

***Product Harm Crisis Management: A Systematic Review and Future Research  
Directions***

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**Abstract**

Product harm crisis management has caught much attention among academics and practitioners because product safety issues received increasing customer and media attentions in recent years. This study systematically reviewed 155 articles that investigate product harm crisis management published between 1993 and 2013. The sample articles are from multiple disciplines of literatures, such as marketing, management and communications. We developed a summary of article distributions based on various classifications such as year of publication, product type investigated and research methodology implemented. We identified five major research domains based on Situational Crisis Communication Theory and summarized the research focus and major findings for each research domain. This study concludes with future research trend in product harm crisis management literature.

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## **Introduction**

Product harm crises are defined as well publicized instances of defective or dangerous products (Dawar & Pillutla, 2000). Well known examples are Mattel's massive toys recalls in 2007 (Teagarden, 2009) and Toyota's massive automobile recalls since a fatal car crash in 2009 (Andrews, Simon, Tian, & Zhao, 2011). Defective product can harm consumers, companies as well as the society. The deaths, injuries, and property damage arising from faulty products are estimated to cost the U.S. alone more than \$900 billion annually (CPSC, 2012). During a product harm crisis, consumers receive negative information and thus create negative attitudes toward the company (Siomkos & Kurzbard, 1994). Tackling the cost involved in the crisis, enhancing existing operations, and rebuilding reputation in the long-run are critical. Therefore, understanding on product harm crisis is beneficial to operations managers and the whole society.

However, there is not yet a comprehensive and systematic review on product harm crisis in the literature. Therefore, the objectives of this study are:

1. To describe product harm crisis related articles distribution by various classifications
2. To summarize the main findings in previous studies
3. To conclude research trend and suggest future research opportunities

## **Methodology**

Product harm crisis is an inter-disciplinary issue. Therefore, sample articles are collected from the following five electronic databases to capture a wide range of journal articles.

1. Business Source Complete
2. Science Direct
3. ABI/INFORM
4. Emerald Fulltext
5. JSTOR

We conducted a full text search of the journal articles by relevant keywords "product harm crisis", "product recall", "product crisis" and "recall crisis" published from 1993 to 2013. 155 articles from 104 journals were collected as sample.

## **Article Distribution**

This section presents article distribution based on year of publication, journal, product type and country researched, and analytical approach.

### Distribution of Articles by Year of Publication

Figure 1 shows the article distribution by year from 1993 to 2013. Product harm crisis is getting much attention, especially after 2008, which may relate to the increasing product harm incidents, for instance, 2007 was called as “the year of recall” in which many China-made products were recalled (Beamish & Bapuji, 2008).

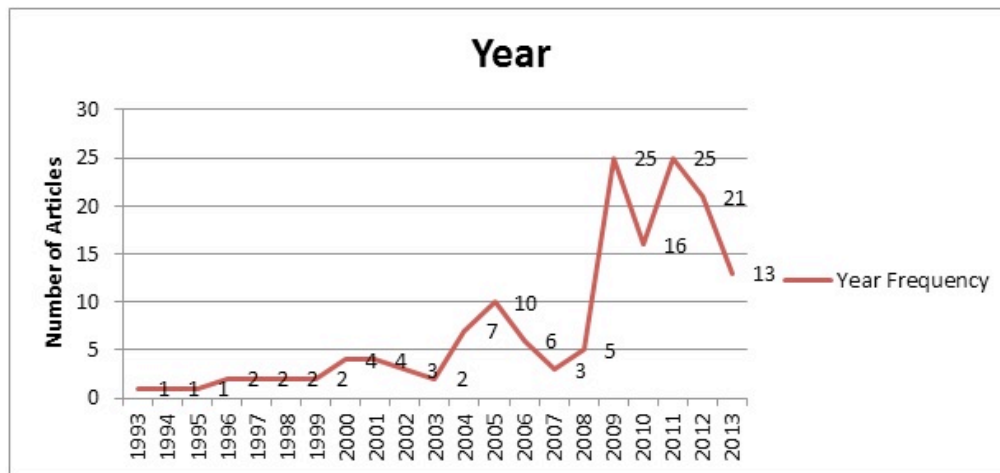


Figure 1. Article distribution by year of publication

### Distribution of Articles by Journal

Sample articles were collected from 104 journals. Table 1 presents a list of 14 journals that published three or more product harm crisis related articles. It shows a wide range of disciplines, from food safety to marketing, management to communication management. The top one is Public Relations Review, which publishes articles examining communication between companies and the public, public relations, marketing and management.

