5-1-2015

NEW PLAYSTATION (PS3 & PS4) CONSOLES REFURBISHING PROCESS, GAMESTOP, LTD. GRAPEVINE, TEXAS

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by

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Presented to the Faculty of the Honors College of
The University of Texas at Arlington in Partial Fulfillment
of the Requirements
for the Degree of

HONORS BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2015

ACKNOWLEDGMENTS

I would like to thank the following people who made things happen for me during my entire stay at the University of Texas at Arlington. Special thanks to Dr. Jamie Rogers from the IMSE department who relentlessly helped me through the entire semester. She showed me what the real professional world will be like in my last semester at the department. I will never forget Dr. Agonafer Dereje for his thoughtful and wise advice, couple with his unstoppable support to me through my days in the University of Texas at Arlington. Ms. Lisa Thompson for her coaching and advising that helped me from the start to graduation. I cannot forget my Mother, for her endless endeavor to make sure I graduate from one of finest universities in the world, even though she never had the opportunity to graduate even from pre-school. I want to especially thank my second home for the past few years; the Department of Industrial & Manufacturing Systems Engineering (IMSE), both lecturers and students for the warm and fruitful ground they offered to me and my peers to be here this day. Finally, I will say thank you to Ms. Bobbie Brown for being one of the most caring staff at the University of Texas at Arlington; she has always worked really hard to ensure students' success in the Honors College.

May 6, 2015

ABSTRACT

NEW PLAYSTATION (PS3 & PS4) CONSOLES

REFURBISHING PROCESS, GameStop, Ltd.

GRAPEVINE, TEXAS

Tangwa A. Nembo, IE

The University of Texas at Arlington, 2015

Faculty Mentor: Jamie Rogers

Manufacturing moved out of the United States in the late 1990s and early 2000 because of the high cost of production. Even though some companies did complain of taxes as a prime reason for moving, touch labor was the most evident cause of out sourcing, especially to China. GameStop, Inc. is the number one game retailer in the world and has special features that many retailers don't have. This is its ability to sell refurbished games (software and consoles). This is possible by taking trade-ins from stores and then taking them to their refurbishing center in Grapevine, Texas and changing the games through this process to "like new". This process is almost 98 percent touch labor, a resource that must be efficiently used so as to be profitable. This can only happen if there is a capable process in place with very little variability. Because only a controlled process can produce good products that will delight customers, delighting

the customer is what every business needs in order to be productively efficient and stay profitable.

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CHAPTER 1

INTRODUCTION

1.1 Product Identification

GameStop Ltd, the number one video game retailer in the world, leads in all sectors of the video game industry. Many companies, including Radio Shack that just filed bankruptcy a few months ago and Wal-Mart Stores Inc., have tried the process of refurbishing but due to the fact that this processes is highly labor intensive they faced the dilemma that American manufacturing had in the late 1990s early 2000. By late 2001 China had become the safe haven for labor intensive manufacturing and still is up to date. The reason behind this is the fact that the process of refurbishing video game hardware is possible to be automated, but you cannot predict the future of the consoles. So the investment in the automation becomes obsolete whenever new consoles are put in the market by Sony, the manufacturer of PlayStation consoles.

Even though GameStop leads the market, this does not mean that they are perfect in this business. There are still struggles on how to continue to be profitable in the business with competition everywhere. The struggles here are the same as elsewhere, with the same problem concerning how to efficiently use the available resources without compromising product quality which could easily lead high cost. In this project, I will be able to develop a new process, including a new process map, the economic benefits of the proposed process, and finally a proposed methodology on how to continually improve and control this new process for quality and cost.

In this process, I will focus my attention on the refurbishing of PlayStation (PS3), PS3 Large and PS3 Slim consoles from the moment they are received from UPS service trucks. As a requirement of the Senior Design Capstone Course, the project will be entirely performed in line with ABET requirements and use of DMAIC procedure that are Define (D), Measure (M), Analyze (A), Improve (I), and Control (C). In the project definition phase, the problem will be defined and well stated with a SIPOC diagram, that is, supplier, Input, Process, Output, and Customers. The measure phase will be accompanied by a cause and effect diagram, analyze phase will include process outcome, and a process map. The improve phase will be made up of economic benefits of the proposed process and the control will be what to do in order to maintain productivity and efficiency.

