# PROJECT REPORT

## Tool Crib IMIMS

TEXAS A&M UNIVERSITY


**Submitted to:** Dr. Michael Graul

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**Prepared by:**
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## Executive Summary

Tool Crib IMIMS project was put together due to significant sets of inefficiencies in the current inventory and vendor management practices of RS: overstocking of items, inability to track inventories accurately, relationships with too many vendors for the same item, and fragmented purchase order workflows. These have resulted in excessive costs, disrupted operations, and made the enterprise vulnerable to security breaks.

The IMIMS was designed to enhance the way inventory is classified, automate purchasing tasks, manage vendors more effectively, and increase security. It works with advanced tracking tools and platforms like D365 and L2L to provide real-time data and insight. This project is applying the Systems Engineering lifecycle for a long-lasting, expandable solution that fits RS's business and strategic goals.

Currently, the project has shown amazing effects like procurement cycle times reduced, manual errors reduced, and inventory accuracy improved. In fact, the process of consolidating vendors and performance evaluation refined processes for sourcing, while the implementation of strict security measures paved the way to ensure data security and compliance. Besides, some environmental variables such as less waste, and energy-efficient practice gave an extra level of alignment to the project on sustainability.

The remaining activities are system deployment, post-implementation monitoring, and improvement of processes continuously. Functionality and integration must be validated through a pilot test prior to full implementation. Continuous training and stakeholder engagement will facilitate seamless adoption, while periodic audits on performance, security, and environmental concerns are required. Thus, the IMIMS project is fully poised to revolutionize inventory management functions at RS by bringing quantifiable benefits while laying a base for achieving long-term operational excellence.

## Introduction

Efficient management of indirect materials inventory is critical for ensuring seamless production and non-production activities in any operational setting. The Tool Crib Indirect Materials Inventory Management System (IMIMS) project addresses the inefficiencies and gaps in the existing system, focusing on creating a robust, scalable, and secure framework to support RS's production operations. Indirect materials, such as spare parts, cleaning supplies, and other non-Bill of Materials (BOM) items, play a pivotal role in maintaining operational continuity. However, the current management of these materials is hindered by inefficiencies, such as delays in fulfilling requests, lost or misplaced items, and inadequate substitutes for critical resources. These operational symptoms directly impact production timelines, increase costs, and reduce accountability. To address these challenges, this project aims to provide a well-structured plan for the realization of a new IMIMS.

The primary objective of this project is not to create the actual IMIMS design but to develop a comprehensive, actionable plan that enables its realization. This plan targets key areas, including inventory optimization, procurement efficiency, vendor management, and security enhancements. Through the integration of advanced technologies like IoT-based real-time tracking, procurement automation using D365 and L2L platforms, and vendor performance scorecards, the IMIMS project will ensure a systematic and effective transformation of RS's tool crib operations.

This report consolidates the three major deliverables that provide a comprehensive roadmap for the IMIMS implementation. Each deliverable contributes uniquely to the project:

- The Project Charter sets the foundation by clearly defining the purpose, scope, objectives, and constraints of the IMIMS project. It established alignment with stakeholders and highlighted the operational inefficiencies and gaps in accountability that the project aims to address.
- The PMP expanded on the charter by detailing resource allocation, financial planning, and risk management strategies. It provided an organized structure for implementing the IMIMS plan, ensuring proper budget utilization, timeline adherence, and resource optimization.
- The SEMP translated the strategic and operational objectives into a technical execution plan. It offered detailed compliance matrices, resource allocation tables, and integration strategies for system components like IoT platforms, procurement automation tools, and cybersecurity systems.

The IMIMS plan leverages real-world data from RS and integrates industry best practices to ensure practical applicability and scalability. By addressing core requirements like reducing inventory errors, improving vendor relationships, automating procurement workflows, and enhancing data security, the plan aligns with RS's operational workflows to resolve key challenges such as delays, lost items, and accountability gaps. Through a cohesive strategy encompassing high-level operational concepts (CONOPS), resource allocation, and technical execution, this project delivers a comprehensive solution to optimize RS's tool crib operations and drive efficiency, accountability, and security.

# 1. Project Charter

| Rochester Sensors. Engineering Innovative Solutions™ | Project Charter - Tool Crib IMIMS | | | |
|---|---|---|---|---|
| | **Instructor** | **Team** | **Supervisor** | **Project Champion** |
| | Michael Graul | ISEN 665 - Team 9 | Tim Gutschlag | N/A |
| **Purpose** | **Stakeholders** | | **Project Scope** | |
| This project aims to produce a strategic plan to redesign the warehouse operation and improve efficiencies in Tool Crib, which should enhance the effective management of inventory. The effort shall attempt to address the presented areas of inefficiency in accountability, stock control, and purchasing while integrating an improved IMIMS to streamline operations and reduce costs. | The stakeholders include the company: RS Warehouse Operations, Tim Gutschlag (provides operational data and process insights), Engineering Management Team (Responsible for planning and execution), Finance team and Manufacturing Teams, Vendors | | The scope includes optimization of inventories through classification, stocking level, and waste reduction, along with streamlining vendor networks and workflow standardization. Process enhancements will be made through real-time tracking, cost control, and improved warehouse security to ensure efficiency and safety. | |
| **Project Goals** | | | **Milestones** | |
| Inventory Optimization: Vet unused items in inventory, Segregate inventory, Min/Max levels of stock<br>Vendor Review: Retain active and relevant vendors, Develop a process for vendor selection<br>Process Efficiency: Develop real-time inventory tracking mechanism integrated with D365.<br>Cost Savings: Source cost-effective supplies, recommendations to prevent excess spending.<br>Security Enhancements: Limit warehouse access, Monitor high-value inventory | | | ***Description*** | ***ETC*** |
| | | | Project Charter | *Friday, November 22, 2024* |
| | | | Analysis and requirements for new tool crib IMIMS | *Wednesday, November 27, 2024* |
| | | | Vendor consolidation plan | *Thursday, December 5, 2024* |
| | | | Stock level guidelines | *Friday, December 13, 2024* |
| | | | Warehouse Security Plan | *Monday, December 23, 2024* |
| | | | Architechture for new IMIMS | *Monday, January 13, 2025* |
| | | | Test and Deploy | *Monday, January 22, 2024* |
| **Constraints & Dependencies** | | | | |
| Timely access to inventory, vendor, and usage data to support fact-based decisions and balance goals of cost-savings with controlled expenses.<br>Some of the key activities among those would be effective coordination, stakeholder feedback, and iterative adjustments to make processes align with D365 and new workflows. | | | | |

*Figure 1: Project Charter*

Project charter is a foundational document that formally authorizes the project and provides a rough or high-level framework to guide the project. It establishes the project's objectives, scope, stakeholders, company goals, and identifies the constraints and dependencies. It is also a reference point for stakeholder requirements, roles, milestones and the purpose of the project.

The project charter outlines a strategic plan aimed at improving RS' warehouse operations by addressing the inefficiencies in inventory management, vendor management and procurement process. The primary focus is to optimize inventory levels, sort unused items, consolidate vendor database and integrate an IMIMS system with D365 for real time inventory tracking. Additionally, the project also emphasizes implementing cost effective methods, improving the warehouse security, and streamlining warehouse operations to reduce expenses. Milestones include stock level guidelines, vendor consolidation plan, warehouse security, and architecture for the new IMIMS plan among others.

# 2. CONOPS

## 2.1 Vision and Purpose

The Tool Crib IMIMS is envisioned as an operational system designed to streamline inventory management, vendor relationships, order processing, cost control, and security within the Tool Crib and SP&M warehouses. The system ensures optimal inventory levels, accurate procurement workflows, and enhanced security while minimizing costs and operational disruptions.

The Tool Crib IMIMS is designed to:

- Classify, track, and manage inventory efficiently.
- Optimize vendor relationships and streamline procurement workflows.
- Reduce operational costs through targeted cost-saving strategies.
- Enhance inventory security with robust controls and audits.

The system ensures uninterrupted operations, cost reduction, and real-time accountability, addressing inventory and procurement management inefficiencies.

## 2.2 Customer Value Proposition (CVP)

The IMIMS provides:

*Operational Continuity:* Reliable availability of tools and materials to prevent production delays.

*Efficiency:* Automating inventory tracking and procurement workflows to reduce manual intervention.

*Cost Savings:* Strategic cost-reduction measures through inventory optimization and vendor consolidation.

*Security:* It can be improved accountability with access controls and audit mechanisms.

*Data Insights:* Real-time updates and detailed reports for informed decision-making.

## 2.3 Scope

The IMIMS focuses on managing indirect materials within the Tool Crib and SP&M warehouses. The scope includes:

*Inventory Classification and Tracking:* Categorizing inventory into active, inactive, and overstocked, with automated alerts for stock-level adjustments.

*Vendor Optimization:* Consolidating vendor data, monitoring performance, and streamlining sourcing strategies.

*Procurement Management:* Automating workflows for timely order processing and inventory updates.

*Cost Control:* Identifying high-cost items and implementing cost-saving measures while monitoring financial impacts.

*Security:* Implementing access controls and conducting regular security audits.

### 2.4 Key Operations

*Inventory Management:*

- Classify inventory into active, inactive, and overstocked items.
- Establish stock levels and issue real-time alerts for low or overstocked items.
- Track inventory changes with live updates.

*Vendor Management:*

- Consolidate vendor data to reduce redundancies.
- Evaluate vendor performance using scorecards for strategic sourcing decisions.

*Order Processing:*

- Automate procurement workflows based on stock-level alerts.
- Ensure real-time updates to inventory after order fulfillment.

*Cost Reduction:*

- Identify high-cost inventory and develop cost-saving strategies.
- Monitor the financial impact of savings measures.

*Security Management:*

- Restrict access to inventory with physical and digital controls.
- Maintain access logs and conduct periodic security audits.

### 2.5 Resources

*Stakeholders:*

*Tool Crib Staff:* Responsible for day-to-day inventory management.

*Procurement Team:* Ensures timely vendor interactions and cost efficiency.

*Finance Team:* Monitors and implements cost-saving strategies.

*Security Team:* Enforces access controls and conducts audits.

*Data:* Inventory records, usage patterns, and vendor performance metrics.

### 2.6 Controls

*Approval Workflows:* Govern classification, stock adjustments, and procurement processes.

*Audit Processes:* Validate inventory data and ensure compliance with policies.

*RS Policies and Standards:* Define operational guidelines for cost control and security.

*Access Control Protocols:* Restrict inventory access and monitor usage.

### 2.7 Outputs

*Categorized Inventory:* Detailed classifications of active, inactive, and overstocked items.

*Stock-Level Alerts:* Notifications for low or overstocked inventory.

*Vendor Scorecards:* Evaluations of supplier performance and reliability.

*Purchase Orders:* Approved requests for inventory replenishment.

*Cost-Saving Recommendations:* Actionable strategies to reduce expenses.

*Access Logs:* Detailed records of inventory usage and access.

*Security Audit Reports:* Compliance reviews for inventory protection.

### 2.8 Conclusion

By focusing on inventory optimization, procurement efficiency, cost control, and security, the Tool Crib IMIMS will deliver a comprehensive solution to address operational challenges at Rochester Sensors. It will integrate existing systems, robust workflows, and detailed reporting to ensure efficient, secure, and cost-effective inventory management.

# 3. IDEF0 Model

## 3.1 Model CVP (Context, Viewpoint, Purpose):

*Purpose:* The purpose is to optimize the inventory and vendor management system for RS's tool crib operations.

*Context:* The current Tool Crib has issues like overstocking, inventory mismanagement which has led to operational inefficiencies, increased cost and improper idea of existing stock and vendor review. The project seeks to improve operational performance via a better inventory management system, vendor management and improved security.

*Viewpoint:* From an EM perspective, the project focuses on strategic planning, process optimization and technology integration to achieve improved inventory management, vendor management, process optimization and cost reduction.

