Automatic Assembly System

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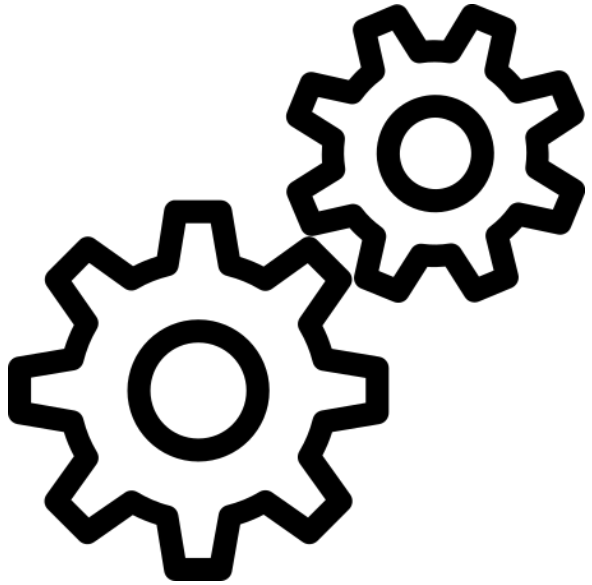
IE 4466 SENIOR DESIGN

Introduction

- Systems engineering approach
- Concept for the project



References: graphical process - Bing images

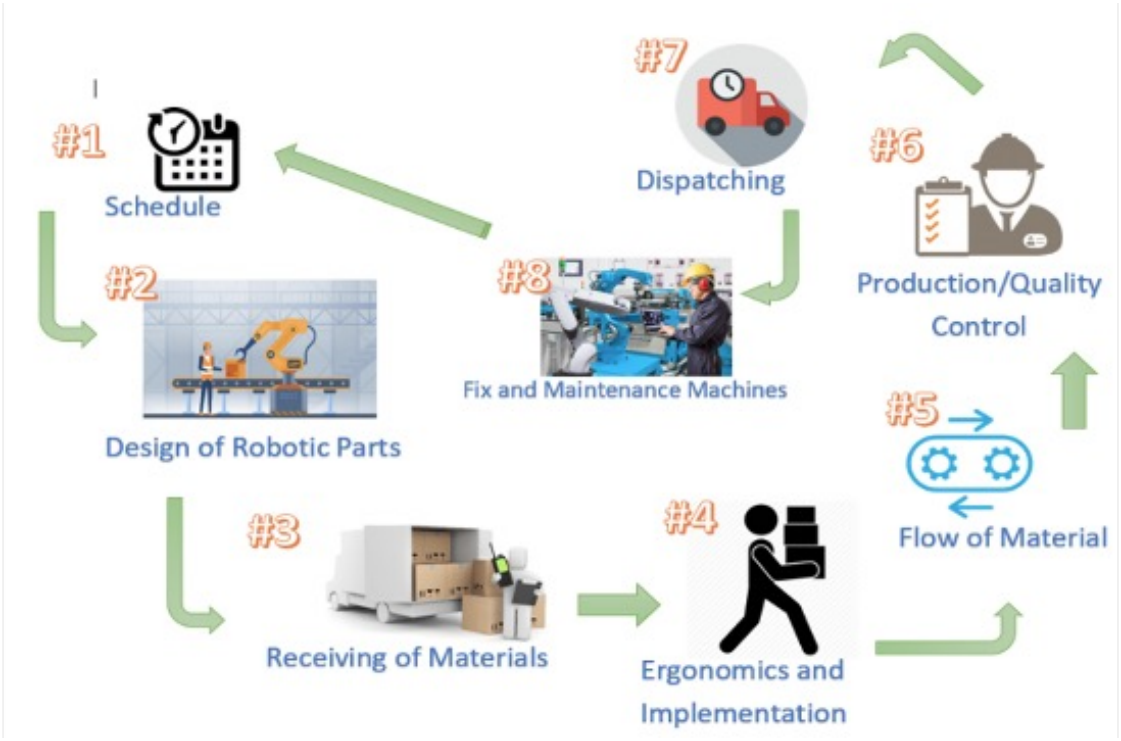
Stakeholders

People having interest on the process or company where the project is being developed.

