Project Interim Report: Improving the Cell Phone Refurbishment Process

Introduction

PPS is third party company that services/refurbish cell phones for companies such as HTC. PPS also services other electronics too, but the main focus of PPS are cell phones. PPS's goal is to produce quality refurbished products as if it was brand new. To do this, all of refurbished phones must go through the refurbishment process that includes vigorous testing to make sure that they meet quality standard. Because of this strict standard, many phones will fail the testing phase of the refurbishment process. By failing these tests, the rejected phones will have to go back to the repair technician, thus increase the work load of the technician and halting new work orders. This is a problem for the company because it slows down their production and ultimately their revenue stream. By finding a way to improve the refurbishment process, the company could reduce the number of rejected phones and increase its production.

Methodology and Results

Improvement Cycle #1: Understanding Your Process

To understand the refurbishment process, I created a flowchart and SIPOC diagram. I created the flowchart to show the flow and steps of the process. The flowcharts consist of the major steps of the process, decision making points and their choices, and the starting and ending points of the process. All of these steps flow through three departments: Diagnostics, Repair, and Testing. By making a flowchart, I had a better understanding of the steps involved in the process. And by making a SIPOC diagram, I have a detailed account of the suppliers and customers, as well as the inputs and outputs of the process.

I got some of my data through observation of my time working there. I used to be a repair technician with some diagnostic knowledge. As a repair tech, I know about the step involved in

repairing a cell phone and the refurbishment process. I also gathered some of my data through An, a friend/coworker who worked in the testing department. By interviewing An about the testing process, I learned that there were two testing phases, and most phones rejections are from the first test. The first test is cosmetics, which deals with the physical state of the phone, and the second test is software and hardware. From An, I found out the many reasons a cell phone will fail cosmetics testing and the average rate of passed/failed phones.

Although with the combined data I've gathered, I would have like to get more data from someone in the diagnostics department. I would like to find out if there's any misdiagnosis that could influence the end testing.

Improvement Cycle #2: Measuring Current Process Performance

To measure the number of phones that got rejected by testing and the causes of the rejections, I decided to use the Pareto Chart. I decided to use this chart because it shows the causes of the problem as well as the frequency of the causes along with its cumulative percentage.

To get this data, I had An documented 200 phones that she had failed over a course of a week. Out of those 200 rejected phones, 153 were because of cosmetics reasons. So about 75% of the phones that was rejected by testing was for cosmetics reason. The number one cause for rejection is because there were dusts under the screen, which accounts for 44% of the total rejections. The next highest cause for rejection is because there are some scratches on the phone casing. That makes up about 21% of the accumulative causes. And the operating system freezing is the third highest cause with an accumulative of 12%. These three causes (out of 11) makes up 77.5% of the rejection, which is almost close to the 80/20 rule.

While gathering this data, I learned that one of the top causes for rejection is system freezing. This is a software failure and not a cosmetics failure which makes up 75% of the total rejections. This shows that about 25% of rejection are software failures and about half of that is because of system freezing. This is surprising because of how high system freezing is compared to other software failures.

I later went back and asked An how many of those 200 rejected phones were first time rejected and how many have been rejected multiple times. Of those 200 rejected phones, about 75% were rejected for the first time. About 20% were on their second rejection, and about 5% were on their third or more rejection.

Even though I had a lot of data on the causes of rejections, I would like to see how many phones actually passed. If I were to repeat this process, I would have An also document how many phones passed both testing.

Improvement Cycle #3: Identifying the Cause of the Problem

With the data that I got from An, I was able identify some of the causes of rejections. I used the Affinity Diagram to group the causes together. By using the Affinity Diagram, I am able to organize the causes of the rejections into categories to better understand the data.

Using the Affinity Diagram and my understanding of the testing phase of the cell phone refurbishment process, I organized the causes for rejections into 3 categories. The first category is cosmetic failures. All causes for cosmetic failures fall under this category. Next I split up the causes for hardware failures into 2 categories. One category being hardware failure that is mainboard related such as system freezes or no power. And the other category is hardware failure that is non-mainboard related and easily replaceable such as vibrator or camera problem.

