

## **Abstract:**

This report delves into the high-profile failure of the Samsung Galaxy Note 7, a flagship smartphone that faced a catastrophic recall due to critical battery defects. The analysis offers an in-depth exploration of the factors that led to the product's failure, the profound repercussions on Samsung's reputation, and the invaluable lessons derived from this incident, particularly concerning quality control and crisis management.

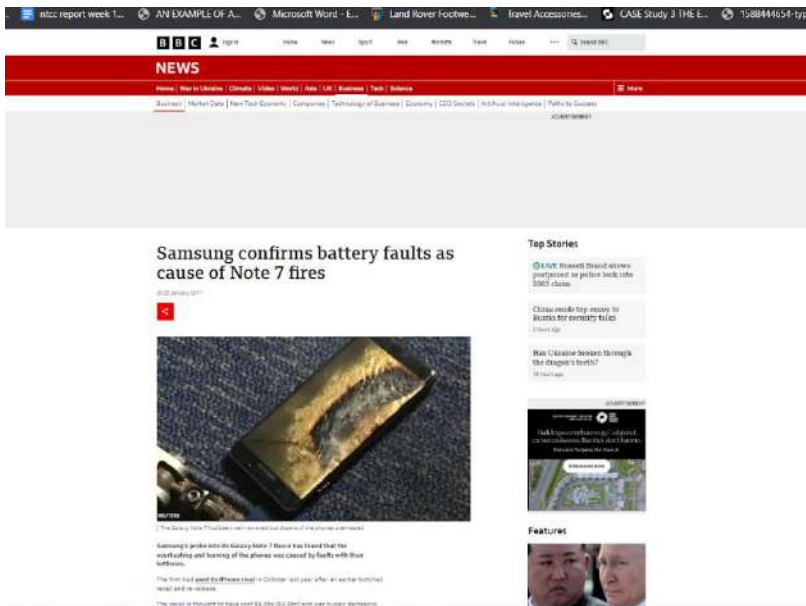
The Galaxy Note 7's downfall was primarily attributed to battery issues, including overheating and spontaneous combustion. Samsung's initial underestimation of the problem, delays in taking decisive action, and inadequate communication with consumers exacerbated the crisis. This failure had far-reaching consequences, including a substantial loss of consumer trust, significant financial losses, legal battles, and damage to its brand image.

From this case study, the importance of proactive quality control measures, rigorous testing, and swift response to potential safety concerns is evident. Furthermore, it underscores the critical role of effective crisis management and transparent communication with customers when product defects arise. Lessons learned from the Galaxy Note 7's failure have reverberated throughout the industry, serving as a cautionary tale and a catalyst for heightened vigilance regarding product safety and quality in the consumer electronics sector.

## Introduction:



The Samsung Galaxy Note 7, introduced in 2016, was a flagship smartphone that garnered significant attention for its innovative features and sleek design. Boasting a large, high-resolution display and enhanced S Pen functionality, it promised to be a game-changer in the smartphone industry. The Galaxy Note 7 aimed to redefine productivity and creativity for users. One of its standout features was the introduction of an iris scanner, providing an additional layer of security for unlocking the device. This smartphone also featured water and dust resistance, making it suitable for various environments. With a powerful processor and advanced camera capabilities, the Galaxy Note 7 promised a premium user experience. Its ergonomic design and curved edge display added to its appeal. Despite its initial promise, the Galaxy Note 7's journey was marred by a major battery issue that led to safety concerns and a recall, marking a notable chapter in the history of smartphone technology. Also, after its release, a series of reports emerged about the device catching fire and exploding, leading to its eventual recall.



**Product Description:**

The Samsung Galaxy Note 7 boasted a sleek design, a high-resolution display, a powerful processor, and advanced camera capabilities. Its standout feature was the iris scanner, which added an extra layer of security. The smartphone was expected to be a strong competitor in the market and had garnered a loyal fan base before the crisis.

**Design:** The Galaxy Note 7 featured a sleek and premium design with a curved edge display, similar to the Galaxy S7 Edge. It had a large 5.7-inch Quad HD Super AMOLED display, which was known for its vibrant colors and high-quality visuals.

