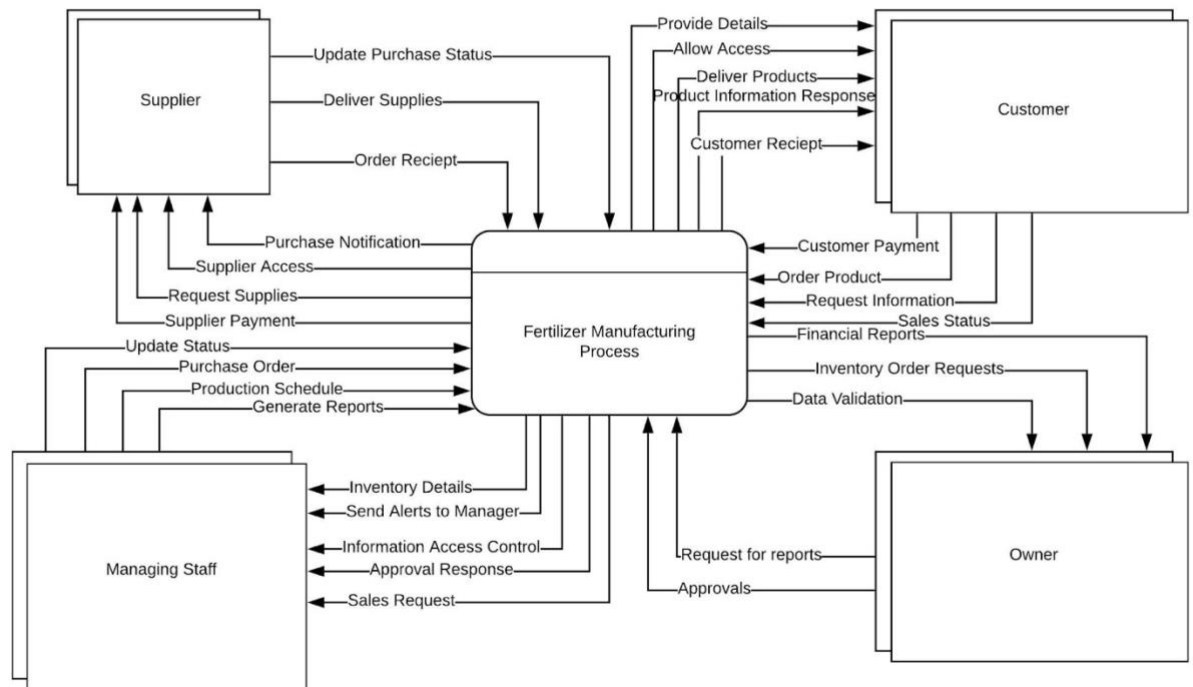- Allow Access
- Provide Details

To Managing Staff
- Approval Response
- Sales Request
- Send alerts to manager
- Inventory Information
- Information Access Control

To Owner
- Data Validation
- Inventory Order Requests
- Financial Reports

4.2 Context Level Diagram

Context Level
Diagram

The four entities described in the Context Diagram Description are retained in the Level 0 Diagram. However, the system shown previously is now expanded and includes 5 processes and 1 data store.

Data Stores:

Database (D1): This data store contains all the financial as well as warehouse inventory details. It is a combination of the Ledger Book and Inventory File that were being maintained by the company in physical form. Electronically, all the data is store in MYSQL tables that can be accessed using the right technology.

Processes:

1. Raw Material Purchasing: This process ensures a reliable supply of raw materials into the manufacturing of fertilizers. The procurement of raw materials is done by contacting the supplier and performing transactions depending on the requirement of the factory.

System Inputs

From Managing Staff
- Purchase Order

From Suppliers
- Deliver Supplies

From Database (data store)
- Retrieve Purchases Information

System Outputs

To Suppliers
- Request Supplies
- Supplier Payment

To Database
- Store Purchase data
- Update Supply Inventory

2. Inventory Management System: This process allows the organization to control and administer warehouse operations from the time goods or materials enter a warehouse until they move out. Operations in a warehouse include inventory management, tracking payments and auditing.

System Inputs
From Managing Staff
- Generate Reports

From Suppliers
- § Update Purchase Status

From Database (data store)
- Retrieve Inventory Information
- Pull financial data

System Outputs *To Suppliers*
- Send Purchase notification

To Customer
- Product Information Response
- Provide customer access

To Managing Staff
- Send alerts to manager
- Notify manager to report

To Owner
- Financial Reports

3. Sell Finished Products: This process performs sales of fertilizer products from the factory to the customers in return for money. This process also involves the customer contacting the company to enquire about the availability of products along with the financial transactions that happen during the sale. Based on the demand of the products and request of customers, the production is updated so that new products can be manufactured in time.

System Inputs

From Customer
- Order Product

From Database
- Retrieve Sales Information

System Outputs

To Customer
- Deliver Products
- Customer Receipt

To Managing Staff
- Sales Request

To Database (data store)
- Store Sales Data
- Update Product Inventory

4. Request for Approval: This process is used to get approvals from the Owner regarding important purchases of inventory done by the managing staff within the company.

