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THE IMPACT OF PRODUCT RECALLS ON BUSINESSES AND PROJECTS

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Introduction

Product recalls represent significant challenges for companies, often triggered by quality issues, safety concerns, or regulatory violations. Nowadays, many products have become an inevitable problem striking companies and manufacturers to be recalled.

However, without timely and adequate preparation, product recalls can disrupt production lines and result in considerable financial losses. Furthermore, it is expected that along with the technology, research and development, some defective products can be eliminated or minimized. In the view of Lewis, cited in Ahsan & Gunawan (2014), altered competitive, technological, social, and political landscapes have amplified the potential repercussions of operational failures (Gunawan & Ahsan, 2014).

Product recalls can precipitate crises that affect a company's reputation, sales, and overall value. How firms manage these recalls is pivotal, as investors interpret a proactive strategy and be aware of potential crises and inappropriate strategies. Recalls involving hazardous materials can pose safety hazards and regulatory compliance issues.

Another main aspect of the firm that will need to be considered is the product-harm crisis that will occur when products contain hazardous materials, which could cause injuries or death if are not used correctly, which will violate the safety standards (Magno, 2012).

The automotive industry is always particularly affected by product recall because the manufactures vehicles in large series (OE) and the cost goal is to achieve the best quality. As evidenced in Figure 1, the general product recall tends to increase due to global development, the higher complexity of the technologies and changing regulations (Wollny, 2013).

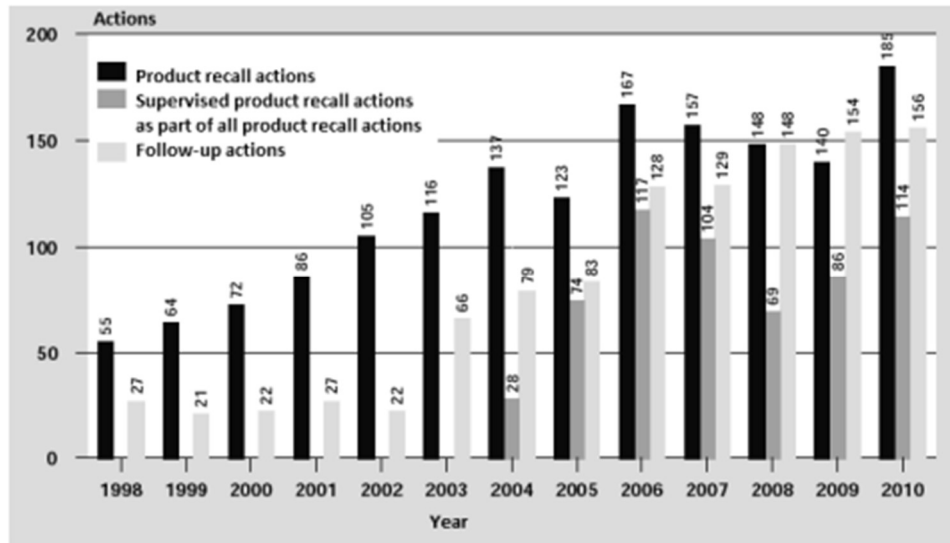


Figure 1. The static of a product recall from 1998 to 2010 in Germany (Wollny, 2013,p.79)

The product recall that has been chosen for this report is the battery recharging kit of an Electric vehicle. The product recall followed a fire incident attributed to the improper charging system and operation, therefore the battery recharging team had to recall the battery recharging kit.

The customer started to recharge the vehicle at around 10 pm. After 8 hours at approximately 6 am a massive explosion happened and the accident involved a Porsche Panamera that got on fire. At the same time, the house of the owner got fired up, and one of the main defaults was (Sun, et al., 2020):

“The reason caused this fire is blamed to the improper installation and operation of the charging system (Sun, Bisschop, Niu, & Huang, 2020,p.27)”.



Figure 2. The main vehicle and house caught fire due to the poor installation of a Battery recharging Kit(p.27)

Costs associated with product recalls and control

According to Diallo, Henry, and Ouzrout, as cited in Mayounga (2018), the primary focus of quality control in businesses is to adopt a proactive supply chain management (SCQM) strategy. Many product recalls occur when many companies lack reinforced recognized product or industry standards.

To address this issue, two crucial questions must be considered (Mayounga, 2018):

- 1) What factors preceding product recalls are preventable and have subsequent consequences?
- 2) What is the likelihood of each factor within the prevention framework for recalls?

