
A Pathway for Process Improvement Activities in a Production Environment: A case study in a Rework Department

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Brief Outline

- Overview of the system and motivation
- A systematic problem solving methodology
- Conclusions

Overview of the system-1

- A dishwasher plant
 - Takeback policy for defected products
 - Repaired and sold again
- Input rate is higher than revision rate
 - Huge inventory of returned products

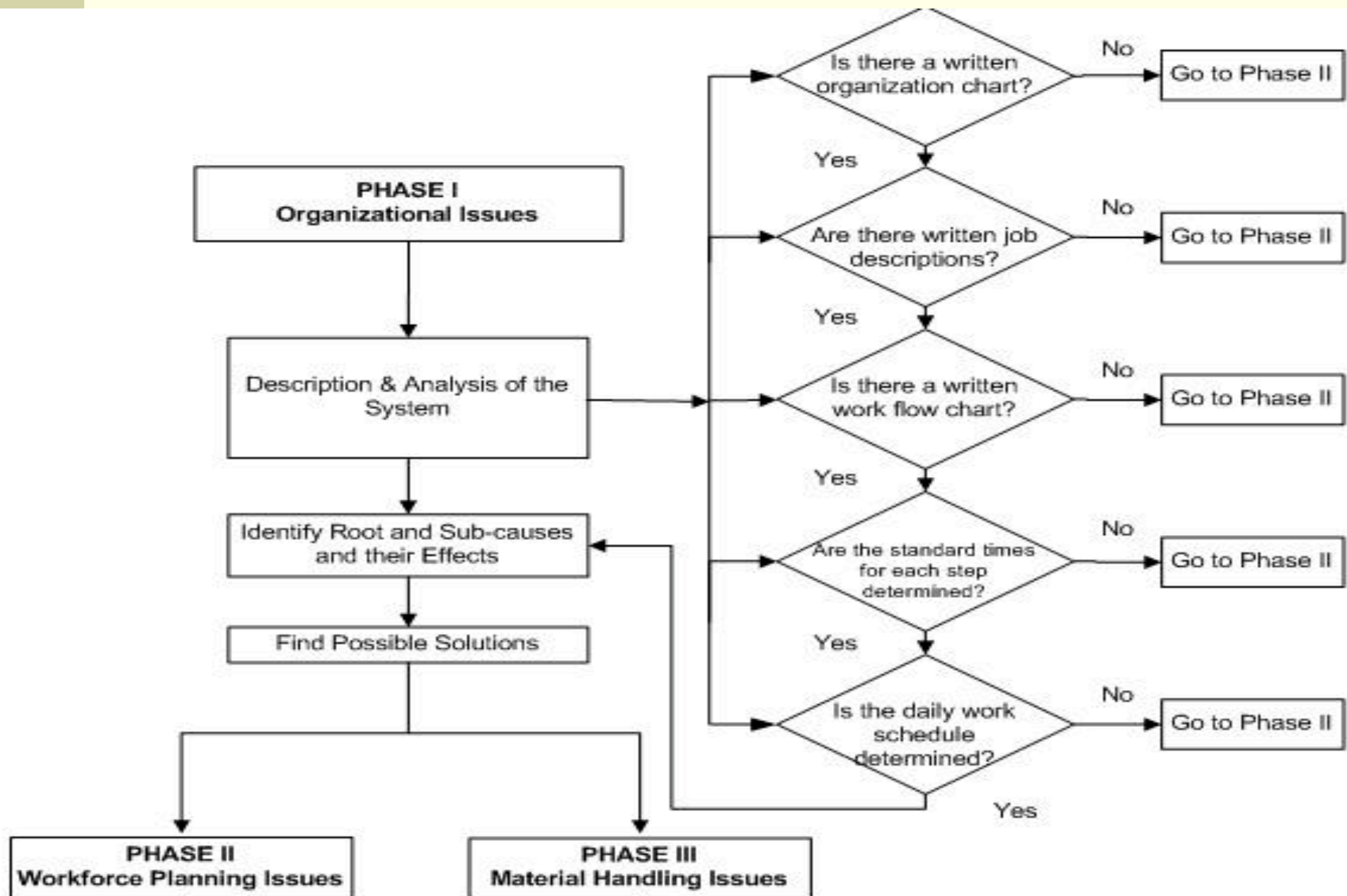
Overview of the system-2

- Problem and solution seem simple
 - Increase the workforce
 - Revision rate would increase, too
- Firm did so;
 - Increase number of workers
 - Overtime
- But revision rate increased very little
- This indicates a detailed analysis is necessary