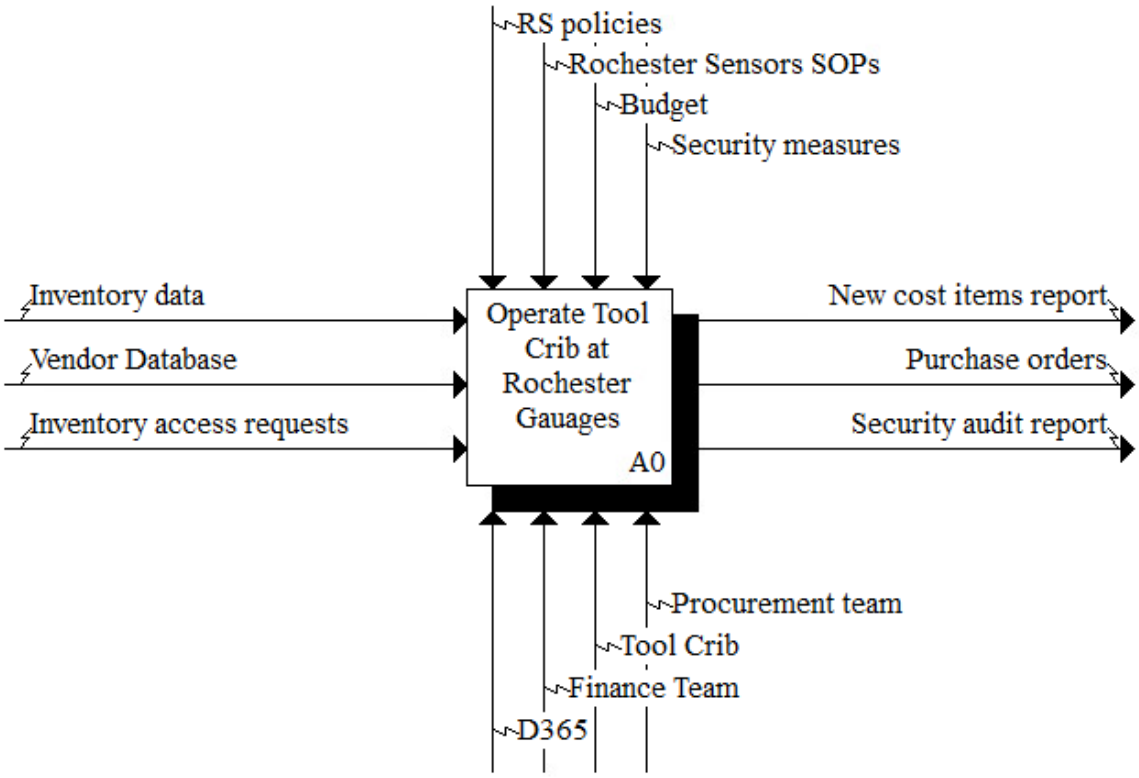


*Figure 2: A0 – Operate Tool Crib at Rochester Gauges*

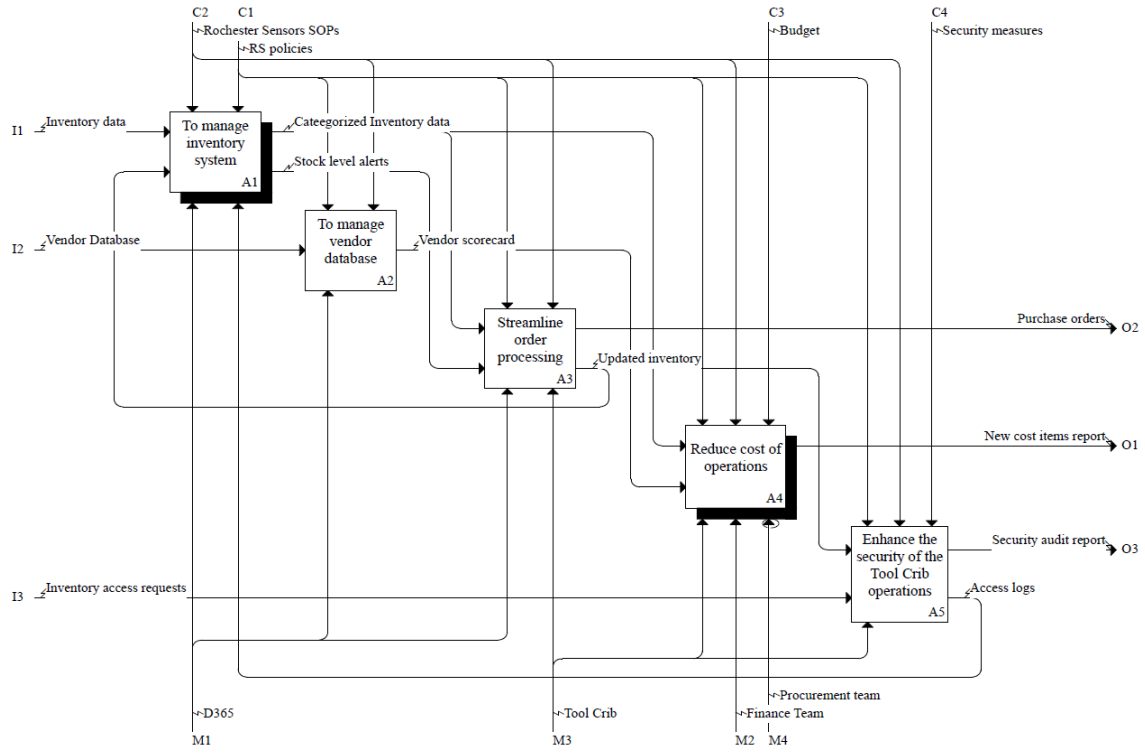


*Figure 3: A1 – A4*

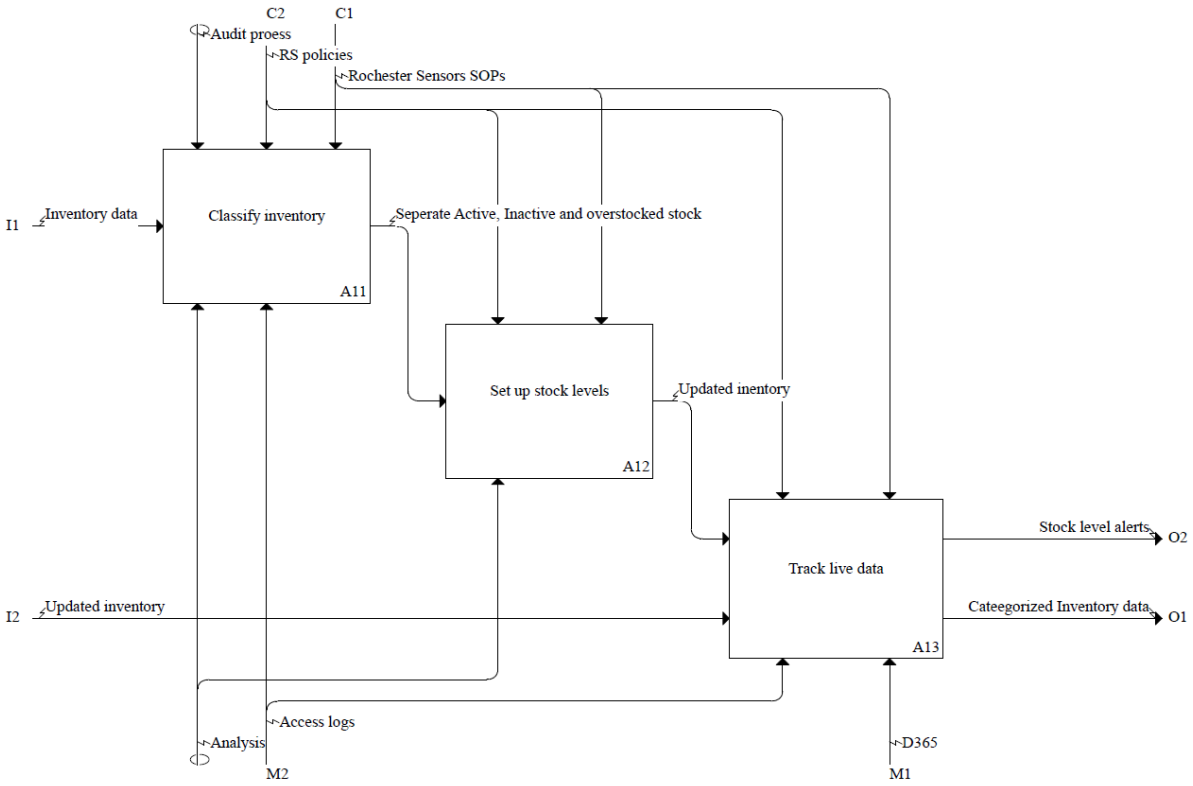


*Figure 4: A11 – A13*

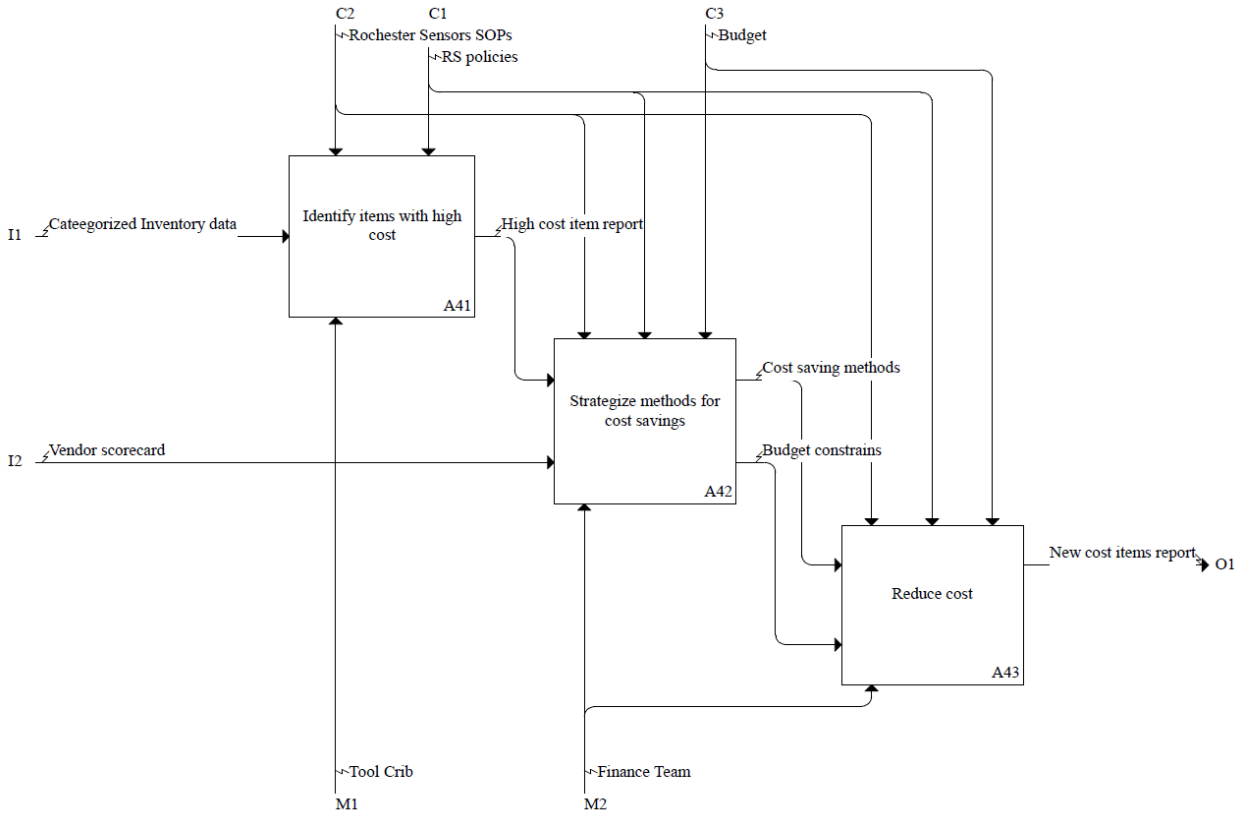


*Figure 5: A41 – A43*

# 4. Project Management Plan

## 4.1 Executive Summary

The Tool Crib Indirect Materials Inventory Management System (IMIMS) Project is a strategic move by Rochester Sensors to rid the company of inventory and vendor inefficiencies. It seeks to deliver real-time data for well-informed decision-making, optimize operations, lower expenses, and improve security. As a high-level administrative document, the PMP provides a structured approach for planning, tracking, and integrating project activities with organizational objectives and constraints. The Project Team responsible for this endeavor consists of the Rochester Sensors team warehouse employees, procurement, engineering management, finance, and the outside vendors. By adding real-time tracking, workflow automation, vendor optimization and enhanced security regulations, the new IMIMS will fully reshape the current inventory management processes. Current inefficiencies such as overstocking, the incorrect tracking of inventory items, and multiple vendor affiliations have resulted in numerous operational disturbances and excessive expenses. These are issues that the IMIMS is supposed to help resolve for cost reduction and smooth operations. The focus is on inventory and handling of indirect materials by the RS Tool Crib and SP&M warehouses. Key milestones to be achieved by the project include system architecture design, testing, deployment, and finalization of charter. The execution of the project is scheduled in phases over 16 weeks, ending in January 2025. This project follows the structured Systems Engineering lifecycle of stakeholder input, iterative refinement, and integration. While the SEMP defines technical execution, the PMP describes the administrative activities.

## 4.2 Requirements

For operational effectiveness, efficiency and safety, the IMIMS must meet the following specifications. These specifications represent the requirements of Rochester Sensors and its stakeholders:

*Inventory Management:*

- Develop an inventory classification system that classifies inventories as active, inactive, and overstocked.
- Allow for proactive modification in inventories with automatic warnings based on stock levels
- Embed functions that provide real-time tracking of inventory availability and usage

*Vendor Management:*

- Minimize redundancy by optimizing and consolidating the vendor database.
- Utilize scorecards for performance evaluation of vendors for facilitating strategic sourcing decisions.
- Standardization of the process of selecting vendors would facilitate cost efficiency and reliability.

*Procurement Efficiency:*

- Integrate D365 and L2L systems for automating the procurement process.
- Minimize manual errors and delays, allowing for real-time updates of inventories post-orders being filled.

*Optimization of Costs:*

- Assess which inventory items are expensive and implement cost-saving measures with no compromise on the efficacy of operations.
- For the purposes of accountability and transparency, track and report on the financial impact of the cost-cutting measures.

*Safety:*

- Implement tight access controls to restrict both physical and virtual access to only authorized personnel.
- For the sake of ensuring responsibility and adherence to compliance, ensure there is a lot of access and regular security audits.
- Ensure private inventory data is secure by using cybersecurity and encryption.

*Health and Environmental Aspects:*

- Rationalize inventory procedures towards minimal environmental impact, considering energy and waste.
- Enhance the safety process of employees handling inventories, supported by the proper PPE and ergonomic design.

### 4.3 Project Organization

The Project Organization would be a Matrix Organization. The project involves collaboration between Engineering Management Team, Finance Team, Procurement Team, Tool Crib Staff, and Security Team, each responsible for a specific functional area. Shared responsibilities among different teams show matrix structure. The project also requires major input from the stakeholders including RS Warehouse Operations and Tim Gutschlag. The responsibilities are as:

*Supervisor (Tim Gutschlag):*

- Provides operational data and insights.
- Ensures alignment with RS's strategic objectives.

*Instructor Team Supervisor (Michael Graul):*

- Supervises project execution.
- Provides academic oversight and ensures alignment with course objectives.

*Engineering Management Team:*

- Planning, execution, and system design.
- Cross-functional efforts and manages project milestones.

*Finance Team:*

- Comes up with cost control methods and is responsible for budget allocation.
- Cost-saving strategies and evaluate financial impacts.

*Procurement Team:*

- Manages vendor databases and sourcing.
- Ensures timely vendor interactions and procurement workflows.

*Tool Crib Staff:*

- Categorizes inventory
- Provide inputs for the new real-time inventory tracking integration.

*Security Team:*

- Implement and monitor access controls and maintain access logs.

### 4.4 Work Definition (WBS)

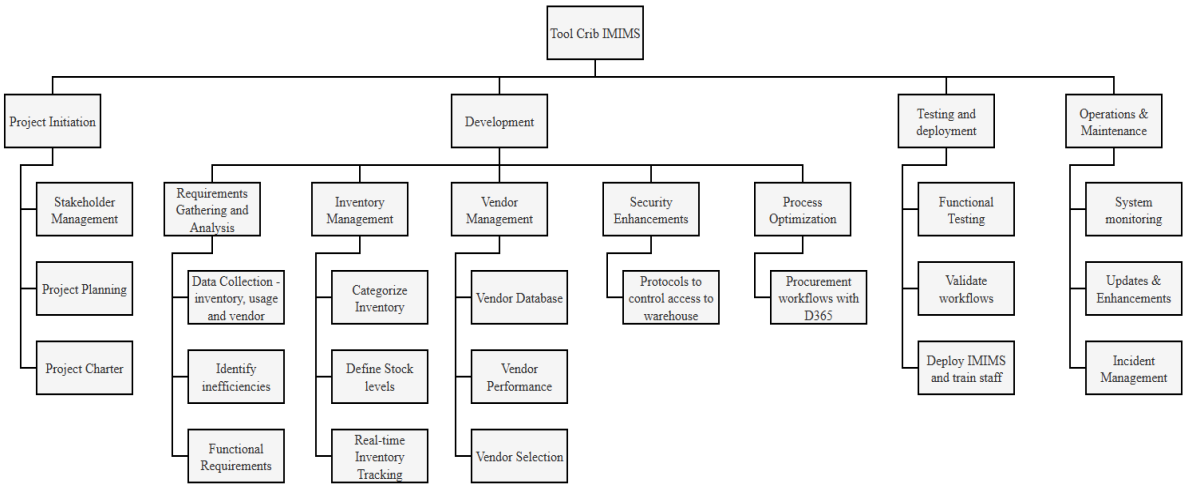


*Figure 6: Work Breakdown Structure*

### 4.5 Schedules with milestones (Gantt)

Gantt chart gives the timeline for key activities that take place in the IMIMS project. The starting line is drawn from Project Charter Finalization and Requirements Gathering in November 2024 to establish the foundational elements and scope of the project. The critical path activities would include Vendor Consolidation Plan and Stock Level Guidelines Development, that enable ease of inventory, while the Warehouse Security Plan provides security on information. IMIMS Architecture Design outlines the structure of the system in January 2025 and should be followed with Testing and Deployment by January 22, 2025. This chart ensures that progress is tracked effectively, resources are allocated well, and there is stakeholder visibility, hence meeting the Systems Engineering life cycle for successful project objectives.

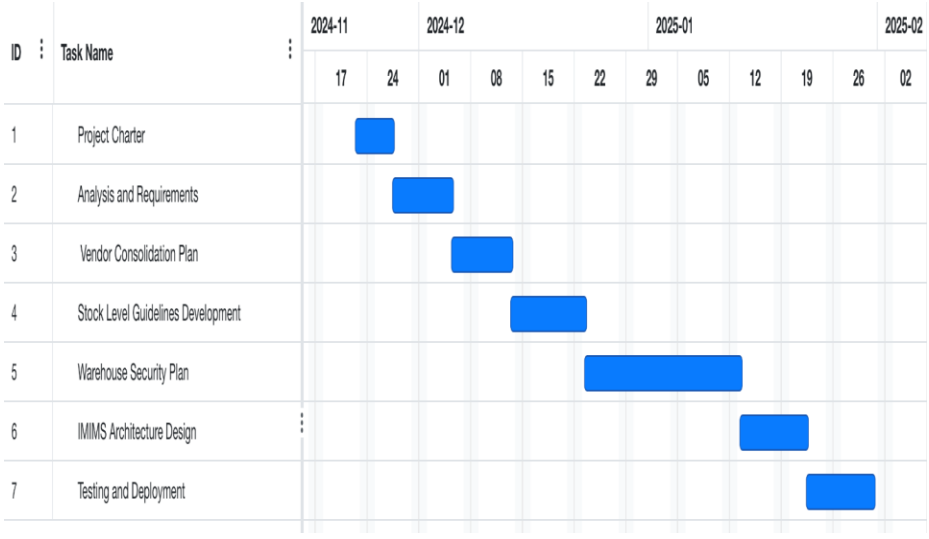


*Figure 7: Gantt Chart*

### 4.6 Project Budget

| Category | Details and Activities | Approximate Cost (in $) | Resource Allocation |
|---|---|---|---|
| Inventory Management | Real-time tracking system, classification of inventory | 200,000 | Software integration, classification labor, IoT tags. |
| Vendor Management | Vendor database optimization, performance evaluations with scorecards. | 100,000 | Tools for vendor assessment, consultant fees. |
| Procurement Workflow | Integration of D365 and L2L for automated procurement. | 60,000 | IT resources, system testing, and vendor support. |
| Cost Optimization | Inventory reduction, stock threshold adjustments, cost analysis. | 80,000 | Analytical tools, finance personnel. |
| Security Enhancements | Access control systems, cybersecurity measures, physical security audits. | 80,000 | Secure access solutions, training for staff. |
| Training and Support | Stakeholder training for new systems and workflows. | 10,000 | Training modules, workshop sessions. |
| Health and Safety | PPE and ergonomic warehouse redesign for staff handling inventory. | 20,000 | Equipment procurement, layout restructuring. |
| Contingency Fund | Reserved for unforeseen technical or operational challenges. | 150,000 | Emergency resources for rapid deployment. |

*Table 1: Project Budget*

In order to meet the objectives of the Tool Crib IMIMS project, this budget plan effectively distributes resources, ensuring effectiveness, cost reduction, and improved security. While staying in line with project deliverables, the organized allocation allows for flexibility in the face of unforeseen obstacles.

### 4.7 Quality Plan

The Quality Management Plan indicates that the Tool Crib IMIMS achieves its objective as efficiently and satisfactorily to its stakeholders as possible. The plan for controlling the quality is to ensure that high quality is maintained during project implementation. This is the quality plan:

1. *Inventory Accuracy:* Use D365 for live tracking for real time validation.

Perform weekly audits to categorize inventory viz. Active, inactive, overstocked.

2. *Stakeholders review:* Conduct meetings/quality reviews with stakeholders and also include procurement and finance teams.
3. *System Integration Testing:* make sure there is data flow between D365 and L2L for inventory updates and also for procurement requests.

4. *Procurement Workflow Validation:* Conduct simulation for automated procurement workflow in L2L.

We can monitor the vendor data and performance scorecards.

### 4.8 Risk Plan

| Risk | Impact | Mitigation Strategy |
|---|---|---|
| Integration delays | This delay is caused due to challenges faced in D365 and L2L | • Seek the early engagement of technical experts for set-up and testing.<br>• Introduce buffer time to the project schedule. |
| Vendor resistance to consolidation | The vendor may resist changing vendor data, or performance evaluation. | • Clearly communicate the advantages of the new system to all vendors.<br>• Sponsor training or provide an appropriate guidebook as a resource supporting vendors in adjusting to new requirements. |
| Data inaccuracies | Errors in inventory classification or in entering the vendor's data could disrupt the workflows. | • Validate the data at regular intervals during the configuration of the system.<br>• Introducing forms of automated error-checking procedures in D365 and L2L. |
| Budget overruns | Costs may become more than estimated because of unforeseen technical difficulties or extra resource requirements. | • Provide weekly expense tracking and align spending to milestones. Call for reserves for contingency purposes within the budget. |

*Table 2: Risk Plan*

### 4.9 Testing Plan

The Testing plan ensures that Tool Crib works in a manner like the original expectations while realizing the intended outputs. The plan is as follows:

1. *Unit Testing:* The purpose of this testing is to validate individual system components like inventory classification, live tracking and procurement workflow.

2. *Integration Testing:* The objective is to verify the smooth process of transferring data from D365 to L2L
3. *System testing:* Here we test the IMIS on the entire flow of tasks and data accuracy, alerting and reporting.
4. *User acceptance Testing:* Determine the usefulness and effectiveness of the system regarding the desired stakeholders.

The test reports are presented to the stakeholders

### 4.10 Change Control Plan

The Change Control Plan is built to manage with due regard the evolution of a project scope, schedule, or resources to the least extent of disturbance with punctuality.

The change management process is:

1. *Change Request Submission:* any team member or stakeholder can submit a change request form, and it should include the reason, the impact on scope and mitigation strategies.
2. *Impact assessment:* The EM team considers the request for change and its impact on timeline, budget, resources and scope.
3. *Approval process:* if the changes are over 1% then they have to go through the higher management of SDO and owner.
4. *Implementation:* the approved change requests will be added to the project plan. This will be implemented in WBS, roadmap and milestone schedule.
5. *Monitor change:* The effects of the changes executed on the project performance are monitored closely. Follow-up meetings are also conducted to ensure the changes follow the scope.

A change log should be maintained which will include: all the submitted change requests, approvals, and details.

### 4.11 Documentation Plan

The aim is to set up a collaborative structure for managing and maintaining documents and ensure that all team members and stakeholders have access to the documentation, that is accurate, updated frequently with recent progress and any changes to the project.

This can be achieved using Microsoft cloud-based system that includes MS SharePoint and One Drive to store the documents. The documents can be made editable to the personnel handling documentation using MS Word and MS Excel, and accessible to anyone working on the project and the stakeholders.

The documentation would include Project Charter, Project Matrix, research, requirements gathering and analysis documents, functional specifications and requirements, vendor data, inventory database, IDEF0 models, process flowchart, security protocols, procurement system

workflow, training manuals for the old and new Tool Crib, testing phase cases and results, final IMIMS, and final approval and any other documentation.

Also, the older versions are to be maintained in an archive folder for reference and record. There will be multiple versions of a document, the naming would be 'name_vx.doc', where x is the version number. For example, the IDEF0 models would be named as – IDEF0_v1.AI0X, IDEF0_v2.AI0X, etc. Maintain a log of each document update. Setup automatic backups on the cloud and local system for each file to recover them if the system crashes.

### 4.12 Procurement Plan

*Inventory Management System Procurement:*

- We will acquire real-time tracking software that is compatible with D365 and L2L.
- Will integrate IoT-based inventory tracking tags for classification and monitoring.

*Vendor Consolidation:*

- To consolidate vendor base by evaluating performance scorecards.
- Retain high-performing vendors; discontinue redundant relationships.
- Implement a standard vendor selection process for future procurements.

*Security System Acquisition:*

- Purchase hardware for physical access control to limit access to the warehouse.
- We will invest in cybersecurity tools to safeguard virtual inventory data.

*PPE and Safety Equipment:*

- Purchase ergonomic tools and safety equipment for warehouse staff.
- Ensure compliance with workplace safety standards.

*Automated Procurement System:*

- Automate purchase requests using the integrated D365 and L2L platforms.
- Establish stock-level triggers for real-time order processing.

*Approval Mechanisms:*

- To implement a structured process for purchase order validation by the procurement team.
- Conduct regular audits to ensure adherence to procurement policies and cost-efficiency.

### 4.13 Implementation Plan

The implementation of the Tool Crib IMIMS will be carried out in carefully planned phases to ensure minimal disruption to operations while achieving the project goals. Here's how we plan to proceed:

*Phase 1: Setting Up the System*

We will start by configuring the D365 and L2L platforms to work seamlessly together. This will include integrating the new real-time inventory tracking system with IoT tags. These tags will help us classify and monitor stock levels efficiently. Once the systems are set up, we'll perform initial tests to make sure everything is running smoothly.

*Phase 2: Cleaning Up the Vendor Database*

Next, we'll focus on streamlining the vendor database. Our procurement team will evaluate all current vendors using scorecards to identify the most reliable ones. We'll consolidate the list by keeping the best performers and eliminating redundancy. At the same time, we'll implement a standardized process to ensure future vendor relationships are efficient and cost-effective.

*Phase 3: Securing the Warehouse*

To enhance security, we'll install physical access control systems to limit entry to authorized personnel only. On the digital side, we'll implement cybersecurity measures to protect our virtual inventory data. Staff will be trained to understand and follow these new security protocols, ensuring accountability and compliance.

*Phase 4: Training the Team*

Once the systems are in place, we'll provide hands-on training to warehouse staff, procurement teams, and other stakeholders. Each team will receive role-specific training, covering how to use the D365 and L2L systems, follow new workflows, and troubleshoot common issues. Clear user guides will also be shared to help everyone adapt to the changes.

*Phase 5: Pilot Testing and Feedback*

Before going all in, we'll run a pilot test. This will involve using the new system for a limited set of inventory and procurement tasks. Feedback from this phase will be critical—any issues or inefficiencies will be addressed before full deployment. This phase will also help build confidence among the teams using the system.

*Phase 6: Rolling Out the System*

With everything fine-tuned, we'll fully deploy the IMIMS across the warehouse. The real-time tracking and automated procurement workflows will now become standard practice. Teams will transition to the new processes with ongoing support to ensure a smooth handover.

*Phase 7: Keeping It Running Smoothly*

Once the system is live, we'll regularly monitor how it's performing. This includes audits of inventory levels, vendor performance reviews, and checks on the security systems. We'll also collect feedback and use it to refine and improve operations over time. Scheduled updates and system upgrades will keep the IMIMS functioning optimally.

## 4.14 Health, Safety and Environment Plan

### *4.14.1 Physical Contact Monitoring:*

1. *Safety Policies of Warehouse:*

- The management would implement preventive measures against injuries which may arise when handling the inventories using proper personal protective equipment.
- Safe zones should be correctly perceived so that it would aid smooth traffic flow and reduce chances of accidents occurring.
- Streamline the physical structure of the warehouse to reduce the risks of physically operating it and increasing the efficiency of it maximally.

2. *Risk appraisals:*

- The workplace will be subject to routine checks for the purpose of identification of any hazards.
- The results will assist in the formulation of new safety measures and in the preparation of training materials meant for the same to provide forward looking hazard management.

3. *Reporting and Investigating the Incidents:*

- Reports of incidents and procedures will be put in place to capture the frequency of incidents and any safety management issues in the facility.
- See to it that such concerns are given investigation and resolution with the much-anticipated speed.
- Observe trends in the hazards and threats identified for the development of stronger safety procedures.

### *4.14.2 Virtual Interaction and Communication:*

1. *Interface Usability and Design:*

The IMIMS GUI will be designed to minimize user errors by focusing on operational efficiency and ease of use. This includes:

- Ease of navigation.
- Accessibility requirements to ensure that any employee can effectively use the system.

2. *Policies for Cybersecurity:*

The administrative teams will implement the following policies to control virtual security: Role-based access restrictions to limit the system's functionality to only authorized personnel.