System Inputs

From Managing Staff
- Production Schedule

From Owner
- § Approvals

From Database (data store)
- § Audit Inventory

System Outputs

To Managing Staff
- Approval Response

To Owner
- Data Validation
- Inventory order requests

To Database (data store)
- Update Product Inventory

Fertilizer Manufacturing Process Level 0 Diagram
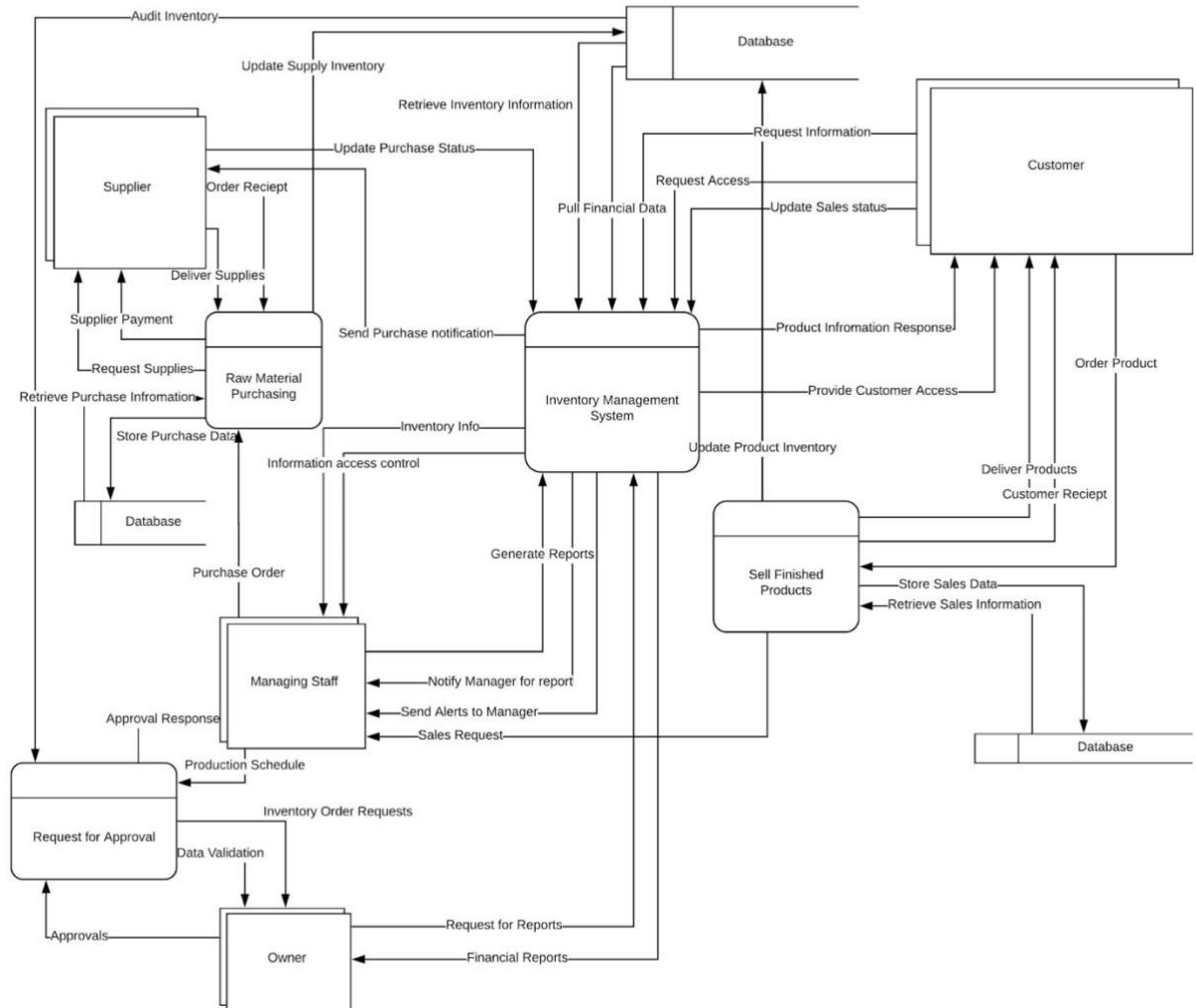
4.3 Level 1 Diagram for Raw Material Purchasing

Processes:

1.1 Initiate Request for supplies: This process is responsible to transferring purchase request from the managing staff of the company to the supplier. It is used during the purchases of raw material and inventory when there is a demand for customer products.

System Inputs

From Managing Staff
   • Purchase Order

System Outputs

To Suppliers
- Request Supplies

1.2 Manage supplier finances: This process is required to handle all the financial work i.e. billing and payment related to the purchase of raw materials in the factory.

System Inputs

From Suppliers
- Order Receipt

From Suppliers
- Order Receipt

From Ledger Book (data store)
- Retrieve Purchases Information

System Outputs

To Suppliers
- Supplier Payment

To Database (data store)
- Store purchases data
- Update Supply Inventory

Raw Material Purchasing Level 1 Diagram
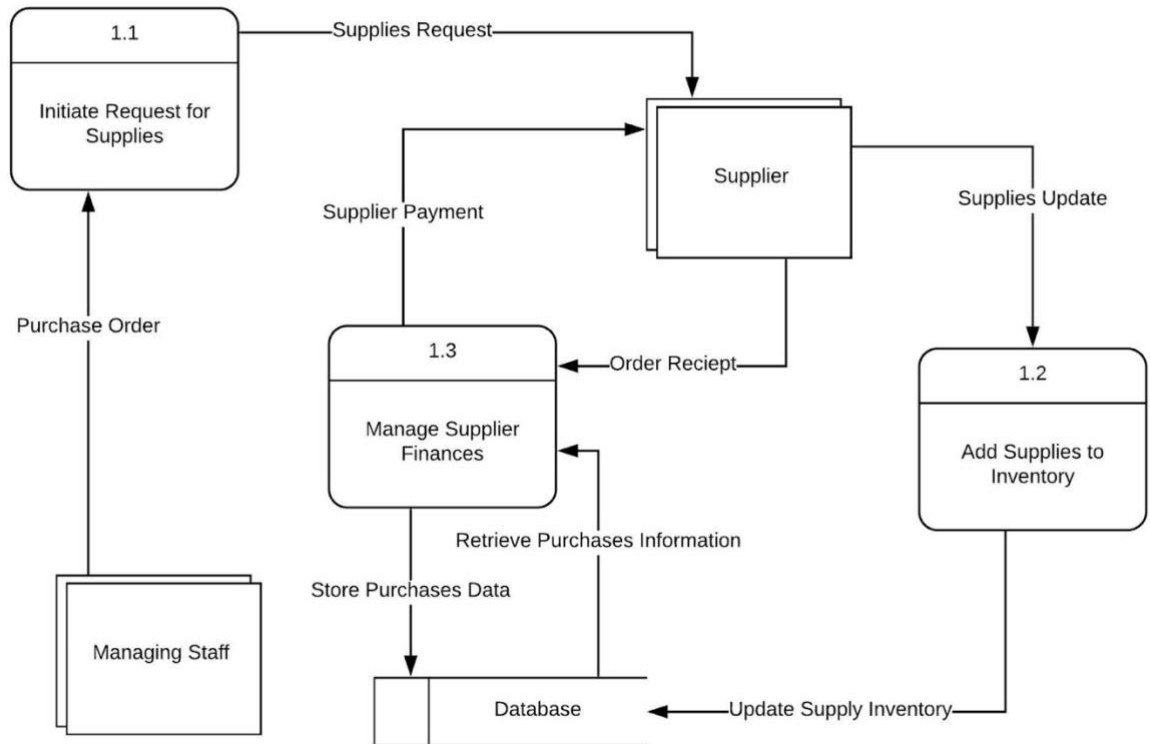
4.4 Level 1 Diagram for Sell Finished Products

Processes:

2.2 Manage Customer Finances: This process is required to handle all the customer related financial work i.e. billing and payment related to the sales of finished goods and fertilizers in the factory.

System Inputs

From Customer
- Customer payment

From Database (data store)
- Retrieve sales information

System Outputs

To Customer
- Customer receipt

To Database (data store)
- Store Sales data

2.2 **Initiate Sales Request**: This process is responsible to transferring sales request from the customers of the company to its managing staff. It is used when goods are ready to be sold to the customers after their manufacturing. On completion of a sale, the inventory data store needs to be updated accordingly.