1.2 Problem Definition

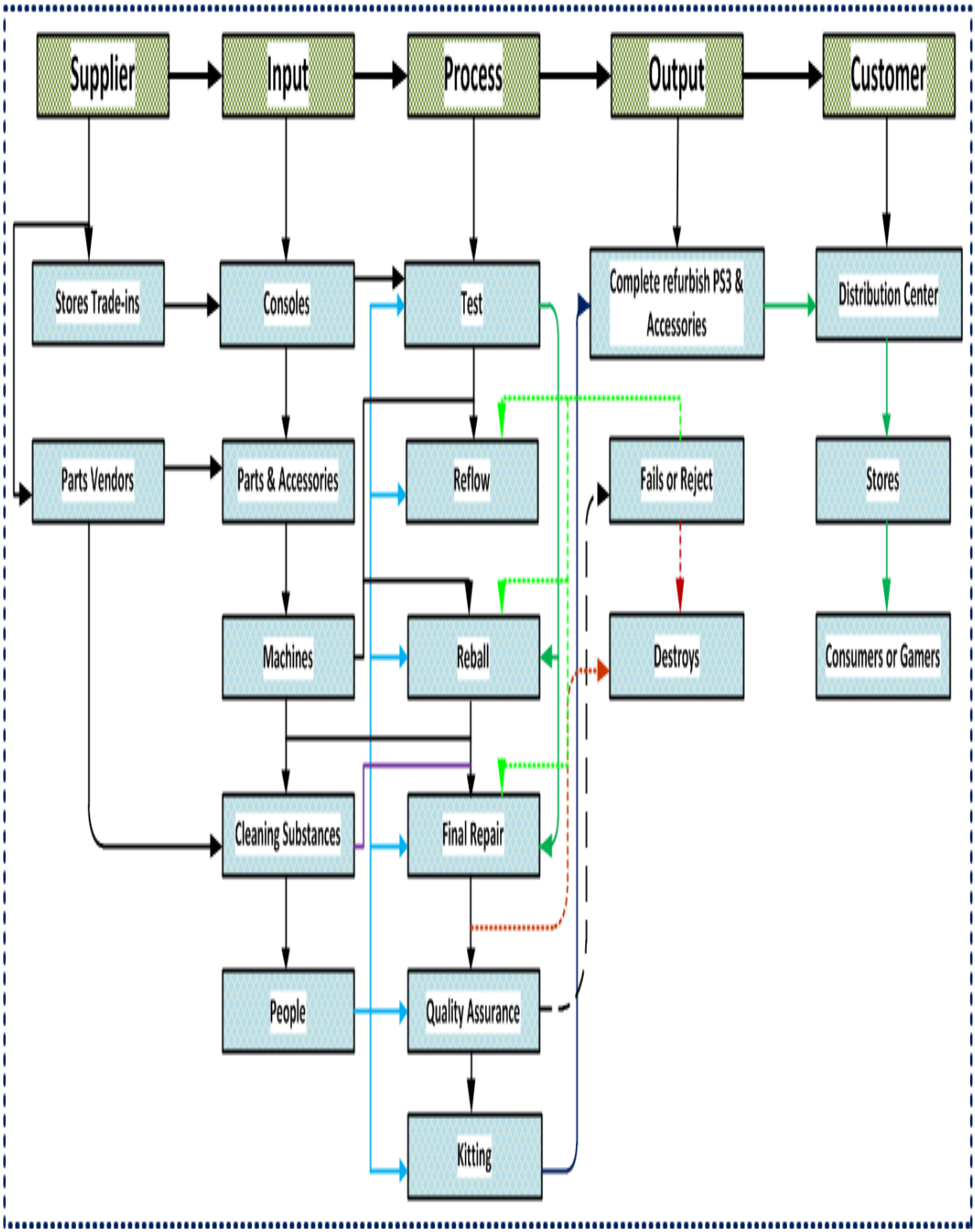
The cost of refurbishing Sony products, especially the PlayStation consoles has been rising at an alarming rate in the GameStop refurbishing center. This was noticed by the company through the cost to refurbish a console (cost per unit or CPU). The recommended solution from the lower management has always been that more labor is needed in order to meet up with demand or production plan. The work standards used in the process were made with the same variations that should have been reduced. These variations alongside inherent or natural process variations have become the reason why the designed processes will never meet its expected outcome. The whole process now resembles; “a sick person that, after being treated by the doctor, the same sickness is injected into them”. The question asked from the view of a process improvement engineer is; what have you been improving? Given that the cause of the problem was