- Perform periodic credential checks and system updates to keep the security standards high.
- Incident response team: quick resolution of security flaws or breaches.

### *4.14.3 Environmental Controls*

1. *Inventory Optimization:*

- To minimize waste and to ensure efficient use of the resources, managers will analyze and optimize inventory.
- It includes classifying and managing inactive, active, overstocked products to avoid overproduction and disposal of waste.

2. *Energy Efficiency:*

The IMIMS system shall be screened for energy efficiency. To pave the way for sustainability, Cloud-based solutions along with Energy-efficient hardware will be given the green signal.

3. *Compliance Audits:*

Ongoing audits will confirm compliance with environmental standards, ensuring that the project minimizes its ecological impact and is in line with sustainability objectives.

## 4.15 Communication Plan

The goal is to ensure proper communication, including updates, changes, any issues faced among the project team, stakeholders and other people involved in the project.

Microsoft Teams will be used for instant communication. Jira will be used for task management and tracking. Jira has task boards for tracking and assigning tasks.

| Type of communication | Personnel | Frequency | Purpose |
|---|---|---|---|
| Weekly meetings | Project team, Project manager | Weekly (Monday) | Review progress, address any issues, discuss for the week |
| Weekly status update meetings | Project manager, Stakeholders | Weekly (Friday) | PM shares updates of the week to the stakeholders, takes into account new updates and discuss plan of next week |
| Monthly Stakeholder Meetings | Team leads of the project, Stakeholders | Monthly (1st working day of the month) | Milestone review, updates, future activities |
| Ad Hoc Meetings | Project manager, Stakeholders | As required | Address risks, critical issues that need immediate stakeholder input |

*Table 3: Communication Plan*

In case of critical issues, delays or risks notify the team and stakeholders immediately via email and discuss a suitable time to conduct a meeting nearer.

### 4.16 Financial Plan

The financial plan ensures that the Tool Crib IMIMS project is not only feasible but also optimized for cost-efficiency, profitability, and sustainability. It includes funding strategies, cost controls, return on investment (ROI) projections, and long-term financial management.

#### *4.16.1 Funding Sources:*

*Internal Allocations:* Utilize existing company budgets from procurement, engineering management, and IT departments.

*Contingency Reserves:* Allocate 10% of the budget from organizational contingency funds for unforeseen expenses.

*Vendor Cost Sharing:* Explore cost-sharing opportunities with long-term vendors for integration and training efforts.

#### *4.16.2 Cost Management Strategies:*

1. *Vendor Optimization:*

- Consolidate vendors to negotiate bulk discounts and reduce procurement costs by approximately 15%.
- Implement performance-based contracts to minimize waste and maximize value.

2. *Inventory Control:*

- Reduce holding costs by optimizing stock levels through real-time tracking.
- Minimize overstocking by adhering to calculated Min-Max thresholds.

3. *Security Investments:*

- Leverage existing IT infrastructure to reduce new hardware expenses by 20%.
- Phase security implementations to align with the project timeline and cash flow.

### *4.16.3 Return on Investment (ROI):*

*Cost Savings:* Inventory optimization and vendor management will reduce operating costs by an estimated $200,000 annually.

*Productivity Gains:* Automated procurement systems will improve operational efficiency, saving approximately 3,000 man-hours annually (~$150,000 in labor costs).

*Risk Mitigation:* Improved security measures will lower risks of theft and data breaches, reducing potential liabilities by 30%.

### *4.16.4 Long-Term Financial Sustainability:*

- Establish a 3-year maintenance and update budget to ensure the system remains effective and up to date.
- Allocate $30,000 annually for system updates, stakeholder training, and security audits.
- Monitor recurring costs against savings to ensure the system continues delivering a positive ROI.

### *4.16.5 Monitoring and Reporting:*

- Conduct quarterly financial reviews to track expenditure against the planned budget.
- Use financial dashboards integrated into D365 to provide real-time visibility of costs and savings.
- Generate annual reports summarizing cost efficiency, savings achieved, and ROI for stakeholders.

# 5. Systems Engineering Management Plan

## 5.1 Purpose and Scope

### *5.1.1 Purpose*

The Tool Crib IMIMS represents a profoundly strategic project at Rochester Sensors Company for the possible solution to the most critical hurdles imposed by inventory and vendor management in business operations. These difficulties, which are inclusive of overstocking, correct tracking of inventories, un-optimized procurement workflow, and broken vendor relationships, have consistently kept RS's productivity back, further increasing costs while creating vulnerable situations in terms of security. The IMIMS project aims at addressing all these issues, assisted by the latest technologies and best practices in inventory and supply chain management.

The IMIMS project should be developed into a scalable, efficient, and robust system; it must contribute to the improvement of daily functioning without turning away from the long-term strategic objectives set out by RS. IMIMS integrates real-time tracking, automation of workflows, optimization of vendors, and tight security features all in one cohesive framework that can help execute seamlessly to power up business growth.

The project has many goals, focusing on important areas needed for great performance:

*Operational Efficiency:*

The IMIMS will also be able to drastically cut human errors, delays in processing, and requirements for manual intervention because it can apply automated workflows based on real-time inventory tracking. This system will provide RS with a holistic view of the active, inactive, and overstocked items since there will be a high degree of precision in the categorization and monitoring of the inventory. This will enable them to reduce wastage, increase production, and utilize whatever little is available correctly.

*Vendor Relationships:*

Vendor management is one of the cornerstones of the purpose of the project. The IMIMS will bring together the vendor database, check vendor performance using scorecards, and create a standard way to choose vendors. These steps will remove extra work, build strong partnerships, and make sure sourcing is reliable and at the best costs.

*Cost Optimization:*

Cost control will be one of the biggest differentiators that will drive the implementation of IMIMS. It will serve in depicting the highly valued items within the inventory and the relevant cost-saving measures that will strive towards offering cost reductions without compromising operation quality. Automated procurement workflows integrated into existing platforms like D365, L2L further drive cost efficiency by removing delays and manual errors.

*Enhance Security and Compliance:*

The IMIMS will ensure strong physical and digital security of the inventory and data of RS. It shall ensure access, cybersecurity, and audits in a timely manner to provide confidence that no person other than authorized persons can access the sensitive information and inventory.

The Tool Crib IMIMS project shall take up all inventory management issues of Rochester Sensors in a holistic manner. In doing so, overcoming present inefficiencies would also form a foundation for growth, innovation, and excellence. Through detailed planning and structured execution, followed by continuous refinement, the IMIMS project will aim at transforming inventory management into an organized, secure, continuous value-addition process throughout the organization.

### *5.1.2 Scope*

| | | |
|---|---|---|
| **Inputs** | System Requirements | • Real-time inventory tracking, categorization, and automatic notifications.<br>• Integrate D365/L2L in such a way that Procure-to-Pay is friction-free. |
| | Organizational structure | • Interdepartmental collaboration including engineering, procurement, finance, and warehouse operations. |
| | Raw Materials | • Current inventory items controlled by the IMIMS system.<br>• IoT-enabled tracking tags for real-time inventory tracking. |
| | Data/Documentation | • Existing inventory information, databases from vendors, and purchase history.<br>• Requirements, workflows and training comprise project documentation |
| **Outputs** | System/Product Ready Consumer Use | • IMIMS with integrated tracking of the vendor management and procurement process. |
| | Supporting Resources | • User manuals, role-based instructions, and continuous support of warehouse personnel/stakeholders. |

| | | |
|---|---|---|
| | | • Detailed system documentation includes security protocols and operational workflows. |
| | Waste (Residue) | • Obsolete inventory items identified and removed, along with redundant vendor relationships being eliminated.<br>• Minimum physical waste, since inventory and workflow processes are at their best. |
| **Controls** | Technical | • Integrations compatibilities with already existing platforms such as D365 and L2L.<br>• Limiting scalability in terms of future expansions without major upgrades.<br>• Ensuring data accuracy by tracking in real time and automating workflows. |
| | Political | • Comply with the organizational policy and regulatory standards of Rochester Sensors.<br>• Assistance from influential stakeholders, including executive management and heads of departments.<br>• Resistance to the change in procurement and vendor selection workflows |
| | Sociological | • Adaptation problems of the warehouse personnel and other stakeholders to the new system.<br>• Need for effective communication to address concerns about job security and workload changes.<br>• Training programs to ensure that the IMIMS interface and its processes are well adopted. |
| | Economic | • Project budget constraint of $700,000, with limited flexibility for unforeseen expenses.<br>• Expected saving in investment because of reduction in inventories and procurement operation cost.<br>• Cost-sharing opportunities concerning training and integration efforts when working with long-term vendors. |

| | | |
|---|---|---|
| | Environmental | • It reduces waste through optimization of inventories with minimal overstocking.<br>• Adopting energy-efficient hardware and cloud-based solutions reduces electricity consumption.<br>• Compliance with relevant environmental regulations and sustainability objectives |
| **Mechanisms** | Human Resources | • Inventory categorization and implementation by warehousing staff supported.<br>• Procurement, engineering, and finance make decisions in teams. |
| | Materials/Liquids | • Trackers based on inventory management.<br>• PPE and ergonomic tools for employee safety. |
| | Computer Resource | • D365 and L2L platforms integrated with IMIMS for real-time data exchange.<br>• Cloud-based storage, analysis, and system monitoring servers. |
| | Facilities/Utilities | • The IMIMS shall be in operation in the Tool Cribs and SP&M warehouses.<br>• Power-efficient hardware, optimized warehouse layouts. |
| | Maintenance and Support | • Regular system updates and regular security audits.<br>• Training programs for continuous improvement among stakeholder and technical support staff |

*Table 4: Project Scope*

### 5.2 Applicable Documents

The documents included in the SEMP are organized to ensure complete technical and managerial coverage. Annotated inventory of the documents in SEMP:

- *Project Charter:* Establishes scope, purpose, objectives, stakeholders and a rough timeline of the project. This document is consulted to ensure project goal timelines and stakeholder requirements alignment.
- *CONOPS (Concept of Operations):* Operational framework of the Tool Crib IMIMS. It determines how the system will operate, and addresses inefficiencies and improvement operations.

- *Functional Requirements Document:* Functional requirements of the new Tool Crib IMIMS for inventory management, vendor management, optimized procurement workflows and improved security.
- *IDEF0 Model:* Detailed diagrams that show the process for inventory management, vendor management, optimized procurement workflows and improved security. It includes inputs, controls, mechanisms and outputs for the achievement of the functional requirements.
- *Gantt Chart:* It includes the timelines for project phases and milestones. It is used to track the progress of the project and ensure alignment with the deadlines. It is updated and modified as needed based on delays and early completion.
- *Work Breakdown Structure (WBS):* It provides a structured breakdown of work packages and tasks.
- *Project Management Plan (PMP):* Comprehensive plan document covering project schedule, resource allocation, risk management, change control, health, safety, and environmental plan.
- *Procurement plan:* Document highlighting plan for vendor management, purchases, procurement workflows, including plan for optimization of workflows.
- *Testing Plan:* Guidelines for testing each unit and integration of the new Tool Crib IMIMS, this ensures proper system performance.

## 5.3 Technical Summary

The Tool Crib IMIMS (Indirect Materials Inventory Management System) is aimed at addressing the inefficiencies in RS' current warehouse operations. By introducing a new and better inventory management system and optimized workflows, the project aims to enhance inventory control, improve vendor management and procurement workflow while ensuring security and cost control.

### *5.3.1 System Design Influencing factors:*

The system is designed as a scalable, integrated solution to ensure efficient Tool Crib Operations. The design includes:

- *Inventory Management System:* Include real time tracking of inventory to minimize overstocking, reduce stockouts and ensure required inventory being present. IoT is used for real-time inventory tracking. Automation of alerts when a stock reaches min/max level. Overstocked items are highlighted for relocation or return to vendor based on the demand of that stock. Integration with D365 for streamlined data flow and control.

- *Vendor Management:* The objective is to improve vendor performance, reduce redundancy, and establish long-term, cost-effective partnerships. Evaluate vendors based on quality, cost, reliability, and history of delivery times. Remove unreliable and inactive vendors. Group supplies under more reliable vendors for more cost efficiency. Identify alternate vendors who are more reliable for cost savings.

- *Procurement Automation:* Streamline purchase order creation to save time and reduce errors. Automated generation of request for supplies to vendors based on stock levels. Link with D365 and L2L workflows. Still requires multi-level approval to complete procurement and ensure budget constraints.

- *Security Enhancements:* This is done to protect inventory against unauthorized access and theft. Restricted entry to only authorized personnel with electronic locks accessed via keycard or passcode. Access log and surveillance cameras are also established.

### *5.3.2 Critical Questions:*

Questions guiding the project:

- How can inventory be categorized and tracked more accurately?
- What are the processes needed to streamline vendor management?
- How can procurement workflows be automated and integrated with D365 and L2L?
- What are the security measures needed to be taken to protect inventory and prevent unauthorized access?
- How can we measure success in operational efficiency, cost savings, inventory management and customer satisfaction?

### *5.3.3 Project Constraints:*

*Cost:* Budget constraints are needed for cost-effective solutions for technology and procurement optimization and implementation.

*Schedule:* The project must be completed in the scheduled time to align with organizational objectives and stakeholder requirements.

*Key Performance Indicators (KPIs):* The system must achieve at least 95% accuracy in inventory records, 87% or more on time delivery rates and low returns due to incorrect or below par supplies, reduce procurement time by at least 15%, reduce costs in procurement by 20%, and there shouldn't be any unauthorized access to warehouse, security footage and access logs.

### *5.3.4 Customer and Users:*

The customer is RS warehouse operations. They require the new Tool Crib IMIMS to optimize the existing system, and have a better vendor management system, optimized procurement workflows and enhanced security.

The users are the Tool Crib staff, who will operate the IMIMS for inventory tracking, vendor management and procurement. Procurement team who are responsible for managing vendor

relationships, placing orders, purchases and sourcing materials. The security team who have access control ensure there is no unauthorized access to the warehouse, access logs and security cameras.

The priority of the customers and users is to have accurate inventory tracking to minimize errors in stock levels, and understocking or overstocking supplies. Make sure that the new system can be operated within budget constraints, and it can reduce operational expenses by streamlining processes. They also wanted automated systems for procurement workflows. They also want a more stringent security system for inventory protection. The system should be capable of handling future expansions and operational needs.

In conclusion, the Tool Crib IMIMS align with the company's strategies, aimed at optimizing and automating workflows. Integration with D365 and L2L supports other projects focused on process automation.

## 5.4 Responsibility and Authority

### *5.4.1 Governing Authority*

The key stakeholders holding the governing authority are the supervisor Tim Gutschlag, Instructor Michael Graul, and the Engineering Manager.

### *5.4.2 Multidisciplinary Teamwork*

As stipulated in the PMP, a matrix organizational structure will be used to promote cross-functional collaboration among different teams like engineering, sales, finance and security. Meetings will be conducted weekly to review and discuss previous and future tasks. Regular status updates on the tasks will be done on Jira.

### *5.4.3 Roles and responsibilities*

| Role | Responsibility | Authority |
|---|---|---|
| Supervisor | Oversees alignment with company goals, makes sure milestones are fair and resolves escalated problems. | Has authority over budget, purpose and scope. |
| Engineering Manager | Control over design of new IMIMS, manages technical teams, and makes sure of integration with D365 and L2L | Has final call on technical deliverables |
| Procurement team lead | Manages vendor database, evaluates vendors based on their history and manages purchases | Authority over purchases and vendor contracts |
| Finance team Lead | Controls project budget, identify cost effective methods | Takes any cost related decisions |

| | | |
|---|---|---|
| Security Team Lead | Manages access to warehouses, has control over access logs, security cameras and manages security protocols | Authority of any security related decisions |
| Tool Crib Operations Team Lead | Categorizes inventory, ensure proper working and usage of the new IMIMS | Control of operations linked to Tool Crib |

*Table 5: Roles and responsibilities*

The roles and responsibilities are assigned during the project initiation phase, they are assigned based on individual experience and the project requirements. Authority levels are aligned with the responsibilities making sure that the team leads have the decision making power for their respective areas.

### *5.4.4 Technical Staffing and Training*

*Engineering Management:*

Lead Engineer: Senior engineer with high level of experience in systems engineering and IMIMS

Support Engineers: Entry and mid-level engineers helping in process design

*Procurement and Vendor Management:*

Procurement Specialist: Experience in vendor evaluation and negotiation

Analysts: People who can work on data collection and analysis

Train staff with inventory categorization frameworks, vendor management metrics and procurement workflows.

*Finance:*

Finance lead: Can track costs, determine budget and identify cost effective methods

*Tool Crib Staff:*

Inventory Manager: Oversees inventory categorization and determines max/min levels

Operations staff: Responsible for real-time tracking. Ensure training of technical and operations staff on the new Tool Crib IMIMS.

*Security Team:*

Security Lead: Looks after security protocols

Train security team on access control and security measures.

## 5.5 Common Technical Processes

### *5.5.1 Systems Engineering Processes for the Project*

The systems engineering processes are designed to guide the development and operation of the Tool Crib IMIMS. They focus on delivering stakeholder requirements across the system lifecycle:

- *Requirements Analysis:*

  The stakeholder needs like inventory optimization, vendor management, and security, are captured and refined into technical specifications.

  Workshops, surveys, and collaborative reviews are conducted to ensure alignment.

- *System Design:*

  Develop a modular architecture integrating D365 for procurement automation, L2L for workflow management, and IoT platforms for real-time inventory tracking.

- *Implementation and Testing:*

  The deployment is phased to allow iterative feedback.

  The testing phases include unit testing, integration testing, and system-level validation.

- *Operation and Maintenance:*

  It includes continuous monitoring, stakeholder training, and system updates to ensure sustainability.

### *5.5.2 Methods for Systems Engineering Tasks*

The following methods ensure rigor and adaptability in engineering tasks:

- *Requirements Engineering:*

  Iterative stakeholder reviews to refine the requirements.

  Workshops and simulation prototypes validate initial designs by real world testing.

- *Model-Based Systems Engineering (MBSE):*

  SysML diagrams are used to capture relationships between system components.

- *Simulation and Prototyping:*

  Pilot deployments and virtual simulations test system performance before full-scale deployment.

- *Agile Development:*

  Iterative sprints are taken place to focus on refining features and addressing stakeholder feedback.

### *5.5.3 Tools for Supporting Methods*

The following tools are used for the execution of engineering tasks:

- *D365 and L2L:* They are the core systems for procurement and inventory management.
- *IoT Tools:* To enable real-time tracking updates and system alerts.
- *Documentation and Collaboration:*
    a. Confluence for documentation.
    b. Jira for sprint management and requirements tracking.

### *5.5.4 Configuration Management*

Configuration management ensures system integrity by controlling changes and maintaining versioning:

- *Change Control:*

  A Change Control Board (CCB) evaluates and approves updates.

- *Baselines and Versioning:*

  Git repositories or similar tools manage documentation and code versions.

*Visual:*

- *Change Control Flowchart:*

  Depicts the process from submitting change requests to implementation (only included if essential for clarity).

### *5.5.5 Technical Reviews*

Technical reviews are conducted at critical project milestones:

- *Preliminary Design Review (PDR):*

  Assesses whether high-level designs align with requirements.

- *Critical Design Review (CDR):*

  Finalizes detailed designs before implementation.

- *Test Readiness Review (TRR):*

  Confirms readiness for system-wide testing.

### *5.5.6 Trade-Off Studies*

Trade-off studies will ensure optimal decisions by evaluating all the options:

- *Criteria:*

  Consider cost, scalability, and integration feasibility.

- *Methodology:*

  Weighted scoring models such as the Analytical Hierarchy Process (AHP) are applied.

*For Example:* Comparison of IoT platforms for real-time tracking based on costs and complex integration.

### *5.5.7 Technical Change Control*

A structured process ensures all changes align with the project's objectives:

- *Change Control Board (CCB):*

  Authorizes changes after assessing their impact on cost, schedule, and scope.

- *Process:*

  Change requests → Impact analysis → Approval → Implementation.

### *5.5.8 Requirements Management*

Requirements are managed systematically to ensure traceability and validation:

- *Tracking:*

  Use Jira to maintain traceability matrices and track changes.

- *Validation:*

  Link requirements to technical solutions and ensure verification through the testing phases.

- *Documentation:*

  Regular updates capture refinements and alignments with system changes.

| Requirement | Technical Solution | Validation Method |
|---|---|---|
| Real-time tracking | IoT-based inventory tracking | System Testing |
| Vendor management | D365-based management | Integration Testing |
| Procurement automation | L2L procurement workflows | User Acceptance Testing |

*Table 6: Requirements Management*

## 5.6 Technology Insertion

### *5.6.1 Purpose of Technology Insertion:*

Technology insertion is very important to improve the operational Efficiency (OEE), security and accuracy of the IMIMS project. The new technology integrated in this system, their benefits and the timeline are explained in this section. By using IoT, ERP system and cybersecurity enhancement we can reduce manual errors, optimize procurement processes and also safeguard integrity.

### *5.6.2 Technologies to be Integrated:*

*1. IoT based Inventory Tracking*

*Purpose:* The purpose of this is to enable real time monitoring of inventory levels with the help of RFID tags or similar IoT devices.

*Benefits:* Accurate stock level tracking, look for stockouts and reduce overstocking. This is also used to enhance the decision-making process with the help of accurate and real time data.