By using the Pareto chart in Improvement Cycle 2, I was able to see that dust in screen, scratched casing, and system freezing makes up about 80% of the total fail rate. Even though I have the data from the Pareto chart, I also did multi-voting. I want to compared that data of multi-voting to the data we got from the Pareto chart to see what everyone think the root cause is versus actual data from the Pareto chart.

Because An and I have seen the data from Pareto chart, I had a group or 5 repair technicians do the multi-voting. Because they have experience fixing many of their own failed phones, they can make an educated vote on what they think the root cause of the problem is. I gave each technicians 5 votes and they voted dust under screen as the root cause of their problem. This matches with the data of the Pareto chart. In the end, I took the data of the Pareto chart and used it to brainstorm a solution.

If I were to repeat this process, I would let the testers do multi-voting. Maybe they would have a different take on what the root causes for phone rejections are.

Improvement Cycle #4: Determining Recommended Solutions

To come up with a solution, An and I met up with my old supervisor Binh. We sat down and brainstormed some ideas on how to solve one of the root cause of our problem which is dust under screen. In this brainstorming session, we just shout out what we thought could be a solution, and I would write them all down. We came up with about 8 solutions.

In order to narrow down the solutions to the ones we can implement, I used a PICK chart. I used the PICK chart because it's helpful to see how easy a solution is to implement vs its effectiveness. I then use that information to compare it to other solutions to see what I need to

implement. The PICK chart not only show me what I need to implement, it also shows me what other solution is possible and what solution is a bad idea.