**S Pen:** The Galaxy Note series is known for its stylus, and the Note 7 came with an improved S Pen. It had a finer tip, increased pressure sensitivity, and new features like Screen-off Memo, which allowed users to quickly jot down notes without unlocking the phone.

**Iris Scanner:** One of the notable innovations was the introduction of an iris scanner for biometric authentication. This allowed users to unlock their phones and secure their data using their eye's unique patterns.

**Water and Dust Resistance:** The Galaxy Note 7 was IP68 certified, making it water and dust resistant. This was a welcome addition for users who wanted extra durability in their smartphones.

**High-End Hardware:** It was powered by a powerful processor (either Snapdragon 820 or Exynos 8890, depending on the region) and had 4GB of RAM, ensuring smooth performance and multitasking.

**Enhanced Camera:** The smartphone featured a 12-megapixel Dual Pixel rear camera for improved low-light photography and fast autofocus.

**USB Type-C:** The Galaxy Note 7 adopted the newer USB Type-C port for charging and data transfer, which was becoming a standard in the industry.

**Iris and Fingerprint Recognition:** In addition to the iris scanner, it also had a fingerprint scanner for added security options.

## What's inside a lithium-ion battery?

Lithium-ion batteries can store a large amount of energy in a small space, but the problem of overheating has been seen before

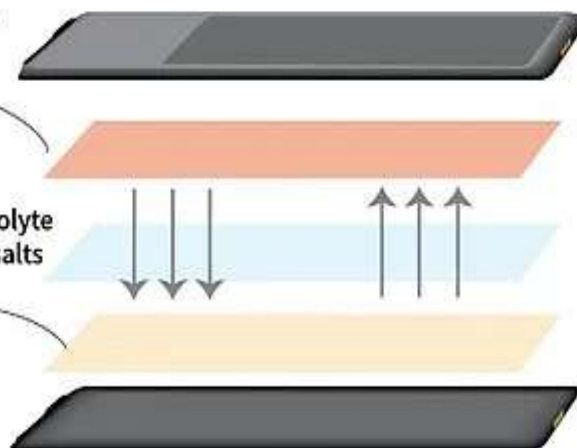
### The layers

Of a lithium-ion battery

• **Anode**  
(Graphite)

Separated by electrolyte  
containing lithium salts

+ **Cathode**  
(Lithium)



**Discharging**  
Battery in use

Lithium ions  
migrate to  
the cathode

**Charging**  
Plugged in

Electricity  
drives ions  
back to anode

### Overheating

- ▶ Can be caused if there is a fault or damage to the thin separator fluid between the anode and the cathode
- ▶ The separation fluid can be very thin in compact batteries that maximise the active material
- ▶ If the cathode and anode touch there can be a short-circuit, leading to overheating, and a **“thermal runaway”**

Source: [batteryuniversity.com/](http://batteryuniversity.com/)  
[livescience.com/Chemistry.about.com](http://livescience.com/Chemistry.about.com)

## **Initial Stage: Launched and Promotion**

**Unveiling and Launch:** Samsung officially unveiled the Galaxy Note 7 on August 2, 2016, at the Samsung Galaxy Unpacked event held in New York City. The event was live-streamed and attended by tech enthusiasts, journalists, and industry insiders. The Galaxy Note 7 was positioned as the latest addition to Samsung's flagship Note series, known for its large display and S Pen stylus.

**Pre-Orders:** Following the announcement, Samsung initiated pre-orders for the Galaxy Note 7 in various regions. The device generated significant interest, and pre-orders surpassed previous records for Samsung smartphones. This indicated strong consumer anticipation for the product.

## **Second Phase; Crisis and promotion**

The first reported case of a Samsung Galaxy Note 7 catching fire or exploding was in early 24 August 2016, shortly after the device's initial release. A man in South Korea claimed that his Galaxy Note 7 had caught fire while charging. This incident gained significant media attention and raised concerns about the safety of the device.