*2. Integrating D365 and L2L systems*

*Purpose:* The purpose of automated procurement workflows is to ensure seamless data flow between the inventory and the procurement system.

*Benefits:* The benefits include minimizing manual data entry errors. Getting real time updates of the inventory levels after procurement is done.

*3. Enhancements in Cyber security:*

*Purpose:* The purpose of enhancing cyber security is to protect sensitive inventory and procure data from unauthorized access to the data.

*Benefits:* Reduction in the risks of data getting breached by the competitors and maybe financial losses. This will also follow security standards like ISO 27001.

*4. Automated Procurement Triggers:*

*Purpose:* The reordering process can be automated as and when the stock falls below a defined threshold.

*Benefits:* This will ensure that there is timely replenishment and reduce downtime considerably.

The stock levels are optimized for cost efficiency.

### *5.6.3 Implementation Plan for Technology:*

| Technology | Integration phase | Start Date | End Date | Key Milestones |
|---|---|---|---|---|
| IoT based inventory Tracking | System setup | Dec 2024 | Jan 2025 | Installing IoT tags, configuration of the system |
| Integrating D365 and L2L systems | System setup | Dec 2024 | Jan 2025 | Establish API connections and validate data flow |
| Enhancements in Cyber security | Securing Warehouse | Jan 2025 | Feb 2025 | Implement access control as well as conduct audits to enhance security. |

| | | | | |
|---|---|---|---|---|
| Automated Procurement Triggers | System deployment | Jan 2025 | Feb 2025 | Test and activate trigger points for procurement |

*Table 7: Technology Implementation plan*

### *5.6.4 Potential Challenges and Mitigation strategies*

| Challenge | Impact | Mitigation techniques |
|---|---|---|
| Data security breaches | Inventory data and procurement data compromised | Apply encryption, use edge technique and rapid incident response |
| IoT tag configuration errors | Misclassification of the inventory | Implement pilot testing and error checking techniques |
| Integration delays | Disruption of the project milestones and timelines | Include buffer time in timeline and use expert opinions from multiple disciplines |
| Compatibility issues in the system | Workflow automations delays | Testing the system continuously and giving feedbacks. |

*Table 8: Challenges and Mitigation strategies*

### *5.6.5 Outcomes:*

Integrating IoT, automated procurement and enhanced cybersecurity will considerably enhance the accuracy, security, and efficiency of the IMIMS system. By following the roadmap and addressing the challenges mentioned, the project can be technically advanced, and we can achieve the determined goals.

### 5.7 Additional SE functions and activities

Technical Gantt chart for the activities:

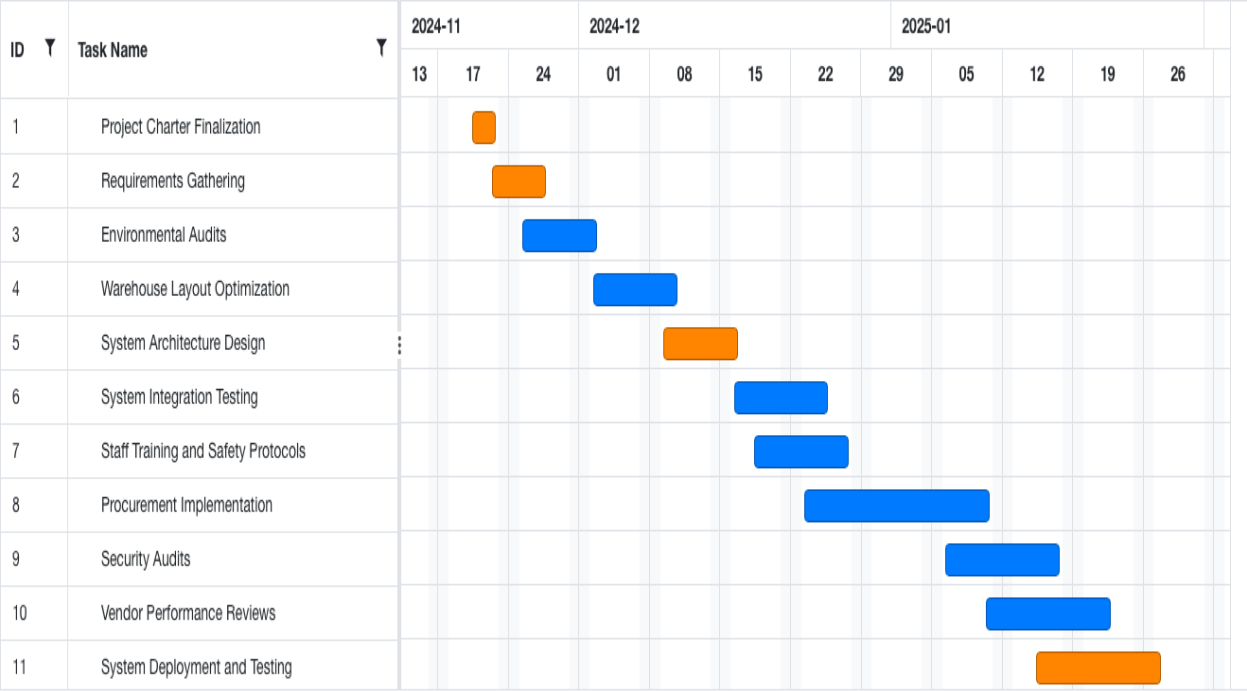


*Figure 8: Gantt chart for additional SE activities*

Here, the orange color represents the milestones

The project manager will report on progress weekly with the internal team and monthly with the stakeholders, which includes upper management.

Technical progress and opportunity for process improvement identification metrics will make sure that the IMIMS project is on course toward achieving the stated objectives. The key metrics for technical progress would involve the system integration success rate, such as percent accuracy, inventory classification accuracy, and percent completion of procurement automation. Metrics to measure process improvement include procurement cycle time reduction, error rates in tracking inventory, and minimization of waste in stock levels.

#### *5.7.1 IMIMS Project Procurement Cycle Metrics*

1. *Procurement Cycle Time Reduction*
    - *Baseline:* On average, 10 days are taken in completing a procurement cycle before the implementation of IMIMS.
    - *Target:* With the automation and integrations to D365 and L2L, the cycle time is expected to decrease to 4-5 days post go-live.

- *Metric:* Reduction percentage in procurement cycle time.
- *Goal:* Reduce the cycle time of procurement by 50%.

2. *Error Rates in Procurement Workflows*
   - *Baseline:* Manual procurement processes today generate about 15% in errors, such as ordering the wrong quantity or misfiling information related to individual vendors.
   - *Target:* With the use of IMIMS, workflows will be automated, which will cut error rates to below 5%.
   - *Metric:* Error rate = (Number of Errors / Total Procurement Transactions) × 100
   - *Goal:* Maintain an error rate of ≤5%.

3. *Waste Reduction in the Inventory Process*
   - *Base Line:* Currently, the inventory is overstocked or unused by 20%.
   - *Target:* Less than 10% overstocking through monitoring in real time and optimization of the purchase level.
   - *Metric:* Inventory classed as waste = wastes of overstocked inventory / total inventory × 100
   - *Goal:* Reduce waste in inventory by 50%.

## 5.8 Integration with project plan and resource allocation

### *5.8.1 Risk Assessment and Mitigation*

Managing risks is central for ensuring smooth execution.

| Risk | Impact | Mitigation Strategy |
|---|---|---|
| Integration Delays | High | Conduct pre-deployment system simulations to identify bottlenecks. |
| Procurement Delays | High | Regular vendor performance reviews with scorecards |
| Data Security Breaches | High | Deploy enhanced firewalls and real-time monitoring systems. |
| Resistance to Process Changes | Medium | Conduct stakeholder training workshops and provide clear communication on system benefits. |
| Inventory Misclassification | High | Implement IOT enabled real time tracking and rigorous testing of inventory categorization. |

*Table 9: Risk Mitigation Strategies*

### *5.8.2 Communication Across and Outside the Project*

Effective communication is critical for stakeholder alignment and project success. The communication plan includes:

- *Internal Protocols:*

  Daily team stand-ups via Microsoft Teams.

  Weekly project updates to management, highlighting resource allocation and progress.

- *External Stakeholder Engagement:*

  Monthly status reports for stakeholders and vendors.

  Procurement updates synchronized with D365 data.

- *Flow Diagram:*

  Internal teams → Project Manager → External Stakeholders.

  Procurement Team ↔ Vendors (for updates on delivery schedules).

### *5.8.3 Decision Management:*

- *Real-Time Updates:* Decision logs are linked to project management tools (e.g., Jira or D365) for automated updates when milestones or tasks are affected.
- *Escalation Process:* A structured hierarchy for escalating critical decisions to senior management or the Change Control Board (CCB) when significant impacts on scope or budget are identified.
- *Stakeholder Engagement:* Encourage cross-functional input (e.g., from inventory, procurement, and IT teams) to ensure decisions are comprehensive and address all project areas.
- *Decision Justification:* Document the rationale behind key decisions, referencing risk assessments, technical feasibility studies, or vendor performance reports.

By leveraging a centralized decision log and ensuring clear documentation and stakeholder accountability, the project will maintain transparency and adaptability.

### *5.8.4 Lessons Learned:*

- *Phased Deployment Ensures Smooth IoT Integration:* A phased rollout of IoT-based inventory tracking reduces the risk of misclassification and ensures accurate real-time updates during initial stages.
- *Vendor Scorecards Improve Procurement Efficiency:* Implementing performance-based evaluations for indirect material vendors helps mitigate supply chain risks and ensures procurement timelines are met.

- *Customized Training Boosts Process Alignment:* Tailored training for staff on D365 and L2L ensures that system workflows are understood and effectively adopted, reducing resistance and errors.

### *5.8.5 Resource Allocation:*

| Resource Type | Input Requirements | Output Requirements | Allocation Purpose |
|---|---|---|---|
| Human Resources | Skill-based labor requirements like IoT specialists, procurement teams, cybersecurity analysts. | Staff training reports, meeting minutes, resource allocation sheets. | Deploy and maintain D365, L2L, IoT, and cybersecurity systems. |
| Technological Resources | D365, L2L licenses; IoT hardware like sensors, trackers; cybersecurity tools (firewalls, encryption software). | Integrated system architecture diagrams; data flow testing reports; real-time inventory tracking | Enable seamless integration and automation of procurement and inventory workflows |
| Financial Resources | Budget approvals according to the financial plan; contingency fund allocation for unplanned events | Financial utilization reports; cost-performance analysis sheets. | Ensure cost-effective deployment of new systems and vendor negotiations. |
| Physical Resources | Warehouse space for IoT system deployment; hardware installation requirements. | Physical layout plans for IoT-enabled tool crib; equipment deployment testing reports. | Support the physical setup and hardware functionality for IMIMS operations. |
| Time Resources | Following the project Gantt chart; testing and deployment schedules. | Timeline adherence reports; milestone completion updates. | Ensure timely delivery of project milestones. |
| Data Resources | Vendor performance metrics, inventory categorization data, procurement history logs. | Data integration testing logs; operational efficiency analysis reports. | Optimize inventory classification and vendor evaluation systems. |

*Table 10: Resource allocation*

## 5.9 Compliance matrices

### *5.9.1 Purpose of the Compliance Matrices*

Compliance Matrices are a very important tool to complete all project requirements like functional, nonfunctional and regulatory, using technical solutions and validation. Using matrices can give us a clear framework that checks the system's alignment with the expectations of stakeholders, industry standards and regulations. By carefully mapping the requirements to the solutions and verification. A matrix is a good way to approach project execution.

### *5.9.2 Functional Compliance Matrix*

| Requirement | Technical Solution | Validation Method |
|---|---|---|
| Real time inventory tracking | IoT tracking system for inventory | Auditing and System testing |
| Automated procurements reorders | Integrating D365 and L2L in the system | Integration testing |
| Vendor performance evaluation | Vendor Scorecards can be used based on D365 | Vendor audit, vendor performance and review |
| Inventory classifications | Inventory categorization with the help of IoT | Verification and unit testing |

*Table 11: Functional Compliance Matrix*

### *5.9.3 Non-Functional Compliance Matrix*

| Performance Metric | Requirement | Solution | Validation Method |
|---|---|---|---|
| Scalability | Can handle up to 10000 items | Scalability testing for the system | Load Testing the system for high number of items |
| Reliability | Increasing uptime to 99% | Making the system IoT structure redundant | Stress testing of the system |
| Security | Securing data with data encryption | Using encryptions and firewalls | Security audit, and penetration testing |
| Response Time | Getting updates in real time under 2 seconds | Optimizing data flow algorithms | Performance testing of the whole system |

*Table 12: Non-Functional Compliance Matrix*

### *5.9.4 Regulatory Compliance Matrix*

| Regulation | Requirement | Solution | Validation Method |
|---|---|---|---|
| ISO 45001 | Ensure safety of the workplace ocean | Redesign the warehouse which would be safe and ergonomic to the workers | Conduct safety audits in the workplace at a regular basis |
| ISO 27001 | Make sure of the data confidentiality | AES-256 encryption and access control | Conduct compliance testing |
| Environmental Protection Laws | Minimize the impact caused on the environment | Use hardware in an energy efficient manner | Select a team of environmental engineers to audit the situation and suggest reformations |

| | | | |
|---|---|---|---|
| OSHA Standards | Maintain safe working conditions | Provide PPE to the workers and conduct safety training for all | Have safety inspections and conduct safety weeks to train the workers in safety. |

*Table 13: Regulatory Compliance Matrix*

### *5.9.5 Integration Compliance Matrix*

This matrix will verify if all the system is integrated or not, It will check functionality of data flow between D365, L2L and IoT components.

| Integration Point | Requirement | Solution | Validation Method |
|---|---|---|---|
| D365 <> L2L | Main requirement is seamless data flow between the D365 and L2L | Integration of the technology based on API | Perform system integration testing to check data flow. |
| IoT < > Inventory Systems | Getting real time updates on the inventory level | Use IoT sensors and data connector for tracking | Testing the user acceptance and data connectors |
| Cybersecurity < > Data System | Data integrity maintenance | Using encryption and role-based access | Performing security audit and penetration testing to further strengthening the security |

*Table 14: Integration Compliance Matrix*

### *5.9.6 Conclusion*

The compliance matrices ensure that the project is aligned with the technical, nontechnical and regulatory requirements. This will give a robust framework to check the system performance, inventory traceability and ensure that the project is in line with the goals set up by the stakeholders and the project meets the industry standard. Using the validation techniques mentioned will make sure that the matrix is accurate and is relevant throughout the lifecycle of the project.

# 6. Next Steps and Recommendations

## 6.1 Next Steps

After following the progress made in the previous phases, it is crucial for us  to follow the next steps to complete the project and for it to be sustainable.

### *6.1.1 System Integration and Testing*

Integrating the IoT systems, D365 and L2L with the operations is essential for seamless operations and efficiency. For this we have to do the following actions and complete the phase by the defined milestones.

*Actions needed:*

- The API based integration between D365 and the L2L should be validated for smooth data flow.
- To make sure if IoT devices give us real time updates, a system wide testing is must.
- A security testing using encryption methods and tests like penetration testing should be performed to safeguard the data from external threats.

*Milestones:*

The integration phase should be completed by Feb 2025, and should achieve accuracy with error rate of 5%.

### *6.1.2 User training*

The staff or users should be well trained of the new technology and should be adopted to the new system, this way the operations will have minimum disruption.

*Actions needed:*

- Develop and distribute the work Instructions and manuals of specific systems to their respective team members.
- Conduct training sessions for warehouse, procurement teams and security people.

*Milestones:*

This phase must be completed by March 2025, and it should achieve 90% user competency.

### *6.1.3 Full System Deployment*

Deploying the entire IMIMS system across all warehouse.

*Actions:*

- The inventory should be equipped with the IoT tracking devices/sensors.
- Automated procurement reorder system should be activated for starting the workflow.

*Milestones:*

The system should be ready and be deployed by April 2025, ensuring a 50% reduction in procurement and 10% improvement in inventory tracking.

#### *6.1.4 Continuous Monitoring and Screening*

To achieve long term goals and success, continuous monitoring of the system and finding out flaws and bugs is very important.

*Actions:*

- Regular audits and performance reviews should be conducted for inventory accuracy, vendor score and cyber security.
- Periodic review system would ensure the teams are inline with the goal set by the RS.

*Milestones:*

By June 2025 there should at least be one performance review.

### 6.2 Recommendations

#### *6.2.1 Strengthen cyber security techniques(measures):*

- Update encryption protocols on a regular basis and have access control based on the role.
- Periodic penetration testing performed for identification of vulnerabilities and issues.

#### *6.2.2 Robust Risk Management plan:*

- Using continuous monitoring to identify risks and brainstorm on ways to mitigate them.
- Performing Qualitative and Quantitative risk analysis to get clear idea of the likelihood, severity and priority of risks.
- Keeping buffers and budget to address unforeseen issues and problems.

#### *6.2.3 Involvement of Stakeholders:*

- Have periodic meetings with the stakeholders to give progress reports and updates.
- Incorporate feedback from the management to stay on the goals required by the Corporate.

#### *6.2.4 Optimize Inventory Management:*

- Use IoT devices to accurately get inventory data to avoid stockouts and understand demand.
- Use predictive analysis and forecasting methods to understand the demand to optimize inventory level.

### 6.3 Conclusion

The recommendations given would help maintain the IMIMS system and help RS achieve their goal of inventory management, procurement and improving security. Following the steps would be necessary to sustain the IMIMS model. While continuous review system is necessary to find errors and incompetencies in the system, thereby finding methods to mitigate them or bring them under control.

# Appendix

***Figures:***



***Tables:***

# Project Report - Rochester Sensors

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TEXAS A&M University

ISEN 663 - Management Control Systems

May 3, 2025

# 1.Summary

The report offers organizational models and analysis of the company Rochester Sensors, as well as recommendations to maintain its long-term viability. Rochester Sensors is a global organization operating since 1913 that seeks to create innovative liquid level measurement technology while offering exceptional customer service. Though already a 100-year organization, as many firms desire to become, the firm must adapt to the modern age, remaining on the edge of innovation and incorporating creative systems if it wishes to remain viable for the next 100 years. Such organizational resilience is a net benefit, but has also led to undesirable siloing and tribal knowledge, rather than diffuse, real-time information. Beyond this internal push for a viability analysis came the COVID-19 pandemic, presenting unique challenges to the firm. Restrictions on in-person activity, as well as declining revenue, meant that the workforce was greatly reduced, creating a need to restructure and re-tool in order to regain market share. In order to perform this analysis, several management control systems models were used, namely organizational charts, an IDEF0 model, a Strategy Map/Balanced Scorecard, a Levers of Control model, a Viable Systems model, and the Malmi-Brown management control system specification. These system analysis tools revealed several areas for growth, namely: high levels of overlap within the operational functions, large spans of authority, a need for externally monitored controls and a need for workshops (or other tools) as culture-building and setting tools. In order to address these deficiencies, the following recommendations were put forward. Firstly, the implementation of bonus based controls to motivate desired employee actions would be beneficial. Increased employee training and cross-functional skill development would open new opportunities for cross-collaboration and raise the overall firm capability. Increased technology utilization in the areas of target setting, production, communication and prototyping, would facilitate real time change, allowing for fast and accurate adaptation to conditions. Finally, and most simply, the increased usage of display and wall space for motivation and target reinforcement would serve as periodic reminders where employees need it most. Ultimately, Rochester Sensors is well positioned to take advantage of their name brand, capitalizing on existing goodwill and strengthening their internal systems to become a global leader in the liquid level measurement field.

# 2. Introduction and Discussion of the Nature of the Problem & the Engineering Approach to Achieving a Solution

**I → P → O (Input → Process → Output)**

Rochester Sensors (RS), a global leader in liquid level measurement technologies, is undergoing a critical organizational transformation to support innovation, improve internal efficiency, and strengthen its competitive position in the sensor manufacturing industry. The **input** to this design effort is a complex organizational system with legacy structures, uneven process integration, and untapped potential in cross-functional collaboration. The **process** involves the application of systems engineering methodologies to reframe and redesign RS's organizational elements—including value delivery systems,

strategy alignment, management control structures, and information flow. The **output** is a comprehensive, viable, and adaptive organizational system architecture that is functionally aligned with Rochester Sensors' mission, vision, and strategic goals.

**N (Nature of the Problem)**

The primary challenge Rochester Sensors faces is misalignment between its strategic aspirations and operational execution. While the firm maintains strong engineering and manufacturing capabilities, it lacks:

- a consistent framework to **measure performance**,
- **interoperable subsystems** across functions,
- and a **cohesive control environment** to ensure strategic direction is carried out through daily activities.

Additionally, organizational structures are not currently optimized for scale, flexibility, or rapid feedback—key characteristics required for innovation-driven firms operating in highly competitive and customer-centric industries.