- **Suppliers:** provide material to the company that is developing the process.
- **Employees:** interest on having a complete production.
- **Companies/Clients:** interested in final product or in the process implemented.

CONOPS & System Requirements

- Concept of Operations



- System Requirements

Use Case Name	Subsystem/Part Name	Req. ID	Req. Title	Requirement
Control amount produced & check quality is up to par to company standards	Production/Quality Control	5.1.1	Defective Glove Disposal	Gloves with tears, incorrect number of fingers, and discoloration shall be disposed of.
Receiving of Materials	Receiving of Materials	2.1.2	Inconistency Reports	Discrepancy report shall be filled out and submitted to upper management when material numbers don't match and/or wrong materials were sent.
Flow of Material	Flow of Material	4.1.1	Material Assembly Process	A layout shall be provided signaling where the raw material is inputed and the where the finish product as a glove bags is an output.
Design of robotic additions to machine	Design of Robotic Parts	1.2.1	Design Analysis	The inspection of the type of production used shall be performed to determine the proper design of arms, or moving parts to add to the existing machine.

Requirements Validation and Verification Plan

Topic	Description
Use Case Name	Receiving of materials from suppliers
Actor(s) Involved.	Upper management & Warehouse workers
Pre-conditions	The material handler must always wear safety equipment. The material handler must complete receiving procedure in a consecutive timeframe. The material handler must never receive shipments in bad conditions.
Post-conditions	The Warehouse workers should keep record of every inventory change for future reference. Upper management should receive digital/electronic confirmation that shipment receiving process has been completed.

Topic	Description
Use Case Name	Design of the robotic additions to the machine.
Actor(s) Involved.	Design of robotic parts.
Pre-conditions	Design Engineer must have the necessary criteria for new innovations. Process Engineer must have the analysis of necessary changes to the machine. The robotic additions must facilitate the production of plastic sleeves.
Post-conditions	Process Manager must ensure that the robotic additions to the machine works perfectly and that it will bring better results than having people developing the machine actions as before.

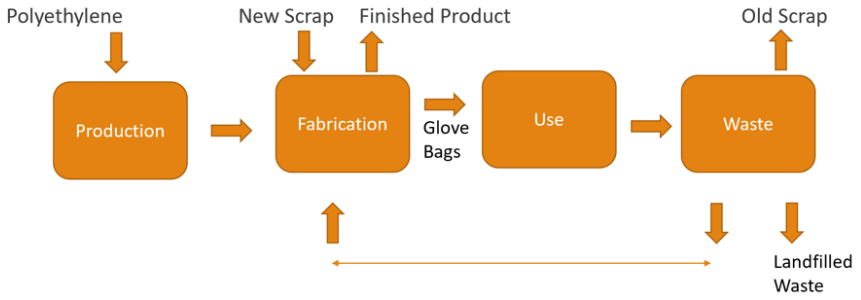
- ✓ Use Cases
- ✓ Actors Involved
- ✓ Conditions/Requisites
- ✓ Who? What? Where? How? When? Why?