In response to this incident, Samsung initially stated that the problem was likely due to a charging issue or not using the original charger and assured customers that it was an isolated case. They stated that they would investigate the matter thoroughly.

On August 31, 2016 another case was reported from South Korea through social media but Samsung deleted the message and provided compensation to the customer privately.

## **Third Phase: Apology and Action**

However, as more reports of Galaxy Note 7 devices catching fire or overheating emerged from different regions, it became clear that the issue was more widespread than initially believed. Samsung subsequently issued a global recall of the Galaxy Note 7 on September 2, 2016, and urged all users to power down their devices and return them for a refund or exchange.

On September 5, 2016, there was an incident reported in Australia where a Galaxy Note 7 allegedly caught fire and caused damage to a hotel room. The incident was widely covered by news outlets at the time and played a significant role in escalating concerns about the safety of the Galaxy Note 7.

On September 9, 2016, Samsung did announce the suspension of sales of the Galaxy Note 7 in the United States, which was a significant development in response to the safety concerns related to the device's batteries. Around the same time, Samsung faced its first lawsuit related to the Galaxy Note 7 issue in Florida, USA. The lawsuit was filed by a Galaxy Note 7 user who claimed that the device had exploded, causing injuries and property damage. The suspension of sales in the U.S. and the legal challenges were indeed pivotal events in the recall and discontinuation process of the Galaxy Note 7 as Samsung worked to address the safety concerns and regain consumer trust.

After some replacement Note 7 phones caught fire, Samsung stated on October 11, 2016, that it would permanently discontinue manufacture of the Note 7 for consumer safety. However,

Samsung was hoping to make up for lost sales from the Note 7 with the release of new colours for the Galaxy S7 edge, such as Blue Coral and Black Pearl.

The United States Federal Aviation Administration and the Department of Transportation's Pipeline and Hazardous Materials Safety Administration restricted the Note 7 from being transported onto any airline aircraft, even while turned off, on October 14, 2016.

## **Drawbacks Of Response**

**Delay and ignorance:** Samsung Galaxy Note 7 failure case was the ignorance and delay in acknowledging the seriousness of the battery issues at the very beginning of the crisis.

**Loss of Consumer Trust:** One of the most significant drawbacks was the loss of consumer trust in Samsung's products. The Galaxy Note 7 was a flagship device, and its safety issues damaged the brand's reputation, making customers hesitant to purchase Samsung smartphones in the future.

**Impact on Supply Chain:** The recall and discontinuation of the Galaxy Note 7 had a ripple effect on Samsung's supply chain and component suppliers. It disrupted production schedules and affected other Samsung products, causing additional financial strain.

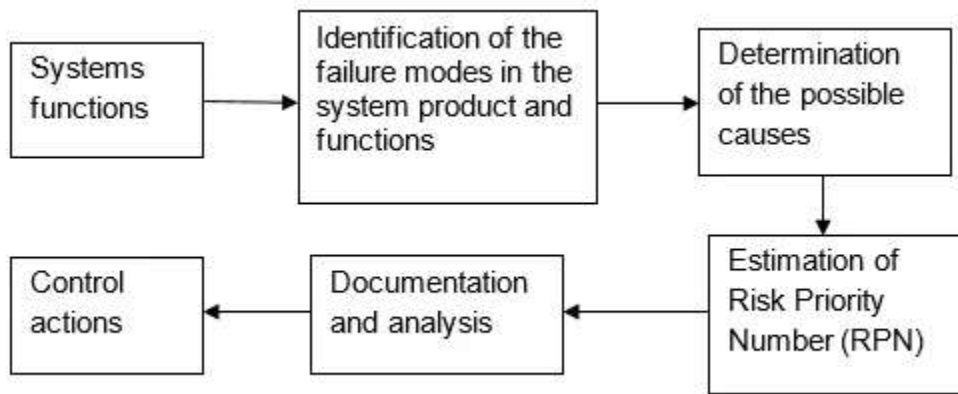
**Impact on Innovation:** Samsung had to shift its focus from innovation and marketing to damage control and recovery. This setback in product development and marketing efforts hindered the company's ability to compete effectively in the short term.