**R (Requirements)**

To solve this, the organization requires a design that:

- Supports **cross-functional coordination** and **channel viability**
- Embeds **control systems** that align strategy with operations
- Enables **scalable decision-making** and **information flows**
- Fosters a **culture of continuous improvement**
- Establishes **measurable feedback loops** tied to strategic and customer goals
- Clearly maps **roles, responsibilities, and systemic functions**

**SA (System Architecture)**

A viable system architecture must model Rochester Sensors as a purposeful system capable of self-regulation, adaptation, and strategic execution. This requires:

- A **Viable System Model (VSM)** at both the macro (SIF) and micro (SIF+1) levels to define viable operations and coordination mechanisms.
- A **Balanced Scorecard and Strategy Map (SM-BSC)** to align the organization across financial, customer, internal, and learning perspectives.
- An **MCS-PKG** (Management Control System Package) to embed cultural, planning, cybernetic, administrative, and reward-based controls.

- A **TO-BE IDEF0 Model** that redefines the firm's value delivery process through optimized activities and interfaces.

This system architecture is designed to support continuous operational excellence while staying agile to external changes.

**AoA (Analysis of Alternatives)**

During design, various modeling frameworks were considered—such as traditional org charts, control matrices, and siloed process improvements—but these failed to fully capture the recursive nature, autonomy, and interdependencies of RS's operational units. Ultimately, the **Viable System Model (VSM)**, when combined with **BSC**, **MCS**, and **IDEF0**, provided the necessary depth and flexibility to:

- Diagnose current-state failures (ASIS),
- Design future-ready configurations (TOBE),
- Engineer viable communication channels (SIF+1),
- And establish multi-layered control environments.

**→ {Formal Design Artifacts}**

The engineering approach resulted in a series of structured design artifacts:

- **MVV, VP, and VDS Definitions** (HW1)
- **ASIS and TOBE IDEF0 Diagrams**
- **Organizational Chart with ASIS/TOBE comparison**
- **SM-BSC with full OMTA mapping and rationale** (HW2)
- **Levers of Control specification across all five categories**
- **Dual-layer VSM with engineered channel rationale** (HW3)
- **MCS-PKG with costed rationales and control life-cycle considerations**

Together, these artifacts represent a fully integrated and engineered organizational redesign—tailored to support RS's strategic transformation goals and operational complexity.

# 3. Organization Charts

ASIS Organizational Structure: Presenting-Ready Argument

Structure Overview: Slide/Visual Aid Context

At Rochester Sensors, the present ASIS system is a functional hierarchy whereby departments—Sales, Engineering, Manufacturing, Supply Chain, Quality, and Finance—are obviously separated by discipline.

Directors or managers in each department answer either the Chief Operating Officer (COO) or Chief Financial Officer (CFO), who in turn answer the President.

Important Branches of Organization:

Sales: Under the direction of the Director of Sales, Sales Product Managers and Sales Representatives are housed.

Engineering: Engineering consists in several applications and NPI engineering units.

Manufacturing: Direct labor, a manufacturing engineering manager, and product supervision all fit under manufacturing.

Supply Chain: Purchasing, warehouse operations, sourcing, shipping.

Quality: Quality assurance addresses test lab-based quality engineering and testing.

Finance: Under a controller, traditional roles of accounting, budgeting, and finance underlie themselves.

Examining ASIS Model Critically: Organizational Inventions

1. Overfunctionalizing and Silos

Every function runs rather independently. Engineering, for instance, limits cross-functional cooperation by not being tightly coupled with manufacturing or quality. Minimal shared ownership or overlap between departments compromises agile decision-making.

Particularly in cross-disciplinary projects like product development, this isolation generates coordination inefficiencies, slows issue resolution, and impedes the flow of ideas.

2. Direct Labor Bottlenecks and Overload

Overreliance on direct labor without efficient integration or delegation to technology or cross-trained teams strains shop-floor operations and lessens adaptability.

Limited scalability, lowered responsiveness, and possible burnout in labor-intensive areas follow from this.

3. Absence of Integration and Centralized Planning

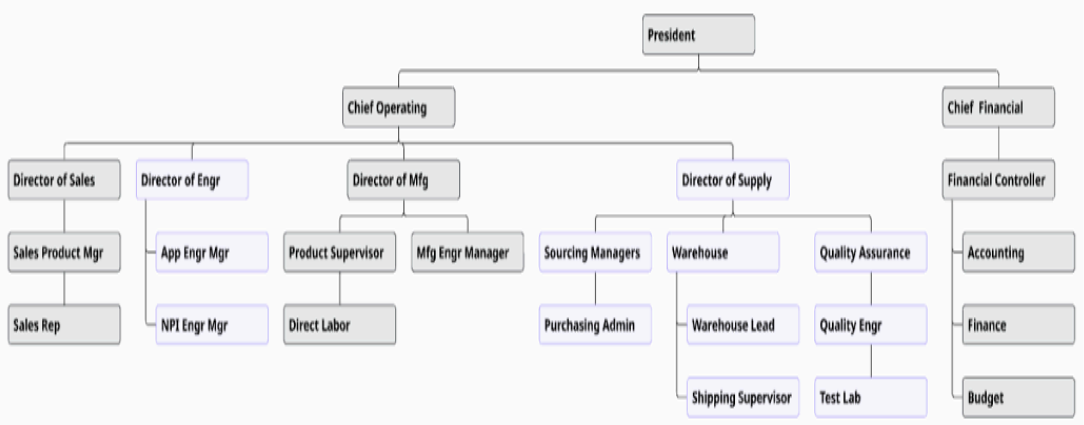
The supply chain is fractured. Purchasing managers, warehouse leads, and sourcing agents work with little centralized control. Especially in feedback loops, engineering and manufacturing are likewise disjointed.

Effects are misaligned procurement, production schedule delays, and a collapse in real-time decision-making.

4. Insufficient roles in project and change management

There are a few committed positions to coordinate efforts among departments. Systems of internal communication and project management are still developing.

Impact: Limits the company's capacity to execute constant improvement or react quickly to changes in the market, so undermining strategic initiatives.




The TOBE model offers to close these discrepancies:

1. A matrix arrangement allowing departmental project-based integration.

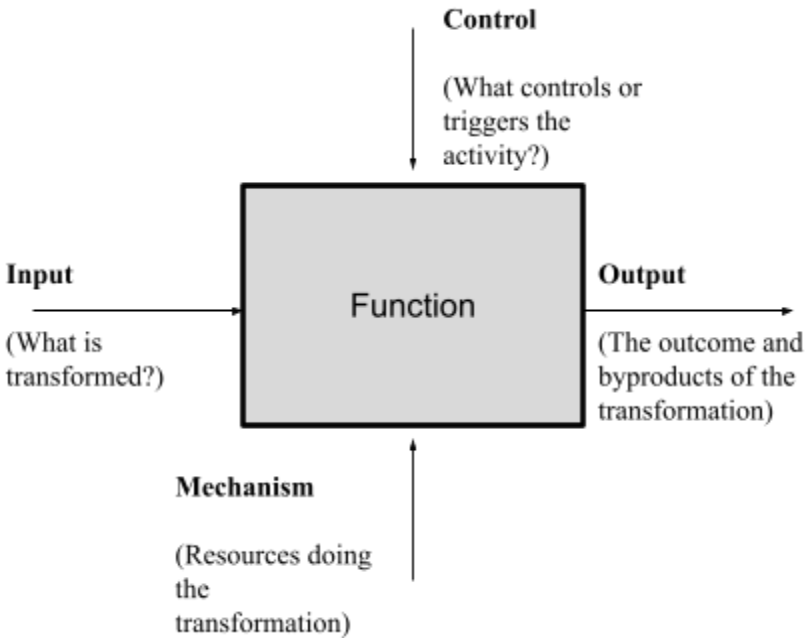
2. Value stream ownership is underlined in order to guarantee end-to-end responsibility.

3. Enhanced cross-functional cooperation amongst manufacturing, supply, and engineering.

4. Particularly, HR and knowledge management, strategic oversight roles for real-time data flow, customer education, and internal asset management play important roles.

# 4.IDEF0 model of the core transformative functions of the ORG

The most typical representation of the organization is the organizational chart. Simple to explain to executives while drawing clear lines of authority and work structures, these charts serve an important purpose in visualizing the organization. However, as a systems engineer, the view of an organization is more broad, roughly defined as some function of its form, fit within the organization, functions, and controls involved in maintaining the system. From this lens, it is beneficial to incorporate additional models into the visualization and design of the organization- in particular, the IDEF0 model. The model provides a visualization of both the function dependencies and controls of the organization, using boxes for functions and arrows to indicate various organizational elements, as shown below.

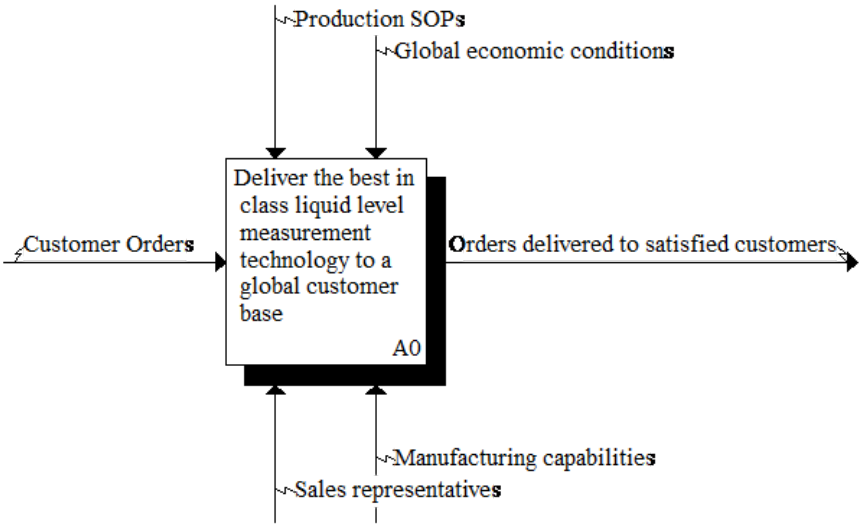



In constructing the IDEF0 model for RS, it was important to clearly define the viewpoint, purpose and context of the model, summarized below.

| | |
|---|---|
| **Purpose** | The purpose of the model is to visualize Rochester Sensors, an already successful 100 year company, as a more efficient company focused on continuous innovation/improvement and the ultimate customer experience. The model draws from the existing functional capabilities, while also suggesting some new functional focuses and controls to ensure that they are successful. |
| **Viewpoint** | The view is that of a systems engineer who has been given access to point of contact within the organization, several documents from leadership, and external sources such as the organization's website. |

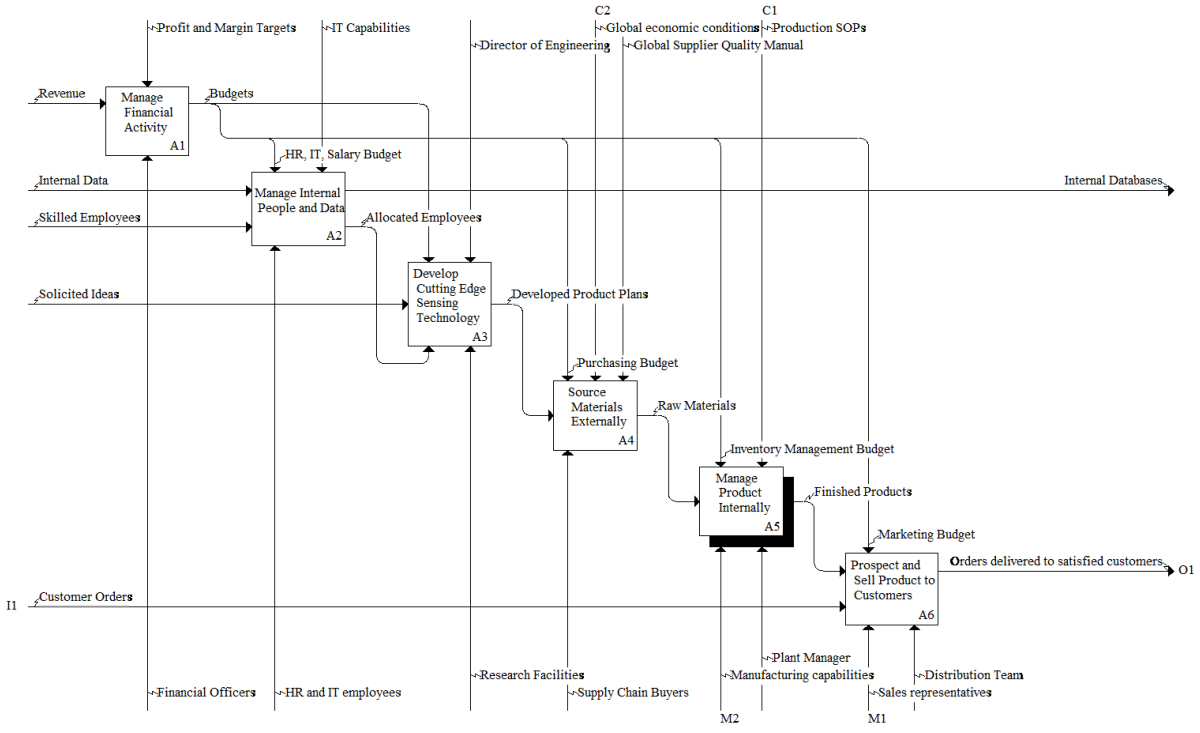
| Context | The context of the model is a view of the entire firm, with a particular focus on the value creation process in assembly and delivery processes. |
|---|---|

The key consideration for this model was on the value creation and delivery functions of the firm, as they have the greatest potential to enhance organizational performance. Ultimately, Rochester Sensors' mission is to deliver excellence and innovation in liquid level measurement, while creating a legendary customer experience, leading the systems engineer to focus the model on the creation and delivery of these sensor systems.This means that more peripheral activities, for instance, like prospecting clients or the specifics of attracting and retaining the right employees, though important for any organization, are left unexplored in favor of the inventory receipt, production, and distribution processes. The following top level model was developed, denoted A0:




Activity items are defined in the glossary, included in this report in Appendix C**.** Their core function is reflective of their goals- best in class points to their customer experience focus, global describes the growth they wish to achieve, and it is centered around Rochester Systems' very specific niche of liquid level measurement. All ICOM elements are internal, apart from the global economic conditions, an important consideration particularly in the present day environment of trade restriction. Failing to consider these would lead to a reactive, rather than proactive organization, one poorly positioned to grow in an effective manner globally.

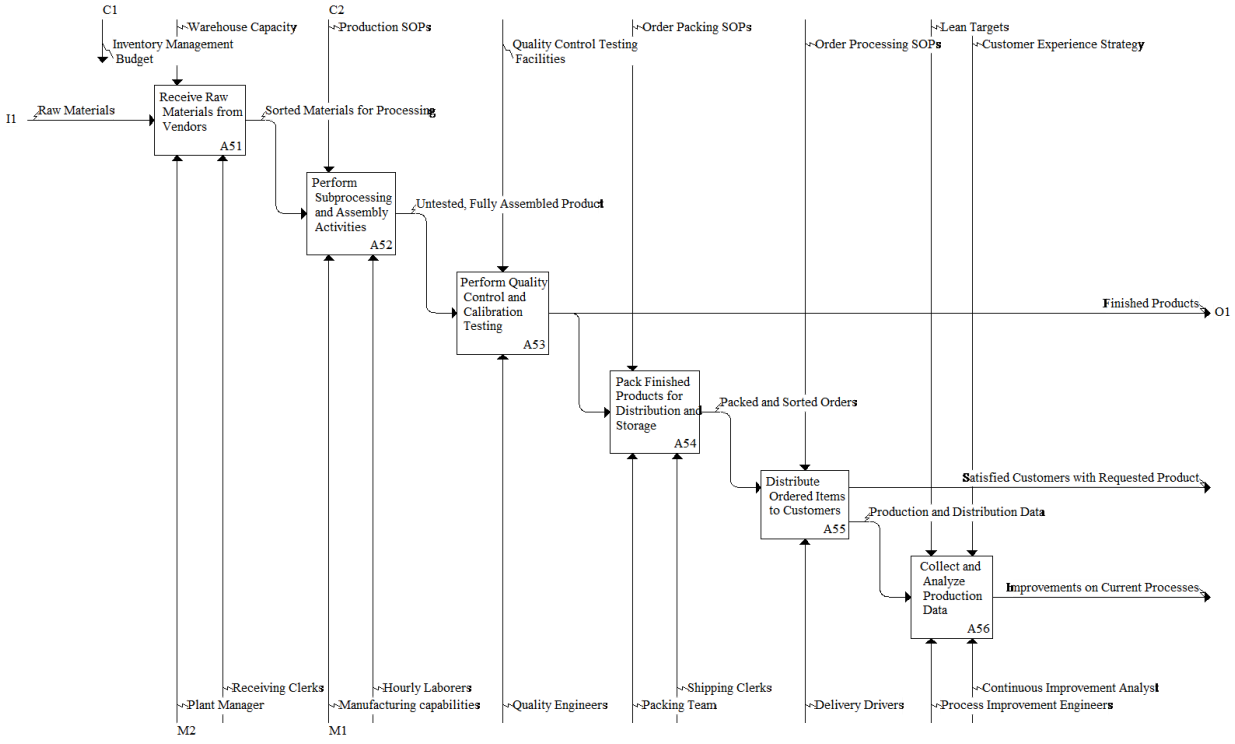
Adding a level of detail, the following decomposition was developed, which is reproduced larger in Appendix A, and denoted A1:




The functional elements of this diagram are primarily drawn from a 2018 internal diagram outlining Rochester's capabilities: HR, Engineering, Sales, Operations and Finance. These functions are key within any organization, indicating a correct focus on the management of people, information in the form of patents and innovation, revenue growth, value creation, and financial management. However, one small, but growing function within RS is the information management piece, providing real time data and transmitting data across the firm. This function was combined with people management, as they are both internal assets, with finance left out given their interaction with the customer ordering process. This internal function is then controlled/triggered by the capabilities and focus of the IT professionals with the firm, indicating a focus on the recruitment, selection and retention of these individuals could be key in modernizing the firm.

Otherwise, a common theme within the controls and management of the functions of disorganization are budgets and people. This is not necessarily a negative, and merely indicates that power is quite centralized with management and financial officers. However, as they look to become a more process driven organization, implementing tools like the Global Supplier Quality Manual (already in place as an objective measure of vendor quality) could be useful in diffusing knowledge and power throughout the firm.

Narrowing the focus even further to the value creation methods involved in inventory management, the following decomposition was developed, recreated larger in Appendix B, and denoted A51( and so on):




A core element of the decomposition is the emphasis on standard ordering processes in production, order packing, and order processing. These systems are essential in ensuring a consistent, quality customer experience and removing reliance on plant managers and supervisors to determine best operating practices on an individual basis. Because this is a global firm, they are operating in environments with high levels of variety, but standard processes help to attenuate that level of variety and ensure that the brand name is not diluted. Another key element is the integration of process improvement into the production cycle. The internal asset management function adds a focus on data collection and analysis, enabling their use in assessing and upgrading the efficiency of the production process at all levels. Given that this function is crucial in creating value for the customer, a focus on it (by dedicated team or data channels) is necessary for improvement of the overall value delivery. A final consideration is the importance of facility quality and variety in determining the quality of the product transformation processes. This is likely not a large concern given the wide ranging manufacturing capabilities at RS, but these capabilities and associated machines must have strict maintenance standards to ensure product quality. Beyond production, investing carefully into the tools and systems used for quality control will ensure that any failings in the manufacturing process are caught internally, before they become blemishes on the firm's reputation.