Requirements Validation and Verification Plan

Req. Title	Requirement	Verification Plan	Verification Data	Requirement Validation
Defective Glove Disposal	Gloves with tears, incorrect number of fingers, and discoloration shall be disposed of.	The batches of gloves shall be inspected to determine any defects in the gloves, and then separate the defective pairs to dispose of from the good pairs that will be kept.	Niggl, J. (n.d.). 3 reasons to separate defects during Product Inspection. Retrieved March 11, 2021, from https://www.intouch-quality.com/blog/3-reasons-to-separate-defects-during-product-inspection The above source indicates that separation of defective from non-defective products is effective and time-saving.	Quality assurance shall separate the defective pairs from the good pairs
Inconistency Reports	Discrepancy report shall be filled out and submitted to upper management when material numbers don't match and/or wrong materials were sent.	Once Inconsistency reports are presented by warehouse workers, inventory control managers shall check and accept the forms. After every month this reports shall be quantified and lowered, as quality may be affected by them.	4 Causes of Inventory discrepancy in your stocktaking. January 7, 2020. Retrieved from: https://www.unleashedsoftware.com/blog/causes-inventory-discrepancy-stocktaking. This article talks about inventory shrinkage, misplaced inventory, human error and solutions on how to fix those error suvch as recount the stock, inwards and outwards stock.	Inventory Control Manager shall monitor amount of Inconsistency reports on a monthly basis
Material Assembly Process	A layout shall be provided signaling where the raw material is inputed and the where the finish product as a glove bags is an output.	Throughput time studies indicate an increase in efficiency with automation.	Dupuy, Kyle, and A. J. Vazquez. "PROCESS MANAGEMENT AND DESIGN LAYOUT OF HIGH THROUGHPUT SCREENING." Digitalcommons.calpoly.edu. Web. 20 Mar. 2021. <https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1234&context=imesp>. This study indicates goal is to design layouts to improve throughput and this was accomplished by modeling the current layout and using a linear programming model to determine where the best possible location for an addition server would be	The majority of the time in operations are spent in value added activities compared non-value added
Design Analysis	The inspection of the type of production used shall be performed to determine the proper design of arms, or moving parts to add to the existing machine.	Throughtout analysis, the machine will be studied in order to determine if the process needs to be improved to provide faster and timeless productivity.	Khan, A., Mineo, C., Dobie, G., Macleod, C., & Pierce, G. (2020). Vision guided robotic inspection for parts in manufacturing and remanufacturing industry. Journal of Remanufacturing. doi:10.1007/s13243-020-00091-x In this website, there is an article that provides the guidance of how to inspect the design of the robotic parts that will be added to the examined system.	The analysis will have to show time, amount and performance of the machine used

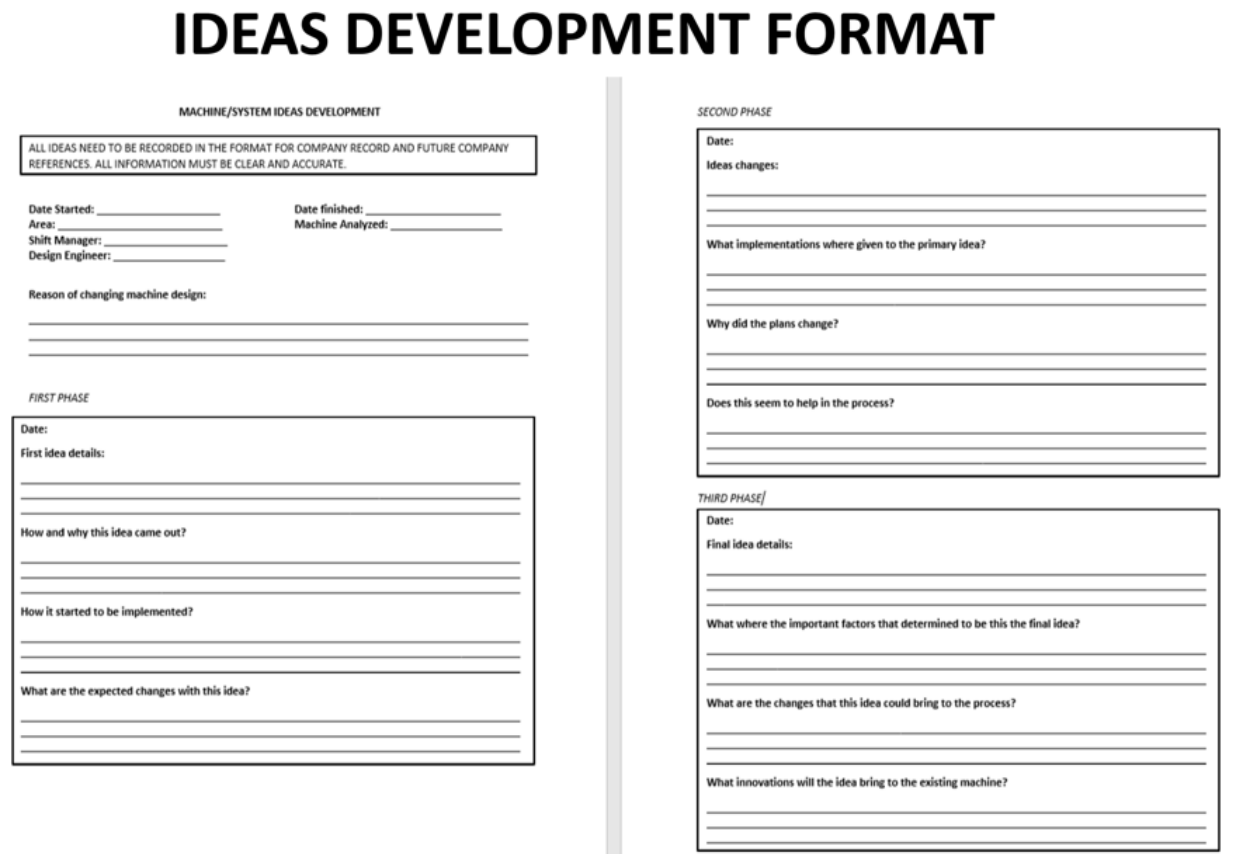
Requirements Validation and Verification Plan