## **Factors Contributing to Failure:**

Failure Mode and Effect Analysis (FMEA) methodologies were used in the analysis. This requires doing a thorough examination of a product's whole lifecycle. It analyses the design, operation, and maintenance specifications by establishing the system functions, identifying the failure modes in the system, and functions that then determine the effects and likely causes. Engineers employ the FMEA during the design stages of a product or after difficulties have arisen.

The first FMEA performed after the failure was a hardware FMEA. This is a straightforward examination driven by the notion that mechanical, electronic, and electrical failures occur as a result of issues such as unexpected stress, overload, and improper wiring. The engineers' study concluded that one of the vendors' lithium-ion batteries had a flaw. The inside of the battery was wrongly coiled, leading the battery to be stressed.

Before releasing the product, Samsung should have conducted a thorough risk analysis on all of the hardware and software from the suppliers. Also, after the recall, the analysis was rushed, therefore the conclusion that the failure was caused by a battery purchased from a certain manufacturer was theorised rather than scientifically confirmed with quantifiable evidence.



FMEA Process (Credits IvyPanda)

## Galaxy Note7 What we discovered

*A short circuit within the battery may occur when there is damage to the separator that allows the positive and negative electrodes to meet within the jellyroll. Based on a detailed analysis of the affected batteries, both Battery A from the 1st recall and Battery B from the 2nd recall, we identified separate factors that originated in and were specific to the two different batteries.*