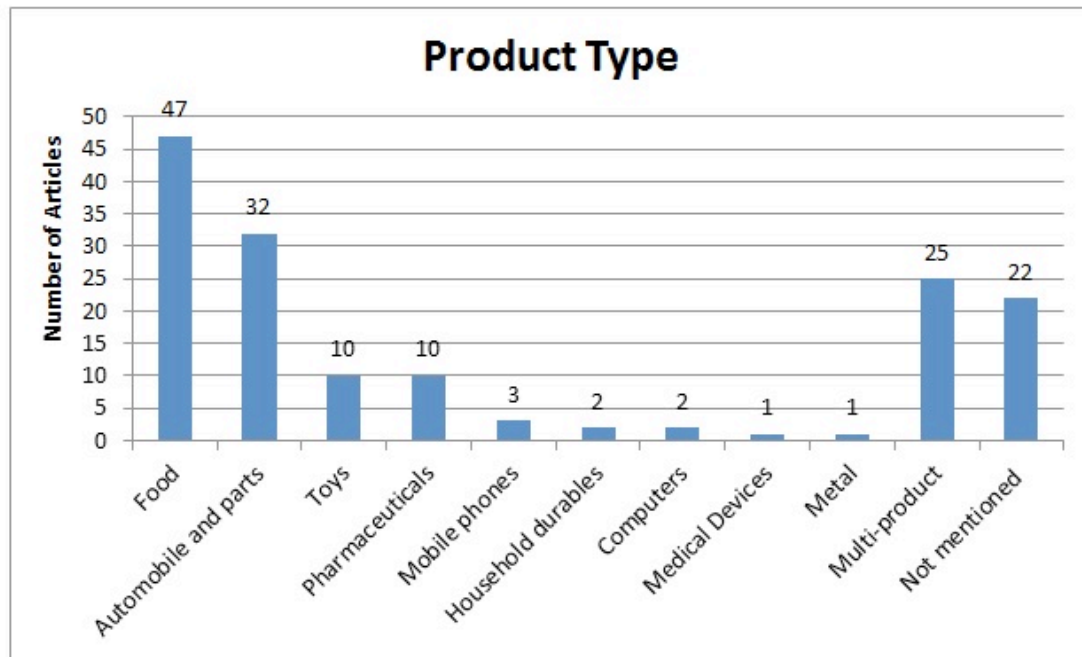
Table 1

*Journals Publishing Three or More Articles on Product Harm Crisis*

Journal	Number of articles
Public Relations Review	12
British Food Journal	4
Business Horizons	3
Corporate Communications	3
Corporate Reputation Review	3
International Journal of Production Economics	3
International Journal of Production Research	3
Journal of Business Ethics	3
Journal of Marketing	3
Journal of Marketing Management	3
Journal of Marketing Research	3
Management & Organization Review	3
Management Science	3
Organization Development Journal	3

**Distribution of Articles by Product Type Researched**

As shown in Figure 2, 108 out of 155 sample articles (69.68%) conducted researches on one product type only while 25 articles (16.13%) conducted researches on multi-product types. The rest (22 articles (14.19%)) did not mention a particular product type. They focused on general issues. For example, ways to increase the effectiveness of recall messages (Berman, 1999; Gibson, 1997, 2000a; Gurau & Serban, 2005; Nawasaki, Oono, & Inoue, 2009) and supply chain issues in product recalls (Chao, Iravani, & Savaskan, 2009; Lyles, Flynn, & Frohlich, 2008; Tse, Tan, Chung, & Lim, 2011). Figure 2 presents the frequently researched product types were food (47 articles (30.32%)), followed by automobile and parts (32 articles (20.65%)), toys (10 articles (6.45%)) and pharmaceuticals (10 articles (6.45%)). The distribution suggests future research may consider products other than food and automobiles.



*Figure 2. Article distribution by product type researched*

### **Distribution of Articles by Country Researched**

As shown in Figure 3, 105 out of 155 sample articles (67.74%) conducted researches on single country. Only 7 of them (4.52%) involved multiple countries. Therefore, more cross-countries researches are suggested to compare the differences between various cultures. The rest (43 articles (27.74%)) did not mention a particular country. Some of these articles discussed issues in a global perspective. For instance, Toyota had massive vehicle recalls globally since the end of 2009. Conceptual papers discussed the case in a global sense (Andrews et al., 2011; Heller & Darling, 2011, 2012; Kumar & Schmitz, 2011). Other general issues were examined irrespective of countries, include effective recall systems (Gibson, 2000a; Kumar, Dieveney, & Dieveney, 2009; Nawasaki et al., 2009; Piramuthu, Farahani, & Grunow, 2013; Wynn, Ouyang, ter Hofstede, & Fidge, 2011) and optimal recall time (Sezer & Haksöz, 2012).

Figure 3 shows that United States (65 articles (41.94%)) and China (16 articles (10.32%)) were the most popular countries, while other countries contributed less than 2.58% respectively. It is surprising that the large Japanese, European and Australian markets received little attention.

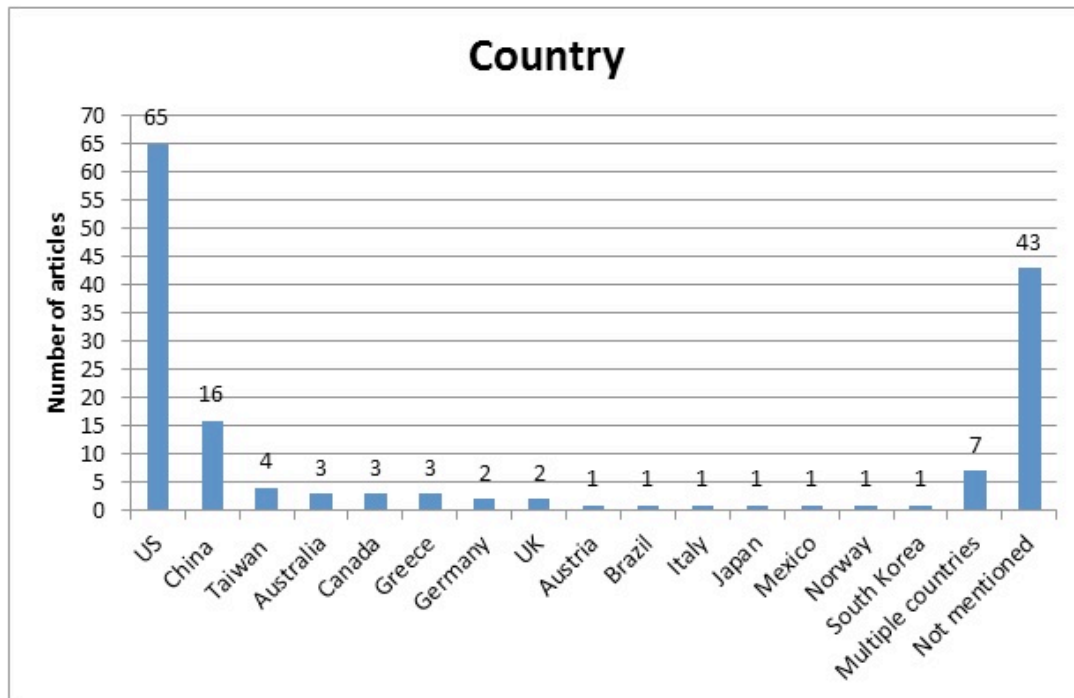


Figure 3. Article distribution by country researched

Figure 4 shows the distribution of the sub-sample of single-country researches (105 articles) by continent. The largest proportion (70 articles (66.67%)) is the Americas including the U.S. and Canada, while there are only a few works researched in Europe (10 articles (9.52%)) and Oceania (3 articles (2.86%)). More works are suggested to study on Japan, countries in Europe, and Oceania such as Australia and New Zealand.