System Inputs

From Customer
- Order Product

System Outputs

To Customer
- Deliver Products

To Managing Staff
- Sales Request

To Database (data store)
- Update product inventory

Sell Finished Products
Level 1 Diagram
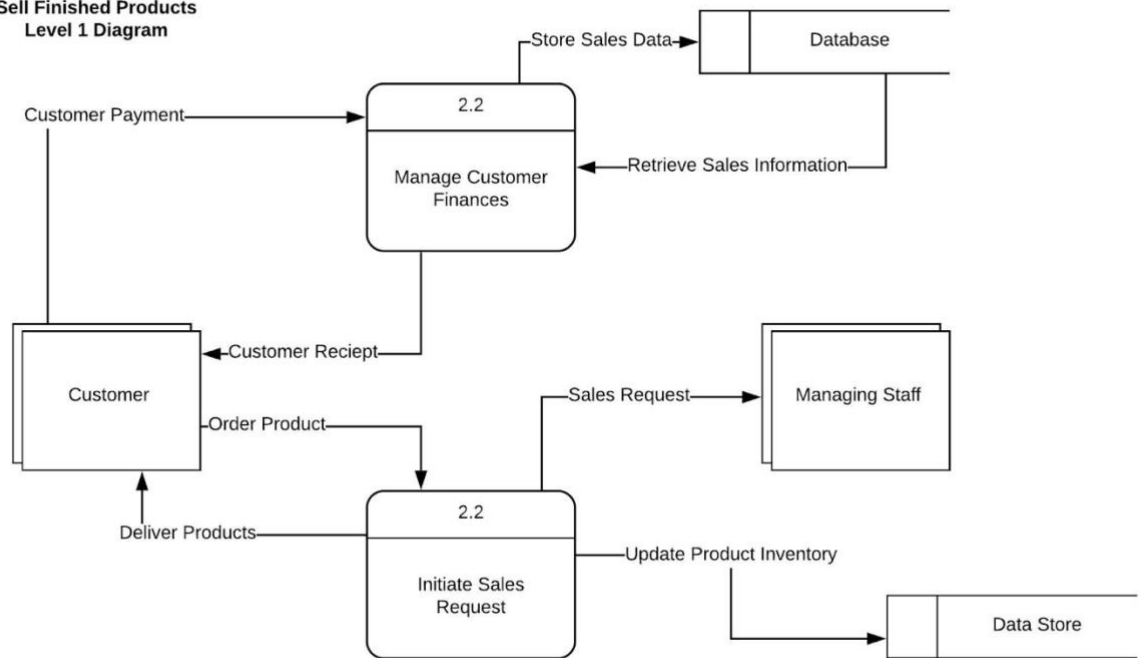
4.5 Level 1 Diagram for Inventory Management

3.1 Verify Status of Request: This process is allows the users and managers to check the status of their order. This can be used for both purchases and sales orders and allows them to efficiently track the progress of demand/supply.

System Inputs

From Supplier
- Update Purchase status

From Customer
- Update Sales Status

System Outputs

To Database
- Update order status

3.2 Manage Database Access: This process allows the managers to control the level of information visible to customers as well as add changes to it. The data managed is retrieved from a data store.

System Inputs

From Supplier
- Request supplier access

From Customer
- Request customer access

System Outputs

To Supplier
- Provide supplier access

To Customer
- Provide customer access

3.3 Browse Product Catalog: This process allows customers and managers within the company to browse the list of products that are available for sale. It helps them monitor the inventory from a front end page.

System Inputs

From Customer
- Request information

System Outputs

To Customer
- Product Information Response

To Managing Staff
- Inventory information

3.4 Send Request to office:

System Inputs

From Owner
- Request for reports

System Outputs

To Managing Staff
  • Notify manager for report

3.5 Create Report File:

System Inputs

From Managing Staff
  • Generate reports

From Database (data store)
  • Pull financial data

System Outputs

To Owner
  • Financial Reports

Inventory Management System Level 1 Diagram
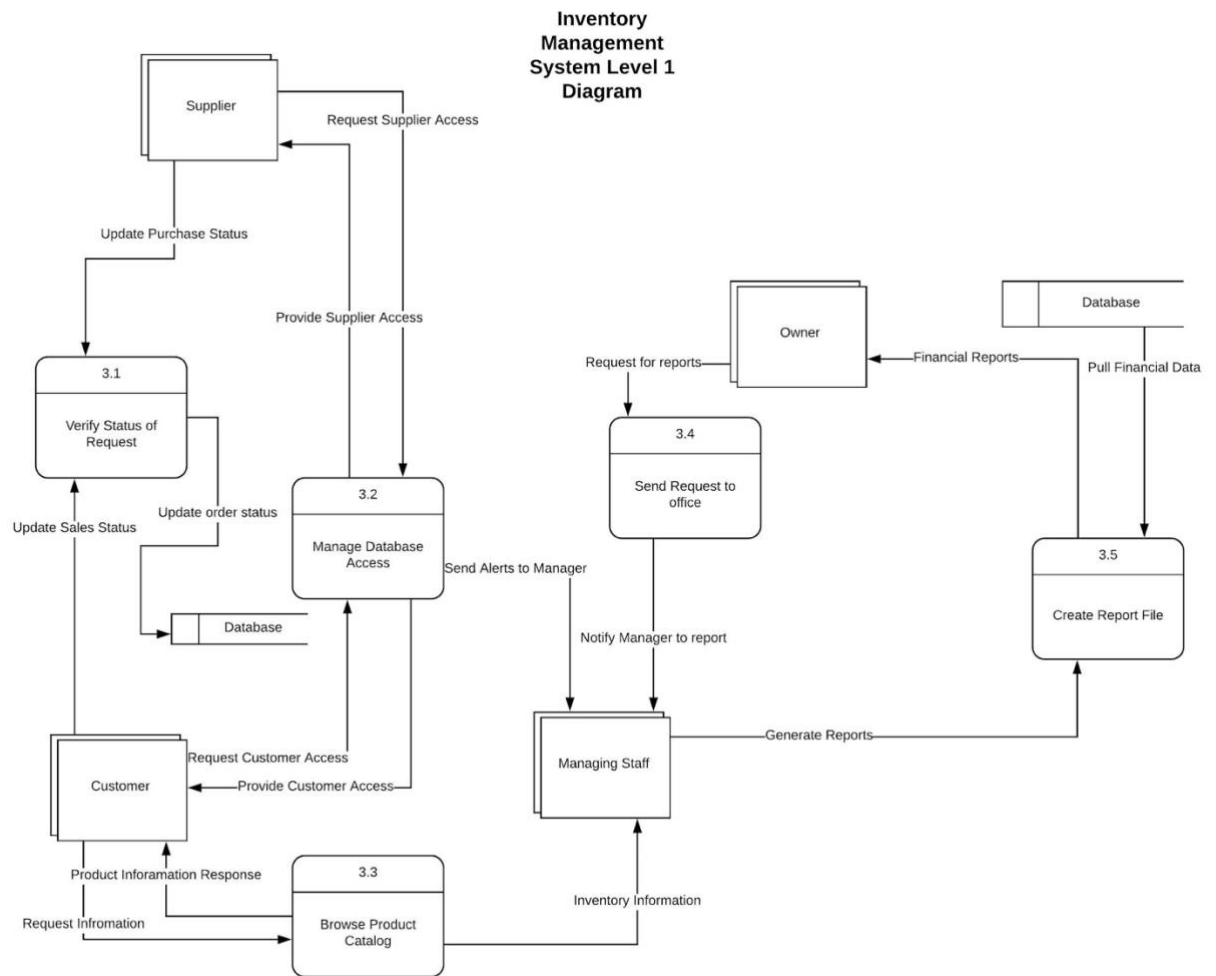
4.6 Level 1 Diagram for Request for Approval

Processes:

4.1 **Send email to communicate:** This process ensures that there's a reliable communication channel between the owner and managing staff through which approval reports and requests can be sent.