Material Assembly Process



Inconsistency Reports

Design Analysis

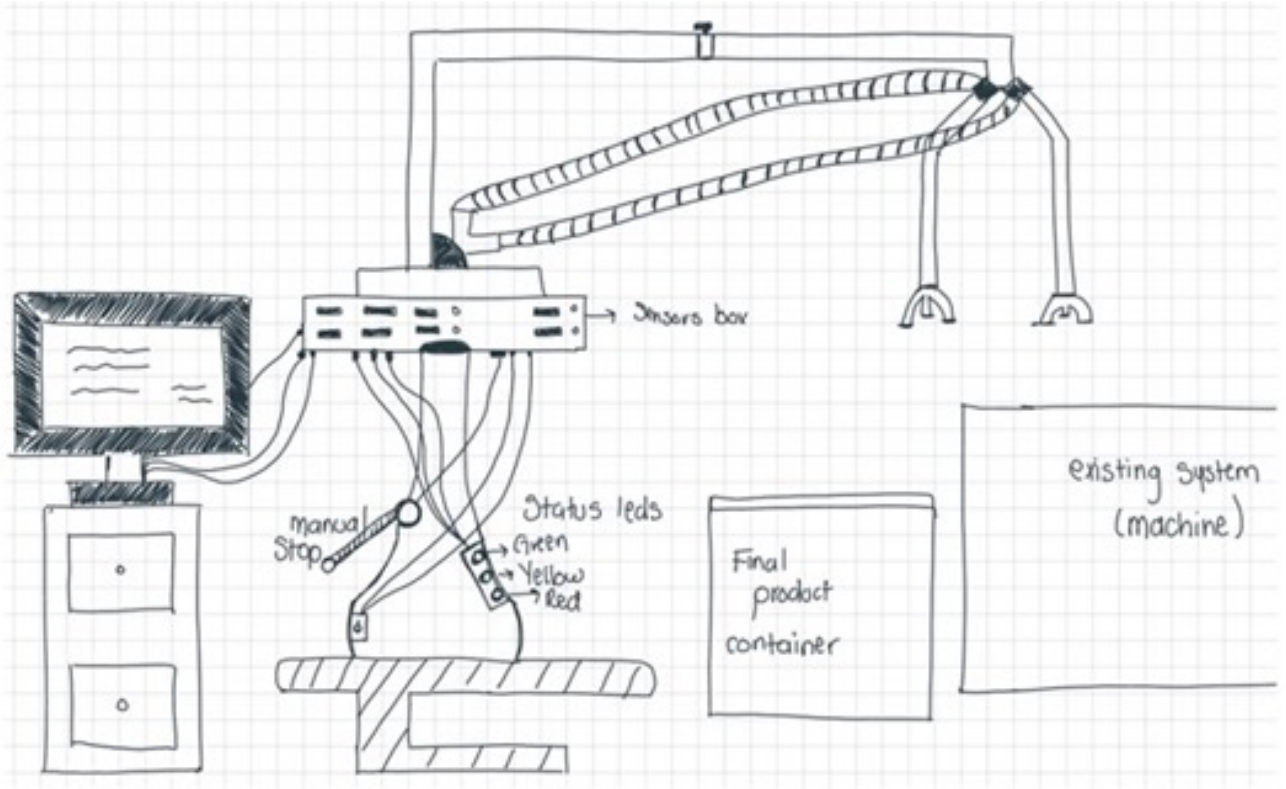


Design

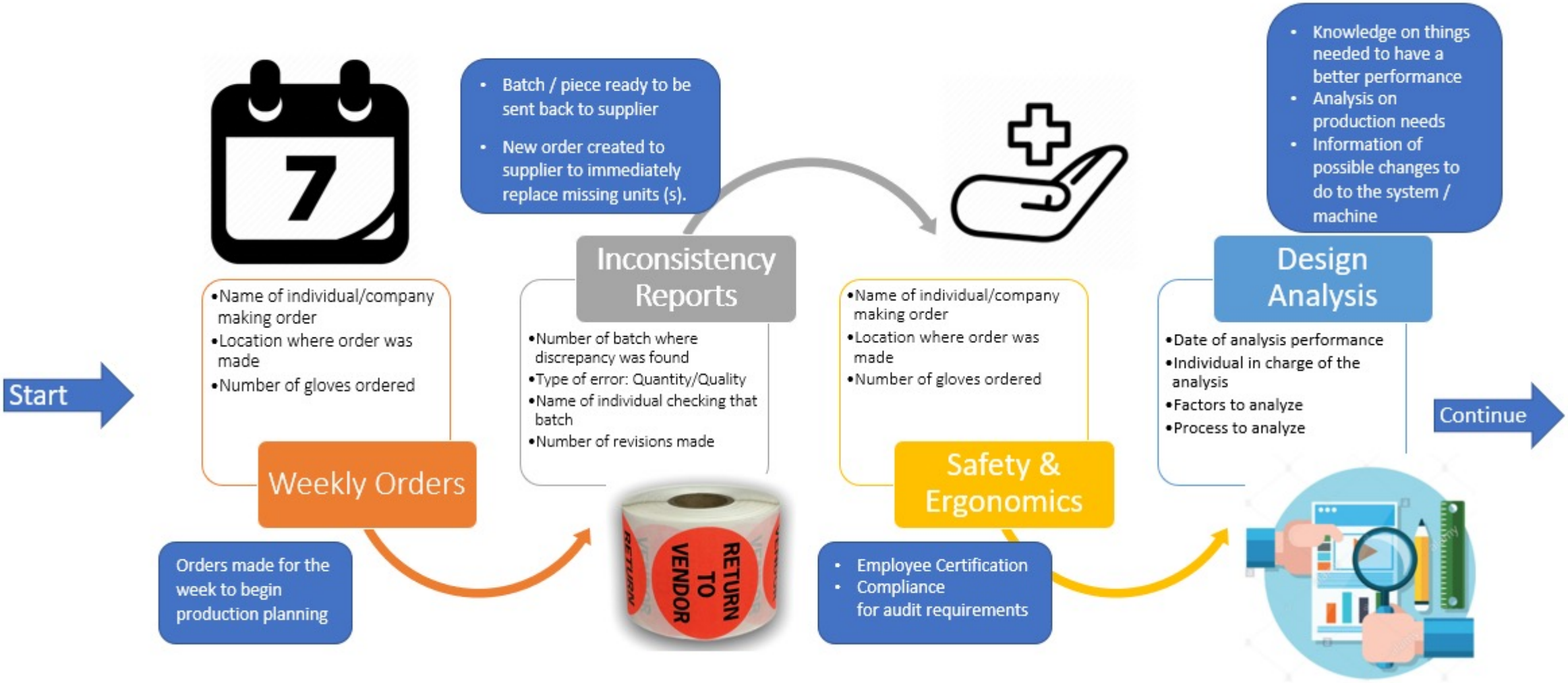
- Assembly of plastic sleeves to rubber/latex gloves.
- Innovation of existing machine.
- Main goal is to improve the production by adding robotic/mechanic parts.