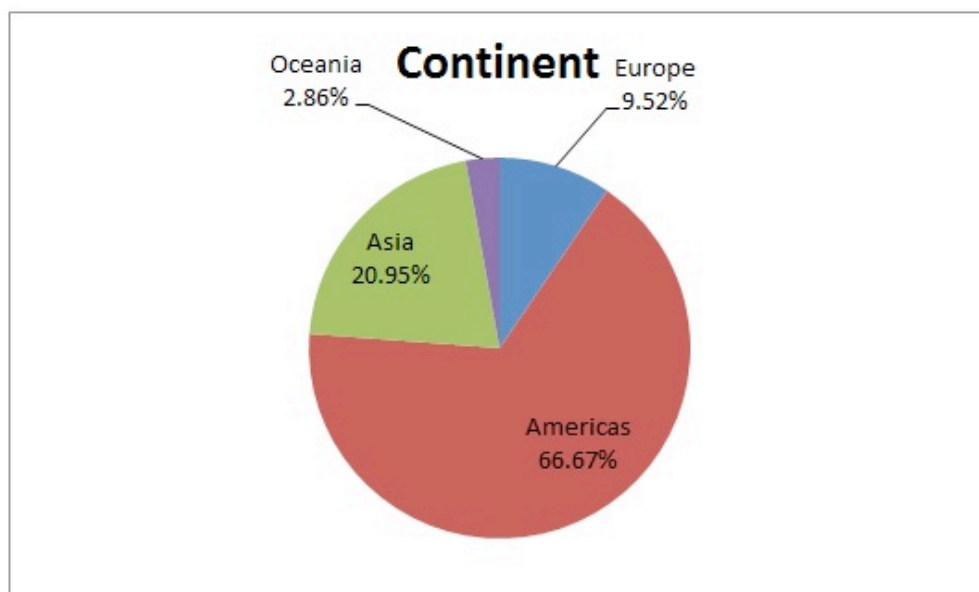
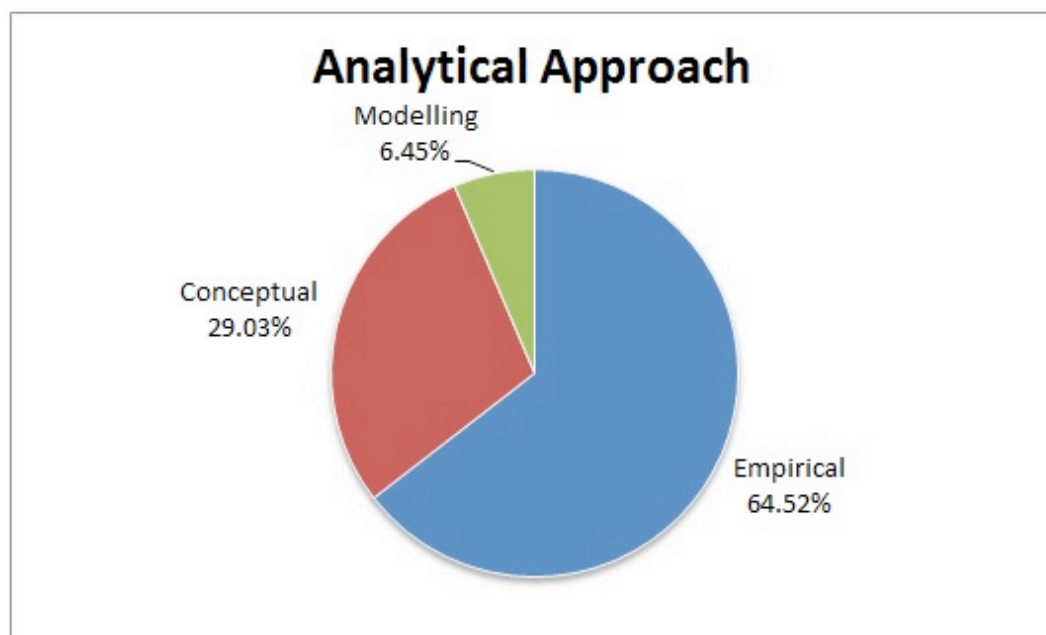


Figure 4. Article distribution by continent researched (single country researched)

## Distribution of Articles by Analytical Approaches

Figure 5 shows that the most frequently used analytical approaches are empirical studies (100 articles (64.52%)). The rest are articles do not present any empirical data. 45 articles (29.03%) are conceptual works and there are 10 mathematical modeling papers (6.45%).

The majority is empirical studies in our sample. A possible reason is the linkage between the crisis and stakeholders. Unlike internal crisis of a company, product harm is negative publicity to the public (Xie & Peng, 2009). Therefore, researchers focused on investigating suitable management concerning stakeholders, rather than developing models for internal optimisation. The focus of the reviewed empirical works is the suitability of different crisis response strategies in order to lessen the harm, and the effect of different moderators involved in product harm crisis. On the other hand, the focus of modeling papers is on developing mathematical models on supply chain management (Piramuthu et al., 2013; Tse & Tan, 2012), recall planning such as optimal recall time (Sezer & Haksöz, 2012) and calculation of direct recall cost (Marino, 1997; Velthuis, Meuwissen, & Huirne, 2009). Future research may consider developing more optimization models for internal management.



*Figure 5. Article distribution by analytical approach*

## Research Domain

This section presents our classification of research domains and the article distribution by research domain.

Our research domain classification is presented in Figure 6. It is based on the structure in the Situational Crisis Communication Theory (SCCT), which suggested a framework on crisis management and communication (Coombs, 2007b). SCCT serves

as one of the key theories in crisis management literature. Coombs (2004) explained that SCCT is evolved from a number of studies that examined how a crisis might shape the selection of crisis response strategies and examined the effect of crisis response strategies on organizational reputation e.g (Bradford & Garrett, 1995; Coombs & Schmidt, 2000; Coombs, 1999; Coombs & Holladay, 1996). It is recently developed and enhanced by researchers in the crisis management literature (Claeys, Cauberghe, & Vyncke, 2010; Coombs, 2004, 2007a, 2007b; Coombs & Holladay, 2002, 2008; Jeong, 2009; Sisco, Collins, & Zoch, 2010). Previous review paper also studied the application of the theory in the crisis management literature (Avery, Lariscy, Kim, & Hocke, 2010). Product harm crisis is within crisis management, SCCT thus helps to provide the classification of the key research domains in this review.