Systematic problem solving methodology

- Based on these considerations, we offer a systematic and three-phase problem solving process.
 - Phase I-organizational issues
 - The system is analyzed
 - Phase II- workforce planning issues
 - The system is defined
 - Phase III- material handling issues
 - Problems, prevent system to work efficiently, are eliminated

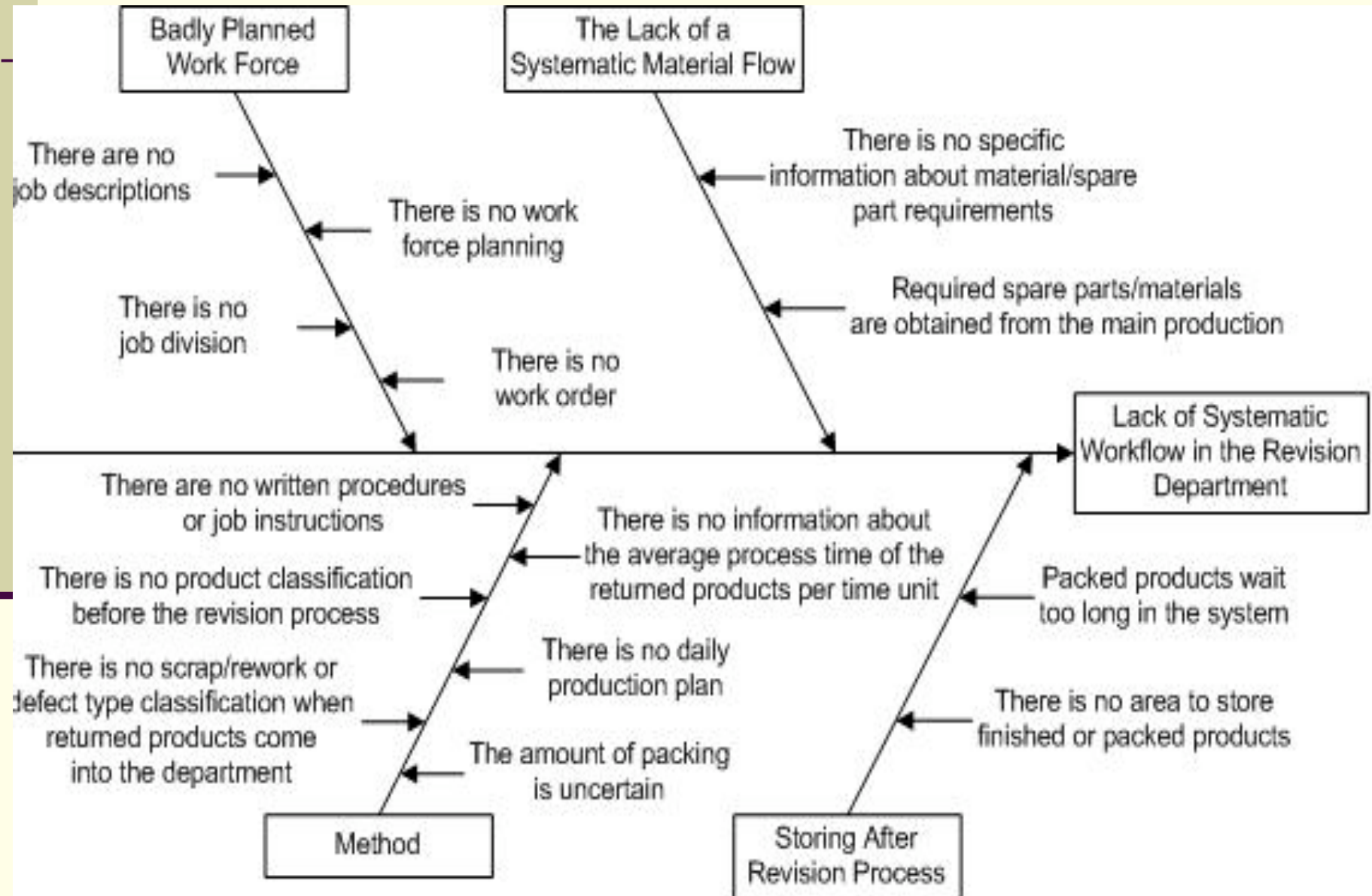
Phase 1



Description and analysis of the system

- For returned dishwashers, a specific department of the firm, namely *the revision department*, performs the re-work, repair and repacking operations, after which all of the products can be sold again.
- The revision department has three employees.
 - Two for revision&packing---One for dissambling scraps
- The department is divided into two sections. One section is used for repairing-packing and the other is for storing the products.
- The firm uses 20 code groups to classify returned dishwashers with respect to their reason for refusal.