made to be part of the same problem itself. After investigations, the current process is actually running at less than 75 percent efficient. Meaning that, for every four units of production, one unit has been loss due to high variability.

1.2.1. Supplier, Input, Process, Output, and Customer (SIPOC)

In order to understand the process and what goes on in the entire process, there should be boundaries. This will enable me to know where and when to start and stop in the improvement phase, in order to avoid too much or under estimation of consequences. In this case, when the products are delivered to the facility by UPS, they are first sorted through the product return department. All the accessories are separated from the consoles. The accessories (cables, controllers, and AC cords) go to the accessories department, while the consoles go to the Hardware Department. In the hardware department, a console is tested if there is power or not and a decision is made by the tester on what the console needs in order to be working correctly again, otherwise it is destroyed. At the end of the process, each refurbished console is matched with its required accessories and ready for kitting, while the ones that could not be repaired are destroyed. The kitted products are shipped to the Distribution Center (DC), where they distributed to stores upon demand, and finally to consumers or gamers.

Figure 1.1: Supplier, Input, Process, Output, and Customer (SIPOC)



1.2.2. Measuring the Current Process

In order to understand and know what exactly needs to be done, and why there should be a change in the process, the current process and the work standards being used should be clearly understood. For production to be effective, the process must be mapped out on a flow chart or process map that should be a clear picture of each step that needs to be followed. The current process does not have this tool, which is why productivity is low and cost of product is going higher. Even with the high cost, the available resources are not being utilized efficiently. The people or operators are too idle, while machine utilization is less than 50 percent. The "ERSA" machines that are used to reattach the central processing unit (CPU) and the graphic processing units (GPU) of the electronic mother boards of the consoles consumes energy, but productivity is less than 50 percent due to its low utilization. Its function is very important because the mal-functionalities of these two chips are the primary causes of failures of the PS3 consoles. Figure 1.2.1.1 depicts the flow of the current process. Lack of proper flow always leads to higher work in progress (WIP) and higher inventory level that comes with a high cost. Work standards also did not reflect the reality of what the processes is supposed to be, that is, a process that should be designed with low variability that will enable higher productivity and better quality at a lower cost.

CHAPTER 2

PROCESS ANALYSIS

2.1 Causes of Process Variation

The cost of production is high due to high labor costs. Reducing the cost can only be effective if the causes are well known and understood. The causes of variability in the refurbishing process could be due to; machines or equipment, personnel, natural or the environmental causes, method or the process itself, materials and management or owners of the process. The figure 2.1.1 is a cause and effect diagram with all the possible causes that could lead to the effect (high cost per unit or CPU). For each cause to be considered if it actually contributed to the problem before any action is taken, the following three questions, called "S3 Check Questions" must be asked and answered accordingly.

2.1.1. S3 Check Questions

1. Can changing the cause change the effect?
2. Can the Cause factor be changed?
3. Will the Problem always exist when cause exists?