Design Proposal

- Computer integration
- Module with sensors that detect failures
- 2 robotic arms
- Product Container
- Existing machinery



Implementation



Batches of good gloves to be moved onto packaging

Amount of gloves to needed to complete batches if necessary

- System will display a complete record of any existing order.
- Name, date, and time for any authorized employee to see.

Continue

- Produced batches of gloves

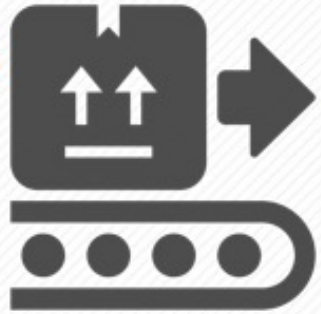
Quality Control

Good gloves to be moved onto production control

Defective gloves that will be disposed of

Production Control

- Complete batches of good gloves
- Batches of bad gloves to be disposed of and counted to produce replacements



- Weight of package
- # of pieces sent to customer
- Quality of units & package before shipment

Shipment Quality Control

Quality Revision displayed and available into the software system

Monthly Quality Checks in charge of Upper management

Order Traceability

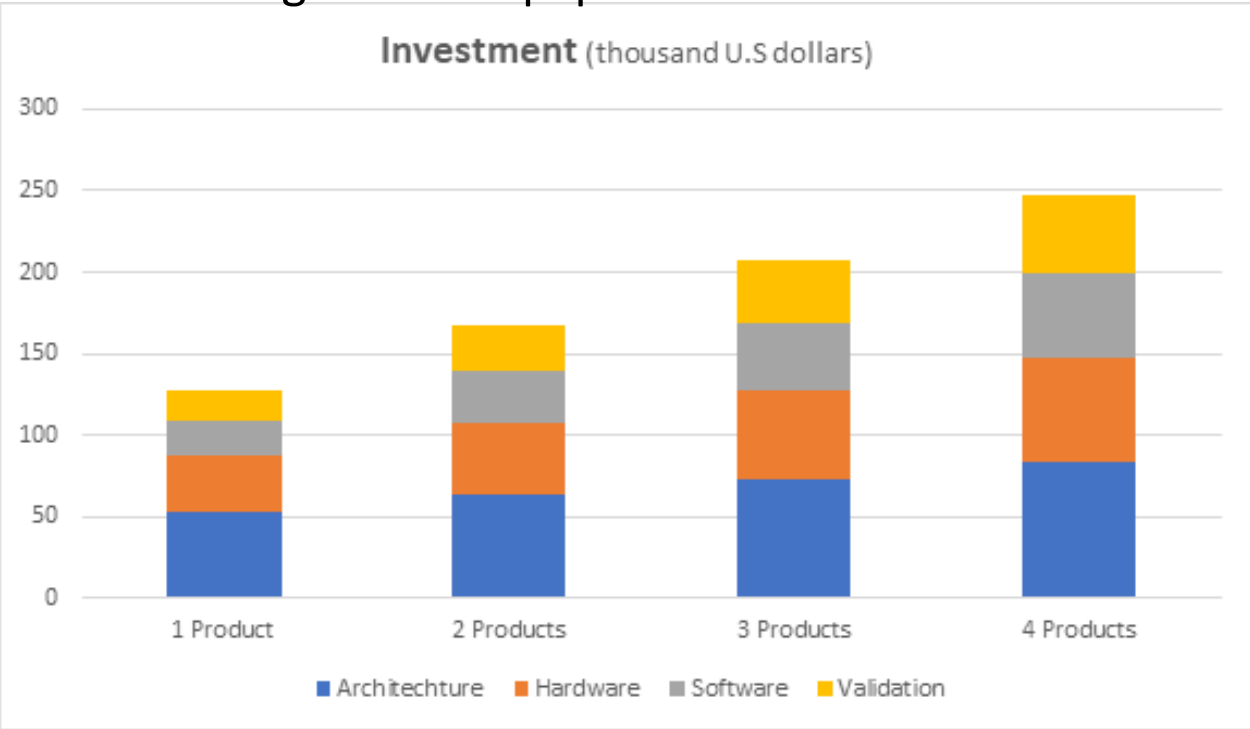
- Name of individual making changes into the order
- Serial number of change (automatically created by system)
- Date, Item #, description of change in order