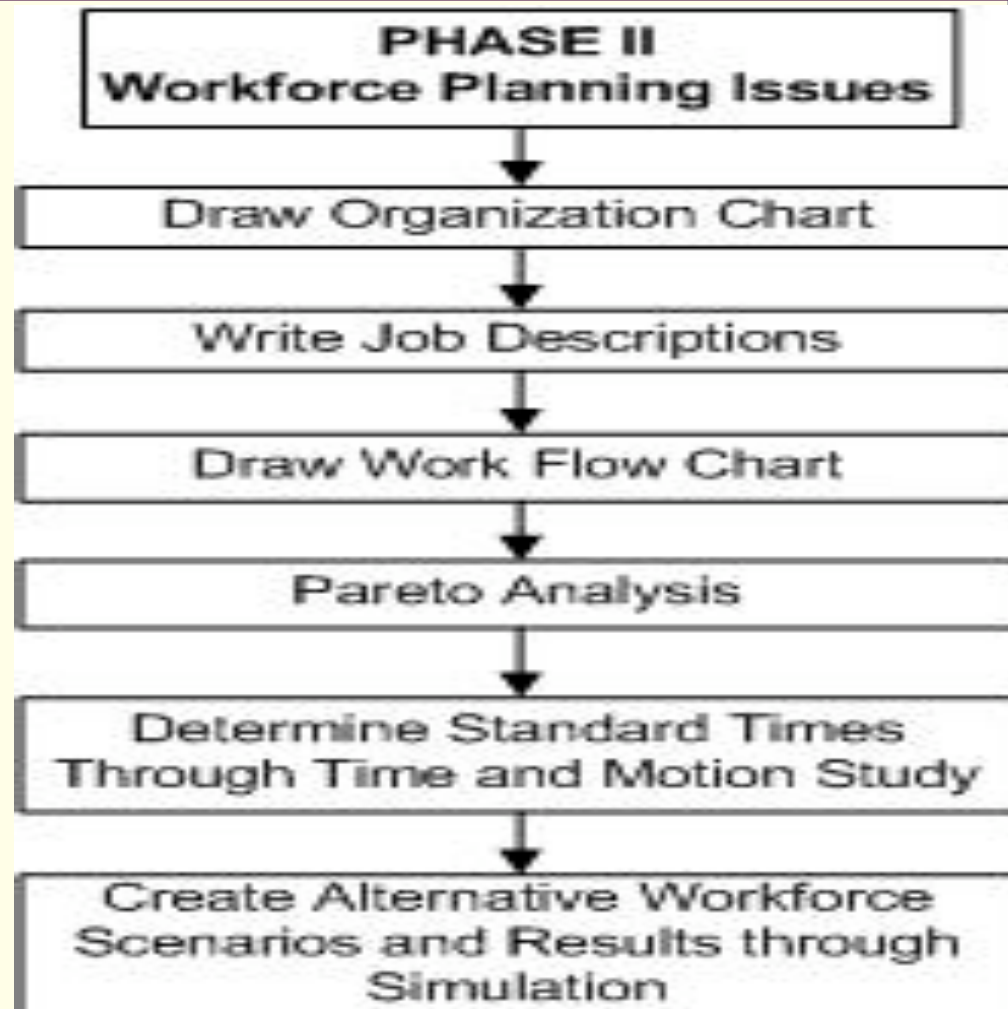
Identifying the root cause, sub-causes, and their effects



Finding possible solutions

- With a TQM approach in mind, we focused on using all possible techniques to eliminate the root cause and the main problem.
- At this step, all analysis results led to the rest of the study. We constituted this step in two phases, namely *workforce planning issues-Phase 2* and *material handling issues-Phase 3*, which seemed to cover the reasons for most of the problems.