System Inputs

From Owner
   • Approvals

System Outputs

To Owner
- Inventory Order Requests

To Managing Staff
- Approval response

4.2 Verify Information: This process allows the owner to keep a tab and verify the authenticity of new purchase requests based on the inventory and production schedule of the factory.

System Inputs

From Managing Staff
- Production schedule

From Inventory File (data store)
- Audit inventory

System Outputs

To Owner
- Data validation

Request for Approval Level 1 Diagram

4.7 Identifying data requirements using Entity Relationship Diagrams (ERD)

Entities:

Owner – Contains all the basic information about the owner of the business.
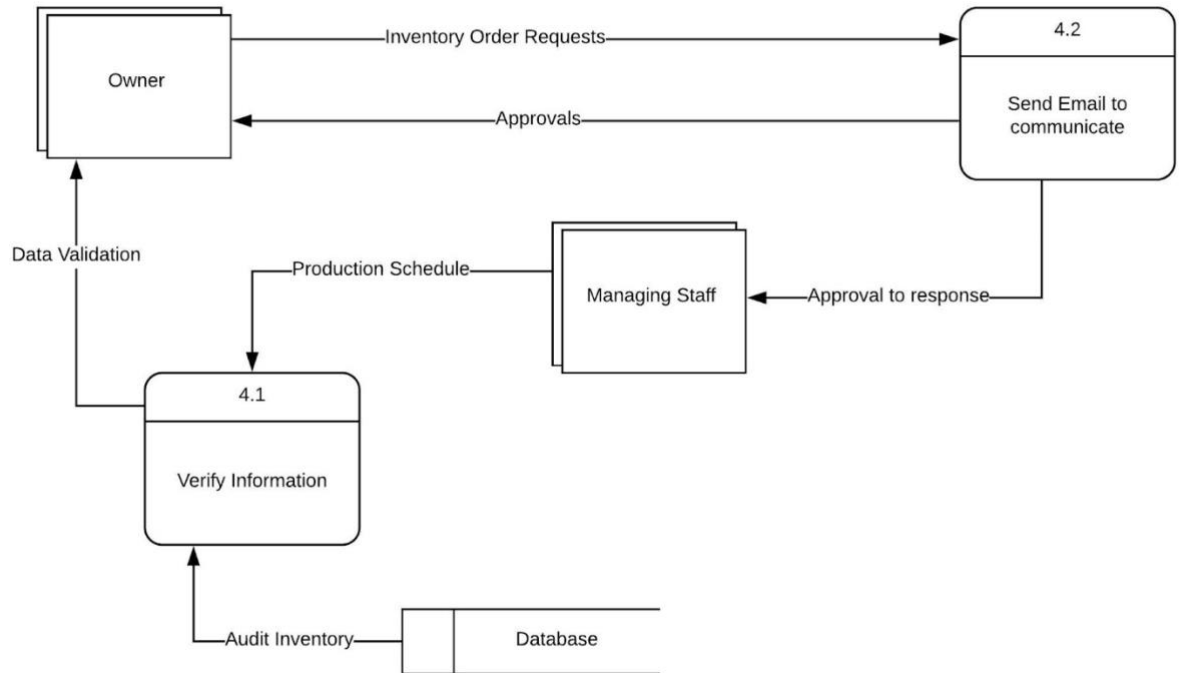Managing Staff - Contains all the basic information about the employees of the business responsible for managing the operations.

Customer – Contains all the basic information about the customers who purchase fertilizers from the business.

Supplier – Contains all the basic information about the suppliers from who the business purchases its raw materials.

Raw Material – This is data about the raw materials that are required for the production of fertilizers in the factory.

Product – This is data like quantity, cost, name and id of all the fertilizer products that are manufactured by the company and sold to customers.

Sales Order – This entity contains all the information about individual sales of products and is stored as a part of the ledger.

Purchase Order – This entity contains information about individual purchases of raw materials like order quantity, payment, supplier id etc.