Table 1. Recall process. (Berman, 2021,p.99)

Communication-related expenses:
✓ Notifying regulatory bodies, supply chain partners, and consumers to encourage consumers to return product ✓ Communication costs to rebuild sales
Logistics-related expenses:
✓ Pulling recalled products off the shelves ✓ Transportation costs to receive and dispose of defective products as well as returning repaired products ✓ Storing, transporting, and destroying recalled products
Engineering-related expenses:
✓ Investigating cause of safety issues ✓ Redesigning defective product components ✓ Closing, sanitizing, and modifying plants
Litigation-related expenses:
✓ Legal fees associated with customers, suppliers, and government agencies ✓ Product liability settlements ✓ Customer reimbursement costs
Loss in brand-equity and market capitalization:
✓ Reduced short and long term sales ✓ Reduced stock market price
Government-agency related expenses:
✓ Fines to government agencies ✓ Complying with government mandated safety testing
Channel member related costs:
✓ Labor costs to dealers to install new part ✓ Channel member reimbursement for costs related to customer notification ✓ Consumer incentives to encourage them to return goods and restore image

Table 1 illustrates an overview of these costs, including identifying safety defects, disposing of defective products, replacing and repairing faulty items, communicating the recall to stakeholders, addressing litigation expenses, managing brand damage, facing government fines, and reimbursing channel members (Berman, 2021).

A company needs to identify the product defect, whether through internal assessment or external factors and initiate a voluntary product recall (Bernon, et al., 2018).

In addition, the major factors that need to be considered in a product return are (Haunschild & Rhee, 2004):

- **External cost:** Expenses which the customer will be notified of through various channels, cost of product return, replacement product, legal fees and brand damage.
- **Internal cost:** The internal cost of a product recall are those expenses where the product needs to be reworked, the quality of the item will need to be investigated a bit further and new development training is required.

In addition, tangible and intangible costs are also crucial (Murumkar, et al., 2018):

- The tangible costs are direct, measurable expenses incurred as a result of a recall, such as production costs and logistics expenses.
- Intangible costs are hidden costs that are difficult to quantify but they can have a huge impact on the organization, such as damage to brand reputation, loss of customer loyalty and potential sales loss as customers may choose to buy elsewhere.

Consequences of poor quality on an organization

Quality costs arise from various activities throughout the product lifecycle, including sales, marketing, design, research and development, purchasing, storage, handling, production planning, production, and delivery. These costs contribute to the final cost of the product or service and typically range between 5% to 25% of a company's annual sales. However, implementing a cost-effective quality management system can potentially reduce quality costs to one-third of the current level.

According to Dale and Plunkett cited in Schiffauerova & Thomson, (2006), quality costs can be categorized into several areas (Schiffauerova & Thomson, 2006):

- Costs incurred during the design process.
- Maintenance and operation of a quality management system
- The entire cost of a system
- Costs associated with product and service failure.

Figure 3 illustrates the conflicting viewpoints regarding the economic scale of quality costs, as outlined by Shank and Govindarajan in Schiffauerova & Thomson (2006). Burgess suggests that these conflicting perspectives can be reconciled within an integrated model in quality cost simulation. Similarly, Fine (1986), Dawes (1989), and Marcellus and Dada (1991) argue that while quality cost economics may represent static conditions, failure costs may decrease over time without a corresponding increase in prevention expenses in dynamic, multi-period settings (Schiffauerova & Thomson, 2006).

In the context of a product recall, Chen et al.(2009) demonstrated increasing asymmetry across the firms, consumers and stock market investors. Firms typically have access to more detailed information about recall through their traceability systems, compared to investors and consumers. Conversely, investors rely on various external sources like corporate announcements, government statements and business media to access a firm's actions and their potential impact on future earnings and company value (Bernon, et al., 2018).

Poor quality has significant persecutions for the organization, whereas, world-class quality means providing products that are going to meet customer needs and expectations at a cost that will represent value to the customer.

