up in flames

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Samsung Galaxy Note 7 Up in Flames

Dual-sided curved display. Water and dust resistance. Immense storage. USB-C faster-than-ever charging. Revolutionary iris-scanning safety technology. Ultra slim and sleek design. But, make sure you have a fire extinguisher nearby. Introducing the Samsung Galaxy Note 7, a smartphone that exploded its way into history.

The South Korean tech giant, Samsung, attempted to stay competitive with Apple’s iPhone 7 by introducing the Samsung Galaxy Note 7. Everything seemed in Samsung’s favor preceding the Note 7’s August 2016 release. Many had chosen to take a try at a non-Apple smartphone. Unfortunately, the Note 7 did not live up to its hype. It was a short-lived smartphone having not only one recall in September 2016, but a second recall in October 2016, due to a similar issue. This double recall situation implies that Samsung management failed to properly and thoroughly address the problem the first time. The costly and damaging outcome of the Galaxy Note 7 is a classic example of the importance of quality management concepts, such as those proposed by management experts Phillip Crosby, Edward Deming and Joseph Juran.

The catastrophic set of events happened two weeks after the release. Samsung was forced to recall around 2.5 million Note 7s after 35 customers reported their devices were overheating (Hollister, 2016). The company identified that the overheating was due to battery issues, but neither detailed the problem nor offered any advice about leaving the phone on or off. Samsung then announced the recall, but making matters worse neglected to notify the U.S. Consumer Product Safety Commission (CPSC) in a timely manner. According to U.S. law, when a safety risk is discovered, the CPSC must be notified within 24 hours in order to jointly carry out a recall announcement with a company (Wells, McKinnon, & Kim, 2016). This delay in issuing a formal recall could have been due to Samsung’s ambiguity surrounding the precise problem and how to best correct it. Once Samsung supposedly fixed the faulty Note 7s with a safe replacement battery from a different supplier they thought the problem had been solved. But, customer complaints soon began flooding in about overheating issues with those battery replaced phones. Five of the replacement phones were reported to have spontaneously caught fire for no apparent reason.
Finaly, Samsung pulled the plug on manufacturing Note 7s and cancelled the product altogether.

After removing the product from the market, Samsung scrambled to make sure people were not still using the Note 7. Refund drop-offs and the Note 7 ban on all U.S. flights were not enough. The South Korean company was concerned there could still be a few rogue phones out there that could continue to damage their reputation. In order to make the Note 7 obsolete, Samsung decided to push an update that prevented the phones from charging and eliminated the ability for connection to cellular networks. Quality management guru Joseph Juran, would consider this mandatory update an example of involuntary obsolescence. Samsung exhibited complete control over the life of its Note 7 product by creating an update that made the phone inoperable after a given time period. Luckily for consumers in this case, the obsolescence of their Note 7 worked to their favor because shortening the life of the phones reduced the chance of fires caused by faulting manufacturing. But, even without the update to stop the Note 7, the phones would have ultimately become obsolete due to the limits of the lithium-ion batteries they used. These batteries have a finite life of 300-500 cycles that lead to a worn-down battery needing to be replaced (Wiens, 2011). In choosing to use lithium-ion batteries, manufacturers such as Apple and Samsung make the decision of how long customers will be able to use their product. For these companies, a smartphone that needs a new battery replacement every few years, ensures customers will need new phones and profits will never cease. In this case, replacement phones did not create additional profit, but they did limit the liability of Samsung and save the company money by limiting exposure to more battery combustions and the possible dangerous consequences of fires. Samsung was able to eventually ensure Note 7s had become obsolete via the issued update, yet how did this product with a major flaw even get to market in the first place? Samsung struggled to answer this question.

Six Sigma methodology would recommend using DMAIC (define, measure, analyze, improve, control) to roadmap the Note 7’s failure and make improvement efforts. First, the problem needs to be defined. In Samsung’s case the problem was the overheating of the Note 7 devices. According to Deming, this problem would be considered a special cause variation since the unpredictable overheating is unnatural and must be eliminated in order to bring the Samsung corporation back to stability. In contrast, Deming suggests that common cause variation, which is natural and predictable, improves the process when controlled. For example, common cause
variation for a smartphone device would be the slight temperature increase when the device is left out in direct sunlight on a hot day. This predictable temperature increase due to sun exposure would further be considered common cause since it could be controlled by the phone’s processor lowering performance in order to cool off.

The next phase of the DMAIC would be to measure. A problem can be quantified by gathering information regarding variation in accuracy, precision, reproducibility, and repeatability. For Samsung, they might have measured how many phones were reported in non-conformance to then decide if they must move onward through the rest of DMAIC. In using DMAIC for solving acute problems, you might only have to complete the define and measure phases (Rivera, 86). For Samsung, the applied action in the first recall did not fix the problem, so continuing through the rest of DMAIC may have been advised by a Lean/Six Sigma expert.