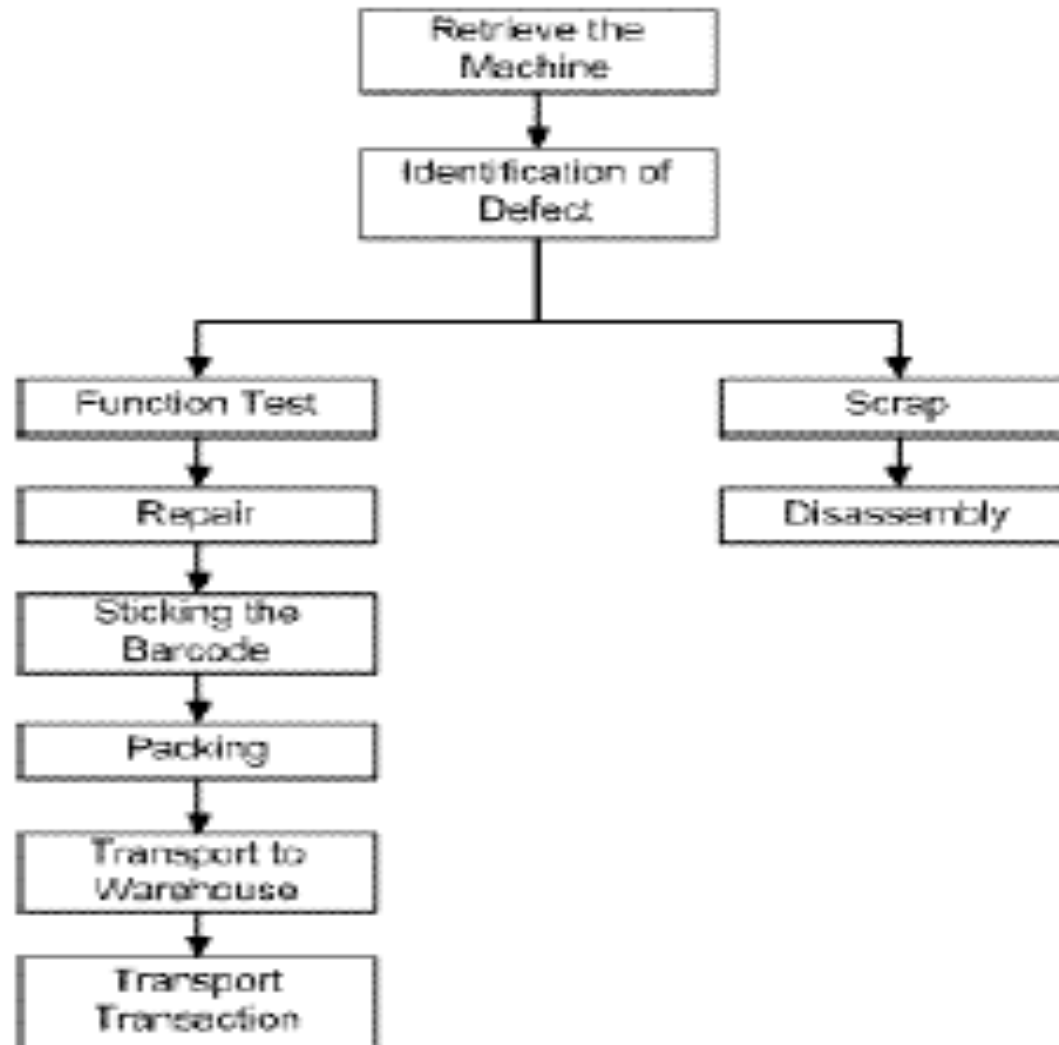
Solution: Phase 2



Organization chart, job descriptions, and the workflow chart

- We simultaneously monitored the whole process and the workflow
- We performed a job analysis.
- Based on this, we structured an organization chart, a standard job description and drew a workflow chart for the revision department employees.

The workflow in the Revision Department



Pareto analysis

- There are a total of 130 subcategories describing the defects types.
- This makes the analysis too complicated to be carried out.
 - Determining standard times for each defect type etc.
- Therefore, a Pareto analysis has been carried out with respect to the amount of products belonging to different code groups.

Pareto analysis results

<u>Code</u>	<u>Explanation</u>	<u>Group %</u>	<u>Cumulative %</u>
201	Packing has a defect	12.41	
202	Side trunk has a defect	49.64	14.63
204	External door has a defect	18.01	
1204	Product does not wash properly	44.50	
1205	Program does not work	15.81	11.68
1208	Product does not work	25.68	
1505	Product working properly	43.65	
1508	Customer dissatisfaction	40.65	20.87
	Product classified as scrap, no revision		24.62
	Total		71.8

Determining standard times

- For the defect types chosen from the Pareto analysis;
- The standard times for each operation in the flow chart were determined with a time study
- Allowences are added

Capacity of the Revision Department

- The solution to this problem should bear two aspects.
 - Firstly, the amount of inventory must be reduced,
 - Secondly a systematic workflow should be established so that the desired level of throughput, which will help in preventing an increase in the inventory, can be achieved.
- To get an idea of the state of the revision department, one needs to know its daily capacity.
 - By comparing the daily capacity of the revision department with the rate of inflow, one can get an idea about changes in inventory.