The first domain is “Responsibility in causing product harm crisis”. The SCCT identified crisis clusters based upon attributions of crisis responsibility (Coombs, 2007b). In product harm crisis, manufacturers are seen as direct defendants towards the crisis (Kumar & Schmitz, 2011; Luo, 2008). However, there are other parties accountable. Therefore, examining the responsibility in causing the crisis is one key domain.

The second domain is “Product harm crisis impact”. A crisis will create reputational threat, which is related to behavioral intentions such as purchase intention and support for an organization (Coombs, 2007b), which in turns affect the firm performance. These impacts are critical to companies. Thus, the impact of product harm crisis serves as another key domain.

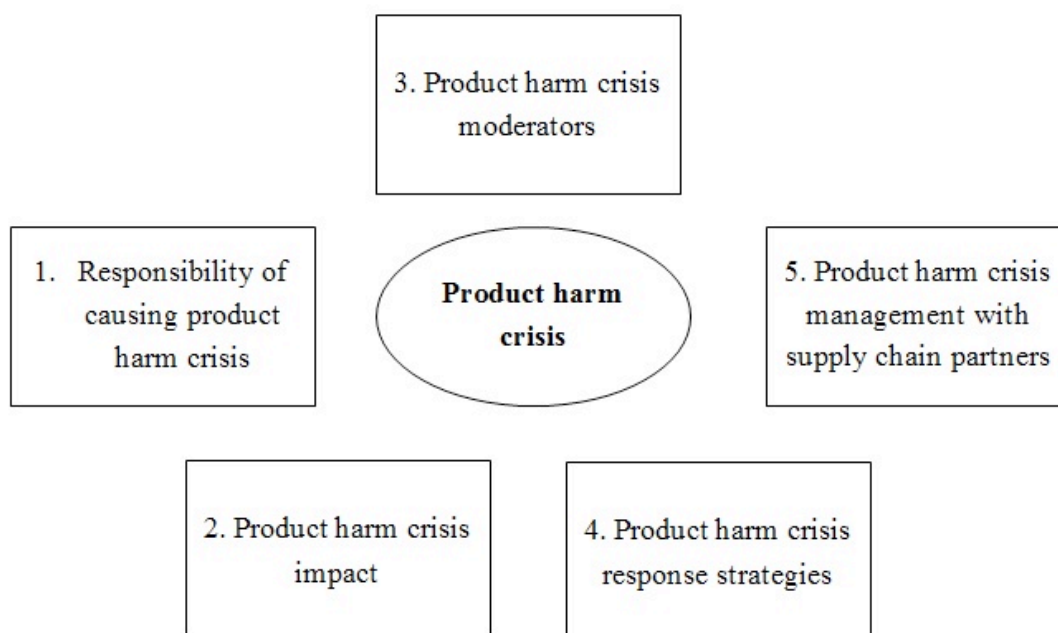
The third domain is “Product harm crisis moderators”. The SCCT suggested a number of factors affect the shaping of negative effects during a crisis, including the reputation, crisis history and crisis severity (Coombs, 2004). The model suggested moderators can affect the level of crisis impact level. Therefore, we classified the role of moderators in product harm crisis as one key domain.

The last domain identified from the SCCT is “Product harm crisis response strategy”, which is a key component in the SCCT. The post-crisis communication between companies and stakeholders are critical. SCCT aimed to develop guidelines to utilize crisis response strategies to reduce negative crisis impact (Coombs, 2007b). Therefore, discussion on different crisis response strategies choices is also an important domain.

The SCCT provides a basic structure to identify the key domains of product harm crisis management, as one kind of corporate crisis. In addition, we identified one more domain, “Product harm crisis management with supply chain partners”. Product recall is a reverse logistics activity that withdraws goods from consumers (Jayaraman, Patterson, & Rolland, 2003). Managing recalls after a product harm crisis is a part of the reverse supply chain, because it requires logistical planning to take the product back efficiently and effectively from consumers (Berman, 1999; Hora, Bapuji, & Roth, 2011). Product recalls interrupt the supply chain and affect the players across it. Traceability could help building trust and long-term relationships among supply chain partners and consumers to reduce recall cost (Kumar & Schmitz, 2011), so maintaining the traceability by cooperation between supply chain partners is essential.