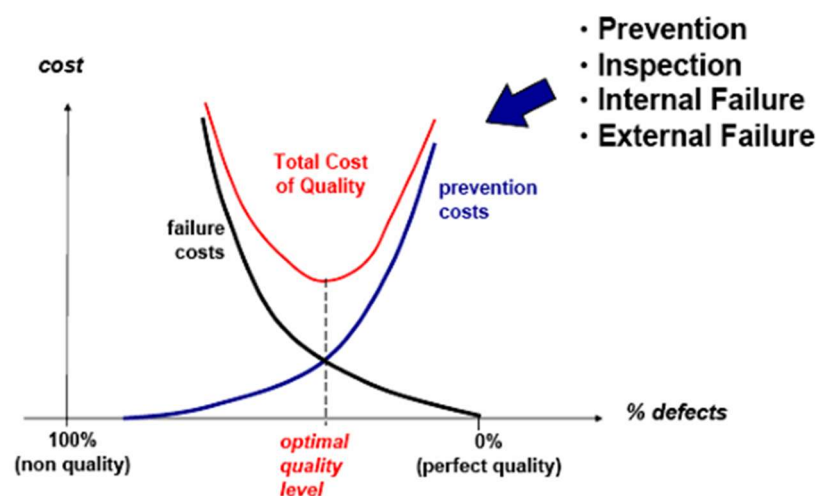


Figure 3. quality costs (Teli, Majali, Bhushi, & Surange, 2014,p.23)

The aim of an organization is to survive and provide a high-quality goods or services. Understanding the costs associated with maintaining quality is crucial for achieving this goal. Many companies worldwide are now focusing on quality as a central customer value and a key component of their strategic approach to gain a competitive edge. Figure 3 illustrates the various costs associated with quality, encompassing the total expenses incurred throughout the product's lifecycle (Teli, et al., 2014).

Costs of quality failure and how they can be managed

The costs associated with quality failures, particularly in the context of product recalls, can have significant implications for a company. One of the primary costs is the damage to the company's reputation and the reputation of its products in the market. In the view of Rheen and Haunschild cited in Majid & Rhee (2018), reputation and brand damage costs are significant considerations for companies dealing with product recalls. Moreover, the Market's response to a recall may be influenced by both the product's reputation and that of the firm (Majid & Rhee, 2018).

In addition, other issues will arise with direct recall costs. A safety recall happens when vehicle manufacturers ask owners to bring their vehicles back to the dealership for safety-related fixes. In general, these recalls can be a big worry for car makers because they can harm the brand's reputation, lower stock prices, and lead to substantial costs (Bates, et al., 2007).

Quality Assurance and Six Sigma applications

Implementing proactive Quality Assurance (QA) measures is essential for managing the costs of quality failure associated with the battery recharging kit firm. Proactive QA involves implementing robust quality control measures throughout the product development and manufacturing process to prevent defects and ensure client safety. This approach includes conducting risk assessments and product testing to identify potential issues early on and address them before the product reaches the market (Ubisense, 2024).

Globalization has increased competition for manufacturers, highlighting the importance of maintaining high quality to succeed globally. Customer satisfaction is crucial for profitability and longevity, with customers prioritizing quality when choosing products or services. Therefore, organizations must carefully consider quality expenses to achieve cost-effective improvement while meeting customer demands (Murumkar, et al., 2018).

Quality failures can incur both internal and external costs for the firm. Rework, often termed as internal failure, involves fixing poor quality issues before the product reaches the consumer. Conversely, warranty changes and recalls represent external failure costs, as they occur after the product has been distributed to customers. Both types of failures result in additional expenses for the firm to rectify quality issues and maintain customer satisfaction (Shah, et al., 2017).

Table 2. Product recall of the Short term against the Long-Term Effects (Liu, Shankar, & Yun, 2017, p.31)

Product Recall: Short-Term Versus Long-Term Effects		
	Short Term (ST)	Long Term (LT)
Costs of recall	Opportunity cost of sales loss due to defective product pulled off the market	- Costs of recalling and replacing/fixing the defected product - Regulatory fines - Consumer liability claim - Opportunity cost of LT sales loss due to damaged brand equity
Information available	- Recall characteristics - Recall volume - Recall severity - Firm's ST response - Recall initiation strategy - ST advertising	- Recall characteristics - Actual LT costs - Effectiveness of the recall process - Firm's LT response - Recall remedy effort (to ensure easy repair and replacement) - LT advertising (to restore brand equity)
Investor response	- Immediate reaction based on ST information - May overreact or underreact in the ST	- Update beliefs on future cash flows with new information - Underreaction or overreaction corrected in the LT

Table 2 illustrates the key distinctions between short and long-term impacts of product recalls (Liu, et al., 2017).