Continuing to the analyze phase, the cause-effect (fishbone) diagram could have been used to visually display the potential causes of the Critical to Quality (CTQ) problem. Since the Samsung Note 7 is a manufactured product, the six M’s – man, machine, milieu, materials, methods, measurement—would be used as causal categories in the diagram. Using these categories, a team approach which is critical to DMAIC, rather than individual effort, would be used in order to arrive at possible answers to the question, “Why are the phones overheating?” Once completed by a team, a cause-effect (fishbone) diagram might look something like this for Samsung:
In a hurry to recover after the first recall, Samsung apparently neglected to do a thorough job of investigating the issue. Using the team brainstorming method of the cause-effect (fishbone) diagram, Samsung could have followed contributing problems to the root cause in a timelier manner, and possibly spared the company the second recall. For example, the issue of the phone’s casing being too slim for the internal components could have been detected earlier. Qichao Hu, founder of the battery start-up SolidEnergy reports “[Samsung] management pushed their engineers to make the battery separator really thin” (Mozur, 2017). Internal components were tight on space inside the casing, so this increased the chance of sparking inside the phone. Phillip Crosby writes “when we were able to identify that at least 20% of revenue was spent doing things over, I realized that we had a tool that would focus the operating executives” (Crosby 106). His statement speaks to Samsung management who had sacrificed safety, quality, and revenue in order to outperform Apple with the slimmest phone on the market. Management paid the price for this. For Samsung, the cost of “doing things over” as Crosby referenced, caused Samsung to incur an approximately $5.4 billion loss (Swider, 2016).

With such a devastating product failure with multiple recalls, how was Samsung able to recover from this? Samsung Mobile President DJ Koh made proactive improvement efforts to move forward and learn from the experience. Considering the DMAIC again, the next phase on the road to recovery would be considered phase four, improvement. One improvement method used in this phase is the Toyota Production System (TPS). Luckily for Samsung, it was able to shift the company culture from outperforming Apple to instead focusing on TPS methods. For example, immediately following the Note 7 fiasco Koh would meet every morning at 8 a.m. with other top management and aides to hunt for the root causes of the failure (Pachal, 2017). This process of using Kaizen Blitz or Rapid Improvement Project (RIP), brings stakeholders of a process together in order to ask questions and eliminate the “low hanging fruit,” or those improvement activities that are easiest to implement (Rivera, 89). Koh admitted that he was unsure how Samsung had become complacent about product safety. “[Prior to the Note 7,] my main focus was how can we deliver meaningful innovation to our end customer” but then Koh realized, “What is the most important thing that I missed? Customer and product safety” (Pachal, 2017). Through meeting with others involved in Samsung management, Koh was able to immediately begin improvements in order to assure Samsung’s focus shifted back to the vital components of a successful, safe product. Koh and the rest of Samsung took the blame for the
faulty phones and felt “a painful responsibility for failing to test and confirm that there were problems in the design and manufacturing of batteries before we put the product out to the market” (Smith, 2017). Instead of blaming the battery manufacturers for the recalls, Samsung was smart to realize it was instead their own duty to spot defective inputs to Samsung processes. As Deming noted in his 14 Points for understanding managing for quality, “Your customers, your suppliers, your employees need your statement of constancy of purpose – your intention to stay in business” (Deming, p. 26). Deming would have agreed that it was Samsung responsibility to ensure that suppliers shared the same quality philosophy as it does, to avoid tolerance for defects.

In order to sustain the improvement efforts, set forth by Koh and the rest of management, the final phase of DMAIC would suggest control. Samsung has achieved control by deciding to revamp the battery safety procedures. Since the Note 7 recall, the company has incorporated a new eight-point battery check, which the company plans to use on all future products in order to control for another defective product. This eight-point battery check includes a durability test, a visual inspection, x-ray, charge/discharge test, TVOC (total volatile organic compound) test, disassembling test, accelerated usage test and ΔOCV (delta open circuit voltage) test. As stated in figure 2, Samsung uses

Figure 2 Samsung’s 8-Point Battery Safety Check Test (Pachal, 2017)
both “X-ray and the human eye” to catch defects in batteries. This dual action of man and machine acting together to prevent defects is an example of the TPS method, called Jidoka in Japanese. In addition, the eight-point check follows the basic ideas behind mistake proofing to prevent defects and protect quality, also known as Poka Yoke in Japanese (Rivera, p. 89).

Samsung has learned that instead of “fighting fires” as issues arise, mistake-proofing the system is a better way to protect against a defective product.

Fortunately, Samsung was able to recover from this incident. Samsung is such a huge, established corporation it is nearly too big to fail because it has the resources to endure huge losses and can afford to start a product line over. For other companies with less wiggle room for loss, this recall most likely would have been the end. Still, the special cause variation that occurred within the Note 7s could have been avoided by Lean/Six Sigma methodology, which would additionally have saved billions of dollars and assured customer loyalty was not lost due to the price of nonconformance. Tools within the DMAIC and the management ideas of Crosby, Deming and Juran likely would have prevented the Samsung Galaxy Note 7 from going up in flames – both literally and figuratively.
Works Cited