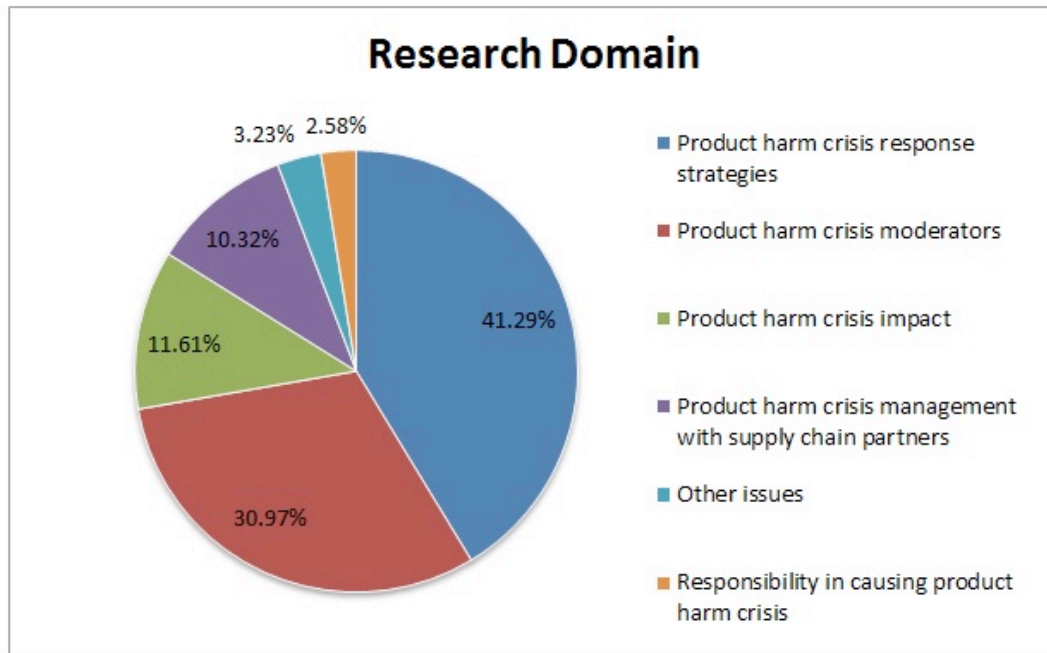


Therefore, how to manage well the crisis with supply chain partners is also a key domain.



*Figure 6. Research domains*

As shown in Figure 7, the largest domain in this review is “Product harm crisis response strategy” (64 articles (41.29%)), followed by 48 articles (30.97%) in “Product harm crisis moderators”, 18 articles (11.61%) in “Product harm crisis impact”, 16 articles (10.32%) in “Product harm crisis management with supply chain partners”, 5 articles (3.23%) on “Other issues” and 4 articles (2.58%) in “Responsibility in causing product harm crisis”. “Other issues” include an overview of food recalls and the hazard involved (Salin, Darmasena, Wong, & Luo, 2006), the difference between nature of recalls issued by government and manufacturers (Rupp & Taylor, 2002), business ethics issues in product recalls (Arce, 2005; Roman & Moore, 2012) and a review paper discussed on the role of theories the literature (Coombs, 2007a). Little attention had been paid to the causes of product harm crisis. We believe building a deeper understanding on the causes would be useful for effective prevention. A complete list of reviewed articles classified in different research domains is presented in Appendix A.



*Figure 7. Article distribution by research domain*

## Summary of Research Issues and Findings

This section presents a summary of key issues and findings in the classified research domains.

### Responsibility in Causing Product Harm Crisis

Only 4 articles (2.58%) focused on responsibility in this domain. Outsourcing to manufactures in low cost regions is a common strategy to save production cost but this can lead to quality control problem. Manufacturers in these regions are viewed as the main defendants on making defective products (Luo, 2008). Nonetheless, with globalization of the supply chains, questions towards the responsibility for such crisis have been raised. For example, Beamish and Bapuji (2008) indicated the main reason of toy recalls in 2007 were flaws in product designs which conducted in the toy companies headquarters, rather than poor manufacturing in Asian factories. Teagarden (2009) suggested the causes of defective products is poor manufacturing in China factories as well as U.S. retailers who pressured the suppliers for lower prices. Moreover, the question of responsibility had been raised for products which are components of another brand such as tires for vehicles (Noggle & Palmer, 2005). It is appeared that the responsibility towards product harm crisis not the sole responsibility of any party, more future works are needed to reveal the root causes and responsibility to assist the crisis prevention.

### Product Harm Crisis Impact

There are 18 articles (11.61%) belong to this domain. Researches generally found product harm crisis involve direct cost deriving from recall procedures (McDonald, 2009; Velthuis et al., 2009) and indirect cost, which is the negative impact including financial performance such as stock prices (Govindaraj & Jaggi, 2004), sales (Van

Heerde, Helsen, & Dekimpe, 2007), market share and penetration (Ma, Zhang, Li, & Wang, 2010); public attitude and buying behaviour such as purchase intention and demand (Marsh, Schroeder, & Mintert, 2004), brand loyalty (Eagle, Hawkins, Kitchen, & Rose, 2005), public attitudes (Piotrowski & Guyette, 2010) and brand image (Custance, Walley, & Jiang, 2012; Gao, Knight, Zhang, & Mather, 2013), despite some found the positive impact such as accident number was reduced by product recalls (Bae & Benítez-Silva, 2011, 2013). It is appeared that few works had been done on investigating the direct cost. More researches are needed as companies must handle the direct cost after a product harm crisis.

### **Product Harm Crisis Moderators**

There are 48 articles (30.97%) discussed on the moderators affect the crisis impact. This is the second largest domain. Other than the three factors suggested in SCCT (i.e., reputation, crisis history and crisis severity) (Coombs, 2007b; Coombs & Holladay, 2002), researchers also examined the effect of other moderators. Internal moderators include product type, firm characteristics, level of corporate social responsibility (CSR) and timing of recall. External moderators include external effect and consumer characteristics. Nine moderators will be discussed in this section.

#### **Moderators in SCCT - reputation.**

Reputation is a key moderator in SCCT. Researchers have different findings. Some found that higher reputed firms suffer less from a product harm crisis (Cleeren, Dekimpe, & Helsen, 2008; Dawar & Pillutla, 2000; Haas-Kotzegger & Schlegelmilch, 2013; Jung, 2011; Siomkos & Shrivastava, 1993; Siomkos, 1999; Siomkos & Kurzbard, 1994) while others revealed that higher reputed firms suffer more (Korkofingas & Ang, 2011; Rupp, 2004). The reputation effect depends on situations. Moowoon and Haunschild (2006) indicated the reputation effect depends on the uniqueness of products and organizational identity. Grunwald and Hempelmann (2010) found the reputation of high quality brands can help protecting manufacturers from receiving blame, but do not have positive effect on perceptions on problem severity. Lei, Dawar, and Gürhan-Canli (2012) found brands with positive prior reputation leads to less blame to the brand, but only when the crisis is considered similar to other crises in the same industry.

#### **Moderators in SCCT - crisis history.**

Crisis history is another key moderator in SCCT. Researchers found the absence of recall history causes companies suffer more. Wang, Salin, Hooker, and Leatham (2002) indicated an initial food recall is associated with reduced financial returns and higher volatility while repeated recalls are not associated with strong reactions. Rupp (2004) also observed the significant goodwill losses for the initial recall of an automobile model. On the other hand, Thirumalai and Sinha (2011) revealed the benefits of the presence of recall history. The likelihood of recalls decreases with the number of prior recalls, indicating the presence of learning of organizations. Seo, Jang, Miao, Almanza, and Behnke (2013) discovered that firms with a past history suffered less severe impacts on stock price compared to firms that had no prior safety incidents.