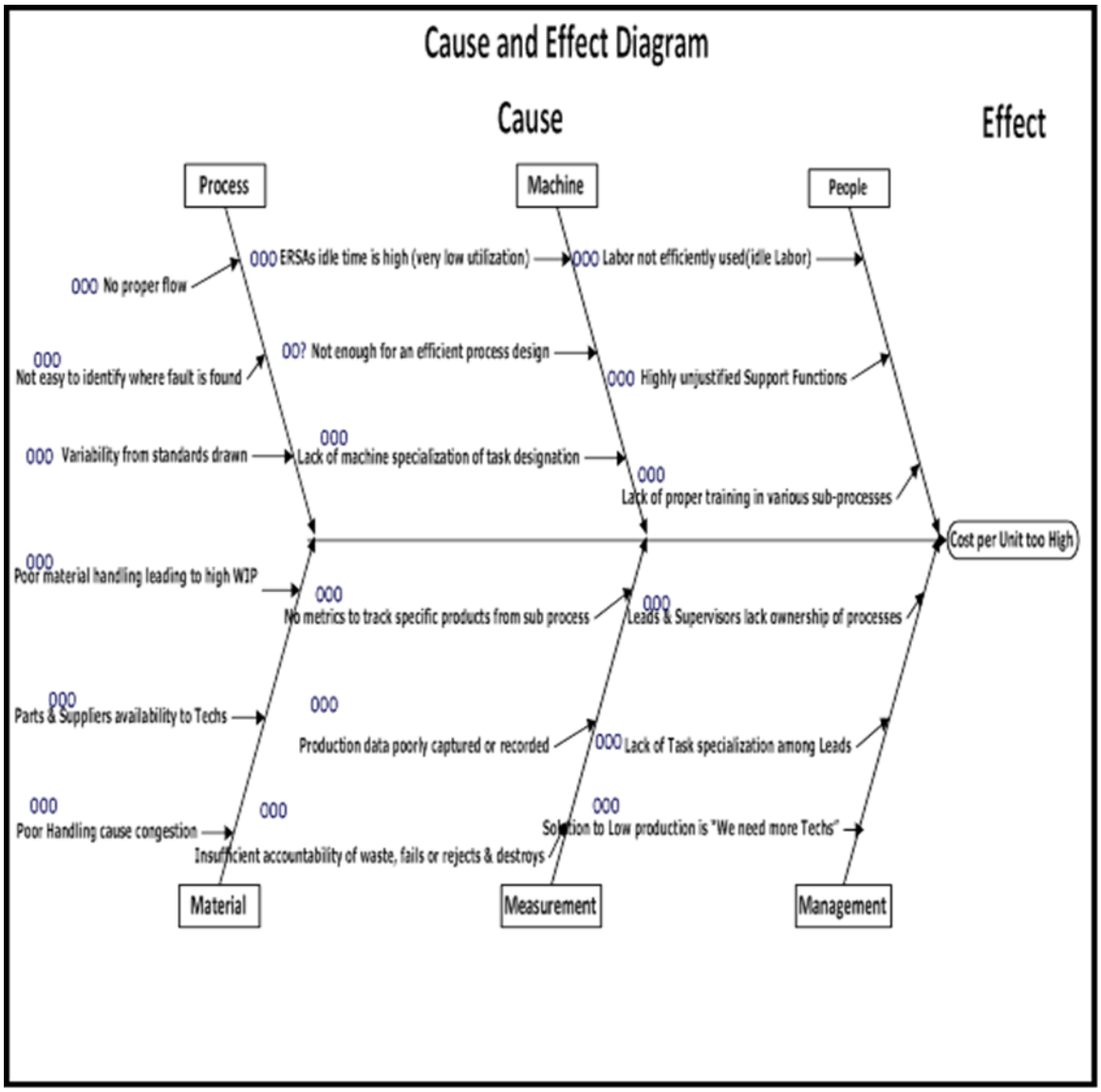
Answers:

If;

a. Yes = O
b. No = X
c. Unknown =?

Each cause on as shown on figure 2.1 below has its corresponding response. From those answers, the most pressing causes were identified to be the process map and work standards.

Figure 2.1: Cause and Effect Diagram of the Refurbishing Process



2.1.2. Process Implementation

Using the answers to the S3 questions and each of the causes on figure 2.1.2 and the DMAIC (Define, Measure, Analyze, Improve, and Control) principles, the following steps will be utilized to obtain a tentative solution. By developing a new process map or flow, and acquiring all the necessary equipment and determining their utilization will set the stage for a pilot test of the project. The process will be measured by performing motion or time studies and then building new work standards that will show the cycle times for each process (cycle time is the time required to perform a given activity or operation, in this case in seconds).The proposed process will be presented to the management or owners of the process. The management will then get the operators to perform the operations necessary to move to a pilot phase of the process.