4.8 The Synchronized System Models (The CRUD Matrix)

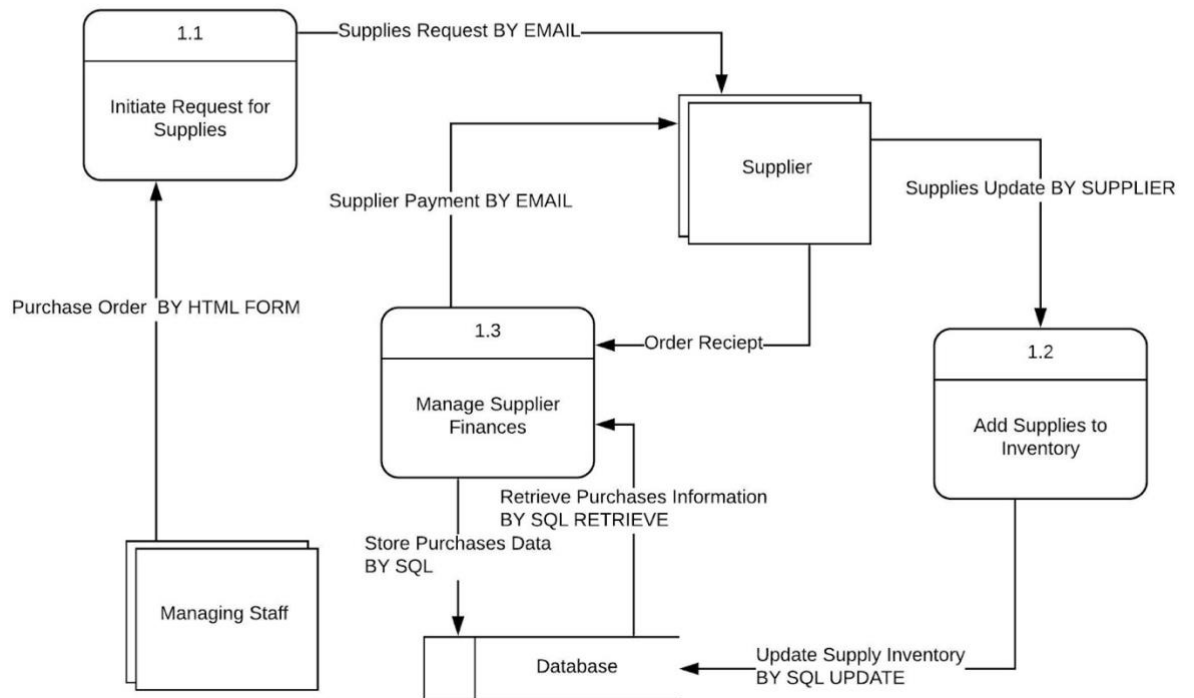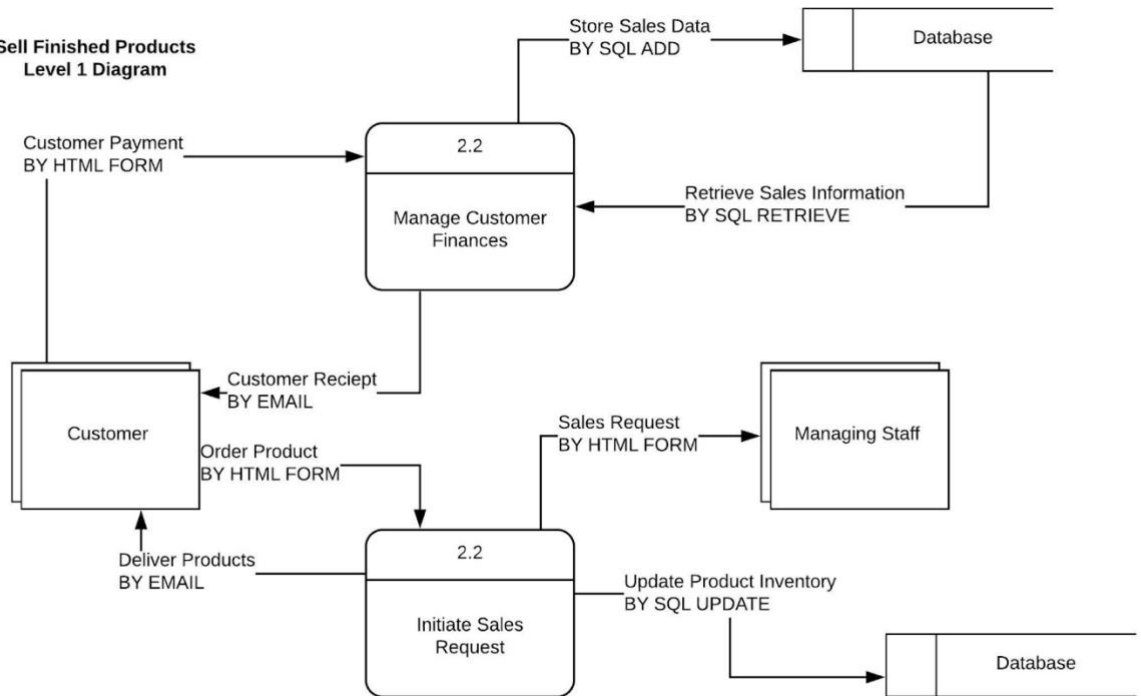| Entity\ Process	Initiate Request for Supplies (1.1)	Add Suppliers to Inventory (1.2)	Manage Suppliers Finances (1.3)	Initiate Sales Request (2.2)	Manage Customer Finances (2.2)	Verify Status of Request (3.1)	Manage Database Access (3.2)	Browse Product Catalog (3.3)	Send Request to Office (3.4)	Create Report File (3.5)	Verify Information (4.1)	Send Email to Communicate (4.2)
Owner									CRU		CRU	CRU
.ownerId												
.ownerName												
.contact												
.address												
.verificationStatus											CRU	
.request									CRU			CRU
Customer				CRU								
.cId				CR								
.cName				CRU								
.cAddress				CRU								
.cPhone				CRU								
Managing Staff										CRU		CRU
.eId												
.eName												
.ePno												
.eAddress												
.eDept												
.response										CRU		CRU
Product								R				
.pId								R				
.pName								R				
.cost								R				
.quantity												
.category								R				
Raw Material	CRU											
.rmId	CR											
.rmDescription	CRU											
.rmCost	CRU											
.rmQuantity	CRU											
Supplier		CRU										
.sId		CR										
.sName		CRU										
.sPhone		CRU										
.sAdress		CRU										
Purchase Order			CRU			RU	R					
.pOrderId			CR				R					
.payment			CR				R					
.pDate			CR				R					
.status			CRU			RU	R					
Sales Order					CRU	RU	R					
.orderId					CR		R					
.date					CR		R					
.paymentInfo					CR		R					
.status					CRU	RU	R					

4.9 The Physical System Design

Raw Material Purchasing Level 1 Diagram

1.1 Initiate Request for Supplies	

Supplies Request BY EMAIL

Supplier

Supplies Update BY SUPPLIER

Supplier Payment BY EMAIL

Purchase Order BY HTML FORM

1.3 Manage Supplier Finances

Order Reciept

1.2 Add Supplies to Inventory

Retrieve Purchases Information BY SQL RETRIEVE

Store Purchases Data BY SQL

Managing Staff

Database

Update Supply Inventory BY SQL UPDATE

Sell Finished Products
Level 1 Diagram

Store Sales Data
BY SQL ADD

Database

Customer Payment
BY HTML FORM

2.2

Manage Customer
Finances

Retrieve Sales Information
BY SQL RETRIEVE

Customer Reciept
BY EMAIL

Customer

Order Product
BY HTML FORM

Sales Request
BY HTML FORM

Managing Staff

Deliver Products
BY EMAIL

2.2

Initiate Sales
Request

Update Product Inventory
BY SQL UPDATE

Database

Inventory Management System Level 1 Diagram

Supplier

Request Supplier Access
BY HTML FORM

Update Purchase Status
BY HTML FORM

Provide Supplier Access
BY HTML FORM

Owner

Financial Reports
BY EMAIL

Request for reports
BY HTML FORM

Database

Pull Financial Data
BY SQL RETRIEVE

3.1
Verify Status of Request

3.2
Manage Database Access

3.4
Send Request to office

3.5
Create Report File

Update Sales Status
BY HTML FORM

Update order status
BY SQL UPDATE

Database

Send Alerts to Manager
BY EMAIL

Notify Manager to report
BY EMAIL

Request Customer Access