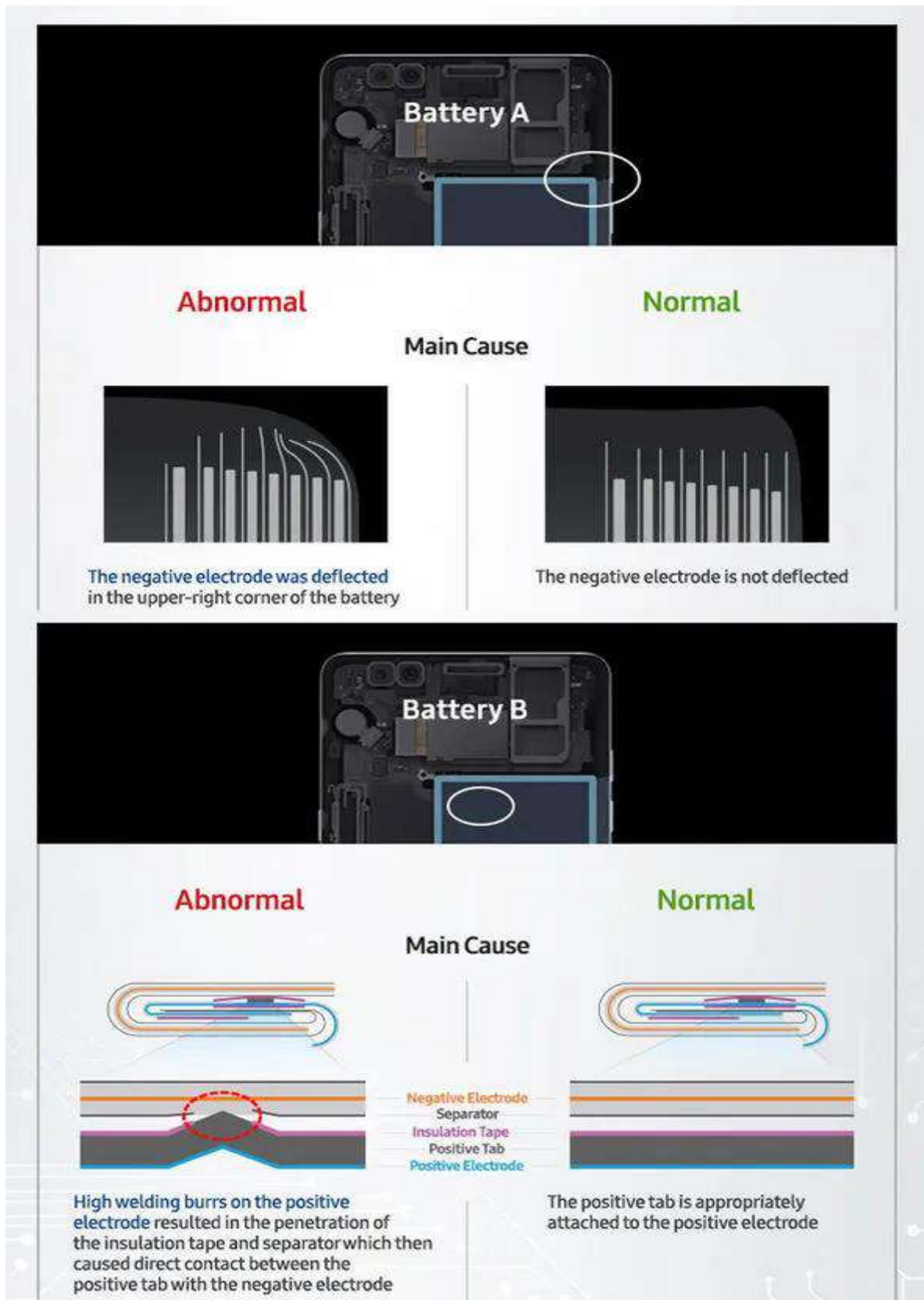
### Lithium-Ion Battery Structure

The diagram shows a cross-section of a lithium-ion battery. On the left, a smartphone is shown with a callout to its battery. The battery structure includes a 'Pouch' containing a 'Jelly Roll' of electrodes. The 'Jelly Roll' consists of a 'Positive Electrode' and a 'Negative Electrode' separated by a 'Separator'. 'Positive Tab' and 'Negative Tab' are also shown extending from the electrodes.

Credits: Samsung Electronics

- a. **Battery Defects:** The primary reason for the Samsung Galaxy Note 7's failure was a critical defect in its lithium-ion batteries. Some batteries were prone to short-

circuiting, causing overheating and, in many cases, combustion. The defect was traced back to issues with the manufacturing and quality control processes.



*Credits Samsung Electronics*



**b. Slow Response:** Initially, Samsung's response to the battery issue was slow and inconsistent. The company underestimated the severity of the problem, leading to consumer frustration and concerns about safety. This delayed response amplified the negative impact on the brand's reputation.

**c. Damage to Brand Reputation:** The Galaxy Note 7 crisis inflicted significant damage to Samsung's reputation. The brand that had built trust through years of quality products was now associated with safety hazards and recalls. The incident resulted in a massive loss of consumer confidence.

**d. Financial Consequences:** The recall and discontinuation of the Galaxy Note 7 cost Samsung billions of dollars, not only in recalling and replacing the devices but also in lost sales and damage to its overall brand value.

## **Lessons Learned:**

### **a. Quality Control:**

The Galaxy Note 7 debacle underscores the importance of rigorous quality control in product manufacturing. Comprehensive testing of components, especially critical ones like batteries, is essential to prevent defects.

### **b. Swift and Transparent Response:**

In times of crisis, companies must respond swiftly and transparently. Acknowledging the issue, taking responsibility, and providing clear information to consumers are critical steps in managing a crisis effectively.

### **c. Reputation Management:**

Building and maintaining a strong brand reputation is invaluable. Samsung's reputation was severely tarnished due to the Galaxy Note 7 incident. Companies should prioritize reputation management as a strategic imperative.

### **d. Continuous Improvement:**

Learning from mistakes and continuously improving products and processes is crucial. Samsung implemented comprehensive battery safety measures in subsequent products to prevent a repeat of the Note 7 incident.

## **Conclusion:**

The Samsung Galaxy Note 7 failure serves as a poignant case study in the importance of quality control, crisis management, and reputation preservation. The product's defects, slow response, and resulting damage to Samsung's brand were costly lessons for the company. However, Samsung's subsequent actions, including implementing more stringent quality control measures and transparently addressing the issues, demonstrate its commitment to learning from this failure. The Galaxy Note 7 incident underscores the enduring importance of quality and consumer trust in the technology industry.

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