Smith Thomas and Quelch cited in Liu, Shankar, & Yun,(2017), propose a strategic approach to product recall management. They highlight the importance of communication, policy planning, product development, and logistic functions. These are fundamental to let the customer know and the investors in regards to the firm's belief in the brand recalled, where the aim is to fix the issue and rectify the defects.

Furthermore, measuring, reporting and reducing the cost of quality (COQ) is fundamental in a firm. According to De Mast cited in Murumkar, Teli, Jadhav, Dharmadhikari, and Nikam, (2018), in cases of poor-quality product recalls, implementing Six Sigma methodologies becomes essential. Six Sigma is a continuous improvement approach aimed at minimizing waste and variation in company processes as illustrated in Table 3 (Murumkar, et al., 2018).

Table 3. Six Sigma process explanation (Murumkar, Teli, Jadhav, Dharmadhikari, & Nikam, 2018,p.4)

Authors	Definitions
Firka (2010)	Six Sigma is a systematic and data-driven approach to process improvement that targets the near-elimination of defects from every product, process, and transaction.
Antony (2002)	Six Sigma is a breakthrough process improvement strategy that yields dramatic reduction in defects, errors, or mistakes in any process. Improved processes lead to improved customer satisfaction, increased market share, business profitability and so on. Six Sigma is a powerful strategy developed to accelerate improvement in product, process, and service quality by relentlessly focusing on reducing variation and eliminating waste.
Marques et al. (2013)	Six Sigma is also a process-focused approach aimed at achieving business improvement. The main goal here is to improve the performance of a specific core process, one project at a time. To that end, it is important to understand not only the processes, by themselves, but also how their outputs impact on the customer's (both external and internal) requirements.

In addition, the Six Sigma is a flexible and comprehensive system which is able to achieve, sustain and maximize business success.

“The goal is to stop the defects before they appear and reduce the cost of poor quality (COPQ) by adopting a prediction, rather a reactive approach toward rejection and rework.” (Murumkar, Teli, Jadhav, Dharmadhikari, & Nikam, 2018,p.5)

Therefore, for the Battery Recharging kit the beneficial of implementing a Six Sigma program to is to ensure customer satisfaction, increase efficiency, maximize the advantage and market share and importantly save millions on operating expenses (Murumkar, et al., 2018).

Ethical issue

Several studies highlight the necessity of exploring ethical considerations in crisis management, particularly concerning product recalls. Bundy et al. cited in Liu, Liu, Moon, & Siegel, (2023), emphasize the importance of exploring crisis management from the perspectives of fairness and justice. Meanwhile, Welbourne Eleazar cited in Liu, Liu, Moon, & Siegel, (2023), argues that ethical considerations play a vital role in recall responses, further, they argue that refusing to accept responsibility during morally sensitive recall incidents can lead to delays in resolving the issues (Liu, et al., 2023).

Critical Factors to consider (Crumbly & Carter, 2015):

Transparency and Honesty, in other words, upholding ethical standards, necessitates transparent and honest communication throughout the recall process. It's crucial to openly acknowledge any product defects or safety concerns to customers, stakeholders, and regulatory bodies without concealment or deception

Customer safety: Prioritize customer safety after decisive action must be taken to address any safety hazards posed by the battery recharging kit, including recalling defective products, issuing timely warnings, and providing clear instructions for safe usage or return.

Moreover, in a product recall integrating sustainable practices is crucial especially when protecting the environment. Sustainable practices aim to mitigate environmental harm by implementing eco-friendly disposal methods, minimizing waste generation and reducing the carbon footprint associated with the disposal process (Emilsson & Dahllöf, 2019).

Product recall process

The product recall scenario addressed, involves a Battery Recharging Kit recall prompted by a house fire incident. According to Beamish & Bapuji cited in Beckmann, Vogelsang, & Reuter (2017), product quality issues can arise due to various factors such as failure to meet standards, deviation from requirements, or inadequate safety measures. Also, if the industry is not acting on time with the product recall and does not respond to customer complaints, then the government will intervene to see the issue, further, if the safety standards are found to be violated by the government experts, they contact the manufacturer company. If the product specifications do not align with government safety regulations, the government may prompt the manufacturer to recall the product from the market. Government-initiated recall involve several stages of investigation, during which the manufacturer retains the option to initiate a recall at any point in the process. (Beckmann, et al., 2017)

One process that has been used in the past for a product recall is the SWIFT model, previously used by Samsung's Note recall, initially aimed to address quality issues swiftly. However, Samsung's case highlights the complexities involved. Despite identifying a battery problem from a single supplier, a comprehensive investigation revealed issues from multiple suppliers. This delay and inefficiency in pinpointing the root cause resulted in a staggering \$5.3 billion recall cost. This instance underscores the need for companies to adopt robust quality control measures and proactive recall strategies to mitigate risks and minimize costs associated with such incidents. The Samsung's Note recall clearly shows how product recall can be very expensive due to supply chain complexity (Clemons, et al., 2021)

In the automotive industry, product recalls carry significant weight due to their potential impact on customer safety and global quality of life (Clemons, et al., 2021).