# 5. SM-BSC

After visualizing the function and controls present in the current organization, it is useful for the system engineer to look to the future, envisioning the future of the firm as it pertains to viability and success. From a business perspective, the future, at least that which can be controlled internally, is driven by strategy. Strategy in itself is driven by a clear definition of the organization's mission, vision and values, opportunity analysis, forecasting methods, issue identification, and finally a clear statement of strategic objectives. However, beyond a mere statement of strategy to shape the direction of Rochester Systems, actionable steps and objectives must be put into place to help quantify progress. For this purpose, the Strategy Map-Balanced Scorecard (SM-BSC) was the next model used to envision the future of Rochester Systems. The strategy map translates strategy into objectives to target from 4 key perspectives: financial, customer, internal (value creation processes), and learning and growth (people, information, organizational capital). These perspectives' objectives must ultimately lead to the top objective of creating long-term shareholder value, the purpose of any for-profit organization. The balanced scorecard adds quantifiable, targeted measures, targets and initiatives to the 4 perspectives, differentiating it from the often myopic, purely financial goals managers tend to set. With this context in mind, and designing for the desired revenue and cultural goals of ROchester Sensors, the following SM-BSC was designed:

| Strategy Map: SIF- Rochester Systems | | Balanced Scorecard | | Action Plan | |
|---|---|---|---|---|---|
| Perspective | Objectives | Measurement | Target | Initiative | Budget |
| **Financial** | Increase revenue through high-value products | Revenue growth | 15% increase in revenue over the next 2 years | Launch new high-margin sensor line | $100,000 for R&D, prototyping, and bringing the product to market |
| | Improve operational efficiency | Unit cost reduction | 10% reduction in unit cost | Lean production initiatives like waste elimination or JIT | $30,000 for a lean consultant |
| | Identify new markets | Potential sales volume identified | $1 million+ of lifetime sales markets identified | Perform a market analysis on areas with need for liquid measurement, focused on Africa/the Middle East as these areas are underserved | $10,000 for research, travel and market sizing projects |

| | | | | | |
|---|---|---|---|---|---|
| **Customer** | Improve on-time delivery | % of orders delivered on time | At least 85% delivered on time | Cross-train staff and optimize supply scheduling | $38,000 for training costs and software/tool upgrades |
| | Increase customer satisfaction | Net promoter score | 60+ NPS | Implement a post-delivery survey | $5,000 to develop and host a survey |
| | Reduce product lead times | Average time from order to delivery | Lead times under 3 weeks | SMED to reduce setup time | $30,000 SMED workshops |
| **Internal** | Streamline production processes | Process cycle time | 20% cycle time reduction | Implement digital work instructions (DWI) | $15,000 for DWI software and training |
| | Strengthen quality control systems | % of reworked items in production | Rework percentage below 3% | Introduce automated in-line quality checks | $40,000 for automation tech |
| | Improve first-pass yield | First-pass yield rate | First-pass yield ≥ 95% | Kaizen events for process bottlenecks elimination | $25,000 for Kaizen workshops |
| **Learning and Growth** | Develop cross-trained, process driven experts | • % of common cross-competency skills held by each employee<br>• SOP assessments | • 75%+ of skills deemed transferable<br>• 80% correct knowledge of and adherence to protocol | • Brianstorm a list of basic skills all employees need and construct skills surveys around this list. Develop peer-led training to address deficiencies.<br>• Posting most common SOPs on the visual communication boards, re-emphasis in daily meetings for 6 months+ | • $10,000 to create surveys and incentivize peer training creation<br>• $500 towards sign creation |

| | | | | | |
|---|---|---|---|---|---|
| | Develop instantaneous information systems capacity | % of R&D employees trained, and with access to tech | 90% or more employees within the next year | Tightening of hiring standards, training development, allocation of budget towards necessary technology | $50,000 towards licenses and training fees |
| | Develop instantaneous information systems capacity | % of employees with personal objectives tied to strategic goals | 100% of employees with at least 1 objective tied to strategy | Refinement of job roles to tie directly to strategic needs | 10% of total salaries allocated for bonuses via by strategic goal achievement (not all will be paid out) |

The financial perspective aims to strengthen Rochester Sensors' profitability and operational performance by emphasizing high-value product development, cost-efficiency, and assuring that all available markets have been tapped. Increasing revenue through a new high-margin sensor line aligns with the company's strategic goal of growing its electronic product share, while lean production initiatives directly support cost reduction and margin improvement. Performing market research, particularly in areas of the world with high levels of untapped resources, further aids in revenue growth goals while supporting the vision of becoming a global leader. Key financial metrics, such as revenue growth and cost per unit, enable precise monitoring of value creation, while lifetime sales predictions confirm only the most profitable new markets are explored. By targeting a 15% revenue increase and a 10% cost reduction, the organization reinforces its focus on innovation-led growth and lean transformation. The associated investments in R&D and lean expertise are justified as enablers of both long-term competitive advantage and short-term financial gains.

The customer perspective focuses on how well an organization meets customer needs and expectations, while building lasting partnerships and brand equity. In Rochester Sensors, this encourages improvement in on-time delivery, customer satisfaction, and meeting lead times consistently. The combined budget finances strategic initiatives, including staff cross-training, scheduling enhancements, post-delivery feedback systems, and the implementation of SMED reductions. These initiatives are aimed at improving delivery dependability, soliciting customer feedback, manufacturing flexibility, and overall insight into RS performance. In delivering these objectives, new challenges may arise, such as employee fatigue from cross-training, disengagement from surveying, and process volatility from SMED implementation. Risk mitigating approaches include spaced-out training, crossed survey designs, and focusing on process improvements in targeted areas before full implementation as a pilot run.

The internal perspective focuses on strengthening Rochester Sensors' core manufacturing capabilities to support its value delivery system and strategic growth objectives. By streamlining production processes, improving first-pass yield, and enhancing quality control systems, the company can reduce waste, minimize rework, and ensure consistent product reliability—key priorities outlined in its RBS philosophy. Metrics like process cycle time, rework percentage, and first-pass yield provide clear visibility into operational health, while ambitious yet achievable targets drive performance. Initiatives such as implementing digital work instructions, introducing in-line quality checks, and conducting Kaizen

workshops not only align with lean principles but also foster a culture of continuous improvement. These controls support upstream financial goals, improve customer outcomes, and reinforce the firm's commitment to excellence and reliability in high-mix, high-precision manufacturing environments. This focus on ambitious metrics for production excellence, though supported by internal initiatives, also require a more intangible culture of buy-in and excellence at all levels, supported by learning and growth initiatives.

The primary goal of the learning and growth objectives are to foster greater innovation within RS, helping to maintain their status as a product leader in the category. They are already known for their innovation in advanced sensor technology, and capitalizing on these creative capabilities could be key for the continued growth they seek. Placing emphasis on SOPs and transferable skills will enable knowledge to become less "tribal", and more diffused, as well as the quick switching of employees between tasks as needed. Giving R&D employees access to virtual prototyping technology, as well as ensuring they are all trained in its use, will enhance the speed of prototype development and the speed to market. Finally, tying bonuses to strategic goals will ensure accountability and buy-in at all levels. The most expensive endeavor would likely be the technology development, given the ongoing need for licensing and potential salary increases needed for more skilled employees, but is also likely the most necessary in ensuring the long term viability of RS. One potential unintended consequence is a lack of attention to goals and objectives not directly tied to strategy. For instance, it could be hard to quantify quality customer service, meaning employees forego this in favor of pure revenue growth. The primary mitigation strategy is a careful definition of the targets and goals in other areas of the SM-BSC to only incentivize desired behavior. Another potential impact is a self-stratification of employees based on their perceived value, as determined by skills surveys. A collaborative, team based culture will be key in mitigating this, framing any weaknesses as learning and growth opportunities, and ensuring all roles are valued within the organizational structure.

# 6. LOC

Using Robert Simons' Levers of Control, it is easy to achieve a balance between control and innovation in an organization. In order to balance these two competing concepts, the framework highlights four key pointers, these include: belief systems, boundary systems, diagnostic control systems, and interactive control systems. Each of these is a "lever" that managers can count on. These levers together make sure that an organizational strategy adapts to internal or external uncertainty while being executed.

For Rochester Sensors, the LOC model was structured to coincide with the company's strategic goals: faster advancement in liquid-level measurement technologies, achieving high-quality standards across the globe, and ensuring that customer experience is consistent. The LOC model is aimed at meeting Rochester's strategic goals while allowing the company to sustain the cultural cohesiveness and ethical values.

| Levers of Control | Designed Levers | Rationale |
|---|---|---|
| Belief Systems | ● Publish and promote core RBS values<br>● Quarterly value-based recognition rewards<br>● New hire orientation on mission/values<br>● Integrate RBS values into performance reviews<br>● Display RBS success stories | ● Supports company mission and values by facilitating coherent and cohesive communication across the entire organization.<br>● Aligns employees' actions with core values by rewarding employees who demonstrate company culture and performance standards.<br>● Integrates cultural knowledge and expectations from the onset to promote sustained engagement and continuity with the organization.<br>● Integrates cultural values into the formal appraisal system so that feedback aligns with value expectations and personal growth.<br>● Brings values to life by sharing case studies of how employees implement company values in their jobs. |
| Boundary Systems | -Strategic Bound- no more than 20% of R&D billed hours doesn't on mechanical work<br><br>-Addition of codes of conduct on the team visual communication board<br><br>-Enforcement of strict vendor codes of conduct (margins, quality of sourcing, moral treatment) | -This lever maintains the desired strategic focus on non-mechanical systems moving forward<br><br>-This allows for CoCs to constantly be top of mind, either consciously or unconsciously<br><br>-Strict boundaries for external partners help maintain the unified image of RBS in terms of quality and values |

| | | |
|---|---|---|
| | -Develop a standard customer experience procedure (# contacts, chain of command)<br><br>-Periodic missives from the top to celebrate desired behavior and discourage others | -Boundaries for customer experience further a unified image across the organization, as well as making excellence the standard<br><br>-Messages from the top ensure employees feel proper appreciation when they are within the bounds, as well as tying employees at all levels together |
| Diagnostic Control Systems | ● Weekly KPI Dashboards<br>● Daily floor observation walks<br>● Monthly plant financial reviews<br>● Downtime trend analysis<br>● Order fulfillment monitoring | ● To promote speedy evaluation of performance metrics and take corrective measures if needed.<br>● Facilitates daily interactions with the team, enabling leaders to witness and resolve issues, as well as effectively support the teams.<br>● Integrates operational activities with financial results so they can be monitored for value creation.<br>● Discovers measures to correct inefficiencies and encourages the use of data to improve.<br>● Safeguards continuous and punctual deliveries needed for supporting customer promises. |
| Interactive Control Systems | - Cross-department project reviews<br>- Feedback forums<br>- Strategy discussion workshops | -Encourages collaboration -continuous innovation -shared understanding of strategy |
| Internal Control Systems | ● Implement automated compliance checks for ISO and quality standards<br>● Introduce real-time access control and audit trails for sensitive manufacturing areas<br>● Require dual authorization for material withdrawals or sensitive engineering changes<br>● Conduct monthly internal audits for financial and operational processes<br>● Enforce traceability documentation for every sensor product | ● These controls ensure consistent adherence to industry and customer standards, reducing the risk of compliance violations and quality failures.<br>● Audit trails and dual authorization enhance accountability and deter misuse of materials or unauthorized changes.<br>● Internal audits proactively identify and correct financial/process risks before external audits.<br>● Traceability supports product recalls, warranty claims, and customer confidence, especially critical in regulated sectors served by Rochester Sensors. |

The belief system at RS is constructed around the objective of remarkable customer service, vision, and level of innovation that the company wishes to achieve. These beliefs are ingrained within the company and reinforced through a set of structured practices. First, all new employees are introduced to the core values of the organization during the orientation session so that they understand what RS stands for. Recognitions are also done quarterly and are geared for employees who showcase desired values as identified by organizational leaders, aimed at strengthening desired behaviors across the company. Furthermore, participating in appraisals evaluation, value demonstration alignment is ensured, which guarantees that the cultural expectation and officially sanctioned assessment are balanced. This is necessary for productivity.

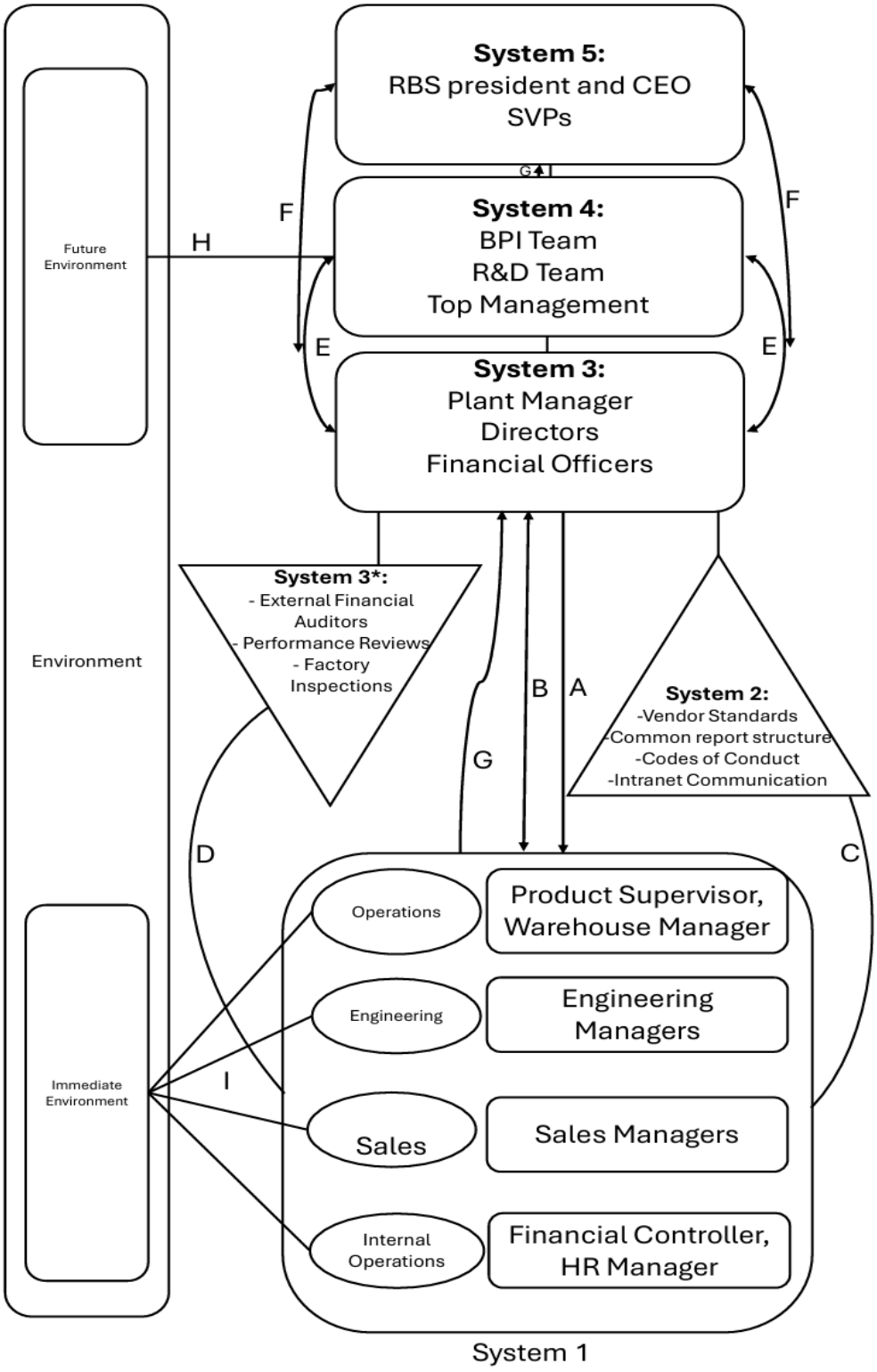
The boundary system at RS is used to distinguish areas of unacceptable behavior as well as non-negotiable limits. One such restraining boundary is strategic in nature since it restricts the percentage of R&D hours that can be spent on mechanical projects to ensure focus on advanced sensor technology. Vendor codes of conduct are enforced without exception to safeguard RS's brand and protect high ethical and quality standards among its global suppliers. Moreover, these codes of conduct, along with procedures pertaining to customer experience, are visibly displayed in the relevant work areas and embedded within the digital communication systems, thereby guaranteeing consistency in messaging. These boundaries are dual purpose, supporting both compliance and strategic alignment, while at the same time shielding RS from reputational damage and operational inconsistencies.

The diagnostic systems at RS allow for the measurement, monitoring, and correction of performance. At RS, these include KPI dashboards that are checked weekly and evaluate metrics like on-time delivery, cost per unit, and production cycle time. This ensures that responsibility and problem-solving at the moment are promoted through daily plant floor walks by the supervisors. These are done at the supervisor level. There are also monthly reviews of the financials, which integrate the strategic and operational results with profitability. Profitable results help in trend revelation to help start focusing resources. There is also an analysis of trends in downtime as well as monitoring of order fulfillment, which ensures that customer satisfaction is maintained and inefficiencies internally are dealt with swiftly. Together, these tools help foster and drive change and agility needed to enable improvement, irreversible change, and analyze variances, enabling RS to achieve its objectives.

The interactive controls motivate collaboration, learning, and changes in behavior. At RS, project reviews are done regularly across departments to enhance functional conversation as well as determine whether projects are fulfilling a strategic purpose. Employees are also engaged in feedback forums designed to surface bottom-up innovations, which have sustained improvements in processes. All these RS practices are integrated within the Strategy discussion workshops that happen every quarter with engineering, sales, and operating leaders to develop a common understanding of the company’s direction. This fosters a culture where innovation is not just permitted but expected, allowing the organization to rapidly respond to technological and market shifts.

# 7. VSM of the ORG

Viable Systems Model: Rochester Systems


System 5:
RBS president and CEO
SVPs
System 4:
BPI Team
R&D Team
Top Management
System 3:
Plant Manager
Directors
Financial Officers
Future Environment
Environment
Immediate Environment
System 3*:
- External Financial Auditors
- Performance Reviews
- Factory Inspections
System 2:
-Vendor Standards
-Common report structure
-Codes of Conduct
-Intranet Communication
A
B
C
D
E
F
G
H
I
Operations
Product Supervisor, Warehouse Manager
Engineering
Engineering Managers
Sales
Sales Managers
Internal Operations
Financial Controller, HR Manager
System 1

Channels, Functions, and Associated Costs:

| Channel | Specification | Potential Costs |
|---|---|---|
| A | Periodic reporting on employee conduct, process adherence, and financial markers from managers to directors | $0-1000s, depending on existing reporting infrastructure |
| B | Budget authorization limits determined quarterly<br>Publicly posted KPI targets by department | $0 |
| C | Visual communication board (posting of codes of conduct, safety measures, SOPs)<br>Intranet development | ~$50000 investment towards intranet development and management |
| D | Review scores flagging employees to target via training or reassignment<br>Safety flags raised by local inspection able to be fixed without CEO oversight | $0 (other than cost of real-time data systems) |
| E | Periodic face to face meetings for ongoing communication<br>Blind voting on initiatives to encourage honesty in decision making | $0 |
| F | CEO/manager meetings to discuss current priorities and issues<br>CEO final veto on contested decisions | $0 |
| G | CEO/director warehouse walkthroughs<br>Use of intranet for direct communication and issue submission | $0 |
| H | External conferences and networking<br>Business development team research and market surveys | ~$2000 per employee towards yearly continuing education |
| I | Client site visits<br>Vendor sales calls | ~$2000 travel budget per manager to engage directly with customers |

**Functional Costs**

| System | Costs |
|---|---|
| 1 | $0 (existing roles) |
| 2 | $50000 towards intranet |
| 3 | $0 (existing roles) |
| 3* | ~$20000 (auditors and inspectors ) |
| 4 | $0 (existing roles) |
| 5 | $0 (existing roles) |

Rationale and Discussion (costs, unintended consequences, mitigation strategies)

- Common conduct, reporting and training structures between divisions facilitate the ability to collaborate, employees are given a common “lingo” and can self-regulate. These commonalities also reduce variability in actions within warehouses and between countries, making viability more achievable.

- Performance reviews give for clear employee targets, as well as providing a managerial audit on their operations as the S3* should. One possible consequence, however, is the possibility of employee overcorrection towards only doing activities that aid the self as opposed to overall team and company performance. This could be mitigated by a bonus structure tying money to company performance (an added cost) or merely adding these team-based metrics to individual reviews.

- Outside factory inspections provide a prevention/mitigation strategy for any potential legal issues raised by unsafe operating conditions, keeping the organization viable. They also complement any information the S3s glean by talking to their direct reports or doing more informal walkthroughs.

- Business Process teams will need an internal (operations) and external (improvements on the horizon) focus to maximize current performance while looking to the newest tools to do so, better enabling their ability to diagnose the environment while planning its future. There is a risk that their priorities may become skewed, or they become overworked with a dual focus, pointing to an increased hiring need, or the formation of a new team to split responsibilities between in- and external improvement.

- The usage of the visual communication board as a common feature within offices and factories allows for standardized messaging and emphasis of the MVV, supporting the role of the S5 in the organization within its direct intervention.

- Industry conferences provide the ability to look to the innovation of others for inspiration, as well as networking opportunities to source and potentially capture talented new engineers. A potential risk is the R&D team spending too much time outside the company rather than innovating internally, which could be limited by a cap on the number of events attended per year

# 8. MCS Framework

An MCS is best described as an integrated set of tools, processes, and cultural systems that a firm employs to assist with strategy management. For this report, we utilized the Malmi and Brown framework, which divides controls into five groups: cultural, planning and cybernetic, reward and compensation, and administrative. These categories enable RS not only to measure performance, but also to shape the behaviors, incentives, and decisions critical for sustainable organizational success.

The MCS package developed for Rochester Sensors is integrated with the LOC model, combining both formal and informal systems to strategically align the business directions with employee behavior and activities, as well as the realities of the market. The next section describes each category of control along with its rationale and the logic behind its execution.

| Cultural Controls | | | | | | |
|---|---|---|---|---|---|---|
| **Clans** | | **Values** | | | **Symbols** | |
| Encourage collaboration through team-building exercises and workshops. | | Promote and integrate RBS values in every aspect of employee performance (from recruitment to performance reviews). | | | Display success stories from employees who embody company values. | |
| Planning | | Cybernetic Controls | | | | Reward & Compensation |
| **Long range planning** | **Action planning** | **Targets** | **Financial Measurement Systems** | **Non-financial Measurement Systems** | **Hybrid Measurement Systems** | Implement a quarterly bonus system based on departmental performance aligned with overall company goals. |
| Implement strategic visioning workshops for leadership every 6 months. | Develop quarterly operational plans that align with the company's | Set quarterly and annual KPIs for key financial and operational metrics (e.g., revenue growth, | Use real-time financial dashboards that track revenue, operating margins, | Track customer satisfaction scores (e.g., NPS) and internal production performance metrics. | Integrate both financial and non-financial KPIs into a balanced performance scorecard | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | annual goals. | first-pass yield, on-time delivery). | and unit costs. | | for each department. | |
| Administrative Controls | | | | | | |
| **Governance Structure**<br><br>Establish a clear governance framework that defines roles, responsibilities, and decision-making authority for each function. | | **Organization Structure**<br><br>Define an organizational hierarchy that promotes clear communication and cross-departmental collaboration. | | **Policies and Procedures**<br><br>Develop standardized procedures for key business processes, including manufacturing, R&D, and customer service. | | |

**Cultural Controls**

**1. Clans – Encourage collaboration through team-building exercises and workshops**

- Rationale: Encouraging teamwork through collaboration-focused activities helps employees align on common goals and fosters a cooperative organizational culture. Given Rochester Sensors' emphasis on innovation and customer focus, enhancing collaboration ensures that teams can share ideas, solve complex problems together, and improve productivity. As highlighted in the company data, working cohesively enhances operational efficiency, supports continuous improvement, and drives overall company performance .
- Life-Cycle Costs: The recurring cost of training facilitators, venue rentals, and other logistics should be considered in the long term. These costs also include management time for planning and executing these activities.