BY HTML FORM

Provide Customer Access
BY HTML FORM

Customer

Managing Staff

Generate Reports
BY HTML FORM

Product Inforamation Response
BY HTML FORM

Request Infromation
BY HTML FORM

Inventory Information
BY EMAIL

3.3
Browse Product Catalog

Request for Approval Level 1 Diagram

4.10 The Candidate System Solutions table and descriptions of candidates

Characteristics	Candidate 1- Salesforce	Candidate 2- NetSuite	Candidate 3 – Custom Built
Portion of System Computerized	Off the shelf software can be purchased and customized according to business requirements	Same as candidate 1	Warehouse operation in relation to order fulfilment.

Benefits	Quick implementati on usually within 2-3 days as it is a	Same as candidate 1	Flexible and creative software tailored to
	packaged software		the fertilizer industry
Servers and Workstations	Salesforce Cloud	Online, Server/Cli ent	MS Windows Server 2019 MS Windows 10 (clients)
Software Tools Needed	Salesforce database to store customer, supplier and raw material data.	Oracle Database for data storage	HTML, PHP, PostgreS QL SERVER Visible Analyst
Application Software	License for Salesforce as a CRM	Free product tour for one month and then licensed	Customiz ed solution
Method of Data Processing	Cloud Storage	Cloud	Client/ Server

Output Devices and Implications	Laser printers for order invoices and monthly report	Same as Candidate 1	Laser Printers Barcode Printers
Input Devices and Implications	Keyboard & Mouse	Same as Candidate 1	Scanner Digital camera software Keyboard and mouse
Storage devices and Implications	Salesforce Cloud database (Oracle)	Oracle Database	PostgreS QL server

4.11   The Feasibility Analysis Matrix

Feasibility Criteria	Wt	Candidate 1- Salesforce	Candidate 2- NetSuite Microsoft	Candidate 3- Custom

Operational Feasibility - Functionality A description of to what degree the candidate would benefit the organization and how well the system would work. Political A description of how well received this solution would be from both user management, user, and organization perspective.	30%	Only supports member services and business process will have to be modified to take advantage of software functionality. The stakeholders are not particularly keen on this solution since there will be a lot of customization needed since Salesforce is a general CRM system Score: 65	Off the shelf inventory management system with little customization required This is a solution which is well received for the organization but since the business is based in a small town in India they cannot rely on cloud based systems Score: 80	Fully supports user required functionality The upper management is satisfied with this position since it will help make a system close to the needs of the particular company and the industry as a whole Score : 100
Technical Feasibility - Technology	30%	Widely used software with all required	Software made for inventory	Required to hire technical staff to build software.