### **Moderators in SCCT - crisis severity.**

Crisis severity is also a key moderator in SCCT. Generally, researchers found the higher the severity of the crisis, the impact are more negative (De Matos & Rossi, 2007; Haas-Kotzegger & Schlegelmilch, 2013; Korkofingas & Ang, 2011; Laufer, Gillespie, McBride, & Gonzalez, 2005; Siomkos, Triantafillidou, Vassilikopoulou, & Tsiamis, 2010; Sun, Chen, & Wang, 2012; Thomsen & McKenzie, 2001). Vassilikopoulou, Lepetsos, Siomkos, and Chatzipanagiotou (2009) found the importance of several factors varies with the crisis severity level. Organizational response and time are the most important factors in medium-extent product harm crises, whereas social responsibility and external effects influence consumer purchase intentions most in severe crises.

### **Internal moderators - product type.**

The negative effect of product harm crisis depends on product type. Some products are found more vulnerable than the others. For example, food (Haas-Kotzegger & Schlegelmilch, 2013; Zhao, Li, & Flynn, 2013), drugs and toys (Chu, Lin, & Prather, 2005), automobile (Chen & Nguyen, 2013; Yeung & Ramasamy, 2012). In the automobile industry, particularly, Rupp (2004) found the type of defective components matters. For example, defective heater recalls are less costly while air bag recalls lead to larger equity losses. Yeung and Ramasamy (2012) also observed some products are more vulnerable when negative impact does not diminish over time, including automobiles, luxury goods and apparels while financial services, beverages and electrical appliances are less vulnerable.

Product types in terms of other nature and characteristics were also examined. For example, in terms of country of manufacture, Laufer, Gillespie, and Silvera (2009) suggested consumers view less favourably towards products manufactured in developing countries such as China. In terms of substitutability, Bunniran, McCaffrey III, Bentley, and Bouldin (2009) found substitute products appeared to be affected more in a product harm event.

### **Internal moderators - firm characteristics.**

Moderator effect of firm characteristics also provides some insights. For instance, firm size is a factor to influence the magnitude of the impact on stock price (Salin & Hooker, 2001; Seo et al., 2013). Salin and Hooker (2001) observed that stock prices fell immediately after recalls for smaller firms, but not necessary for larger firms. Moreover, Thirumalai and Sinha (2011) indicated that firms with a research and development focus have a higher likelihood of another recall. Zhao et al. (2013) found that Chinese companies suffered greater financial losses than their Western competitors.

### **Internal moderators - level of corporate social responsibility (CSR).**

CSR is the perceived “societal obligation” of an organization (Brown & Dacin, 1997). Examples are environmental conservation, employee support and fair consumer treatment. Researchers found the crisis impact depends on CSR level. High CSR level can moderate the negative impact (Assiouras, Ozgen, & Skourtis, 2013; Jung, 2011;

Kong, 2012; Minor & Morgan, 2011; Vassilikopoulou, Siomkos, Chatzipanagiotou, & Pantouvakis, 2009) and low CSR level firms suffered more (Lin, Chen, Chiu, & Lee, 2011; Siomkos et al., 2010). However, some scholars suggested CSR is more effective in some aspects. For example, Klein and Dawar (2004) found CSR can moderate the crisis impact on consumers' brand evaluations only for CSR-sensitive-consumers.

### **Internal moderators - timing of recall.**

Time serves as a moderator in product harm crisis. Magno (2012) revealed the longer the time taken to start the recall after primary signals of potential injuries, the more negative is the post-recall brand attitude. This suggests firms should immediate recall defective products as earlier as possible. However, Gao, Knight, Zhang, Mather, and Tan (2012) discovered the "early information" effect in consumer blame in a multi-brand product harm crisis that the first accused brand get more harm than late-reported ones.

### **External moderators - external effect.**

Researchers examined how the external parties such as the press and government agencies affect the product harm crisis impact. Positive external effect refers to external parties hold positive attitude towards the troubled company such as reporting its social responsible act during the crisis (Siomkos & Kurzbard, 1994). Positive external effect helps positive changes of consumer attitude (Siomkos & Shrivastava, 1993; Siomkos, 1999; Siomkos & Kurzbard, 1994; Wei, Lo, & Lu, 2010). Conversely, negative external effect causes more negative consumer attitude towards the company (Sun et al., 2012; Yannopoulou, Koronis, & Elliott, 2010). Moreover, extensive news coverage was found to increase the harm by the crisis and caused the companies suffer more (Feng, Keller, Wang, & Wang, 2010; Seo et al., 2013).

### **External moderators - consumer characteristics.**

Researchers indicated demographic characteristics of consumers such as age and gender affect the extent of attitude changes towards the companies. Laufer and Gillespie (2004) found women blame a company more than men for a product harm crisis because they feel more personally vulnerable. Older customers tend to blame the company less (Laufer, Silvera, & Meyer, 2005; Silvera, Meyer, & Laufer, 2012).

Other consumer characteristics were also examined in the literature. While Siomkos, Rao, and Narayanan (2001) indicated there was not a strong difference in changes of pre-crisis and post-crisis attitude between positively and negatively oriented individuals, other consumer characteristics were observed to affect the extent of product harm crisis impact. Dawar and Lei (2009) revealed that consumers with lower brand familiarity are more sensitive and vulnerable to crisis information while consumers with prior crisis experience and product knowledge are less affected (Haas-Kotzegger & Schlegelmilch, 2013).

Moderators appeared to be complex towards the impact of product harm crisis, except some are straight forward: crisis history: it is beneficial to have prior recall history; crisis severity: the more severity of the crisis, the more negative impact it is; CSR

level: higher CSR level lessens the negative impact; external effect: positive attitude from external parties leads to positive impact and vice versa. More works are suggested to explore on internal moderators, because companies could control it to a large extent, and consumer characteristics because such crisis is directly related to end customers.