**2. Values – Promote and integrate RBS values in every aspect of employee performance**

- Rationale: Core values play a crucial role in embedding the company’s mission and vision into the workforce. This control ensures that company values are not only emphasized during

onboarding but also consistently integrated into day-to-day operations. It leads to stronger employee alignment with organizational goals, such as continuous improvement and reliability, while also improving employee retention. Rochester Sensors' emphasis on values like reliability and customer focus necessitates this integration for organizational success .

- Life-Cycle Costs: Recurring costs include annual training sessions and performance review updates. The sustained effort is needed to maintain alignment with values through consistent reinforcement in workplace culture.

**3. Symbols – Display success stories from employees who embody company values**

- Rationale: Sharing success stories reinforces desired behaviors by showcasing role models who demonstrate company values. Recognizing employees who embody these values fosters motivation and engagement among peers. It also builds a culture of recognition, where employees feel appreciated for contributing to the company's long-term goals, such as operational excellence and customer satisfaction.  Minimal, primarily covering internal communication platforms such as newsletters, digital signage, and recognition events.
- Life-Cycle Costs: Ongoing costs include maintenance of communication channels, monthly updates on success stories, and recognition award costs.

**4. Mentorship – Networks foster a comfortable learning environment**

- Rationale: Mentorship helps to improve existing skills and learn new ones. Mentors serve as role models for cultural norms and organizational behavior and beyond just skill transfer. Mentorship improves retention, fosters collaboration, and enriches organizational knowledge. It incentivizes an environment to learn and grow.
- Life-Cycle Costs: Maintenance of performance tracking systems, governance of mentor-mentee matching platforms, mentor training sessions, recognition of outstanding mentors and successful mentees

**5. Annual Awards – Celebrations encourage good performance**

- Rationale: Celebratory events within an organization serve to promote company values, reinforce social relationships within the organization, and provide opportunities for public appreciation of good performance. These awards enable mental and emotional attachment to the organization's identity fostering engagement, morale, pride, and loyalty to the company especially during periods of growth and transformation.
- Life-Cycle Costs: Event advertising, planning committees, stagnation avoidance strategies, and incentivized celebrations all contribute to the management cost of the event.

**Planning Controls**

**6. Long-Range Planning – Implement strategic visioning workshops for leadership every 6 months**

- Rationale: Long-range planning ensures that the leadership remains aligned with the vision of the company, helps identify potential risks and growth opportunities, and drives the long-term sustainability of Rochester Sensors. It allows the organization to forecast changes in the sensor technology market and adapt to industry trends. As noted in the company's vision, this approach helps position the company for continued global leadership in liquid-level measurement technologies. The cost includes facilitators for the workshops, venue fees, and travel expenses for leadership. These costs will likely vary based on the frequency of workshops.
- Life-Cycle Costs: Periodic costs every 6 months for hosting workshops. The implementation of strategies and monitoring progress will also incur recurring costs.

**17. Departmental Recognition Programs**

Rationale: Intrinsic motivation is built and desired behavior is reinforced without apparent monetary expense through non-monetary reward such as "Employee of the Month" based on departmental performance. Contributions are rewarded through publicized recognition, which generates loyalty and instills cultural excellence and continuous improvement values.

Life-Cycle Costs: Low; mostly internal communication, award certificates, and occasional team celebrations.

**18. Skill-based Pay Enhancements**

Rationale: Higher payment to employees for receiving valuable, cross-functional training (e.g., certificates in lean manufacturing, quality control) reinforces learning, process improvement, and flexibility in staffing, and is part of supporting operations effectiveness and quality control activity.

Life-Cycle Costs: Moderate; certificate price refund, pay increases for skill acquisition.

**19. Innovation Incentives**

Rationale: Rewarding employees for introducing innovative ideas for improvement (e.g., cost-reduction, lean) encourages an innovation culture and maintains Rochester Sensors' policy of ongoing improvement.

Life-Cycle Costs: Variable; cost with number and size of ideas received, offset by operations savings resulting from improvements made.

**20. Leadership Development Rewards**

Rationale: Career paths and other incentives for employees demonstrating leadership behavior (e.g., Kaizen event facilitation, mentoring) provides long-term sustainability through internal talent pools.

Life-Cycle Costs: Moderate to high; includes cost of investment in leadership training program and cost of promotion but warranted in succession planning.

**Administrative Controls**

**21. Governance Structure – Establish a clear governance framework**

Rationale: Clear governance structures ensure that decision-making authority and responsibilities are well-defined, enabling faster decisions and smoother operations. This is essential for achieving strategic alignment and accountability in an organization. It’s particularly important as Rochester Sensors scales its operations. Moderate, involving costs for consulting, HR processes, and organizational restructuring.

Life-Cycle Costs: Recurring costs for ensuring governance structure aligns with company growth and development.

**22. Organization Structure – Define an organizational hierarchy**

Rationale: A clear organizational hierarchy ensures that roles and responsibilities are well-defined, improving communication and reducing confusion. The right structure promotes decision-making and operational efficiency .

Life-Cycle Costs: Ongoing costs for maintaining and updating the structure as the company evolves.

**23. Policies and Procedures – Develop standardized processes for key business functions**

Rationale: Standardized processes ensure that employees follow the best practices for consistent, high-quality service delivery. This improves operational efficiency and ensures that Rochester Sensors can deliver its products consistently, regardless of external factors. Initial costs involve creating SOPs and training employees.
Life-Cycle Costs: Ongoing costs for training new employees and updating procedures as the organization grows and changes.

**24. Compliance Management System Implementation**

Reason: Implement computerized systems for monitoring compliance with ISO standards, safety standards, and customer specifications. It helps in achieving regulatory compliance and reducing the risks of fines, as per internal audit programs already resolved.

Life-Cycle Costs: High initial cost (software licensing, installation, training), but medium-low recurring costs for maintenance and upgrading.

**25. Development of Risk Management Framework**

Rationale: Implement an enterprise risk management (ERM) framework in existence that actively identifies, assesses, and tracks operation, finance, and reputation risks. This enables Rochester Sensors to anticipate and guarantee organizational sustainability.

Life-Cycle Costs: Reasonable; cost involves the hiring/appointment of risk officers, reporting software installations, regular risk audits.

- 

**7. Action Planning – Develop quarterly operational plans that align with the company's annual goals**

- Rationale: Action plans break down strategic goals into smaller, actionable tasks, ensuring that every department can directly contribute to achieving the annual objectives. Aligning operational plans with the company's core values ensures that every function, from manufacturing to customer service, supports the broader goals of growth and innovation. This also enhances accountability, as departments have specific targets to meet. The cost primarily involves employee time for planning sessions, meetings, and tracking progress. Some costs may also be associated with project management software.
- Life-Cycle Costs: These are recurring costs each quarter. Resources for progress tracking and management oversight may increase as the organization grows and targets become more ambitious.

**8. Departmental Goal Setting**

- Rationale: Goal setting at the departmental level takes the corporate vision and develops achievable local goals. Goals are properly aligned which improves clarity within the day-to-day work that needs to be accomplished, improves morale through clear role definition, and helps cultivate self-responsibility. Well-structured departmental goals create feedback loops that provide continuous alignment correction if shifting over time.
- Life-Cycle Costs: Fostering workshops, progress monitoring dashboards, annual goal setting templates, quarterly reviews, and goal misalignment.

**9. Rolling Forecasts**

- Rationale: With rolling forecasts, organizations can change projections and budgets every month or every quarter. This flexibility minimizes risks associated with rigid annual budgets in today's ever-evolving markets and enables leaders to respond more rapidly to both internal and external operational cues.
- Life-Cycle Costs: The maintenance of a financial model, labor associated with assembling and updating data on a quarterly basis, and leadership presentations.

**10. Capital Budgeting Reviews**

- Rationale: Routine and controlled capital budgeting makes certain resources are allocated only to those projects that yield additional value concerning strategic objectives and returns. The review mechanisms bolster responsibility, eliminate the politics of favoritism within resource allocation, and improve the finances of the organization by continuously auditing expectations against outcomes and recalibrating risks.
- Life-Cycle Costs: The costs of evaluation systems, financial modeling training, project audits, risk evaluations, internal review boards.

**Cybernetic Controls**

**11. Targets – Set quarterly and annual KPIs for key financial and operational metrics**

- Rationale: Setting KPIs allows management to monitor performance in real-time and make data-driven decisions. By focusing on financial and operational targets (e.g., revenue growth, first-pass yield, on-time delivery), Rochester Sensors can keep its teams aligned with strategic goals. This helps track progress towards becoming the global leader in liquid-level measurement, which is part of its vision .
- Life-Cycle Costs: Ongoing costs for system upgrades, data input, and employee time spent on tracking progress and adjustments.

**12. Financial Measurement Systems – Use real-time financial dashboards**

- Rationale: Financial dashboards provide real-time insights, enabling managers to make fast adjustments to ensure profitability and financial performance. It also helps in aligning operational performance with financial outcomes, directly supporting goals such as revenue growth and cost reduction .
- Life-Cycle Costs: Recurring costs for software maintenance, user training, and upgrades.

**13. Non-financial Measurement Systems – Track customer satisfaction scores (e.g., NPS)**

- Rationale: Monitoring customer satisfaction (e.g., NPS) provides critical feedback on how the company meets customer expectations. This non-financial metric complements financial data, helping to improve customer loyalty, service quality, and identify areas for operational improvement. Low to moderate, involving survey creation, data collection platforms, and analysis.
- Life-Cycle Costs: Recurring costs for regular surveys, data collection tools, and analytical resources.

**14. Hybrid Measurement Systems – Integrate both financial and non-financial KPIs**

- Rationale: A hybrid approach provides a holistic view of the company’s performance by combining financial data with non-financial metrics. This ensures that Rochester Sensors doesn't just focus on profit but also customer satisfaction, employee engagement, and operational efficiency, ensuring long-term sustainability .

- Life-Cycle Costs: Ongoing costs for software updates, data collection, and training on interpreting combined KPIs.

**15. Management Reporting Systems**

- Rationale: Boundary spanning reporting systems abstract, distill, and transmit operational and strategic information to high level organizational decision makers. Adequately managed reporting aids in the promotion of transparency, highlights discrepancies, and enables prescriptive management action to be taken. Management at all levels require accurate and timely reports prepared for data analysis or reporting for imprinted and sudden leadership strategies to be relied on.
- Life-Cycle Costs: Resource planning system, report design automation, interface module customization, executive review work, platform update costs, user training refreshers.

**Reward & Compensation**

**16. Implement a quarterly bonus system based on departmental performance**

- Rationale: Linking rewards to departmental performance encourages employees to focus on specific operational goals. This financial incentive is tied to key metrics like on-time delivery and cost control, motivating employees to continuously improve. It aligns employee interests with company-wide goals like operational efficiency and customer satisfaction.
- Life-Cycle Costs: Quarterly costs based on actual performance. Management time is also required for evaluation and distribution.

Culture control is at the base, and they influence conduct and culture through values, rituals, and informal practices. Team-building activities and mentorship are used at RS to cultivate collaborative, clan-like cultures. From the start, RBS values are integrated into performance management, hiring, and onboarding, so alignment is achieved from the outset. Positive examples of employees living these values are onscreen upholding of values and highlighted in value newsletters, so their encouragement becomes a routine. These tools support a culture of shared purpose and engagement, making it easy for RS to retain talent, build trust, and foster innovation organically. Because of their low financial cost and high cultural benefit, these controls are extremely useful.

The forward-looking strategies at RS comprise: biannual strategic visioning sessions for leadership; quarterly departmental operational planning; and dynamic rolling financial forecasts. Departmental alignment through goal-setting ensures that all teams work collaboratively toward the corporate strategy, while capital budgeting reviews constrain resource allocation to prevent imbalances. These planning mechanisms integrate short-term execution with the overarching long-term vision. Furthermore, they cultivate responsibility since all departments are required to present evidence of how their contributions further the collective goals of the firm.

Cybernetic controls involve monitoring and comparing systems to benchmarks. RS captures revenue, operating margins, and unit costs with real-time financial dashboards, ensuring that constituents have visibility into the organization's comprehensive financial performance. Non-financial indicators such as customer NPS, first-pass yield, and rework rates guarantee sustained customer satisfaction and operational excellence. These two dimensions are captured in Hybrid performance scorecards which help achieve a balanced view of best performance. With these systems in place, RS avoids the problem of

having a single metric drive decision-making at the expense of overshadowing critical value domain metrics to performance strategic outcomes.

As with most things, motivation comes with incentives. Creative bonuses linked to departmental achievement, along with innovation rewards which compensate employees for reasonable process improvement contributions, are part of RS's quarterly bonus structure. Additionally, pay-for-skill premiums motivate interdepartmental training and shift work, supporting process adaptability and fostering internal succession planning through leadership development. These measures are crucial to molding the behavior of individuals to meet the desired outcomes and actively cultivate future leaders of RS. By rewarding behaviors, not only outcomes, these measures promote desirable cultural buy-in.

Administrative controls provide a systemic frame for governance, power, and compliance. At RS, these are the elements of a documented governance system, an operational organizational chart, and uniform policies and SOPs at the interdepartmental level. A compliance management system certifies compliance to ISO and proprietary benchmarks, and a risk management framework examines operational and financial vulnerabilities. These controls are essential in one such international enterprise where alignment and the reduction of risks required to preserve trust from clients and regulators is strategically important.

# 9.Discussion

After completing the analysis and applying the systems engineering approach to the redesign of **Rochester Sensors'** organizational structure and processes, several key conclusions and lessons have emerged. First and foremost, it became evident that **alignment between strategic goals and operational execution** is absolutely essential for the company's success. The integration of tools like the **Viable System Model (VSM)** and the **Balanced Scorecard (SM-BSC)** highlighted how critical it is for the company to establish a clear, structured alignment between its operational functions and long-term goals. Without such alignment, even an organization with strong technical expertise and high-quality products would struggle to meet its strategic objectives. The project underscored that a clear framework for linking day-to-day operations with the overarching vision of the company is necessary to drive sustainable growth and profitability.

A significant takeaway from the **VSM** analysis is the importance of creating a **self-regulating and adaptable system**. By analyzing the S1 operations (SIF+1), we learned that each subsystem within the organization must be capable of functioning autonomously while remaining aligned with the overall system's objectives. This self-sufficiency enables the company to be more agile in responding to both internal challenges and external market shifts. The VSM, by focusing on autonomy and feedback loops, ensures that each operational unit can make decisions within its scope while still adhering to the broader organizational goals, fostering a culture of **flexibility** and **innovation**.

Additionally, the **Management Control System Package (MCS-PKG)**, along with the **Levers of Control (LOC)** framework, demonstrated the need for **robust performance monitoring and control systems**. The integration of these controls ensures that strategic objectives are not only set but also **measured**, **tracked**, and **adjusted** as necessary. Through the use of cultural, planning, and cybernetic

controls, we learned that the right control systems can drive performance, guide decision-making, and align employee behavior with organizational priorities. These controls ensure that there is a structured and consistent effort to meet goals, while also enabling **continuous improvement** and **responsiveness to change**.

Another important lesson learned through the project was the significance of **feedback loops** in ensuring continuous organizational monitoring. Both **financial** and **non-financial** metrics, such as **customer satisfaction** and **production efficiency**, provide critical insights into the health of the organization. The project reinforced the idea that relying solely on financial metrics does not provide a comprehensive understanding of the company's performance. By integrating **qualitative measures** alongside financial data, Rochester Sensors can gain a fuller picture of its success and adjust strategies proactively rather than reactively. This dual approach allows the company to remain aligned with both short-term goals and long-term strategic objectives.

The project also emphasized the importance of **communication and collaboration** across all levels of the organization. While the **new control systems and models** were designed to improve efficiency and alignment, successful implementation requires **active engagement** from both leadership and employees. The redesign process must be accompanied by **clear communication**, **training**, and ongoing **feedback** to ensure that everyone within the company understands their role in the new system and feels motivated to adopt the changes. Resistance to change is a natural outcome of such an overhaul, and it is essential to manage this carefully to ensure smooth integration of the new systems.

Finally, one key lesson was the need for **careful change management** during organizational redesigns. The introduction of new models, controls, and processes can initially cause **disruptions** or confusion, especially when employees are unfamiliar with the new systems. The project highlighted the importance of **structured change management**—ensuring that employees are adequately prepared and supported as they transition to new processes. Without this proactive approach, the organization risks encountering significant **operational delays** or **employee disengagement**.

In conclusion, this project has shown that a **viable, self-regulating system** capable of adapting to changes, with strong feedback loops and well-aligned performance controls, is crucial for the long-term success of Rochester Sensors. By applying the **VSM**, **SM-BSC**, and **MCS-PKG**, we have created a comprehensive framework that ensures operational goals are aligned with strategic objectives and that the organization can continuously adapt and improve. The insights gained from this work provide a solid foundation for Rochester Sensors to navigate future challenges, **remain competitive**, and maintain **sustained growth** in the evolving sensor technology market.

# 10. Recommendations:

**1. Continuously Align Operations with Strategic Goals Using VSM and SM-BSC**

Through the development of the **Viable System Model (VSM)** and **Balanced Scorecard (SM-BSC)**, it became clear that the alignment between operational functions and strategic goals is crucial for the long-term success of **Rochester Sensors**. The **SIF+1 (S1 operation)** design in the VSM emphasizes the importance of autonomous subsystems, but it also requires regular alignment with overarching strategic goals. To maintain this alignment, it is recommended that **quarterly strategy reviews** be instituted, where senior leadership evaluates operational performance based on **financial** and **non-financial metrics** from the **SM-BSC**. This ensures that all departments are moving in the same direction, particularly in terms of customer satisfaction, operational excellence, and innovation.

**2. Strengthen Feedback Loops with Real-Time Performance Measurement (SM-BSC & MCS-PKG)**

The **SM-BSC** and **MCS-PKG** have demonstrated the critical importance of both financial and non-financial performance measures. Given that feedback loops were highlighted as a gap in the organization, **implementing real-time performance dashboards** across departments will allow for immediate identification of gaps and inefficiencies. The **cybernetic controls** embedded in the **MCS-PKG**, such as **operational KPIs** (e.g., on-time delivery, first-pass yield, customer satisfaction), should be fully integrated with **real-time tracking software**. By leveraging **cloud-based business intelligence tools**, Rochester Sensors can gain better visibility into day-to-day operations and make data-driven decisions quickly, reducing delays in **feedback** and ensuring quicker adaptations to external or internal changes.

**3. Enhance Cross-Functional Collaboration Through Culture and Knowledge Sharing (VSM & LOC)**

The **VSM** and **Levers of Control (LOC)** models identified **siloed operations** and a lack of **cross-functional collaboration** as key barriers to success. As seen in the **clans and values** controls of the **LOC**, creating a culture of collaboration is critical to operational success. It is recommended that **regular cross-departmental workshops** be held to promote the exchange of ideas, solve complex problems together, and ensure that employees across production, R&D, and customer service are aligned. Moreover, Rochester Sensors should implement a **centralized knowledge management system** to capture and share **best practices** and **process improvements** across the organization, reducing redundancy and improving operational consistency.

**4. Implement Agile Practices in R&D and Manufacturing (VSM & SM-BSC)**

The VSM and SM-BSC have shown the importance of **adaptability** and **flexibility** in maintaining a competitive edge. To promote innovation and speed in bringing products to market, it is recommended that **agile practices** be adopted within both **R&D** and **manufacturing** teams. The introduction of **iterative development cycles**, **rapid prototyping**, and **cross-functional teams** will allow Rochester Sensors to react quickly to customer needs, technological changes, and market demands. By incorporating **agile methodologies** into its existing processes, the company can improve product development cycles and enhance time-to-market without compromising on quality, thereby reinforcing its competitive position in the **sensor technology industry**.

**5. Strengthen Employee Engagement and Change Management for Smooth Transition (MCS-PKG & LOC)**

The **MCS-PKG** and **LOC** highlighted that organizational changes, particularly those involving new controls and systems, require **active change management**. The introduction of new systems, such as performance dashboards, automated quality controls, and realigned departmental goals, can face resistance without **adequate training** and **communication**. To mitigate potential disruptions, it is recommended that Rochester Sensors implement a comprehensive **change management plan**, including:

- **Employee training programs** for new systems and technologies
- **Ongoing feedback mechanisms** to address concerns and ensure smooth transitions
- **Incentives for early adoption** and active participation in new processes, helping to reduce resistance and boost morale.