An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support this candidate.		functionality and easy to use for non technical users	management systems. No need of technically trained individuals	MS Visual Basic and C++ knowledge required for integration
Expertise An assessment to the technical expertise needed to develop, operate, and maintain the candidate system		No high technical expertise is required to use Salesforce but customization would need a little knowledge about company's technical needs. Score: 80	This is the easiest solution since it is meant for inventory management. Very little technical expertise would be required Score: 90	Highly skilled individuals in software development would be required Score: 85
Economic Feasibility - Cost to develop, Payback Period, NPV,	30%	Approx : $1,200 <2 months NPV : $1000 Score: 65	Approx : $2,000 < 3 months NPV : $1000 Score:60	Approx : $500 <1 month NPV : $200 Score:90

Schedule Feasibility: An assessment of how long the solution will take	10%	Less than 2 weeks	10- 15 days	3 months
to design and implement		Score: 85	Score:95	Score:80
Ranking	100%	71.5	78.5	90.5

Rationale for weights

1) **Operational Feasibility**
   Weight: 30%
   We consider operational feasibility of the important as the proposed solution that our team would decide to implement must improve the efficiency of the current business processes to large extent. To gain this approval, the stakeholders of the company must be highly convinced of its success and should see it beneficial from staff as well as user's perspective.
2) **Technical Feasibility**
   Weight: 30%
   At the second level, technological demand of the project should be easy to meet and implement. We need to make sure that there are no errors when the implementation is done. Also, run-test should be conducted to ensure that there are no glitches as the single error can result in entire system failure

3) **Economic Feasibility**
   Weight: 30%
   The current budget the company has allotted to this project is not high, so we must compromise that by selecting a solution which would cost the company less in short term but yield long term benefits
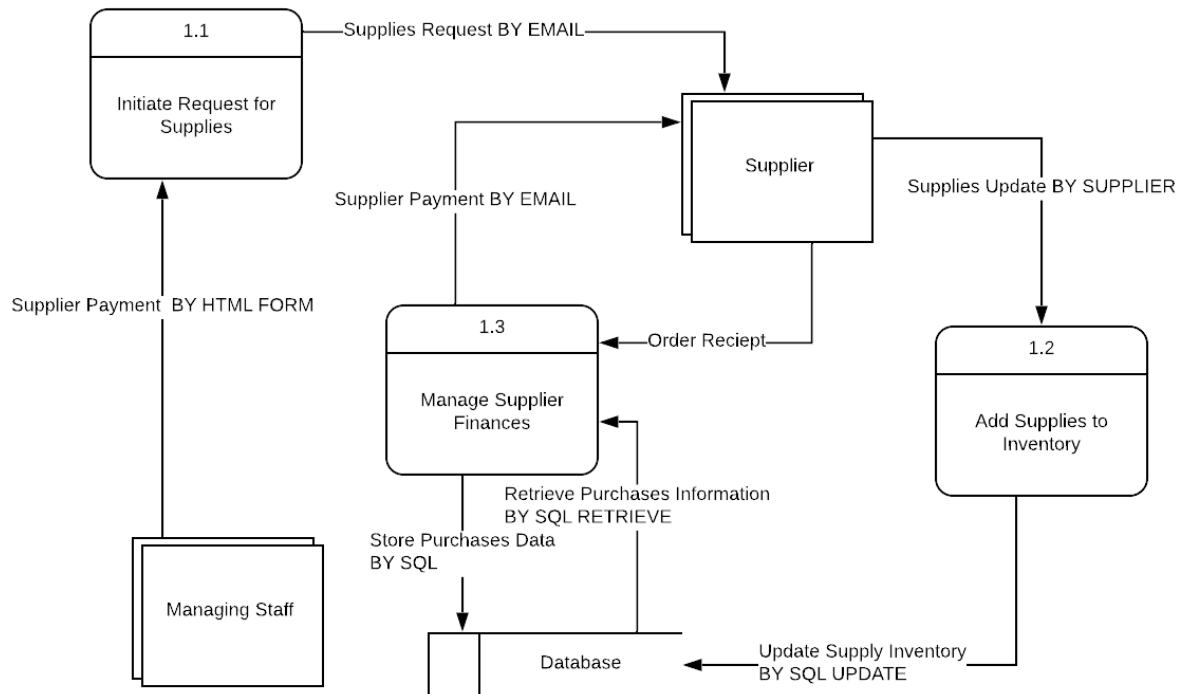4) **Schedule Feasibility**
   Weight: 10%
   Since we are building a new project and allocating time to build a completely new system by hiring entry level software engineers, we can compromise a bit on the time taken. We are giving budget and proper implementation of system more importance than time taken to complete it
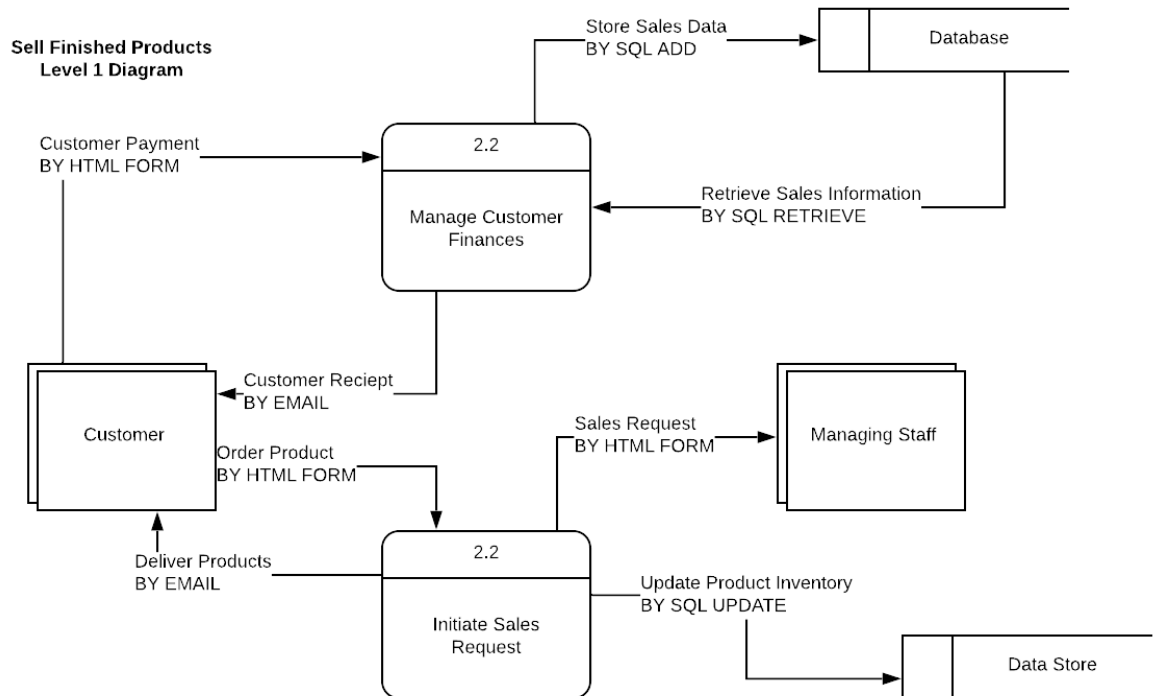
4.12 The Physical DFDs
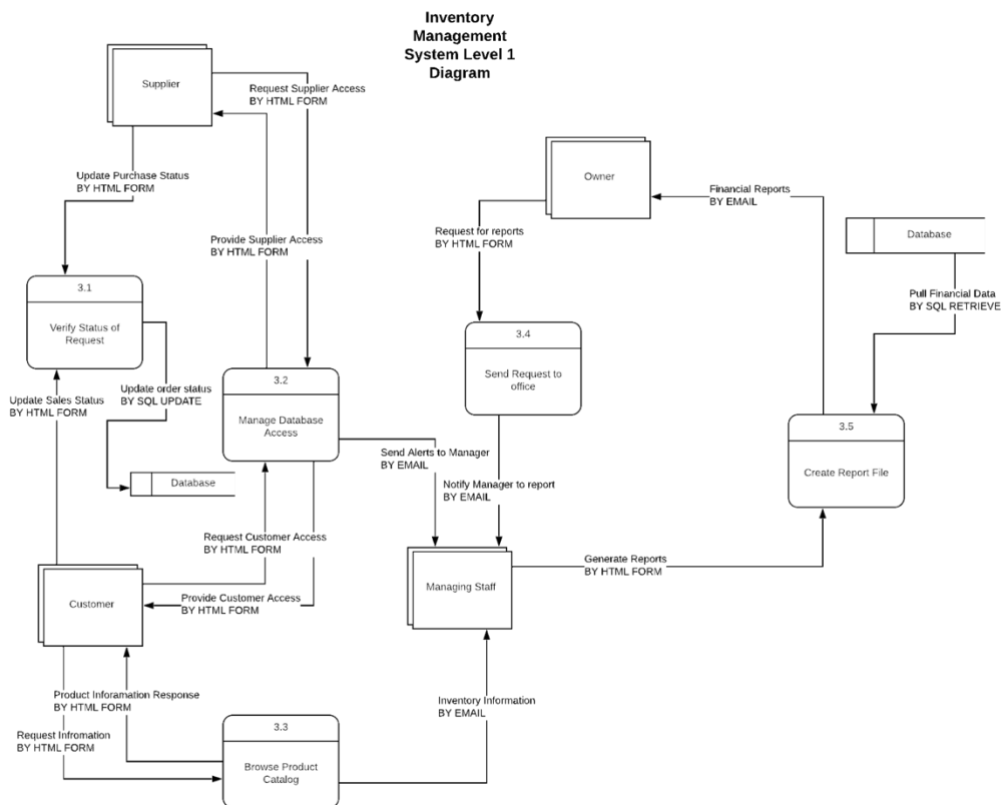
Physical DFD: Raw Material Purchasing