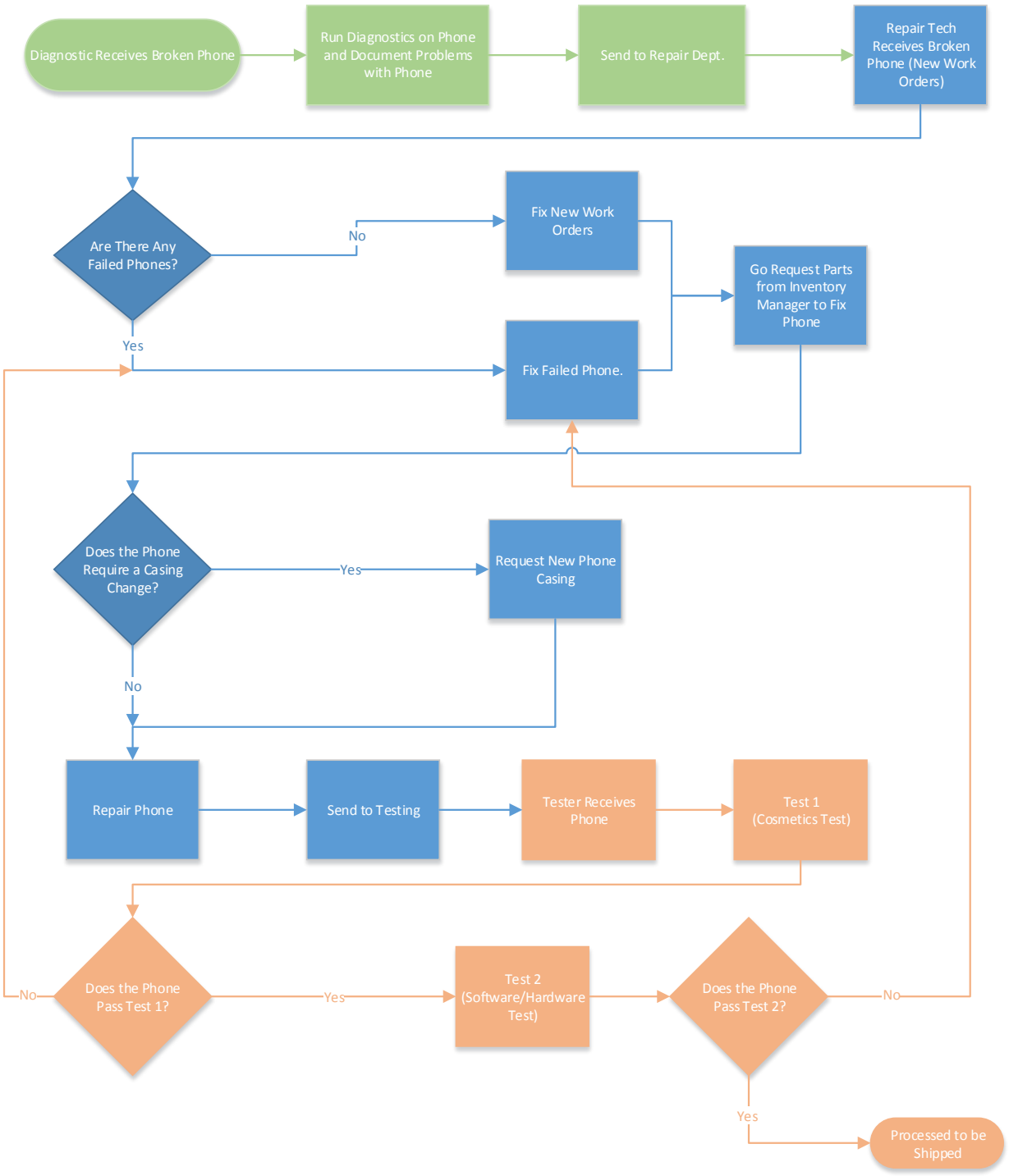
Now with our solutions, we determined where it would go on the PICK chart. The solutions that needs to be implemented immediately are installing air purifier followed by installing or upgrading better air filters for the AC units. These 2 solutions seems to have most impact to ease of implementation ratio. The solutions that are possible and can be implemented later are clean more and provider portable vacuums and/or lint rollers. The solution that we decided that is too hard to implement and provide little impact is limiting outdoor access to the building. So by adding more air purifier and upgrading to better air filters, we think that it would decrease the number of phones that would get rejected because of dust under the screen, which alone counts for 44% of the total failed phones.

If I would to repeat this process, I would try to get more people involved in the brainstorming process. Having more people could provide us with more solutions that we could pick from.