### **Product Harm Crisis Response Strategies**

There are 64 articles (41.29%) focused on response strategies to tackle product harm crisis. This is the largest domain. Researchers discussed on planning and choosing appropriate response, including crisis response strategy type, communication channel and style.

#### **Accommodative and defensive strategies.**

Marcus and Goodman (1991) divided crisis responses into either accommodative or defensive. Accommodative strategies include proactive actions that accept responsibility, such as remedial action, whereas defensive strategies are passive actions that try to evade from taking crisis responsibility such as denial.

Generally, accommodative strategies are more effective than defensive ones. Accommodative responses are found to lead to higher trust level and future purchase intention from customers and organizational learning level while defensive strategy indicated reputational damage (De Blasio & Veale, 2009; Haunschild & Rhee, 2004; Madera & Smith, 2009; Souiden & Pons, 2009).

Typical cases in certain industries show the success of adopting accommodative strategies and failure from adopting defensive ones. For example, the cases of Toyota vehicle recalls and Ford and Firestone tire recalls showed the companies tried to minimize the responsibility by slow, passive responses (Gibson, 2000b; Heller & Darling, 2011, 2012) and putting blame on other companies (O'Rourke, 2001) resulted in failure. Other examples are, Coca-Cola denied responsibility led to government bans (Tsang, 2000); Snow Milk Products' prompt response, published apologies and investigated production processes led to success in its 1955 contamination crisis whereas it refused to issue a recall in its 2000 crisis resulted in severe damage (Wrigley, Ota, & Kikuchi, 2006). Some studies compared the cases of adopting accommodative and defensive strategies by different companies. For instance, Hargis and Watt (2010) indicated Johnson and Johnson proactively assumed its responsibility for the defective products even it had no responsibility for the crisis. This helped the company to recover sales quickly. However, in Bausch & Lomb's case, the slow and passive response intensified the damage. Venugopal, Soni, Tiwari, and Gupta (2012) suggested that Dell's proactive actions such as closely followed the investigation helped to improve brand image successfully while Toyota recalled products passively led to reputation and sales loss. Moreover, a leadership of accommodative strategies is also important. The honesty and compassion of the CEO was found to be able to rescue company from potential failure and earn trust from consumers in food product harm crises (Charlebois, 2011; Stanwick & Stanwick, 2012).

On the other hand, some researchers found defensive strategies could be advantageous. Chen, Ganesan, and Liu (2009) observed that proactive recall strategies that recall products before any safety incidents have a more negative effect on firm value than passive ones. Moreover, defensive strategy is found to lead to higher perceptions of the organization-public relationships and corporate social responsibility (Haigh & Brubaker, 2010). It is tend to be effective for crises in which organizational responsibility is not obvious and the organization's reputation is low (Dardis & Haigh, 2009).

### **Marketing and public relations strategies.**

Researchers also investigated into marketing and public relations strategies such as marketing campaigns. Carroll (2009) revealed that companies can potentially withstand a product harm crisis without following traditional accommodative strategies. The study examined a food contamination case of Cadbury Schweppes. Although there are severe damage such as damage to reputation, lost sales and financial penalties, launching an effective marketing communications campaign restored consumer confidence and normalized the demand. Shah and Chen (2010) noted that consumers consider public relations actions more credible than advertising in building a good image in a product harm crisis while Piotrowski and Gray (2010) indicated that marketing and public relations strategies failed in Toyota's case. Pranav (2011) found that public relations campaigns can create attitudinal or behavioural compliance. Future research may analyse the success factors in these strategies as previous findings are mixed.

### **Public communication strategies.**

Strategies in communication with the public during product harm crisis are examined. For instance, making use of multi-channels such as press releases, direct mail, display ads and flyers are found positive influence when handling a product harm crisis (Gibson, 1997; Wang & Lu, 2010). Cyber recall system and communication tactics are also suggested to assist the effectiveness of recall, but speed and automation are the keys to be improved (Gibson, 2000a; Nawasaki et al., 2009).

The communication style and elements of recall message to the public are also investigated. However, the communication style tends not to be critical. For instance, the degree of danger of the defective product is unrelated to the advice style given to consumers (Gurau & Serban, 2005). Moreover, showing victim visuals do not significantly affect perceptions and reactions to the crisis situation (Coombs & Holladay, 2011).

From the reviewed articles, it is appeared that traditional accommodative strategies may not always be the best way to handle product harm crisis, and companies may use different strategies simultaneously. More future works are needed on the mixture usage of both accommodative and defensive strategies. Also, relatively little research has been conducted into other strategies such as marketing and public communication style. There is a need to analyse the success factors in these strategies as previous findings are mixed. Unlike other domains such as crisis impact and moderators, response strategies are elements that companies could largely control. Therefore, future research may consider focus on this issue.

## **Product Harm Crisis Management with Supply Chain Partners**

There are 16 articles (10.32%) in this domain. Product harm crisis become complex when more supply chain members are involved, especially for globalized supply chain. Researchers discussed on the challenges in product recall supply chains (Donnelly, Karlsen, & Dreyer, 2012; Kinsey, Seltzer, Ma, & Rush, 2011; Lyles et al., 2008; Marucheck, Greis, Mena, & Cai, 2011; Tse et al., 2011) and made suggestions on effective recall management. For example, the usage of technologies and systems were investigated. Radio-frequency identification technology is beneficial to enhance the traceability between different supply chain partners in a product recall (Kumar & Budin, 2006; Kumar et al., 2009; Piramuthu et al., 2013). Moreover, frameworks and models for supply chain partners coordination were developed. For example, agreements between supply chain members such as recall cost sharing contract types were compared. It is noted that for both contracts, using root cause analysis is more beneficial than a contract which shares the total recall cost between the parties (Chao et al., 2009). Also, traceability optimization models and workflow-based coordination frameworks between supply chain partners have been developed (Wang, Li, & O'Brien, 2009; Wynn et al., 2011). In addition, for supplier evaluation and selection processes, that are the processes important to the risk of future product harm crisis, margin incremental analysis approach is suggested (Tse & Tan, 2011, 2012).