2.2 New Process Map for PS3 Large and PS3 Slim

The new process map, as shown of figure 2.2.1, is a picture of what the proposed process is going be like. In this case, one can easily at any moment, be able to identify where there is a problem in the process and go after it without interruption of production. Each step in the process has a work or labor standard developed for the activities involved. This is a document that shows all the required steps to perform each activity by an operator. It also shows the expected output or unit per transaction (UPT) per shift per operator. The cycle times (time required to perform any given activity under normal working conditions by a well trained operator) in seconds will be converted to reflect the actual cost per activity or operation, sub processes and consequently the entire process.

CHAPTER 3

COST ANALYSIS

3.1 Metrics

The following metrics were used to quantify the entire process. The time (cycle time) required to repair a PS3 Large console was measured to be 2570sec/pc. For PS3 Slim console is 2197sec/pc. Since only what is completed by each operator is counted as production; production leads, vacations, personal days off, sick days, launch breaks, rest room breaks, trainings and meetings are accounted or paid for by 40 percent of the standard time or cycle time.

$Cycle\ time\ of\ PS3\ slim = 2197sec/pc$

$Cycle\ time\ of\ PS3\ Large = 2570sec/pc$

$Earned\ time\ adjustment = 13\%(7.25vs.8hrs) + 7\%(training, meetings) \implies$

$STD\ time \times 20\%$

$Vacations, Personal\ days\ off, sick\ days = STD \times 10\%$

$Total\ Time\ Earned = 20\% + 10\% + 10\% \implies STD \times 40\%$

$\implies 1.4 \times \left(\frac{2197sec}{pc}\right) = 3076sec/pc$ For each PS3 Slim console

$\implies 1.4 \times \left(\frac{2570sec}{pc}\right) = 33598sec/pc$ For each PS3 Large

$\implies Cost\ per\ Unit\ (CPU) = (total\ time) \times \frac{average\ wage\ per\ hour}{seconds\ per\ hour}$

$PS3\ Large\ CPU \implies \frac{3570sec/pc \times \$14.50}{3600sec} = \$14.49/pc$

$$PS3\ Slim\ CPU \Longrightarrow \frac{3076sec/pc \times \$14.50}{3600sec} = \$12.39/pc$$

3.2 Economic Gains

The benefit of the new process was derived using a cost comparison of the present or current process and production schedule or plan until the end, given that demand does not drop. This shows an expected gain of 19 percent if the process is fully implemented. The entire analysis is just on labor cost alone because it is, and has always been, the prime indicator of the cost of production. Supplies and machines could be added to maximize the sub processes but, in the case of this project, machines are left to the hands of the management to decide on what to use since they produce most of the time based on their market demand.

Table 3.1: Economic Benefits of the Proposed Process

Plat Form	**PS3 Slim**		**PS3 Large**	
	Current Process	Proposed Process	Current Process	Proposed Process
Cycle Time	3810sec/pc	3076sec/pc	4425sec/pc	3599sec/pc
Units Per Transaction (UPT)	6.7pcs/shift	8.3pcs/shift	5.6pcs/shift	7.1pcs/shift
Cost Per Unit	$ 15.35	$12.39	$17.82	$ 14.50
Total saving	19%	$2.96	19%	3.32
Forecast Production(Units)	62040/year	62040/year	54322/year	54322/year
Cost to produce	$952,314.00	$768,675.60	$968,018.04	$787,669.00
Gain		$183,638.40		$180,349.04
Total Gain from process				$363,987.44