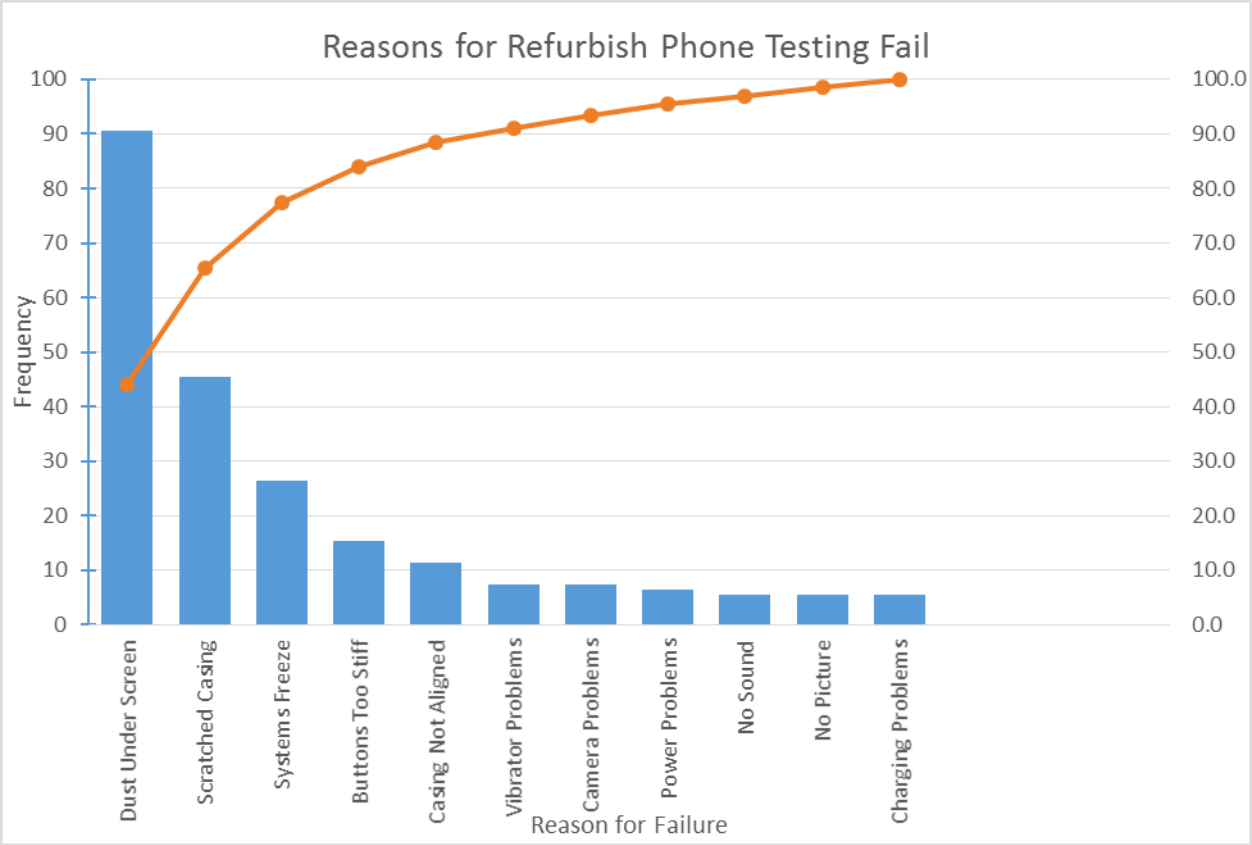
Appendix A – SIPOC Diagram

Suppliers	Inputs	Process	Outputs	Customers
Cell Phone Parts Manufacturer	Diagnostic Techs Repair Techs Testers Warehouse Workers Inventory Managers	1. Diagnostics Receives Broken Phones 2. Diagnose 3. Sends to Repair 4. Repair Techs Picks up Broken Phones 5. Repair any Failed Phones First 6. Send to Testing 7. Test 1 8. Test 2 9. Process for Shipping	Refurbished Phones	Cell Phone Companies Cell Phone Users

Appendix B – Flowchart



Appendix C – Pareto Chart and Data



Complaint	Count	Cumulative Count	Cumulative %
Dust Under Screen	88	88	44.0
Scratched Casing	43	131	65.5
Systems Freeze	24	155	77.5
Buttons Too Stiff	13	168	84.0
Casing Not Aligned	9	177	88.5
Vibrator Problems	5	182	91.0
Camera Problems	5	187	93.5
Power Problems	4	191	95.5
No Sound	3	194	97.0
No Picture	3	197	98.5
Charging Problems	3	200	100.0

Appendix D – Affinity Diagram

Appendix E – Multi-Voting

Causes	Votes
Dust Under Screen	x x x x x
Scratched Casing	x x x
Systems Freeze	x x x
Buttons Too Stiff	x x
Casing Not Aligned	x x
Vibrator Problems	x x
Camera Problems	x x
Power Problems	x x
No Sound	x
No Picture	x x
Charging Problems	x

Appendix F – Brainstorming and Benchmarking

1. Clean more often.
2. Install/upgrade better AC filters.
3. Buy and install more air purifiers.
4. Employee change into work uniform to prevent tracking dust into work area.
5. Quarantine repair area.
6. Installing portable vacuums at work stations.
7. Provide lint rollers for employees.
8. Limit outdoor access.

Appendix G – PICK Chart