FINAL ASSIGNMENT

CASE STUDY 1

NEW PRODUCT DEVELOPMENT PROJECT

Part 1

Project Description

The project will produce a new system for future installations, and for replacement of those in the field, at a low cost. The product has the potential to be a critical unit in 30 percent of the systems installed in factories. The new system is also easier to update with future technologies.

The Project Priority Matrix for the Project is:

Table 1 Project Priority Matrix for the Project

	Time	Scope	Cost
Constraint	X		
Enhance		X	
Accept			X

Assignment

Develop the WBS outline using the software available to you.

Table 2 has been developed for you to use in completing the project exercises

Question

Does this information (WBS) allow you to define any milestones of the project? Why or why not? What are they?

Remember: Save your file (and back-up files) for future exercises!

Table 2 WBS

New Product Development Project	
Hardware	Hardware specifications Hardware design Hardware documentation Prototypes Order circuit boards

	Assemble preproduction models
Operating system	Kernel specifications Drivers Disk drivers Serial I/O drivers Memory management Operating system documentation Network interface
Utilities	Utilities specifications Routine utilities Complex utilities Utilities documentation Shell
System integration	Architectural decisions Integration first phase System hard/software test Project documentation Integration acceptance testing

Part 2

Use your file from Part 1 and the information provided below to complete this exercise. (See Table 3.)

Table 3 Schedule

Activity	Description	Resource	Duration (Days)	Preceding Activity
1	Architectural decisions	Design	25	
2	Hardware specifications	Development, design	50	1
3	Kernel specifications	Design	20	1

4	Utilities specifications	Development, design	15	1
5	Hardware design	Design, development	70	2
6	Disk drivers	Assembly, development	100	3
7	Memory management	Development	90	3
8	Operating system documentation	Design, documentation	25	3
9	Routine utilities	Development	60	4
10	Complex utilities	Development	80	4
11	Utilities documentation	Documentation, design	20	4
12	Hardware documentation	Documentation, design	30	5
13	Integration first phase	Assembly, development	50	6,7,8,9,10,11,12
14	Prototypes	Assembly, development	80	13
15	Serial I/O drivers	Development	130	13
16	System hard/software test	Assembly	25	14,15
17	Order circuit boards	Purchasing	5	16
18	Network interface	Development	90	16
19	Shell	Development	60	16
20	Project documentation	Documentation, development	50	16
21	Assemble preproduction models	Assembly, development	30	17F-S,lag 50 days
22	Integrated acceptance testing	Assembly, development	60	18,19,20,21

1. Each work package will represent an activity.
2. The project begins January 4, 2010.
3. The following holidays are observed: January 1, Memorial Day (last Monday in May), July 4th, Labor Day (first Monday in September), Thanksgiving Day (4th Thursday in November), December 25 and 26.
4. If a holiday falls on a Saturday then Friday will be given as an extra day off, and if it falls on a Sunday, then Monday will be given as a day off.
5. The project teams work eight-hour days, Monday through Friday.

Warning: Experience has taught students to frequently make separate backup files for each exercise. The software is never as friendly as users expect!

Construct a network schedule for the project and prepare a memo that addresses the following ***questions***:

1. When is the project estimated to be completed? How long will the project take?
2. What is the critical path(s) for the project?
3. Which activity has the greatest amount of slack?
4. Compare the advantages/disadvantages of displaying the schedule as a network versus a Gantt chart

Include the following printouts:

- A Gantt chart.
- A network diagram highlighting the critical path.
- A schedule table reporting ES, LS, EF, LF, and slack for each activity.

Hint: the project should be completed in 530 days.

CASE STUDY 2

Quality control in a manufacturer

Within the recent month, there have been two sudden robot failures on two different tools during a build cycle. Lisa, the manufacturing engineer, has notified Nick, supplier quality engineer, about the failures, assuming that the two robots have some bad parts. She has requested that the two robots be sent back to the supplier for rework, even though no root cause has been identified. But, it seems that such a move has caused some to question where the blame should be placed. The focus of this case is related to project quality management.

OUR BUSINESS

The XYZ Company is a high-tech company producing customized Ion and Electron Microscopes. The applications of their products can be used in a variety of fields, from academia to high-tech industries. Their customers are given the options of customizing the product to meet specific process needs. The company's financial profile shows that their sales revenue last year exceeds $ 400 million. The company is currently upgrading their tools for the improvement in the imaging and wafer transfer system. This is required to help expand the market size and to meet customers' satisfaction. This upgrading project was executed and is now in its operational stage.

WE HAVE A PROBLEM AND IT IS NOT OUR FAULT

Nick: How do you know it was the supplier's fault? Is there a chance that we damaged them during handling or installation?

Lisa: According to the Reject report, the technician said that the two robots were working fine for two weeks after installation. But then there were a few error lines such that the wafer transfer was stopped.

Nick: We don't really know if it's the supplier's fault or not. If it is their fault, those robots wouldn't have worked for two weeks, would they?

Lisa: True. However, anything is possible. I think we should send these machines back for them to check it out.

Nick: We can't just send them back without a well-documented "potential causes" report.

Lisa: We don't have time to do any tests or troubleshooting. They have the experts in their company who can test the robots to find out what's wrong with the machines. I suggest we send them back and save ourselves some time.