Effective product harm crisis management involves maintaining good traceability throughout the supply chain. Researchers investigated ways to manage the crisis well with supply chain partners including technologies and different frameworks for supply chain partners coordination. We believe more works on examining various ways to maintain traceability could give insights for different supply chain players.

## **Conclusion and Limitations**

This article reviews 155 articles in the product harm crisis literature and identifies five research domains. Through the article distribution and the summarization of key findings, research trend is analyzed and future research directions are proposed.

There are several limitations. Firstly, only the journals in the particular searched databases were included. However, we believe searching in five databases made this review comprehensive. Secondly, there is a possible limitation due to the time period. Including articles earlier before our review period may make the review more comprehensive. However, we believe a recent coverage would be more appropriate as product recall regulations are changing from time to time.



Appendix A. Complete list of sample articles by research domains

Research domain	Sample articles
1. Responsibility in causing product harm crisis	Beamish and Bapuji (2008); Noggle and Palmer (2005); Teagarden (2009); Luo (2008)
2. Product harm crisis impact	Bae and Benítez-Silva (2011); Bae and Benítez-Silva (2013); Ma et al. (2010); Choi and Lin (2009a); Piotrowski and Guyette (2010); Custance et al. (2012); Dawar (1998); Eagle, Hawkins, et al. (2005); Gao et al. (2013); Govindaraj and Jaggi (2004); Maggini et al. (2004); Marino (1997); Marsh et al. (2004); McDonald (2009); Van Heerde et al. (2007); Velthuis et al. (2009); Xi and Peng (2010); Zhao, Zhao, and Helsen (2011)

3. Product harm crisis moderators	<p>Assiouras et al. (2013); Bunniran et al. (2009); Chu et al. (2005); Cleeren et al. (2008); Dawar and Pillutla (2000); Dawar and Lei (2009); De Matos and Rossi (2007); Gao et al. (2012); Grunwald and Hempelmarm (2010); Haas-Kotzegger and Schlegelmilch (2013); Jung (2011); Kalaignanam, Kushwaha, and Eilert (2013); Klein and Dawar (2004); Kong (2012); Korkofingas and Ang (2011); Laufer and Gillespie (2004); Laufer, Gillespie, et al. (2005); Laufer, Silvera, et al. (2005); Laufer et al. (2009); Lei et al. (2012); Lin et al. (2011); Magno (2012); Minor and Morgan (2011); Moowoon and Haunschild (2006); Sun et al. (2012); Rhee (2009); Rupp (2004); Salin and Hooker (2001); Seo et al. (2013); Silvera et al. (2012); Siomkos (1999); Siomkos and Kurzbard (1994); Siomkos and Shrivastava (1993); Siomkos et al. (2001); Siomkos et al. (2010); Thirumalai and Sinha (2011); Thomsen and McKenzie (2001); Feng et al. (2010); Vassilikopoulou, Lepetsos, et al. (2009); Vassilikopoulou, Siomkos, et al. (2009); Vassilikopoulou, Chatzipanagiotou, Siomkos, and Triantafillidou (2011); Wang et al. (2002); Wei et al. (2010); Yannopoulou et al. (2010); Chen and Nguyen (2013); Ye, Zhao, Prahinski, and Li (2013); Yeung and Ramasamy (2012); Zhao et al. (2013)</p>
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<p>4. Product harm crisis response strategies</p>	<p>Andrews et al. (2011); Bauman (2011); Berman (1999); Byrd (2012); Carroll (2009); Charlebois (2011); Chen et al. (2009); Choi and Chung (2013); Choi and Lin (2009b); Cleeren, van Heerde, and Dekimpe (2013); Coombs and Holladay (2011); Dardis and Haigh (2009); De Blasio and Veale (2009); Eagle, Rose, Kitchen, and Hawkins (2005); Felcher (2003); Freitag (2002); Gibson (1995); Gibson (1997); Gibson (2000a); Gibson (2000b); Gurau and Serban (2005); Haigh and Brubaker (2010); Hargis and Watt (2010); Haunschild and Rhee (2004); Heller and Darling (2011); Heller and Darling (2012); Jacobs (1996); Joel (2011); Koronis and Ponis (2012); Kramer, Coto, and Weidner (2005); Laestadius, Lagasse, Smith, and Neff (2012); Laufer and Coombs (2006); Laufer and Jung (2010); Li and Tang (2009); Liu, Kerr, and Hobbs (2009); Madera and Smith (2009); Martinelli and Briggs (1998); Miller and Littlefield (2010); Millner, Veil, and Sellnow (2011); Moll (2003); Shah and Chen (2010); Nawasaki et al. (2009); Olaniran, Scholl, Williams, and Boyer (2012); O'Rourke (2001); O'Rourke (2006); Peijuan, Ting, and Pang (2009); Peng and Chen (2011); Piotrowski and Gray (2010); Pranav (2011); Rubel, Naik, and Srinivasan (2011); Sezer and Haksöz (2012); Shehane, Huan, and Ali (2010); Souiden and Pons (2009); Standop and Grunwald (2009); Stanwick and Stanwick (2012); Taneja, Pryor, and Sewell (2012); Tsang (2000); Uzumeri and Snyder (1996); Venugopal et al. (2012); Wang and Lu (2010); Wasserman and Dure (2008); Shang and Hooker (2005); Wrigley et al. (2006); Zavyalova, Pfarrer, Reger, and Shapiro (2012)</p>
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<p>5. Product harm crisis management with supply chain partners</p>	<p>Chao et al. (2009); Donnelly et al. (2012); Hora et al. (2011); Kinsey et al. (2011); Kumar and Budin (2006); Kumar et al. (2009); Kumar and Schmitz (2011); Lyles et al. (2008); Marucheck et al. (2011); Piramuthu et al. (2013); Tse and Tan (2011); Tse and Tan (2012); Tse et al. (2011); Wadhwa and Lien (2013); Wang et al. (2009); Wynn et al. (2011)</p>
<p>Other issues</p>	<p>Coombs (2007a); Arce (2005); Roman and Moore (2012); Rupp and Taylor (2002); Salin et al. (2006)</p>

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