The primary method for handling product recalls is the Product Development Process (PDP). However, timing is critical in the PDP, aiming to minimize the time required for product development. The manufacturing process can be viewed as a series of activities, with each step contributing to the overall PDP timeline.

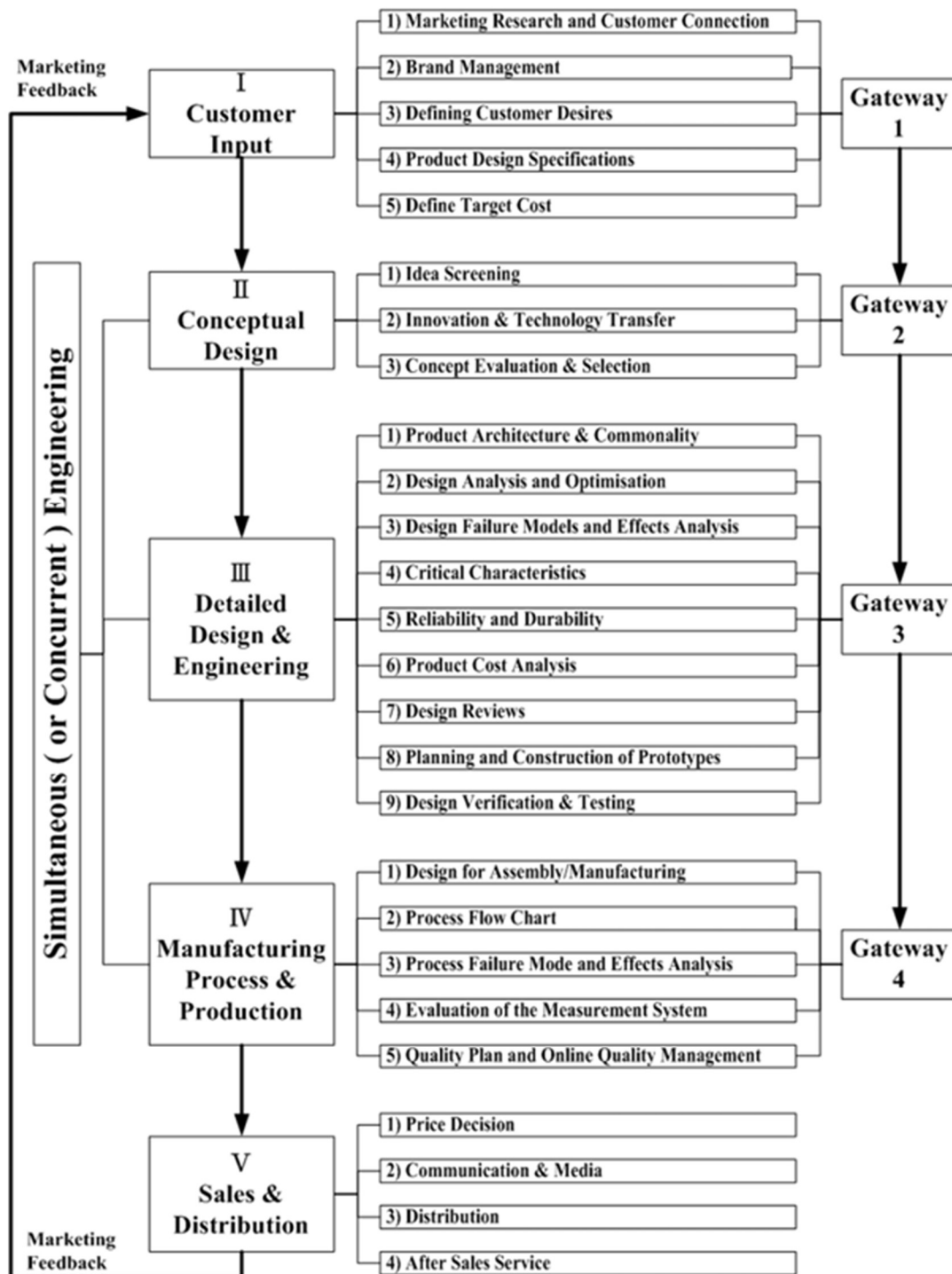


Figure 4. A product Development Process (PDP) used for this product recall (Liang, 2009,p.83)