Nick agreed with Lisa's suggestion. The two robots were sent back to the supplier for investigation. One week later, similar problems occurred on several other machines. The problem became so big that the issue was elevated to Donnie, a manufacturing engineering manager. Donnie asked Lisa to form a team to identify the root cause of the problem. Lisa agreed to put together the team to brainstorm the root cause and the next course of action. She promised to follow the following steps: goal definition, root cause analysis, countermeasures identification, and standardization.

Lisa called a meeting with Nick and the other two manufacturing technicians, Joseph and Ryan. The team was working to get a list of possible causes for the problem. As a normal procedure in the team's analysis, the first thing to do was to create a fishbone diagram.

Joseph: As a starting point, can we capture what actually happened before the error message showed up on the screen?

Ryan: I don't really know what happened. I was just starting to teach the robot, following our procedure, but then the error message showed up.

Joseph: That doesn't make any sense. If nothing changed on the system itself, we shouldn't have gotten the error. There's got to be something changed on the system.

Lisa: Let's create a fishbone diagram for potential root causes of this problem.

The team brainstormed using the affinity diagram method. The purpose of this exercise was to ensure everyone's input was captured during the process. They determined the amount of time to be spent on brainstorming, and then went through each idea that each member came up with. When going through each idea, they also decided whether those ideas were candidates for root causes. If any of the ideas didn't make sense, they put them aside and noted them as "possible but not likely" causes. Some of the ideas are shown in Table below.

Table 4 Results from Brainstorming Session

Potential Causes	Possibility	To Be Tested (Y/N)
Robot's Firmware	High	Y
Robot's Controller	High	Y
Communication to Robot's Controller	Medium	Y
System's PC	Low	Y
Overall System's Communication	Low	Y
System's Software	Low	N (if overall system's communication passes the test)
Robot's Manual Controller	Medium	Y
Robot's Cables	Low	Y
Motion Controller	Low	Y
Motion Cables	Low	N (if motion controller passes the test)

Once the ideas of potential root causes were laid out, they started their fishbone diagram by grouping the potential causes into larger categories such as Software, Mechanical, etc. The fishbone diagram would be used as a tool to communicate with upper management as well as field personnel showing all possible items that needed to be checked if and when the errors occurred again. Figure below is an example of a fishbone diagram.

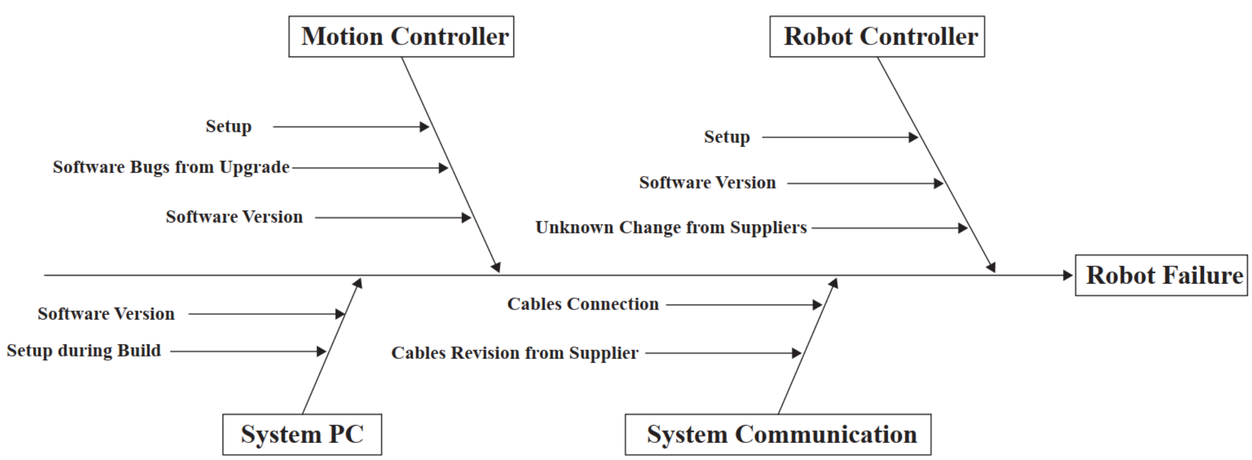

Figure 1 Draft of the Fishbone Diagram for the Failures

Lisa: Here’s the fishbone diagram you requested. We came up with a few things that need to be checked using our tools on the manufacturing floor.

Donnie: How much time do you need? Do you have a test plan for each item?

Lisa: I have not created the test plan yet but it should be straightforward.

Donnie: I think you should create a test plan to show us all what you’re going to do and what the results would be. The customer does not know that we have this issue on the manufacturing floor and they don’t know how severe it is. We should get to the root cause before it gets out of hand.

Lisa: I understand. However, I don’t have the bandwidth to do all of this correctly.

Donnie: This is of the highest priority now.

Lisa: Okay. I will work on it.

System used for testing:

Technician name:

Date:

Potential Cause	Activities	Results
Robot's firmware	Follow "Check Robot's Firmware" work instruction	
Robot's controller	(1) Check revision number for the controller (2) Match the controller version number with the Bills of Materials	
Communication to Robot's controller		
System's PC		
Overall system's communication		
System's software		
Robot's manual controller		
Robot's cables		
Motion controller		
Motion cables		

Figure 2 Quality Testing for the Robot to Be Used by Technicians

Lisa created a spreadsheet that could be used by technicians to test the tool for all possible causes (see Figure 2). This spreadsheet shows all activities to be performed to ensure there are no assumptions made by technicians. The results are recorded and anything worth noting during the test must be written down.

Discussions

1. List the process that Lisa used to create the quality testing of the robot.
2. What can be done to improve the process that she's using?