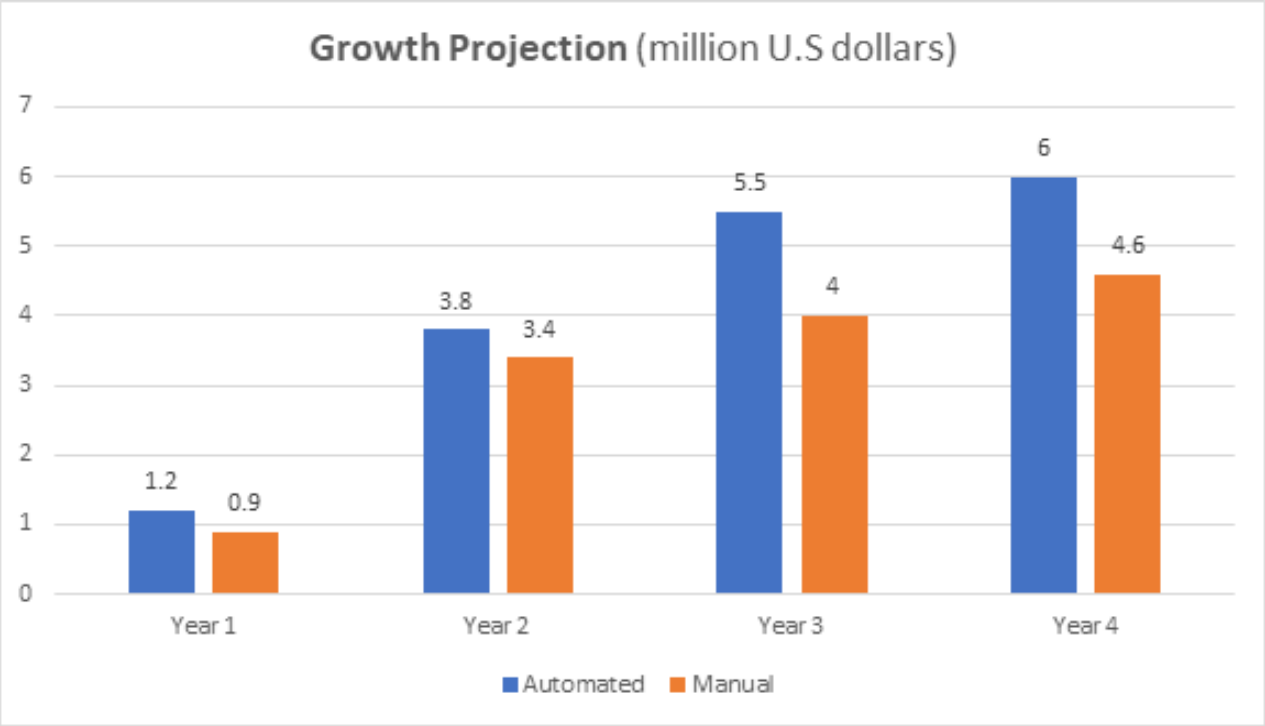
End

Business Plan

The company's budget is looking for an expansion approval of $300,000 focusing mainly on the following activities:

- Automation of assembly lines
- Acquisition of new technicians and training courses
- Purchasing of new equipment





Conclusion

- Robotic Factors
- Design
- Implementation
- Efficiency
- Human Factors
- Quality

Questions?

Thank You