By embedding **change management** into every phase of the redesign, Rochester Sensors will be better equipped to handle the **organizational shifts** without negatively impacting **employee morale** or productivity.

**6. Integrate Lean Principles and Automation to Streamline Operations (VSM & MCS-PKG)**

Given the emphasis on **operational efficiency** throughout the project, it is recommended that **lean principles** be further integrated into **Rochester Sensors' operations**. The **VSM** identified several opportunities for streamlining production and reducing waste. The next step should involve the **full implementation of lean manufacturing techniques** such as **just-in-time inventory**, **continuous flow**, and **value stream mapping**. Additionally, **automation technologies** (such as robotic process automation or automated testing) should be deployed to reduce manual errors and improve production efficiency. The **costs of automation** are offset by long-term gains in **quality** and **productivity**, making it a sound investment for the company's growth.

**7. Reinforce Governance and Compliance Controls (MCS-PKG)**

The **MCS-PKG** underscored the importance of **governance controls** to ensure the company operates within legal and regulatory boundaries. It is recommended that Rochester Sensors strengthen its governance framework by implementing more **stringent audit trails**, **compliance checks**, and **data security measures**. By adopting an integrated **governance structure** across all operational units, the company will ensure that it adheres to both industry regulations and internal quality standards. The **cost of compliance** and **auditing** is justified by the potential for **reduced risk** and **enhanced operational transparency**, which are critical in the highly regulated sensor industry.

**8. Periodic Review and Update of the Organizational Design**

Given the dynamic nature of the sensor technology market, Rochester Sensors should commit to a **regular review** of its organizational design and process models. The **VSM**, **SM-BSC**, and **MCS-PKG** provide strong frameworks, but to remain **competitive and adaptable**, these models must evolve. Annual or biennial reviews should be conducted to assess the continued relevance of the **organizational structure**, **control systems**, and **process efficiencies**. Regular updates will ensure that the company

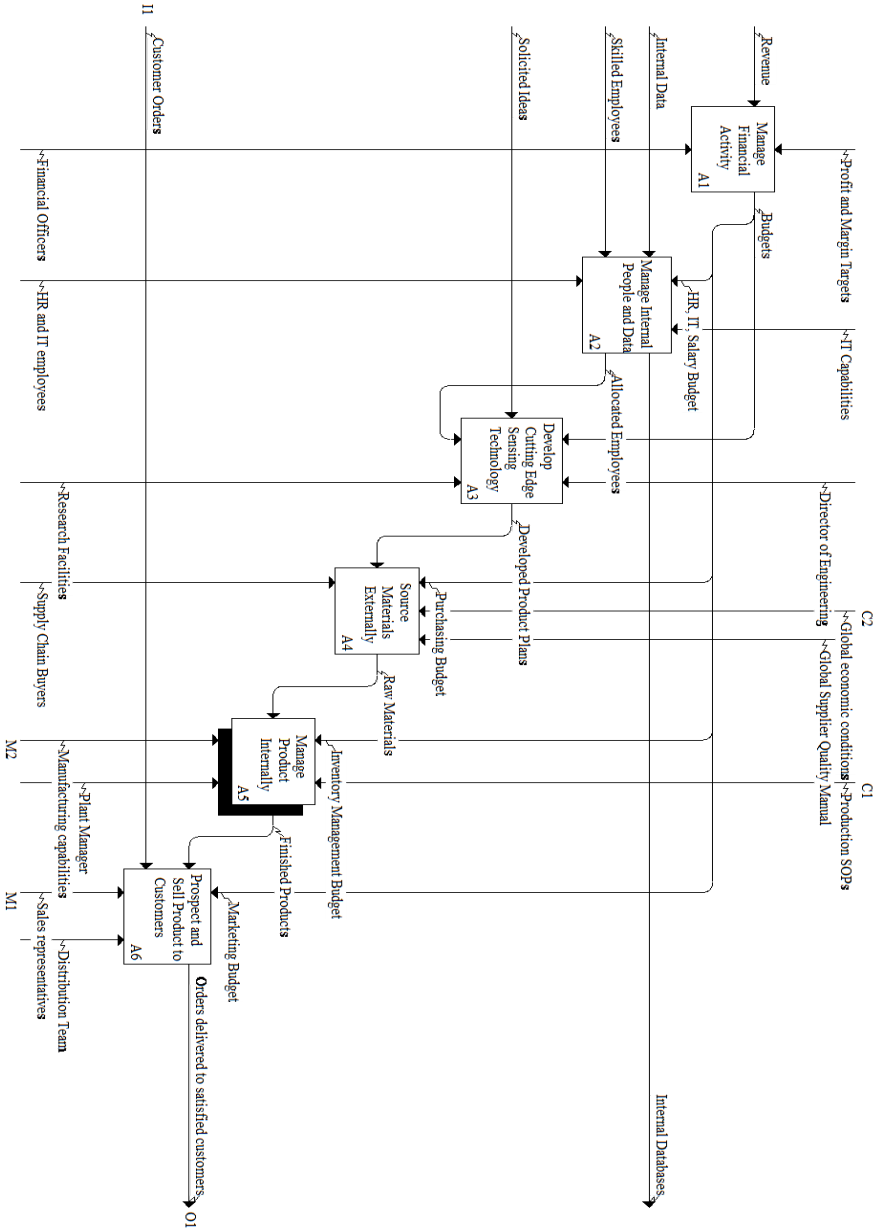
remains **responsive to external changes** and **internal growth**, helping it scale without losing its competitive edge.

**Conclusion**

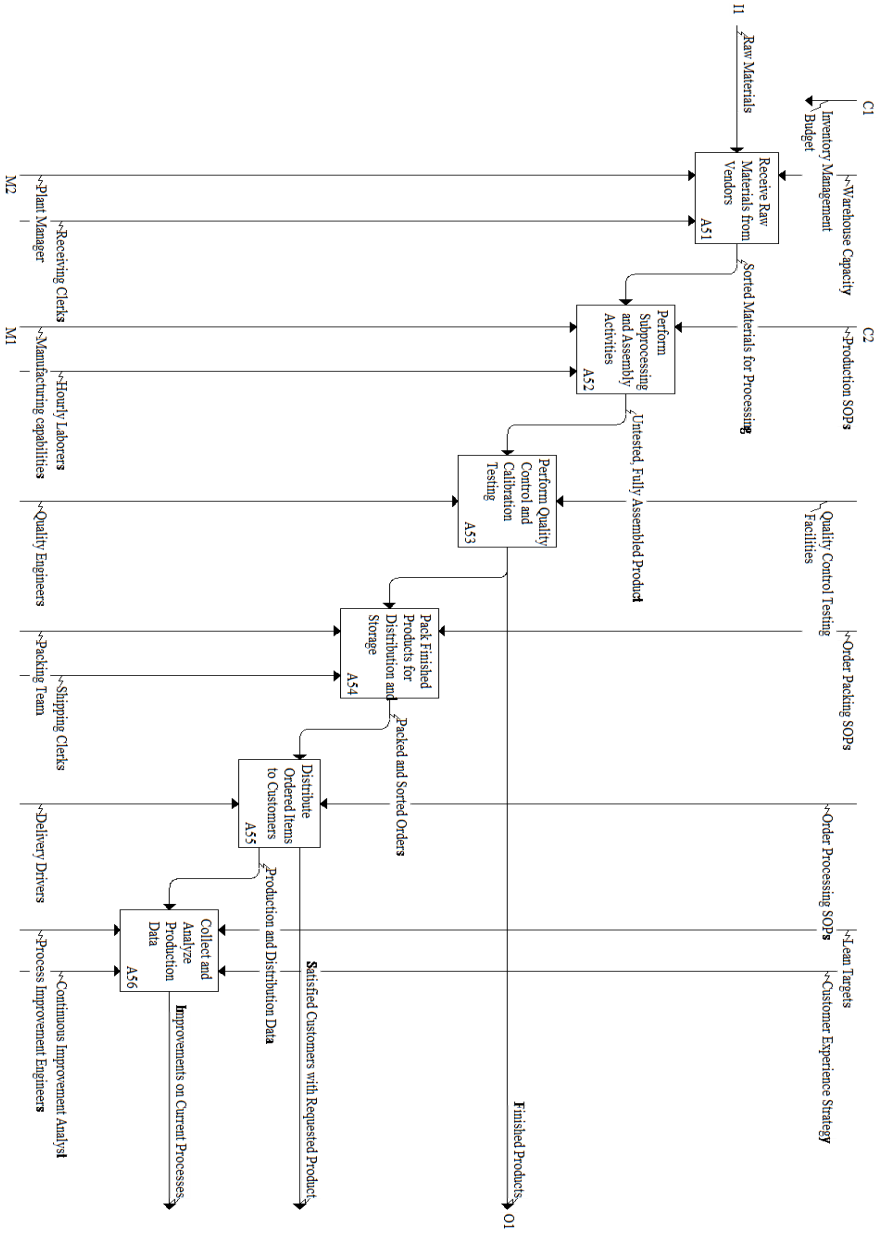
In conclusion, the recommendations provided build upon the solid foundation laid out through the **VSM**, **SM-BSC**, and **MCS-PKG** models. By focusing on **alignment**, **feedback loops**, **employee engagement**, **agility**, and **continuous improvement**, Rochester Sensors can position itself to meet current challenges while laying the groundwork for future growth. These recommendations aim to create an organizational system that is both **adaptive** and **efficient**, allowing Rochester Sensors to maintain its leadership in the **sensor technology market** while ensuring long-term sustainability.

# 11. Appendices:

# Appendix A


Revenue
Internal Data
Skilled Employees
Solicited Ideas
I1
Customer Orders
Financial Officers
HR and IT employees
Research Facilities
Supply Chain Buyers
M2
Manufacturing capabilities
Plant Manager
M1
Sales representatives
Distribution Team
Manage Financial Activity
A1
Profit and Margin Targets
Budgets
Manage Internal People and Data
A2
HR, IT, Salary Budget
IT Capabilities
Allocated Employees
Develop Cutting Edge Sensing Technology
A3
C2
Director of Engineering
Global economic conditions
Developed Product Plans
Source Materials Externally
A4
Purchasing Budget
Global Supplier Quality Manual
C1
Production SOPs
Raw Materials
Manage Product Internally
A5
Inventory Management Budget
Finished Products
Marketing Budget
Prospect and Sell Product to Customers
A6
Orders delivered to satisfied customers
O1
Internal Databases

# Appendix B


I1
Raw Materials
C1
Inventory Management
Budget
Warehouse Capacity
Receive Raw Materials from Vendors
A51
M2
Plant Manager
Receiving Clerks
Sorted Materials for Processing
C2
Production SOPs
Perform Subprocessing and Assembly Activities
A52
M1
Manufacturing capabilities
Hourly Laborers
Untested, Fully Assembled Product
Perform Quality Control and Calibration Testing
A53
Quality Engineers
Quality Control Testing Facilities
Pack Finished Products for Distribution and Storage
A54
Packing Team
Shipping Clerks
Packed and Sorted Orders
Order Packing SOPs
Distribute Ordered Items to Customers
A55
Delivery Drivers
Order Processing SOPs
Lean Targets
Production and Distribution Data
Collect and Analyze Production Data
A56
Process Improvement Engineers
Continuous Improvement Analyst
Customer Experience Strategy
Improvements on Current Processes
Satisfied Customers with Requested Product
Finished Products
O1

# Appendix C

## IDEF0 Model Function and ICOM Glossary

Activities in Diagram"RBS IDEF0"

A0: Deliver the best in class liquid level measurement technology to a global customer base

Description:

At its core RBS is a liquid measurement company seeking to be the best in the world. Their actions are governed by the desire to provide unmatched customer value throughout the buying experience, and to internally be an efficient, collaborative enterprise.

Concepts in Diagram"RBS IDEF0"

Customer Orders

Description:

Demand received from the external customer base for RBS products and services

Production SOPs

Description:

Standard procedures surrounding RBS production process, which govern the type, quantity and quality of product that can be produced.

Global economic conditions

Description:

Economic conditions that govern RBS ability to deliver and receive product from vendors, as well as other surrounding financial conditions that may change on a global scale.

Orders delivered to satisfied customers

Description:

Successful product delivery to the customer, completing the high value experience RBS promises to deliver

Sales representatives

Description:

RBS employees tasked with finding, marketing to, and ultimately completing sales with potential customers, as well as the relationship management with these customers.

Manufacturing capabilities

Description:

Personnel and facility capabilities, which govern the type of product that can be produced, stored, and eventually shipped from RBS to the consumer

Activities in Diagram"A0: Deliver the best in class liquid level measurement technology to a global customer base"

A1: Manage Financial Activity

Description:

Activities related to the financials behind order receipt and processing, management of internal budgets, general accounting, and salaries.

A2: Manage Internal People and Data

Description:

All activities related to the management of people, data, and knowledge proprietary to RS which impacts its internal functions

A3: Develop Cutting Edge Sensing Technology

Description:

All activities pertaining to the R&D department, encompassing research, design, development, and bringing new products to market

A4: Source Materials Externally

Description:

Activities relating to the sourcing of external vendors, vetting them, adding them to approved vendor lists and making orders

A5: Manage Product Internally

Description:

Activities relating to the management of raw material received from external vendors, its transformation into finished product, warehousing, and eventual preparation for delivery to the customer

A6: Prospect and Sell Product to Customers

Description:

Development of potential customers into enthusiastic buyers through the customer sales experience and delivery of products they need in a timely fashion.

Concepts in Diagram"A0: Deliver the best in class liquid level measurement technology to a global customer base"

Customer Orders

Description:

Demand received from the external customer base for RBS products and services

Production SOPs

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Standard procedures surrounding RBS production process, which govern the type, quantity and quality of product that can be produced.

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Description:

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Manufacturing capabilities

Description:

Personnel and facility capabilities, which govern the type of product that can be produced, stored, and eventually shipped from RBS to the consumer

Internal Data

Description:

Data gathered, either internally or externally , with regard to RBS's production and sales processes that should be communicated across the firm to facilitate collaboration and innovation.

Skilled Employees

Description:

Employees (at all levels of the company) hired for (un)specialized roles that have not yet bee allocated

IT Capabilities

Description:

Capabilities defined by the available software and engineers. This concept controls the skill, depth, and efficiency with which assets can be managed

HR and IT employees

Description:

Employees (HR/CFO staff/IT Team) responsible for managing the money, data, and people held proprietary to RBS

Internal Databases

Description:

Internal software developed to facilitate communication and feedback throughout the firm, that can be used eventually for process improvement

Allocated Employees

Description:

Employees that have designated roles that best align with their skill sets and the needs of the firm

Solicited Ideas

Description:

Ideas developed via the culture of innovation, collected from employees either organically or via systematic exploration.

Director of Engineering

Description:

Head of new product engineering responsible for deciding the focus of the department and allocating appropriate personnel to each project.

Developed Product Plans

Description:

Finished plans (prototypes or blueprints) for viable products deemed to be potentially successful on the market

Global Supplier Quality Manual

Description:

RBS's published manual dictating their minimum quality standards for themselves that must be upheld by any possible vendors globally, dictating the types of vendors they may work with.

Purchasing Budget

Description:

Funds allocated for the searching and soliciting of potential vendor pricing, contract negotiation and product purchases.

Inventory Management Budget

Description:

Funds allocated towards the receipt and processing of raw materials into finished products, their storage and distribution, and eventual delivery to the customer.

Marketing Budget

Description:

Funds allocated towards advertising to, attracting, and retaining the best customers.

Budgets

Description:

Funds allocated towards all research and development activities by the executive team

Raw Materials

Description:

Raw materials, such as metals and other hardware necessary for finished product assembly and processing.

Supply Chain Buyers

Description:

Employees charged with finding and negotiating deals with approved vendors for needed raw materials.

Plant Manager

Description:

Employees charged with running all operations related to inventory management, including product supervision, warehousing, purchasing, packing, assembly and product delivery.

Finished Products

Description:

Products that are fully assembled, inspected, and ready to be delivered to the customer.

Distribution Team

Description:

Employees tasked with distributing product, from packers and drivers to any liasons with external shipping companies.

Research Facilities

Description:

Laboratories, prototyping technology, and other materials allocated towards R&D activities.

HR, IT, Salary Budget

Description:

Funds allocated toward HR activities, IT salaries/licensing/system development, and general salaries.

Financial Officers

Description:

Employees tasked with handling all finance related tasks with RS; this group reports to the CFO.

Profit and Margin Targets

Description:

These targets, goals set by the CEO/president, govern the way that budgets can be allocated, and where to concentrate funding. They also govern the types of pricing schemes or payment schedules allowable for customers.

Revenue

Description:

Revenue derived from payments received from customer orders, or other sources (consulting, patent use, etc).

Activities in Diagram"A5: Manage Product Internally"

A51: Receive Raw Materials from Vendors

Description:

Receipt of materials necessary for production from external vendors (or potentially internally), that require further processing for sale.

A52: Perform Subprocessing and Assembly Activities

Description:

All processing, intra-warehouse transportation, assembly, and finishing activities associated with turning material into viable sensors.

A53: Perform Quality Control and Calibration Testing

Description:

Performance of testing, calibration, or defect analysis necessary to determine if finished products are worthy of delivery to the customer.

A54: Pack Finished Products for Distribution and Storage

Description:

Activity associated with the grouping of items together by type, destination, order size, etc and packing them into containers suitable for the shipment and distribution process.

A55: Distribute Ordered Items to Customers

Description:

Activities associated with the transportation, via land, air or sea, of products from warehouses/factories to the customer locations, or central sales points.

A56: Collect and Analyze Production Data

Description:

Observation, collection, collation, and analysis of the production and distribution processes. This is used to continuously improve the processes, as well as determine their adherence to stated lean goals.

Concepts in Diagram"A5: Manage Product Internally"

Raw Materials

Description:

Raw materials, such as metals and other hardware necessary for finished product assembly and processing.

Inventory Management Budget

Description:

Funds allocated towards the receipt and processing of raw materials into finished products, their storage and distribution, and eventual delivery to the customer.

Production SOPs

Description:

Standard procedures surrounding RBS production process, which govern the type, quantity and quality of product that can be produced.

Finished Products

Description:

Products that are fully assembled, inspected, and ready to be delivered to the customer.

Manufacturing capabilities

Description:

Personnel and facility capabilities, which govern the type of product that can be produced, stored, and eventually shipped from RBS to the consumer

Plant Manager

Description:

Employees charged with running all operations related to inventory management, including product supervision, warehousing, purchasing, packing, assembly and product delivery.

Sorted Materials for Processing

Description:

Materials received from vendors must be sorted and tracked to ensure they go to the right warehouses and enter the right subprocessing systems.

Delivery Drivers

Description:

Truck drivers tasked with direct customer delivery or delivery to other distribution methods such as boats or planes.

Order Processing SOPs

Description:

SOPs surrounding the submission, processing and fulfillment of orders, ensuring they are routed to the correct area.

Production and Distribution Data

Description:

Data such as delivery times, machine downtime, defect counts, etc. that are key to understanding strengths and drawbacks of the production process.

Process Improvement Engineers

Description:

Engineers tasked with analyzing and processing data to understand and improve current production processes.

Lean Targets

Description:

Lean engineering targets set by senior management governing what is "acceptable" when analyzing production statistics.

Improvements on Current Processes

Description:

Modifications or additions made to current processes to increase production efficiency, as learned from the data collected and analyzed by process improvement engineers.

Customer Experience Strategy

Description:

Overall desired customer experience design governing any improvements made to ensure production times and quality adheres more closely to strategy.

Packing Team

Description:

Employees tasked with sorting and packing items into acceptable order sizes for customers.

Shipping Clerks

Description:

Employees tasked with receiving items from the packing team, tracking them, and sending them off for shipping activities.

Hourly Laborers

Description:

Laborers tasked with any repeatable manufacturing processes related to assembly and other processing activities.

Receiving Clerks

Description:

Employees tasked with receiving and tracking any incoming materials, assuring they are correctly sorted for processing.

Packed and Sorted Orders

Description:

Orders that have been boxed up, are able to be tracked, and are ready to be shipped to the customer.

Order Packing SOPs

Description:

SOPs surrounding the receipt of orders, sorting of products, and determination of safety stock amounts for future use.

Warehouse Capacity

Description:

Materials receipt is controlled by both current and future warehouse capacity, limiting the amount of material that can be held at any one time.

Satisfied Customers with Requested Product

Description:

Customers who have received orders in the desired quantity, on time, and were satisfied with the ordering and delivery process.

Continuous Improvement Analyst

Description:

Analysts tasked with applying Kaizen philosophy and looking for "Quick Hits"- quick opportunities to capitalize upon for the greatest impact on production processes.

Quality Engineers

Description:

Personnel in charge of ensuring the products are up to RBS' desired quality standards, performing routine checks and pulling any defective product off the line.

Untested, Fully Assembled Product

Description:

Product that has gone through all processing, assembly, and finishing processes, but still needs to be inspected prior to being deemed suitable for sale.

Quality Control Testing Facilities

Description:

The types of labs, technology, and test types available to the QC personnel. These determine the type of testing that can be done on the sensors, as well as the granularity of detail gained from these tests (and ultimately, how confidently RS can guarantee their product).