Creating alternative workforce scenarios

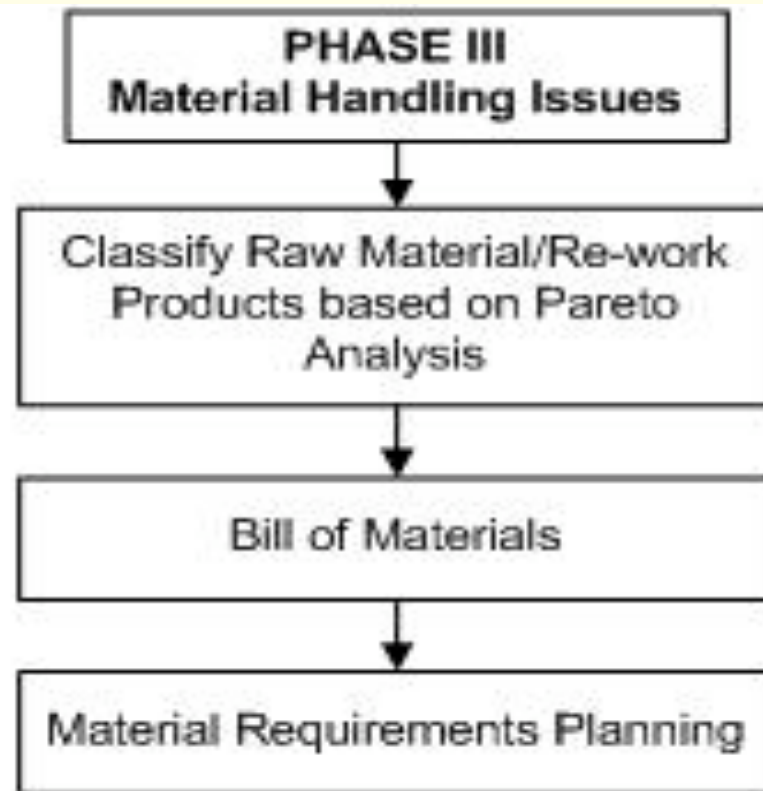
- In order to determine the revision department's daily capacity, a simulation model was constructed with Arena 5.0 simulation software.
- In the simulation study,
 - Overtime is not used
 - Function tests continue in the breaks (lunch etc).
 - Two employees work together and pack revised products in batches.

Creating alternative workforce scenarios

From the simulation results, four workforce schedules, one of which was the current situation, were evaluated.

Scenario	Daily # of Reworked Products
Current Situation (2 full-time employees)	32 products
Alternative 1 (2 full-time, 1 part-time employees)	45 products
Alternative 2 (2 full-time, 2 part-time employees)	68 products
Alternative 3 (3 full-time, 1 part-time employees)	65 products

Solution: Phase 3



Classifying returned products and raw material based on Pareto analysis

- Currently returned products are stored randomly in the storage area.
- We propose to give higher priorities to products selected by using the Pareto analysis. However, this is not possible in random storage
- So, the storage area is re-designed and products with the same defect type are grouped together, ie, a dedicated storage policy is implemented.
- This would result in time savings to search and find the products.

Bill of Materials & MRP

- Spare parts are needed to repair the returned products. However, requirements for each defect type are different. To identify the requirements BOMs are constructed.
- Retrieving the required spare parts takes time, so it would be beneficial to make a plan for the type and quantities of returned products in one period.
 - Knowing the capacity of the dept allows us to make such a plan
- Using the plan and bill of materials, the spare parts requirements can be easily determined.
- By this way, they can be supplied before they are needed and possible time losses due to spare part retrieval can be prevented.

Conclusions

- In this paper, we have described our experience in process improvement for a rework department in a production firm.
- We have proposed a methodology in which different techniques are integrated in a systematic manner.
 - The application of the methodology results in an improved rework operation unit with a higher productivity and less work in process.
- A comprehensive analysis is important since identifying the root and sub-causes of the problem reveals the solution itself.
- The names of stages and techniques used may differ, but the methodology proposed can be adapted to different problems easily.

Conclusions

- The major contribution of this study lies in improving a practical process which includes:
 - Establishing a well-documented process definition through a systematic approach (including job descriptions and organizational charts),
 - Offering a well-built work-schedule in order to have a smooth workflow through Pareto analysis and simulations,
 - Re-organizing the layout of the department and offering a storage policy that would result in a more productive and efficient working environment.

Thanks for your attention

QUESTIONS?