3.3 Conclusion

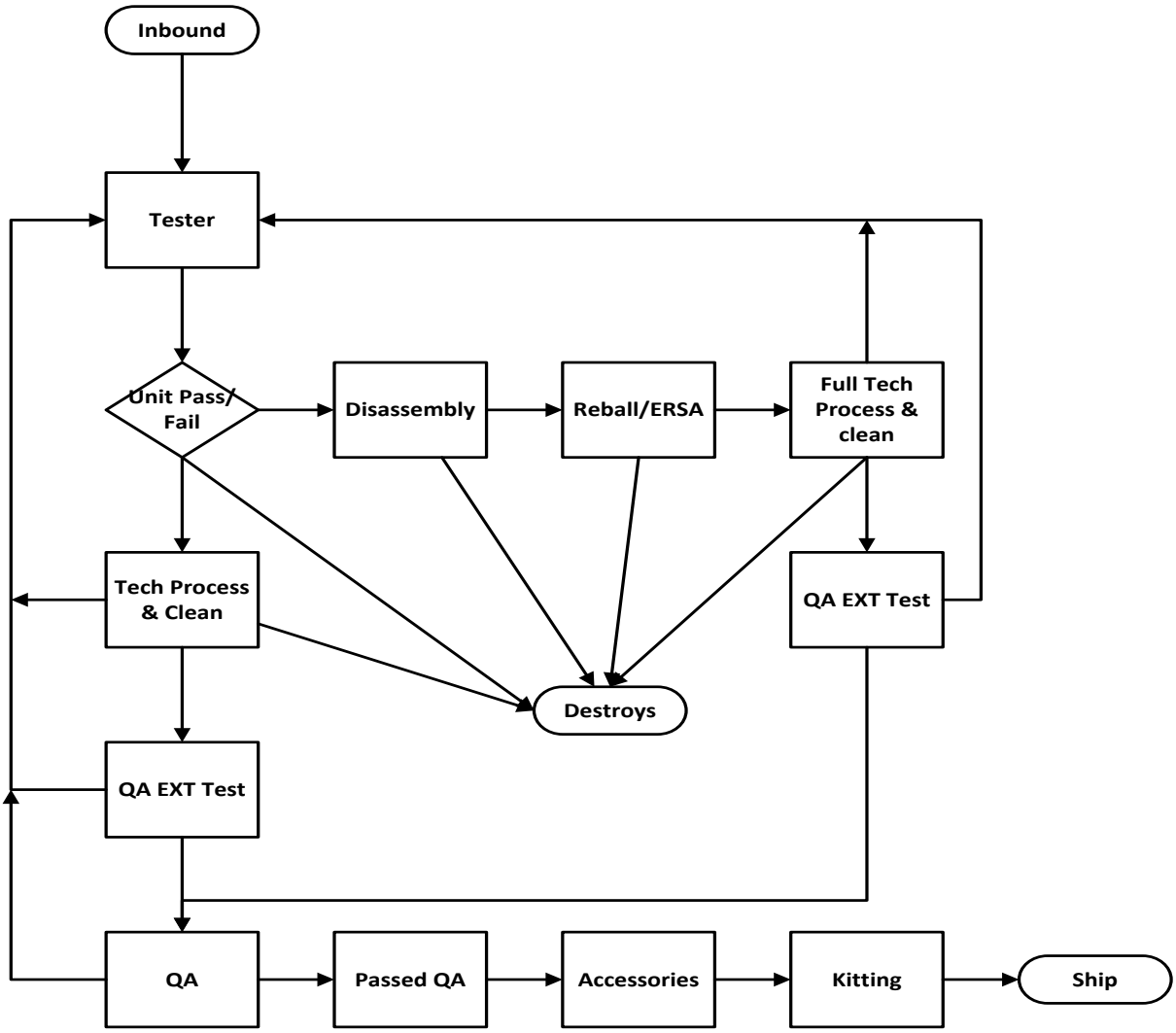
To this point, I will go back to the S3 check questions in section 2.1.1 above, and ask those questions again. Can changing the cause change the effect? Yes; by changing the process flow, changing the standards, and retraining the operators have changed the effect by lowering the cost of production by 19 percent. Can the cause factor be changed?

Yes; actually a new process and layout were put into place for implementation. Finally, will the problem always exist when the cause exists? Yes; this justifies why periodic verification of new standards is very important to better measure the processes. It is the responsibility of the management to constantly inform operators of any changes to the processes, and ensure efficient data capture because wrong data will give wrong results and good data will give good results. Data collected will be analyzed at all times and results used to improved and control the process of production. Controlled processes will produce good products that will exceed customers' expectations.