Figure 5 illustrates the 5 major steps of a PDP model (Liang, 2009):

1. Customer input

- **Receive feedback and complaint:** Gather reports from customers regarding safety concerns, such as instances where the battery recharging kit caused a car to catch fire.

- **Analysis of the issue:** Identify the common issue and collect data from various battery recharging kit to understand the scope and severity of the problem.

2 Conceptual design

- **Reviewing and assessing the issue:** Reviewing customer feedback to identify the design that has contributed to catching the car on fire.
- **Ideas and solutions:** Engage with product design team to generate ideas for improving the safety of the battery recharging kit.
- **Innovation and technology:** bring a new safety tool that will ensure technologies to incorporate into the redesigned kit, ensuring significantly improved safety standards.

3 Detailed Design & Engineering

- **Redevelopment detailed plans:** Develop detailed plans for redesigning the kit, ensuring seamless integration with engineering specifications.
- **Testing and Training:** Conduct rigorous testing of prototypes to verify risk mitigation. Provide necessary training to manufacturing and engineering teams for smooth implementation.

4 Manufacturing process and production

- **Implementation of design changes:** Ensure that it is going to be a good collaboration to integrate design changes into the production process.
- **Quality control measures:** Enforce strict quality control measures during manufacturing to verify kit safety. Regular inspections and testing should ensure compliance with safety standards.

5 Sales and distribution

- **Communication and Outreach:** Develop a comprehensive communication strategy to inform customers about the recall and the availability of the updated kit. Transparency is key in rebuilding trust.
- **Recall Coordination:** Coordinate with distribution channels to recall existing inventory and replace it with updated products.

Finally, having special live customer support channels where appropriate customer inquiries and concerns will be answered is crucial. In addition, to prevent future safety incidents is necessary to educate customers on the correct usage procedures and safety precautions associated with the battery recharging kit to prevent future safety incidents. Provide clear instructions and guidelines for safe operation.

Restoring customer confidence

Restoring a customer confidence during a product recall is fundamental. Clear and honest communication regarding the reasons behind the recall, potential risks, and steps taken to address the issue is essential (Kübler & Albers, 2012).

“Consumers react in terms of (1) brand image, (2) brand attitude, and (3) perceived product quality more positively to product recalls communicated with higher degrees of transparency than to product recalls with lower degrees of transparency.”(Kübler & Albers, 2012).,p.8)

During the product recall, it is crucial to create an honest message explaining the reason for the recall, and potential risks, and to apologize for any damage caused by the faulty product, including property damage such as the house. Additionally, offering appropriate solutions like refunds, repairs, and replacements, and establishing a clear protocol for processing customer requirements is necessary. Proactively addressing customer concerns minimizes the impact on customer trust and loyalty (Kuiper, 2018).

After the product recall, to maintain transparent communication on the regular progress of the recall process, send regular email updates detailing the progress and any developments in resolving the issue. In addition, keep the call center is equipped to handle a high volume of calls and inquiries efficiently and professionally.

Moreover, to ensure customer satisfaction, implement the 5 R guidelines as shown in Figure 5. These guidelines will ensure better decision-making in response to a product recall.