**Raw Material
Purchasing Level
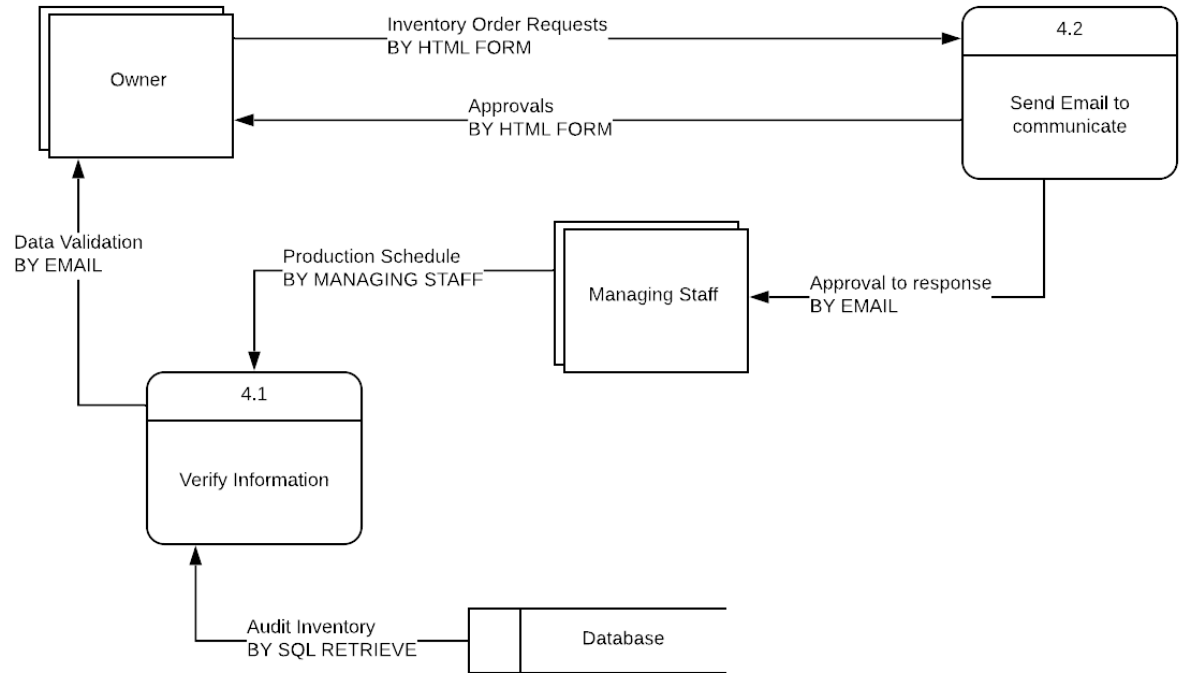1 Diagram**

Physical DFD: Sell Finished Products

**Sell Finished Products
Level 1 Diagram**

Store Sales Data
BY SQL ADD → Database

Customer Payment
BY HTML FORM →

2.2

Manage Customer
Finances

← Retrieve Sales Information
BY SQL RETRIEVE

Customer Reciept
BY EMAIL

Customer

Order Product
BY HTML FORM

Sales Request
BY HTML FORM → Managing Staff

Deliver Products
BY EMAIL

2.2

Initiate Sales
Request

Update Product Inventory
BY SQL UPDATE → Data Store

Physical DFD: Inventory Management System
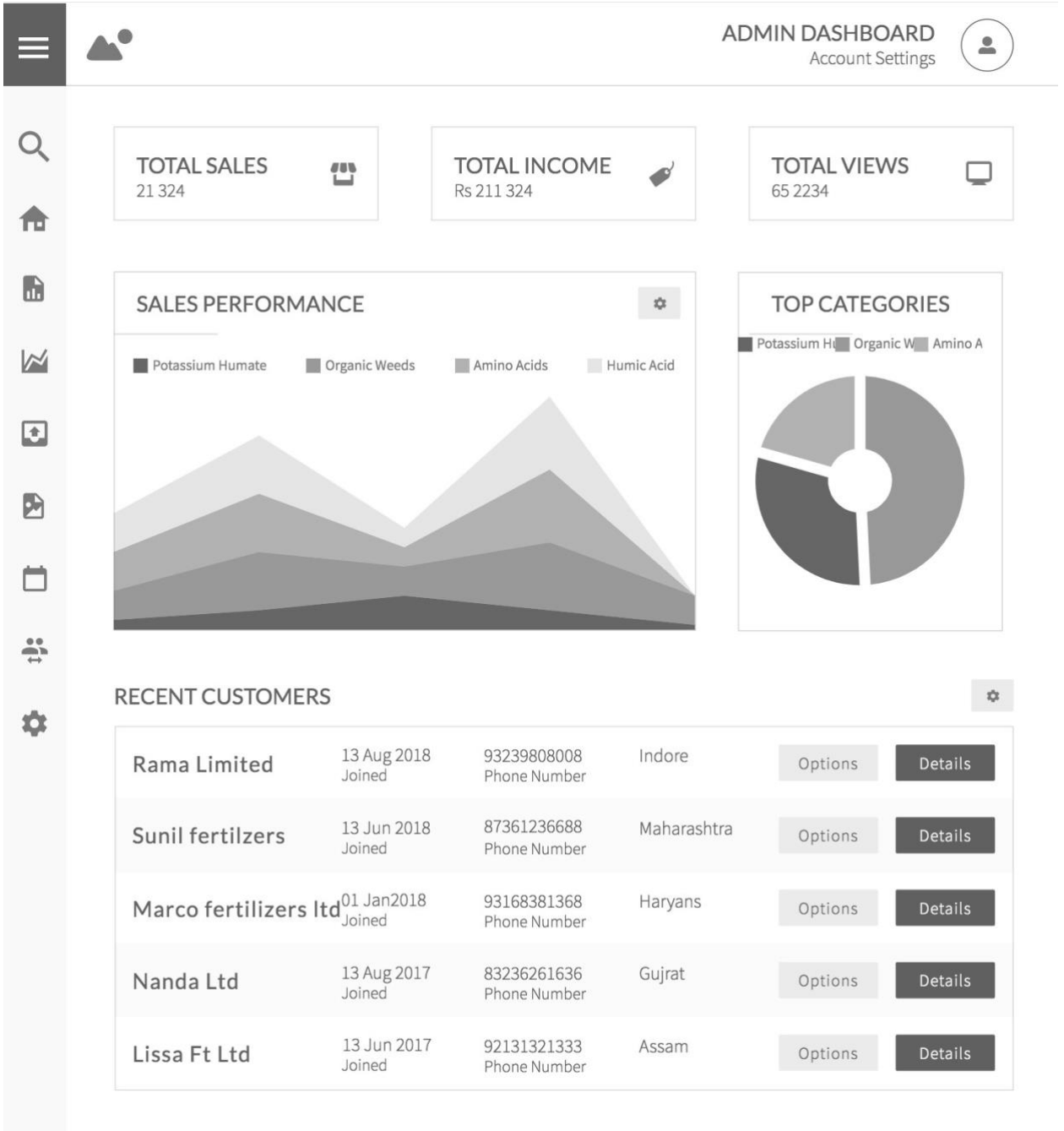

**Inventory
Management
System Level 1
Diagram**

Physical DFD: Request for Approval

**Request for
Approval Level 1
Diagram**

4.12   Input and Output Design

Admin Dashboard of Recent Sales.

TOTAL SALES
21 324

TOTAL INCOME
Rs 211 324

TOTAL VIEWS
65 2234

SALES PERFORMANCE

■ Potassium Humate   ■ Organic Weeds   ■ Amino Acids   ■ Humic Acid

TOP CATEGORIES

■ Potassium Hu   ■ Organic W   ■ Amino A

RECENT CUSTOMERS

Rama Limited	13 Aug 2018 Joined	93239808008 Phone Number	Indore	Options	Details
Sunil fertilzers	13 Jun 2018 Joined	87361236688 Phone Number	Maharashtra	Options	Details
Marco fertilizers ltd	01 Jan2018 Joined	93168381368 Phone Number	Haryans	Options	Details
Nanda Ltd	13 Aug 2017 Joined	83236261636 Phone Number	Gujrat	Options	Details
Lissa Ft Ltd	13 Jun 2017 Joined	92131321333 Phone Number	Assam	Options	Details

Onboarding Process for new customer or supplier

OMEGA N SUPPLIER AND CUSTOMER
Account Settings

New User Details

| Username | Email |

| First Name | Last Name |

Customer or Supplier ▼

☑ Send email confirmation

Add User   Cancel

Customer or supplier Login

OMEGA N

LOGIN

User Name

Password

● **CUSTOMER**
○ **SUPPLIER**

Submit

Customer Input for RFQ

OMEGA N CUSTOMER

∨ Pranay Pant 🔔

Profile

My Account

___

Log Out

Choose Product ∨

Order Now

Supplier Input for supply bid

OMEGA N SUPPLIER

∨ Pranay Pant 🔔

Choose Raw Material ∨

Quantity ∨

BID ●————

ADD BID

Supplier output:

OMEGA N SUPPLIER

Thank you for submitting your bid! Our system has been updated.
To view your previous bids and their status click below

View Bid Status

Customer Output:

OMEGA N CUSTOMER

Congratulations! Your order has been placed!

To view order status click the button below.

View Order Status

Customer status Dashboard

4.13 Implementation Plan

We plan to build a custom software solution to cater to the company inventory administrator, the customers and the suppliers. Each will have its own separate dashboard that provides information pertinent to the stakeholder while reducing data silos as much as possible. The system will help in efficiently connecting the manufacturing facility, the warehouse and the distribution facility.

We would also be adding a tagging system RFID to tag all the finished pallets in order to avoid reordering of raw materials. RFID is a relatively new technology and it works by having a tag that emits information that can be collected by a reader from a distance.

Using this system we will be able to efficiently monitor the flow of the products. Once the data is collected by using RFID, there will be a real time wireless transmission to the central database that is accessible through customized user friendly end-points.

The system will also be able to trigger automatic orders for products that are low in inventory.

As the entire process as of now is manual, we will follow the abrupt conversion plan. This will help us in keeping transition costs as low as possible. The system will also be tested to avoid any failures after deployment.
Implementation steps:

- We will hire an experienced software architect two full stack software engineers to implement the system. As the User interface development is not a high priority and is relatively full stack developer will be able to implement the user friendly access end points.
- We will create a vendor list to procure the RFID technology.
- The software architect with the help of software engineers will implement the central database that would be in-line with the requirements planned in design phase, ensuring that our new system is storing all the required information.
- Parallelly, we purchase and implement the RFID technology in the warehouse.
- Under the guidance from the software architect one of the software engineer will work on the CRUD system to connect the RFID technology to our database while the other will work on the front end and the back end process required to match the customer's demands to the supplier's supply.
- The software developers and the system users will together conduct alpha testing with the unpopulated database and the RFID technology.
- Using simulating, real, maximum workload environment, beta testing will be conducted by the developers with the completed program code and implemented barcode technology.