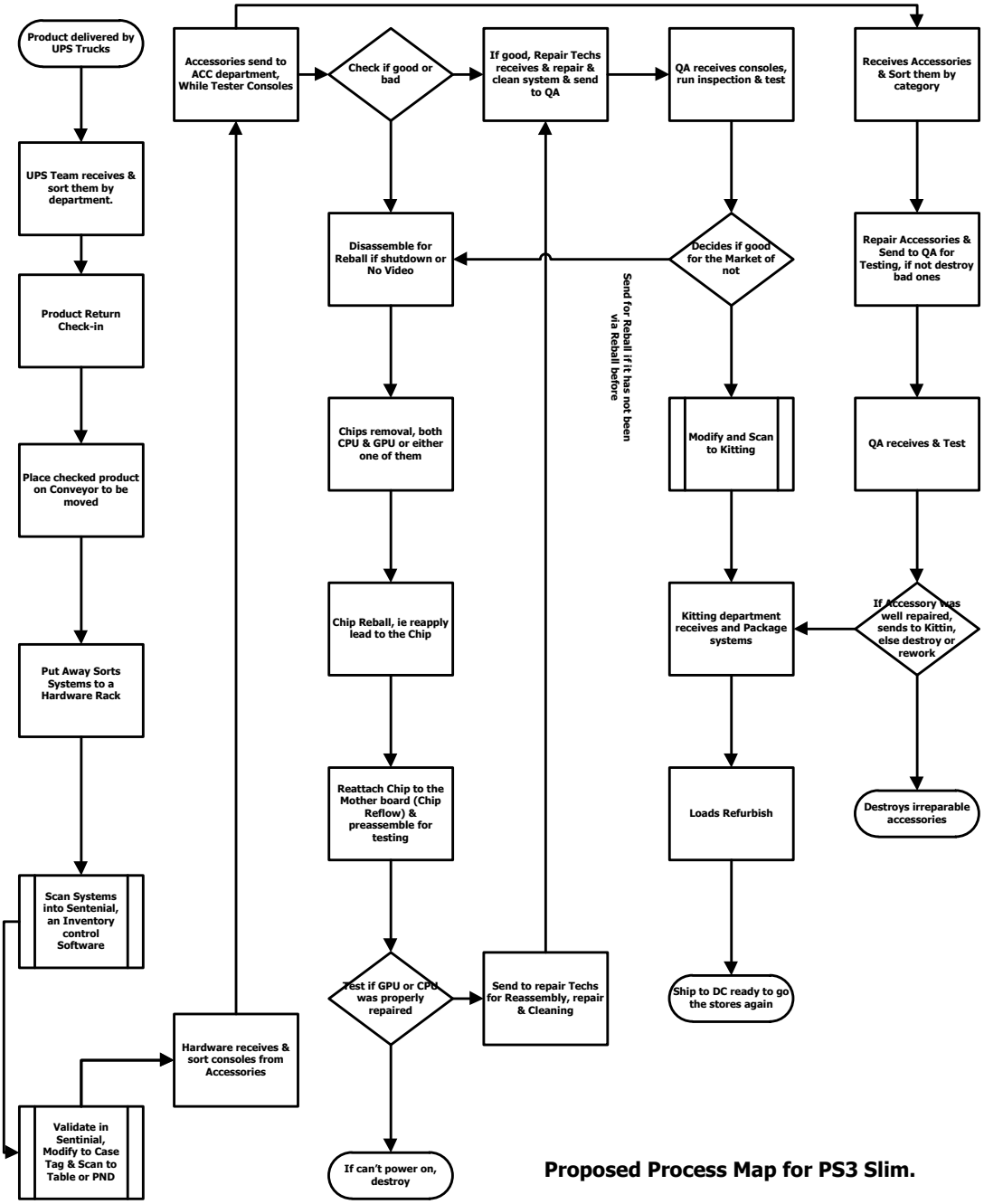
APPENDIX A

PROCESS MAPS FOR CURRENT AND PROPOSED PROCESSES

Current Process Map

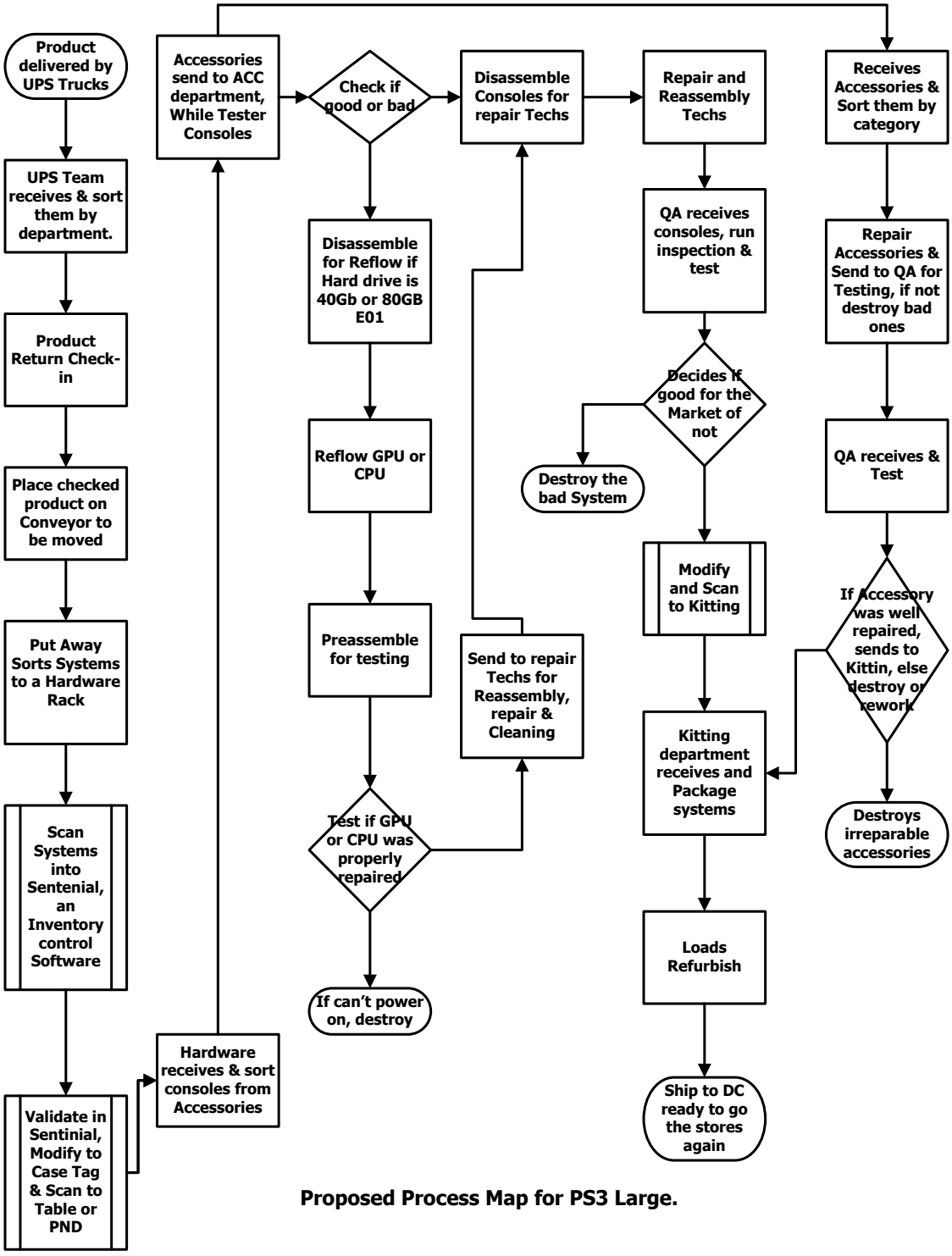


Proposed Process Map for PS3 Slim



Proposed Process Map for PS3 Slim.

Proposed Process Map for PS3 Large



Proposed Process Map for PS3 Large.

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BIOGRAPHICAL INFORMATION

Tangwa Nembo intends to work and gain experience while attending graduate school for his Masters of Quantitative Finance or Financial Engineering at the University of Texas at Arlington. He presently works as a process improvement engineer at GameStop, Inc. Refurbishing Operations Center in Grapevine, Texas. He started as a process improvement engineer intern in June 2014 and continued until August 8, 2014, when he was moved to his current position. Tangwa plans to work as an industrial engineer with interests in the economic and financial part of engineering, and hopes to eventually start and run his own company.