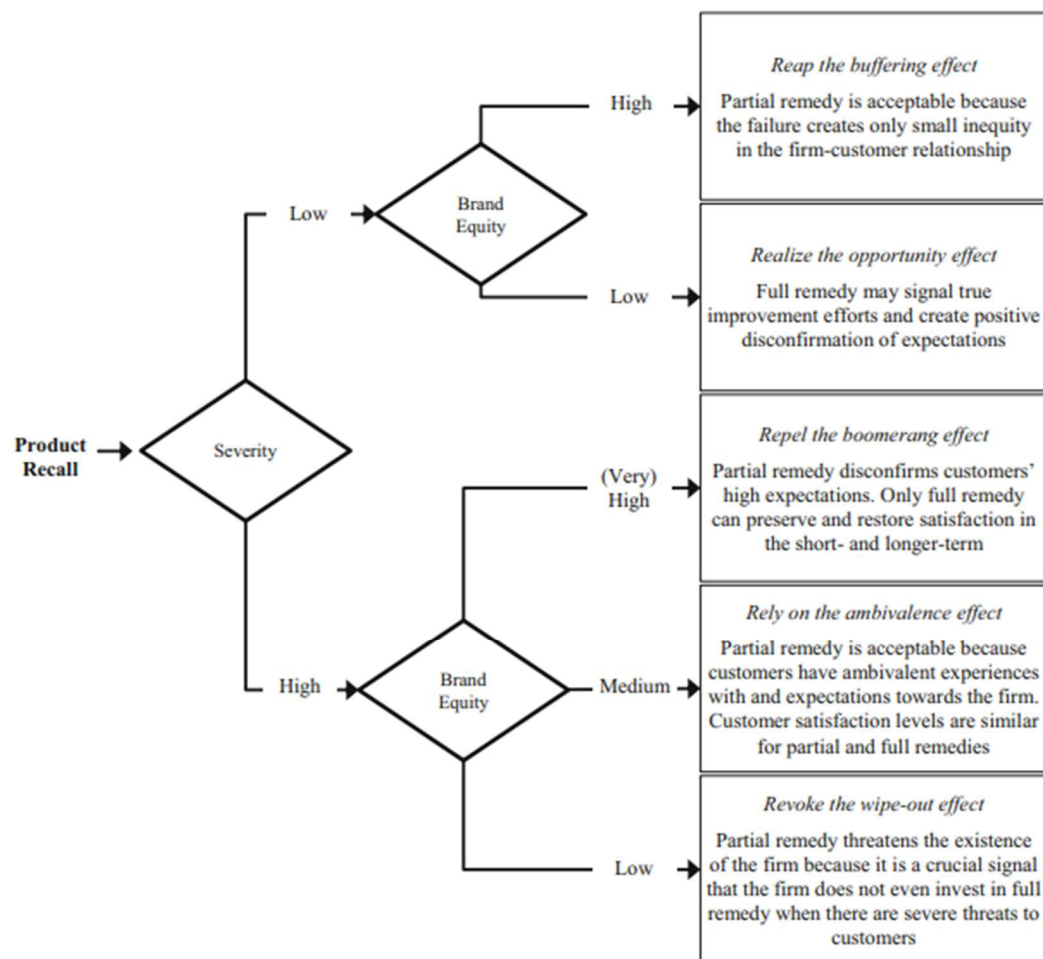


Figure 5. The 5R that guides for optimal remedy choice after a customer has contact for a product recall (Mafael, Raithel, & Hock, 2022,p.191)

Therefore, responding to a product recall firms will need to consider short-term financial costs and long-term non-financial consequences. Although, may seem appealing initially, it's crucial to consider both the immediate financial impact of the recall and the potential long-term effects on customer satisfaction and brand reputation. Prioritizing customer satisfaction and maintaining transparency throughout the recall process can help mitigate long-term damage and rebuild trust with customers (Mafael, et al., 2022).

Conclusion

Product recalls represent significant challenges for companies, but they also offer opportunities for growth and improvement. By implementing robust quality assurance measures, adhering to industry standards, and proactively addressing issues, organizations can navigate recalls effectively while maintaining trust with customers and stakeholders.

In the case of the Battery Recharging kit, swift action is essential to address identified issues and protect the brand's reputation. Implementing Quality Assurance (QA) and Six Sigma methodologies can help prevent future quality failures by ensuring robust manufacturing processes and minimizing waste during recalls.

Prioritizing Customer safety is fundamental in any recall response. Active acknowledgement and fair compensation for damages incurred demonstrate accountability and prioritize customer well-being.

It is important to follow the PDP model to ensure that the Battery recharging kit will follow meticulous steps during the process of product recall. This includes gathering feedback from customers, reviewing design flaws, implementing safety enhancements, and maintaining transparent communication throughout the recall process.

Furthermore, proactive communication with customers during the recall process, such as sending clear emails and offering appropriate compensation, is essential. Keeping the call lines open to address customer inquiries even after the recall is vital for maintaining customer satisfaction.

In conclusion, a product recall is not just a challenge, but also an opportunity for companies to step up, and improve it, and show their dedication to safety, quality and keep customers satisfactions. It is therefore a tough situation for any firm, but it can turn into a positive outcome for everyone involved.

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